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Non-pharmacological treatments for stuttering in children and adults: a systematic review and evaluation of effectiveness, and exploration of barriers to successful outcomes.

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ABSTRACT (477 words)

Background: Despite many years of research there is no certainty regarding the cause of stuttering. While numerous interventions have been developed, a broad based systematic review across all forms of intervention for adults and children was needed including views and perceptions of people who stutter.

Objective: The aims of the study were to report the clinical effectiveness of interventions for people who stutter (or clutter); and to examine evidence regarding the views of people who stutter and professionals regarding interventions.

Data sources: The following electronic databases were searched: (1) MEDLINE, (2) EMBASE; (3) The Cochrane Library (including The Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, Database of Abstracts of Reviews of Effects, Health Technology Assessment Database and NHS Economic Evaluations Database); (4) PscyINFO; (5) Science Citation Index; (6) Social Science Citation Index; (7) CINAHL; (8) ASSIA; (9) Linguistics and Language Behavior Abstracts (LLBA); (10) Sociological Abstracts; (11) and the EPPI Centre. Reference lists of included papers and other reviews were screened and also key journals in the subject area were hand searched.

Review methods: A systematic review of quantitative and qualitative literature was carried out between August 2013 and April 2014. The searches aimed to identify firstly, evidence of effectiveness in populations of pre-school children, school aged children and adolescents, and adults; and secondly, data relating to perceptions of barriers and facilitators to intervention effectiveness amongst staff and people who stutter. A meta-synthesis of the two linked elements via development of a conceptual model was also carried out to provide further interpretation of the review findings.

Results: Systematic search of the literature identified a large number of potentially relevant studies. Of these, 111 studies examining the effectiveness of interventions, 25 qualitative papers and one mixed method paper met the criteria for inclusion in this review. Review of the effectiveness literature indicated evidence of positive outcomes across all types of interventions. Virtually all evidence we identified reported at least some positive effect for some participants. There was however evidence of considerable individual variation in outcome for study participants. The qualitative literature highlighted the need for programmes to be tailored to individual need with variation at the level of the intervention, the individual and interpersonal/social elements. Meta-synthesis of the data highlighted the complexity of elements that need to be considered in evaluation of long term impacts following stuttering interventions.

Conclusions: The evidence we identified, although much of it is from studies at risk of bias, indicates that most available interventions for stuttering may be of benefit to at least some people who stutter. There is a requirement for greater clarity in regard to what the core outcomes following stuttering intervention should be, and also enhanced understanding of the process whereby interventions effect change. Further analysis of those for whom interventions have not produced a significant benefit may provide additional insights into the complex intervention-outcomes pathway.

Key words: Stuttering; stammering; nonfluency; therapy; cluttering; dysfluency

Study registration: The protocol was registered with the PROSPERO database number CRD42013004861.

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GLOSSARY

Articulation The mechanism for producing speech sounds

Cluttering A fluency disorder characterised by a rapid and/or irregular speaking rate, excessive dysfluencies, disordered stress and pausing during speaking. It may co-exist with language or phonological errors and attention deficits. Cluttering is a different fluency disorder from stuttering however it may occur alongside stuttering.

Developmental stuttering Dysfluency of speech which has been present since childhood, this is distinguished from acquired stuttering which appears later in life.

Effect size A way of measuring the size of the difference between two groups. An effect size of 0 indicates that two groups are the same. The convention for rating effect sizes is: a "small" effect size is .20, a "medium" effect size is .50, and a "large" effect size is .80.

P value Probability value – the strength of evidence supporting that assumption that any difference found between groups is not the result of chance. A smaller p value provides stronger evidence that the difference is not due to chance. The convention is to use levels of significance of $p<0.05$ and $p<0.01$.

Stutter Dysfluency of speech which may be characterised by repetition of the initial sound of words, repetition of whole words, "getting stuck" and being unable to say a word, or avoiding certain words or situations because of a fear of stuttering.

Stammer The usual term in the United Kingdom for a stutter.

Speech and Language Pathologist A clinician who has completed an accredited training programme and specialises in treating people with communication difficulties.

Speech and Language Therapist The term for a Speech and Language Pathologist in the UK.

LIST OF ABBREVIATIONS

%SD	Percentage of syllables that are dysfluent
%SS	Percentage of syllables that are stuttered
%WPWR	Percentage of word and part-word repetitions
AAF	Altered auditory feedback
ACT	Acceptance and Commitment Therapy
ANCOVA	Analysis of co-variance
ANOVA	Analysis of variance
AWS	Adults with a stutter/stammer
CBT	Cognitive Behaviour Therapy
CI	Confidence interval
DAF	Delayed auditory feedback
DCM	Demands and Capacities Model
DVD	Digital video disc
ELU	Extended length of utterance
EMG	Electromyography
ES	Effect size
F	Female
FAF	Frequency altered feedback
FU	Follow up
GILCU	Gradual increase in length and complexity of an utterance
HBSS	Home based smooth speech
ISS	Intensive smooth speech
LOCB	Locus of control of behaviour
LP	Lidcombe Program
M	Male
MLU	Mean length of utterance
MPI	Modified phonation intervals
NAT	Speech naturalness
NZ	New Zealand
OASES	Overall Assessment of the Speaker's Experience of Stuttering Questionnaire

OECD	Organisation for Economic Co-operation and Development
OR	Odds ratio
PS	Prolonged speech
PSI	Perceptions of Stuttering Inventory
PWS	People who stammer
RCT	Randomised controlled trial
S24	Revised Communication Attitude Inventory (S24)
SD	Standard deviation
SESAS	Self-efficacy scaling by adult stutterers
SIFT	Semi-intensive fluency therapy
SITO	Self-imposed time out
SLP	Speech-language pathology/pathologist
SLT	Speech and language therapist
SMT	Speech motor training
SPM	Syllables per minute
SSI	Stuttering Severity Index
SSM	Syllables stuttered per minute
STS	Syllable timed speech
SWM	Stuttered words per minute
UK	United Kingdom
USA/US	United States of America
VSM	Video self-modelling
WASSP	Wright & Ayre Stuttering Self-Rating Profile
WPM	Words per minute
WSM	Words spoken per minute

SCIENTIFIC SUMMARY

Background

Treatments for stuttering (which is more often known as stammering in the United Kingdom [UK]) have been available for children and adults since the 1950s. These treatments have encompassed diverse techniques from the use of carbon dioxide, or pharmacological interventions, to those that are non-pharmacological and behavioural or cognitive-based. While there has been a considerable growth in the range of interventions available to people who stutter, much of the review evidence to date has evaluated only behavioural programmes. There has been less examination of treatments which use outcome measures other than stuttering frequency.

The growing range of available treatment options for children and adults who stutter presents a challenge for clinicians, service managers and commissioners, who need to have access to the best available treatment evidence to guide them in providing the most appropriate interventions. While a number of reviews of interventions for specific populations or a specific type of intervention have been carried out, a broad based systematic review across all forms of intervention for adults and children was needed to provide evidence to underpin future guidelines, inform the implementation of effective treatments, and identify future research priorities. The development of systematic review methods provides the opportunity for investigating not only the effectiveness of interventions reported via a wider range of study designs, but also to use qualitative evidence to provide better understanding of why interventions may or may not lead to successful long term outcomes.

Aims and objectives

The aims of this study were: to systematically identify, appraise and synthesise the international evidence on interventions to treat stuttering (and cluttering) in pre-school children, school aged and adolescent children, and adults; and to determine how applicable this evidence might be to the UK context including identifying patient and staff perceptions of potential obstacles to successful outcomes following intervention.

Methods

Systematic review of the literature relating to the effectiveness of interventions for stuttering and views and perceptions regarding interventions for stuttering was carried out. The population under consideration was children, adolescents and adults who have a stutter/stammer. Any intervention which was described as being a treatment for stuttering/stammering which is non-pharmacological and delivered in any setting, by any agent was within the scope of the work. Studies reporting any outcome relating to an effect on stuttering or the emotional wellbeing of people who stutter were eligible for inclusion.

Comprehensive literature searches were undertaken in August 2013 to April 2014 to retrieve studies which met the review inclusion criteria. Searches were not limited by language or location, but were restricted by date to studies published from 1990 onwards. Methods for identification of relevant studies included electronic database searching, reference list checking, citation searching and hand searching of key journals.

Data were extracted by two reviewers using a data extraction form devised for the purpose. Extracted data were checked by the team and disagreement resolved by discussion. Appraisal of study quality was performed using tools based on established criteria for considering risk of bias, with a separate tool for the intervention studies and the qualitative papers.

Results are presented via narrative synthesis of the effectiveness studies, thematic synthesis of the qualitative data, and by a meta-synthesis of the two review components in the form of a conceptual diagram which illustrates elements of the pathway from interventions to long term impact described in the literature. Meta-analysis of intervention effectiveness across the body of literature was not possible due to heterogeneity of intervention content and outcome measurement.

Results

This wide-ranging review of the literature on interventions for people who stutter identified a sizeable body of work and included 137 papers in the evidence synthesis (111 papers contributed evidence to the review of effectiveness, 25 were qualitative studies, and one mixed method paper contributed to both reviews). The review identified seven typologies of intervention studies and found evidence of effectiveness across the range of intervention types. Virtually all the work reported at least some positive outcome for most participants. There was evidence from all types of intervention that effects could be maintained following intervention (although this was weakest in regard to feedback and technology interventions). The review classified around one third of the included work as providing stronger evidence that these health technologies are able to produce positive outcomes, however around two thirds of studies were considered to be at higher risk of bias.

The individual variability in response however was notable, with little evidence that any intervention would be successful for all who received it. In the generally positive reporting of study findings there was in many cases a sizeable number who did not achieve benefit, and in the lower quality studies the potential for participants reported to differ from those not recruited and/or reported cannot be ruled out. In relation to interventions for children who stutter, the natural recovery rate remains an issue for demonstrating levels of effectiveness, with research (while suggesting possible predictors) is unable to differentiate with absolute certainty those individuals who will spontaneously recover from those who will have long term stuttering requiring intervention.

The comparison of stuttering interventions with each other is adversely impacted by variation in systems of measurement, and variation in intervention contact hours. There is little available research which compares the effectiveness of different interventions and thus a very limited pool of evidence for clinicians to draw on in selecting an optimal intervention, and also for PWS to use in order to make an informed choice. The qualitative literature suggested that important elements of successful interventions were: attending to emotional and psychological needs; tailoring interventions to client needs; including maintenance sessions; therapists being client-centred; and having external support networks.

Currently, core outcomes for stuttering have not been established and studies that we identified used a range of outcomes including clinician-measured counts, independent listener counts, and rating by the PWS. The challenge in establishing what a “good outcome” following intervention should be is a key issue for the field. While a sizeable body of studies included in this review reported effectiveness in terms of percentage reduction in dysfluency, it is debateable how significant a reduction of for example 2-3 syllables per 100 syllables might be for the everyday functioning of a PWS. While there is some evidence of increasing involvement of PWS in the determination of outcomes, the field remains dominated by measures of overt stuttering behaviours, in particular the percentage of syllables that are stuttered. The qualitative literature highlighted the different views of people who stutter regarding their stutter, and their differing needs at different stages of the life course, with reduction in overt stuttering being only one aspect. Further understanding regarding how and to what degree intervention outcomes relate to the everyday lives of PWS is needed. Few of the interventions considered any potential adverse impact.

This systematic review did not include consideration of the economic aspects of these health technologies. If questions regarding the cost effectiveness of interventions for stuttering are to be investigated, further understanding of the short and long term outcomes is needed. The conceptual model that we developed which summarises the pathway from interventions to impacts highlights both the complexity of outcome measurement and the need for greater understanding regarding how and why these interventions may lead to positive impacts.

Limitations

The review findings are based on data from a substantial number of published studies, and considered both quantitative and qualitative evidence. We had hoped to include evidence from studies of professional views, however we were unable to identify any qualitative papers exploring professional perceptions that met our inclusion criteria. The work included a range of study designs encompassing both controlled and non-comparator studies. The body of work reporting single cases and multiple case studies was however excluded, together with surveys. While case studies are able to contribute potentially useful data, their inherent propensity for bias, limited generalisability, and the availability of a large volume of higher quality designs underpinned our decision to exclude them from this review. The body of work that we included encompassed both studies that we categorised as being at higher risk of bias, and those at lower risk. We considered whether to use quality criterion as a basis for rejection, however this would have precluded analysis and reporting of a large quantity of literature and we intended to produce a comprehensive “state of the art” review of the area. However in reporting of the results we have detailed and fully considered the quality of study design.

We had intended to carry out a meta-analysis of the effectiveness data however the heterogeneous nature of the literature and variability in outcome reporting meant that a narrative synthesis was most appropriate. In addition the lack of mixed method designs and qualitative papers which described specific interventions precluded our planned meta-synthesis approach which juxtaposes quantitative and qualitative results. Instead we used the two sets of data to develop a conceptual model which sets out components of the pathway from interventions to impacts, and which we believe provides a useful tool to aid understanding of the review findings.

Conclusions

The review indicates that a variety of interventions can produce positive outcomes for people who stutter. The evidence does not permit identification of programmes which are more effective versus those that are less effective with all intervention types seeming able to lead to some benefit for some participants. The heterogeneity in outcomes measures and limited quality of the interventions meant that we were only able to compare intervention efficacy at a narrative level. We were unable to demonstrate any clear dose-response relationship, meaning that currently interventions with many hours of contact did not seem to offer substantially different outcomes to those with fewer, with variation in outcomes at the level of the individual rather than the intervention. The qualitative literature provides insight in to factors that are perceived to facilitate successful outcomes, these include: ensuring that interventions encompass emotional/psychological/social aspects; incorporating “real world” elements; having follow up sessions; and interacting with other people who stutter. This literature highlighted factors that may lead to variation in outcome relating to the individual, the intervention and interpersonal/social processes.

Recommendations for research

1. The field has a large body of small sample baseline-follow up investigations suggesting that alternative study designs are required in the future such as research comparing interventions. Around two thirds of the intervention studies were classified as being at potential higher risk of bias with more robust study designs needed.

2. There seems to be a research gap around aspects of process evaluation such as intervention fidelity; practitioner specific effects, acceptability, and feasibility. Little of the literature included consideration of resource and training implications of interventions – information that is needed in order to inform commissioning as well as clinical decisions.

3. While the literature currently has a tendency for focusing on demonstrating that a particular intervention is effective, the evidence base suggests a need instead to explain how and why therapy works, and in particular a need to further investigate individual variation in response. The use of more mixed method research could help to address these evidence gaps by exploring in depth participant experiences and factors underpinning outcomes.

4. The measurement of outcomes in the field is a considerable obstacle to the evaluation of effectiveness. While different studies continue to use varied measures of stuttering,

comparison between them remains challenging. While measures of overt stuttering behaviours continue to dominate evaluation, the establishment of core outcomes which are of importance and relevance to people who stutter seems to be an urgent priority.

5. A gap in the qualitative literature concerns the views of children receiving therapy. While the issues relating to young people taking part in research are not insubstantial, a reliance on retrospective recall of adults regarding their childhood means that views will inevitably be of historic approaches and potentially affected by later experiences.

6. Another recommendation for future studies concerns the recruitment of less heterogeneous participants. While it is recognised that investigators have a limited pool to recruit from, many studies had variation in baseline characteristics of participants which adds to the challenge of investigating why and for whom interventions are most successful.

7. An element described as facilitating successful outcomes for PWS was a client-centred approach and an individually tailored intervention. This is at odds with some of the programmes evaluated in the included literature which offer a carefully structured and planned product. If "real world" interventions in clinical practice are bespoke and tailored for each individual client drawing on a variety of approaches and techniques, research should ensure that studies that are able to contribute evidence that is applicable to practice.

8. We were able to identify only one study which specifically reported participants who were cluttering. Research on interventions for this disorder seems to be very underdeveloped.

9. A further gap concerns the lack of qualitative studies regarding professional views and experiences of interventions.

Funding

Funding for this study was provided by the Health Technology Assessment Programme of the National Institute for Health Research.

2158 words

PLAIN ENGLISH SUMMARY (241 words)

There are a wide range of treatments that are available for people who have a stutter. It can be difficult to know which treatments should be provided in the NHS, and also to know which treatments might work best for particular individuals. In this research we looked at the results of studies that have been carried out by researchers in different countries around the world. We wanted to find out how well treatments work and what people who stutter or their families think about the treatments.

We analysed 137 published papers in detail, and categorised seven different types of papers describing treatments. Almost all the papers assessing these treatments found benefit from them for some people who stutter. The researchers however frequently described a great deal of difference in results for people who had received the same therapy.

Our research concluded that many different types of treatments can produce benefits for people who stutter. It was not possible to recommend any particular programmes which are more effective versus those that are less effective. All the various types seem to have some benefit for some participants however not for others. When asked their views about therapy, people who stutter and their relatives emphasise how their needs can change at different stages of life. They describe more helpful interventions as often including the following things: emotional/psychological/social aspects in the therapy; “real world” practice; having follow-up sessions; and talking to other people who stutter.

CHAPTER 1 INTRODUCTION

Stuttering is a complex disorder which may encompass social and emotional elements. It may comprise overt stuttering behaviours which may be apparent to a listener (such as the repetition of the beginning sound of a word or blocking where a word appears to get stuck whilst being articulated). Stuttering also may encompass covert behaviours which may be undetectable to a listener, such as avoidance of particular words or situations. Despite many years of research there is no certainty regarding the cause of stuttering, although differences in brain structure and functioning in PWS have been identified. Over time, those who stutter often develop a salient fear of speaking that becomes a deep-rooted obstacle impeding a person's social and vocational opportunities.[1]

Treatments for stuttering (which is more often known as stammering in the United Kingdom [UK]) have been available for children and adults since the 1950's. These treatments have encompassed diverse techniques from the use of carbon dioxide, or pharmacological interventions, to those that are behaviourally-based. Recent interventions have begun to place a growing emphasis on negative cognitions, and related anxiety with regard to stuttering in adults, and on related temperament issues in children and young people. While many treatments exist there remains little agreement as to which should be used and when.[2] In children there is also a lack of consensus regarding when an intervention should begin as there is the complication of a high percentage of young children described as having transient stuttering recovering spontaneously.[3]

In young children treatment may involve combinations of indirect approaches which aim to modify the environment via parents and thereby impact on fluency, attitudes, feelings, fears and language, or direct approaches which involve working with the child to change individual speech behaviours. The use of indirect rather than direct approaches distinguishes treatment for stuttering in young children from those used for older children and adult interventions. Historically, there have been two broad philosophies within the field, with a distinction between stuttering modification approaches (stutter more fluently) which aim to reduce avoidance behaviours and negative attitudes and thereby modify stuttering episodes, and fluency shaping approaches (speak more fluently) which teach new, controlled speech production patterns. These more fluent patterns are learned in formal practice sessions before gradually being generalised to normal conversational settings with these interventions seeking to achieve complete fluency for the PWS. These approaches to intervention may have become less defined in current practice, with interventions commonly drawing on a range of influences.

A number of new approaches for treating stuttering have become available in recent years, including the Lidcombe Program, the McGuire Progam, the Camperdown Program and also the use of Cognitive-Behaviour Therapy (CBT) based approaches. These interventions may be offered by a growing range of private providers in addition to that available via state-funded therapy services. A range of criticisms of these interventions for people who stutter (PWS) have been voiced. Fluency shaping approaches have been criticised for leading to unnatural sounding speech with difficulty implementing the techniques in certain situations, and methods that aim to modify stuttering episodes have been criticised for offering only short term benefit. Both of these approaches have been criticised as offering limited effectiveness, due to the propensity for relapse amongst people who have completed programmes.[1] In addition to these programmes the use of mechanical delayed auditory feedback (DAF) devices has been reported to have some success in reducing stuttering. However, there are concerns that these positive outcomes may occur predominantly when reading aloud, rather than in normal conversational interactions.[4]

While there has been a considerable growth in the range of interventions available to people who stutter, it has been highlighted that there is a need for greater use of evidence-based approaches.[3] A recent review of interventions for adults who stutter concluded that, while there was some evidence that fluency shaping approaches may have the most robust outcomes, no single treatment is able to achieve successful outcomes with all participants.[5] Much of the review evidence to date has evaluated only behavioural programmes, which may be because they tend to have objective measures of effectiveness (i.e. reduction in overt stuttering episodes). There has been less examination of treatments which use outcome measures other than stuttering frequency. Primary research using a broader range of outcome measures is likely to use non-controlled study designs and thus be excluded from many systematic reviews.

The growing range of available treatment options for children and adults who stutter presents a challenge for clinicians, service managers and commissioners, who need to have access to the best available treatment evidence to guide them in providing the most appropriate interventions.[2] Core outcomes for stuttering have not been established, and there is considerable debate within the field regarding what a “good” outcome from intervention should be. Proponents of fluency-shaping approaches use measures such as the number of stutters occurring per sentence, or the percentage of words spoken fluently. There are increasing calls however to consider the outcome from the person who stutters' perspective, with use of measures of self-perception, satisfaction with the intervention, and well-being. These approaches consider effectiveness in terms of psychological change rather than solely greater spoken fluency.

Research questions

Specific aims of the study were:

1. To systematically identify, appraise and synthesise international evidence on the clinical effectiveness of non-pharmacological interventions to treat stuttering in pre-school children, school aged and adolescent children, and adults.
2. To determine how applicable this evidence might be to the UK context, including identifying perceptions of staff and people who stutter regarding potential obstacles to successful outcomes following intervention.

The objective was to present a synthesis which outlines international evidence on interventions for stuttering including recommendations regarding which are most likely to be effective and produce a broad and long term impact.

The review addressed the following research questions:

1. What are the effects of non-pharmacological interventions for developmental stuttering on communication and/or the wellbeing of children, adolescents and adults who stutter/stammer?

2. What are the factors that may enhance or mitigate against successful outcomes following intervention?

The patient group

The patient group considered in this review is people who have a stutter (and/or clutter) of developmental origin. The patient group included any age.

The intervention

The interventions defined in this review were any interventions which have the stated purpose of having beneficial outcomes for people who stutter.

Comparator

Interventions which have any comparator group of participants, or those interventions which have no comparator were included.

Outcomes

The outcomes of interest were any outcomes which were considered to be of benefit for people who stutter in enhancing their communicative interactions or well-being.

How this study has changed from protocol

The study was completed with two very minor changes to the protocol. Firstly, the original protocol had stated that we would exclude support group interventions. While we found no studies which met our inclusion criteria and reported this type of intervention in isolation, we found literature which included this element as part of a programme of intervention. The patient and public members of our steering group also emphasised the potentially important role of support groups for people who stutter, therefore this exclusion criterion was removed from the protocol. The second change related to consideration of outcomes that were eligible for inclusion. The original protocol placed no exclusions on the types of outcome that would be considered in the review. During the identification phase however we identified a small quantity of literature carried out in laboratory conditions which reported only stuttering behaviours when reading aloud, with no measure of spoken interaction. As these data did not relate to functional speech (speech for the purposes of communication) we clarified the inclusion criteria for the review, as being studies reporting beneficial outcome for communicative interaction or well-being.

CHAPTER 2 METHODS

A number of reviews of interventions for specific populations or a specific type of intervention have been carried out in the field of stuttering, however, a broad based systematic review across all forms of intervention for adults and children was needed. We adopted a review method which was able to combine multiple data types to produce a broad evidence synthesis. We believe that this approach was required to best examine the international evidence on interventions, and ascertain whether and how these interventions would be best applied in a UK context in order to inform future guidelines and the implementation of effective treatments in the NHS.

Development of the review protocol

A review protocol was developed prior to beginning the study. The protocol outlined the research questions, and detailed methods for carrying out the review in line with guidance from the Centre for Reviews and Dissemination.[6] The protocol encompassed: methods for identifying research evidence; method for selecting studies; method of data extraction; the process of assessing the methodological rigour of included studies; and synthesis methods. The protocol was registered with the PROSPERO database number CRD42013004861.

Involvement of patients and the public

People who stutter, a charity for stuttering, and also health professionals working in the field were involved in development of the review protocol. The advisory group for the project also had representation from these groups, in order to provide advice regarding potential sources of data during the searching phase of the work, and later in the process in order to assist the team in understanding and interpreting the review findings. The representation on the advisory group of patient and public members was also valuable in terms of identifying avenues for dissemination and translating the key messages of the work for a lay audience.

Identification of studies

Search strategies

A systematic and comprehensive literature search of key health, medical and linguistic databases was undertaken in August 2013 to February 2014. The searching process aimed to identify studies which reported the clinical effectiveness of interventions for PWS, and also studies which reported the views and perceptions of PWS and staff regarding interventions.

Searching was carried out for both reviews in parallel, with allocation to either effectiveness or qualitative reviews at the point of identification and selection of studies for potential inclusion. The search process was recorded in detail with lists of databases searched, date search run, limits applied, number of hits and duplication as per PRISMA guidelines.[7] The search strategy is presented in Appendix 1.

The search involved combining terms for the population (stuttering) with terms for the interventions of interest, i.e. non-pharmacological interventions. This highly sensitive search strategy (i.e. not using terms for comparators, outcomes or study design) was possible because scoping searches retrieved relatively small and manageable numbers of citations. The aim of the strategy was to identify all studies on non-pharmacological interventions for stuttering.

The search strategy was developed by the information specialist on the team (Anna Cantrell) who undertook electronic searching using iterative methods to create a database of citations using Reference Manager. The search followed a process whereby search terms were developed initially from scrutinising relevant review articles, followed by scrutinising retrieved papers to inform further searching.

The first main project search was run on Medline (Ovid) and Psycinfo (Ovid) in August 2013. Following minor amendments to the search terms, a further iteration of the search was then conducted on a larger range of databases in October to November 2013. Topic experts and clinicians in the field were consulted for additional search terms, and for suggestions of additional relevant studies or interventions at regular advisory group meetings and at a clinician workshop session.

In addition to standard electronic database searching, later in the project (February 2014) citation searching was undertaken for all included qualitative citations, and searches were conducted for additional papers by the first authors of all included qualitative studies. In order to ensure that the most up to date literature was not missed, we also conducted hand screening of journals in April 2014 to identify any work published since the main searches had been carried out. The journals that we searched by hand were: International Journal of Language and Communication Disorders; Journal of Speech and Hearing Research; Journal of Communication Disorders; Asia Pacific Journal of Speech Language and Hearing; Clinical Linguistics and Phonetics; Journal of Fluency Disorders; and International Journal of Speech Language Pathology.

Sources searched

The following electronic databases were searched for published and unpublished research evidence from 1990 onwards:

First search iteration

- MEDLINE (OvidSP);
- PsycINFO (OvidSP)

Second search iteration

- EMBASE (OvidSP);
- CINAHL (EBSCO);
- The Cochrane Library (WILEY) including the Cochrane Systematic Reviews Database, Cochrane Controlled Trials Register, DARE, HTA and NHS EED databases;
- ASSIA (ProQuest);
- Linguistics and Language Behavior Abstracts LLBA (ProQuest);
- Science Citation Index (Web of Science);
- Social Science Citation Index (Web of Science);
- Conference Proceedings Citation Index- Science (CPCI-S)- (Web of Science);
- Sociological Abstracts (ProQuest);
- EPPI Centre Databases.

All citations were imported into Reference Manager (Version 12) and duplicates deleted prior to scrutiny by members of the team.

Search restrictions

Searches were limited by date (1990 to present) as the advent of new programmes may have led to changed practice and the review was aiming to synthesise the most up-to-date evidence. This date criterion was set as it marked a major change in interventions for stuttering associated with publication of the first papers reporting the Lidcombe Approach, with the field from this date forward addressing the need for more public evidence for effectiveness. The review thus encompassed nearly 25 years of research.

The searches did not set an English language restriction. While we intended that the review would be predominantly limited to work published in English to ensure that papers were relevant to the UK context, we aimed to search for and include any additional key international papers.

Inclusion and exclusion criteria

Population

- The population eligible for inclusion was PWS of any age. This included those with overt stuttering behaviours such as repetition of syllables or blocking, those with covert behaviours such as word avoidance and also those diagnosed with any other disorder of developmental fluency such as cluttering.
- The review excluded people with a fluency disorder which had been acquired rather than developmental, such as non-fluency associated with an identified neurological impairment (such as head injury, stroke or Parkinson Disease).
- We included studies whose participants were described as being clutterers. While cluttering is considered a distinct disorder from stuttering, it is recognised in the field that it may be challenging to differentially diagnose, and can also co-occur with stuttering. We took the decision therefore to search for and include any literature meeting our criteria, which examined interventions for this population. However, this work would be highlighted in the results as a separate population group.
- The review excluded papers reporting interventions for children who have been defined as having normal non fluency by the authors of the source study.
- The qualitative review considered studies reporting the views and perceptions of interventions for stuttering. The population was people who stutter, their relatives, friends, or significant others, together with the views of staff delivering interventions.

Interventions

- The review included any intervention which had the stated aim of being of benefit to PWS. This could be by either reducing the frequency of occurrence of behaviours (overt and/or covert), or by aiming to address communication and/or social restrictions.
- Non-pharmacological interventions were included.
- Interventions delivered in any setting by any agent were included. This encompassed treatments provided as part of state-funded health service provision, those offered by private providers, and interventions delivered by charitable or voluntary organisations.
- The review excluded interventions which are pharmacological.

- The review excluded interventions which do not have the stated aim of improving fluency outcomes, for example general relaxation or massage sessions, or the provision of information about stuttering.

Comparators

- Studies with any comparator including an alternative intervention, no intervention or usual practice were eligible for inclusion. This included studies which compared pharmacological to non-pharmacological intervention.
- Studies comparing pharmacological intervention to no intervention were excluded.

Outcomes

- Any outcome relating to a positive effect on the communication or the emotional wellbeing of people who stutter was included.
- Relevant outcome measures included: test scores on a standardised assessment such as frequency of non-fluent words, patient self-report of covert stuttering, patient experience, report of frequency of stuttering from a significant other such as a teacher or employer, patient or staff views and perceptions of obstacles to intervention effectiveness.
- Outcomes related to reading aloud only, rather than any measure of communicative interaction were excluded.

Study design

- The review included designs which may be termed randomised controlled trials, randomised cross-over trials, cluster randomised trials, quasi experimental studies, cohort studies, before and after/longitudinal studies, case-control studies and non-survey cross-sectional studies.
- Case reports (a single participant), case series (defined as reporting data from two or three participants), and survey (questionnaire) study designs were excluded.
- The qualitative review examined studies which reported the views of people who stutter or staff perceptions. Any qualitative method was eligible for inclusion (such as interviews and focus groups) Non-qualitative data collection methods such as questionnaire/survey designs were excluded.

Other inclusion/exclusion criteria

- The review included studies from any OECD country, thus studies from non-OECD countries were excluded.
- Studies published in English and key studies published in other languages were included. Studies published in languages other than English without an English abstract were excluded. Studies published in languages other than English which had English abstracts were considered. However, only those considered to be key studies which may add significantly to the review (based on the information in the abstract) were eligible for translation and inclusion.
- Grey literature (unpublished evaluations) from the United Kingdom was eligible for inclusion.

Selection of papers

Citations retrieved via the searching process were uploaded to a Reference Manager database. This database of study titles and abstracts was independently screened by two reviewers and disputes resolved by consulting other team members. This screening process entailed the systematic coding of each citation according to its content. Codes were applied to each paper based on a categorisation developed by the team from previous systematic review work. The coding included categorising papers falling outside of the inclusion criteria (for example excluded population, excluded design, excluded intervention) and citations potentially relevant to the clinical effectiveness review and those potentially relevant to the qualitative review.

Full paper copies of all citations coded as potentially relevant were then retrieved for systematic screening. Papers excluded at this full paper screening stage were recorded, and detail regarding the reason for exclusion was provided.

Data extraction strategy

Studies which meet the inclusion criteria following the selection process above were read in detail and data extracted. An extraction form was developed using the previous expertise of the review team, to ensure consistency in data retrieved from each study. The data extraction form recorded authors, date, study design, study aim, study population, comparator if any, details of the intervention (including who provided the intervention, type of intervention and dosage). Three members of the research team carried out the data extraction. Data for each individual study were extracted by one reviewer and in order to ensure rigour, each extraction was checked against the paper by a second member of the team.

Quality appraisal strategy

Quality assessment is a key aspect of systematic reviews, in order to ensure that poorly designed studies are not given too much weight, so as not to bias the conclusions of a review. As the review included a wide range of study designs this impacted on the tool that we selected. Quality assessment of the effectiveness studies was based on the Cochrane criteria for judging risk of bias.[8] This evaluation method classifies studies in terms of sources of potential bias within studies: selection bias; performance bias; attrition bias; detection bias; and reporting bias. As the assessment tool used within this approach is designed for randomised controlled study designs, we adapted the criteria to make them suitable for use across wider study designs, including observational as well as experimental designs. We anticipated that using controlled designs would be challenging for this literature (particularly due to the ethical issue of withholding treatment).

We therefore aimed to use an appraisal tool that would provide a detailed examination of quality elements across the literature, which would enable the study conclusions to go beyond reporting that higher quality controlled research designs were needed. In order to focus our evaluation, we also identified aspects within the risk of bias criteria which related particularly to the stuttering literature. These included the use of in-clinic versus real-life situation speech data, and the process of collecting and evaluating the speech sample data (see Table 1).

The summarising of quality appraisal scoring within and across effectiveness studies is a source of debate in the field of systematic reviews, with the calculation of overall scores for each study discouraged.[8] Following assessment of the study against each criterion, we considered the overall categorisation of studies as having either higher risk of bias versus lower risk of bias. “Higher risk” studies were those assessed as having bias such that it is likely to affect the interpretation of the results, and “lower risk” were those where bias is unlikely to have affected the results. The final categorisation was influenced by an aggregate approach (how many areas were of concern), but also by considering whether the study contained any particular potential bias that jeopardised the whole study findings. Thus, while the number of “yes” responses was used as an indicator of a higher/lower bias rating of quality, it formed only part of the overall rating decision. In order to produce an inclusive review no quality requirements were set for inclusion, however the risk of bias was fully considered and detailed in reporting the results of the review. It is important to note that we deliberately used the comparative categorisation of higher/lower to provide an indication of stronger or weaker studies across the literature included in this review. A “lower” risk study however should not be assumed to be “low risk” as (to be outlined later), few studies used comparator groups, and even less used full randomisation - therefore even the better quality papers in the review may be subject to bias. See Appendix 2 for detail of the rating for each included study.

Table 1 Tool for assessing the quality of effectiveness studies

Potential risk of bias	Bias present?	Detail of concerns
1. Selection bias – Method used to generate the allocation sequence, method used to conceal the allocation sequence, characteristics of participant group/s. Consider: sample size (more than or less than 10); recruitment process; any issues with participants.	Yes No Unclear	
2. Performance bias – Measures used to blind participants and personnel and outcome assessors, presence of other potential threats to validity. Consider: blinding of assessment of speech data, any other concerns.	Yes No Unclear	
3. Attrition bias – Incomplete outcome data, high level of withdrawals from the study.	Yes No Unclear	
4. Detection bias – Accuracy of measurement of outcomes, length of follow up. Consider: clinic versus outside clinic measures, process of collection of speech data.	Yes No Unclear	
5. Reporting bias – Selective reporting, accuracy of reporting. Consider: use of descriptive versus inferential statistics, pooling of data versus individual reporting	Yes No Unclear	

Assessment of quality for the qualitative papers was carried out using an eight-item tool adapted from the Critical Appraisal Skills Programme tool for qualitative studies (see Table 2).[9] The quality scoring for each study is presented in tabular form across each of the eight items (Appendix 3). We also present a narrative summary of the issues arising from quality assessment across the set of included papers, with categorising of studies by the research team as having either higher risk (where weaknesses in reporting or carrying out a study could affect the reliable interpretation of the conclusions), versus lower risk of bias.

Table 2 Quality appraisal tool for qualitative studies

1. Was there a clear statement of the aim of the research?	Y/N
2. Is a qualitative methodology appropriate to address the aims of the research?	Y/N
3. Was the recruitment strategy appropriate to the aims of the research?	Y/N/Unclear
4. Were the data collected in a way that addressed the research issue?	Y/N/Unclear
5. Has the relationship between researcher and participant been adequately considered?	Y/N
6. Have ethical issues been taken into account?	Y/N/Unclear
7. Was the data analysis sufficiently rigorous?	Y/N
8. Is there a clear statement of findings?	Y/N

Data analysis and synthesis strategy

Effectiveness studies

Data were synthesised in a form appropriate to the data type. It was proposed that meta-analysis calculating summary statistics would be used if heterogeneity permitted, with use of graphs, frequency distributions and forest plots. It was anticipated that sub-groups including age of participants, learning disability, intervention content, and delivery agent would be examined if numbers permitted. The heterogeneity of the included work however precluded summarising the studies via meta-analysis as will be further described later.

Effectiveness review findings were reported using narrative synthesis methods. We tabulated characteristics of the included studies, and examined outcomes by typologies, by outcome measurement, by intervention dosage, and by length of follow up. Relationships between studies and outcomes within these typologies were scrutinised.

Qualitative studies

Qualitative data were synthesised using thematic synthesis methods,[10] in order to develop an overview of recurring perceptions of potential obstacles to successful outcomes within the data. This method comprises familiarisation with each paper and coding of the finding sections (which constitute the 'data' for the synthesis), according to key concepts within the findings. While some data may directly address the research question, sometimes information such as barriers and facilitators to implementation has to be inferred from the findings, as the original study may not have been designed to have the same focus as the review question.[10]

Meta-synthesis

The third element of the review comprised an overarching synthesis of the effectiveness and qualitative elements, to describe how the results of each section of evidence may contribute to our understanding of implementation and outcomes for stuttering interventions. The aim was to produce a "state of the art" review[11] which would provide information for researchers, policy makers and practitioners. New methods to review and synthesise different types of data have been suggested, including the use of grouping data by sub questions (one for qualitative studies and one for quantitative studies), and the use of a synthesis matrix to compare features of interventions against barriers and facilitators reported by intervention participants.[12 13] The use of both qualitative and quantitative data in a single review has been recommended as having the potential to shed light on negative trial results; to identify social factors; as a means of examining issues of implementation; and potentially having a key role in assisting in the interpretation of significance and applicability for practitioners and service planners.[14]

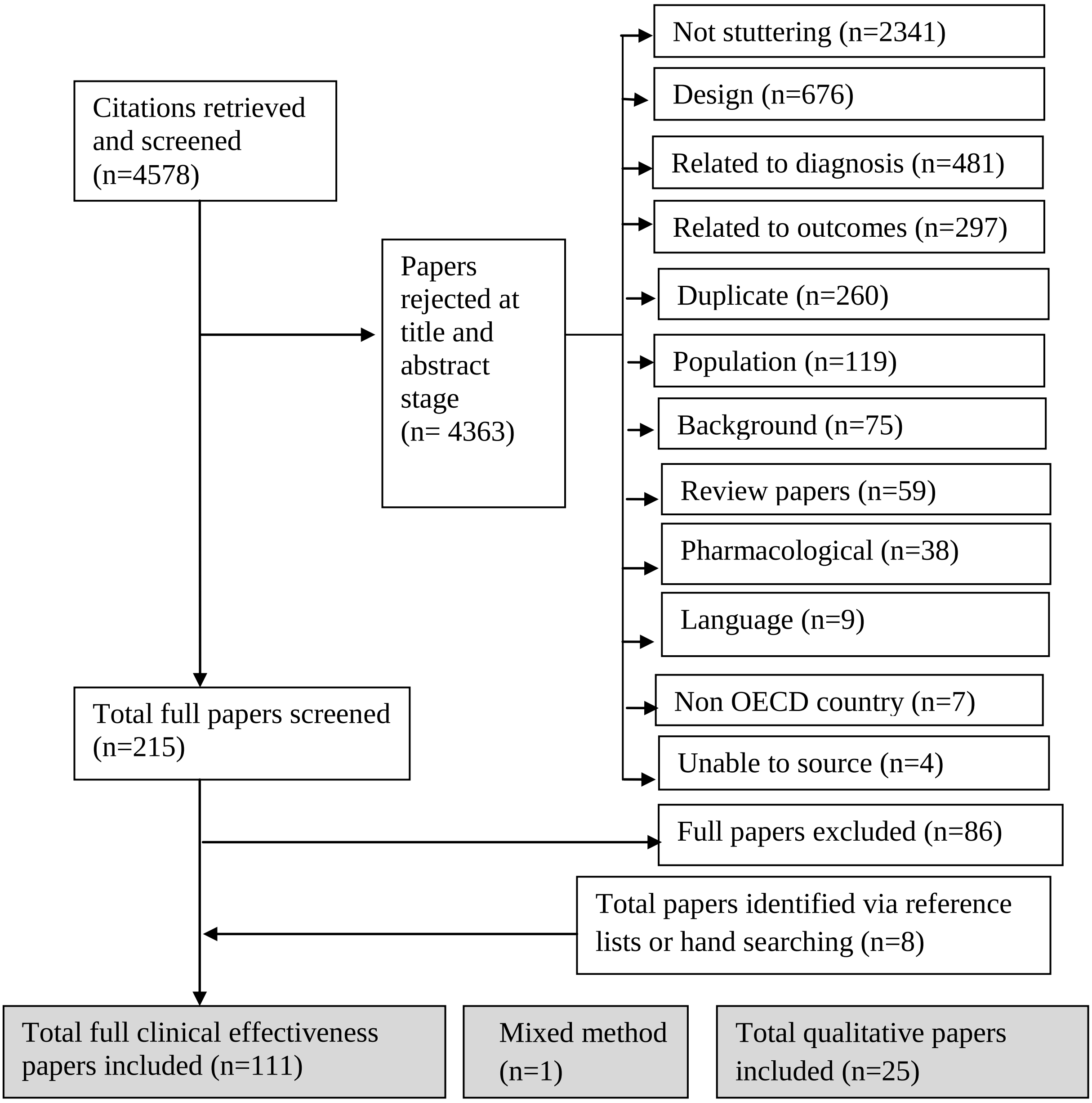
We had planned to meta-synthesise findings from the two reviews via a tabular comparison of intervention outcomes and views and perceptions. The body of literature however contained only limited data reporting perceptions of intervention, and only one mixed method study examining both outcomes and views. In place of a tabular meta-synthesis we have therefore combined the effectiveness and qualitative review findings by developing a conceptual framework. This framework draws on logic model methods to meta-synthesise the intervention typologies and content of interventions, with potential barriers and facilitators to intended outcomes from the qualitative review.[15] It also details outcome measures reported in the effectiveness literature, together with factors influencing longer term impact, and types of impact from the qualitative studies. This method of synthesis using a logic model approach aims to assist in the communication and understanding of the complex pathway between interventions and long term outcomes for people who stutter.

CHAPTER 3 RESULTS OF THE EFFECTIVENESS REVIEW

Quantity of the evidence available

The initial electronic database searches identified 4578 citations following de-duplication. From this database of citations 215 potentially relevant papers were retrieved for further scrutiny. Detailed examination of these articles resulted in 109 papers that met the inclusion criteria for the review of clinical effectiveness. Two further papers relating to the review of effectiveness were identified from additional searching strategies (hand searching of journals). Six further papers were identified from scrutinising reference lists (all qualitative). One paper used a mixed method design and therefore contributed to both reviews. Figure 1 provides a detailed illustration of the process of study selection.

Figure 1 The process of study selection and exclusion



Type of evidence available

Study design

Table 3 details the included effectiveness papers categorised by study design. We have provided a definition of each category in order to ensure clarity. The reporting of study design used by authors encompassed a variety of terminology, with terms in some instances not accurately representing the true design. Fourteen papers reported studies with a comparator, of these four randomly allocated participants to each arm of the study, six allocated participants using quasi-randomisation methods (such as consecutive randomising) and one was a controlled before and after study with no allocation. Of these 14 papers, three reported data from the same study[16] [17] [18] with the greatest proportion of included empirical work using a before and after design (pre-post measure).

Table 3 Papers by study design

RCT, quasi-RCT, controlled before and after [participants in more than one study arm] (14)	Craig et al. 1996 (quasi-RCT),[16] Cream 2010,[19] De Veer et al. 2009,[20] Franklin et al. 2008 (quasi-RCT),[21] Hancock & Craig 1998 (quasi-RCT),[17] Hancock et al. 1998 (quasi-RCT),[18] Harris et al. 2002 (quasi-RCT),[22] Hewat et al. 2006 (quasi-RCT),[23] Jones 2005,[24] Jones 2008,[25] Latterman et al. 2008,[26] Lewis et al. 2008,[27] Menzies et al. 2008,[28] Onslow et al. 1994 (controlled before and after).[29]
Before and after [reported pre-intervention and post-intervention data with no comparator group] (86)	Amster & Klein 2008,[30] Andrews et al 2012,[31] Baumeister et al. 2003,[32] Beilby et al 2012,[33] Berkowitz et al. 1994,[34] Block et al. 1996,[35] Block et al 2004,[36] Block et al 2005,[37] Block et al 2006,[38] Blomgren et al 2005,[39] Blood 1995,[40] Boberg & Kully 1994,[41] Bonelli et al 2000,[42] Bray & James 2009,[43] Bray & Kehle 1998,[44] Carey 2010,[45] Cocomazzo 2012,[46] Craig et al. 2002,[47] Cream 2009,[48] Druce & Debney 1997,[49] Elliott et al. 1998,[50] Femrell et al. 2012,[51] Foundas et al. 2013,[52] Franken et al. 1993,[53] Franken et al. 2005,[54] Gagnon & Ladouceur, 1992,[55] Gallop & Runyan, 2012,[56] Hancock & Craig 2002,[57] Harrison et al. 2004,[58] Hasbrouck 1992,[59] Hudock & Kalinowski 2014,[60] Huinck et al. 2006,[61] Ingham et al. 2013,[62] Ingham et al. 2001,[63] Iverach et al. 2009,[64] Jones 2000,[65] Kaya & Alladin 2012,[66] Kaya 2011,[67] Kingston 2003,[68] Koushik et al. 2009,[69] Laiho & Klippi 2007,[70] Langevin & Boberg 1993,[71] Langevin & Boberg 1996,[72] Langevin et al. 2006,[73] Langevin et al. 2010,[74] Lawson et al 1993,[75] Leahy 1991,[76] Lincoln et al. 1996,[77] Lutz 2009,[78] Mallard 1998,[79] Millard et al. 2008,[80] Millard et al. 2009,[81] Miller & Guitar 2009,[82] Nilsen & Ramberg 1999,[83] O'Brian et al. 2003,[84] O'Brian et al. 2008,[85] O'Brian et al. 2013,[86] O'Donnell et al. 2008,[87] Onslow et al. 1990,[88] Onslow et al.

	1992,[89] Onslow et al. 1996,[90] Pape-Neumann 2004,[91] Pollard et al. 2009,[92] Reddy et al. 2010,[93] Riley & Ingham 2000,[94] Rosenberger 2007,[95] Rousseau et al. 2007,[96] Ryan & Ryan 1995,[97] Sicotte et al. 2003,[98] Smits-Bandstra & Yovetitch, 2003,[99] Stewart 1996,[100] Stidham 2006,[101] Stuart 2004,[102] Stuart 2006,[103] Trajkovski 2011,[104] Van Borsel 2003,[105] Von Gudenberg 2006,[106] Von Gudenberg et al. 2006,[107] Wagaman 1993,[108] Wagaman 1995,[109] Ward 1992,[110] Wille 1999,[111] Wilson 2004,[112] Woods 2002,[113] Yairi & Ambrose 1992,[114] Yaruss et al. 2006.[115]
Mixed methods [used both quantitative and qualitative methods of data collection] (1)	Irani et al. 2012[116]
Cross sectional [data from a single time point only] (11)	Allen 2011,[117] Antipova et al. 2008,[118] Armson & Stuart 1998,[119] Armson and Kiefte 2008,[120] Armson et al 2006,[4] Koushik et al. 2011,[121] Lincoln & Onslow 97 (FU data only),[122] Onslow et al. 2002,[123] Ratynska et al. 2012,[124] Unger 2012,[125] Zimmerman 1997.[126]

While 26 studies carried out outcome assessment immediately following the intervention, there were 51 papers reporting follow up periods of 12 months or more (see Table 4).

Table 4 Studies by length of follow up

Immediate (26)	Antipova et al. 2008,[118] Armson & Stuart 1998,[119] Armson & Kiefte 2008,[120] Armson et al. 2006,[4] Berkowitz et al. 1994,[34] Block et al. 1996,[35] Bonelli et al. 2000,[42] Bray & James 2009,[43] Cream 2009,[48] Foundas et al. 2013,[52] Franken et al. 2005,[54] Franklin et al. 2008,[21] Harris et al. 2002,[22] Hudock & Kalinowski 2014,[60] Jones 2000,[65] Kaya 2011,[67] Kingston 2003,[68] Koushik et al. 2011,[69] Latterman et al. 2008,[26] Nilsen & Ramberg 1999,[83] Onslow et al. 2002,[123] Ratynska et al. 2012,[124] Reddy et al. 2010,[93] Unger 2012,[125] Wille 1999,[111] Zimmerman 1997.[126]
≤ 4 weeks (4)	De Veer et al. 2009,[20] Harrison et al. 2004,[58] Lawson et al. 1993,[75] Onslow et al. 1992.[89]
1-2 months (6)	Baumeister et al. 2003,[32] Bray & Kehle 1998,[44] Riley & Ingham 2000,[94] Smits-Bandstra & Yovetitch, 2003,[99] Stidham 2006,[101] Woods 2002.[113]
3-4 months (8)	Amster & Klein 2008,[30] Beilby et al 2012,[33] Block et al. 2004,[36] Lutz 2009,[78] O'Donnell et al. 2008,[87] Pollard et al. 2009,[92]Stuart 2004,[102] Van Borsel 2003.[105]
5-6 months (9)	Blomgren et al 2005,[39] Cream 2010,[19] Franken et al. 1993,[54] Gagnon & Ladouceur, 1992,[55] Hewat et al. 2006,[23] Iverach et al. 2009,[64] Leahy 1991,[76] O'Brian et al. 2008,[85] Sicotte et al. 2003.[98]
9 months (8)	Andrews et al. 2012,[31] Elliott et al. 1998,[50] Ingham et al. 2013,[62] Jones 2005,[24] Laiho & Klippi 2007,[70] O'Brian et al. 2013,[86] Onslow et al. 1990,[88] Rosenberger 2007.[95]

12-18 months (26)	Allen 2011,[117] Blood 1995,[40] Carey 2010,[45] Cocomazzo 2012,[46] Craig et al. 1996,[16] Druce & Debney 1997,[49] Hancock & Craig 1998,[17] Hancock et al. 1998,[18] Kaya & Alladin 2012,[66] Langevin & Boberg 1993,[71] Langevin & Boberg 1996,[72] Lewis et al. 2008,[27] Mallard 1998,[79] Menzies et al. 2008,[28] Millard et al. 2008,[80] Millard et al. 2009,[81] Miller & Guitar 2009,[82] O'Brian et al. 2003,[84] Onslow et al. 1994,[29] Ryan & Ryan 1995,[97] Stuart 2006,[103] Trajkovski 2011,[104] Von Gudenberg 2006,[106] Wagaman 1993,[108] Ward 1992,[110] Wilson 2004.[112]
2 years (12)	Boberg & Kully 1994,[41] Craig et al. 2002,[47] Femrell et al. 2012,[51] Hancock & Craig 2002,[57] Huinck et al. 2006,[61] Ingham et al. 2001,[63] Langevin et al. 2006,[73] Lincoln et al. 1996,[77] Pape-Neumann 2004,[91] Rousseau et al. 2007,[96] Stewart 1996,[100] Yairi & Ambrose 1992.[114]
3 years (3)	Hasbrouck 1992,[59] Onslow et al. 1996,[90] Yaruss et al. 2006.[115]
Up to 5 years (6)	Block et al. 2005,[38] Block et al. 2006,[38] Gallop & Runyan, 2012,[56] Langevin et al. 2010,[74] Von Gudenberg et al. 2006,[107] Wagaman 1995.[109]
More than 5 years (4)	Lincoln & Onslow 1997,[122] Irani et al. 2012,[116] Jones 2008,[25] Koushik et al. 2009.[69]

Country of origin

A categorisation of included studies by country of origin is presented in Table 5. The greatest proportion of work was reported by authors based in Australia (39 papers), followed by the USA (26 papers). Eight papers were from the UK.

Table 5 Studies by country of origin

Australia (39)	Andrews et al. 2012,[31] Beilby et al. 2012,[33] Block et al. 1996,[35] Block et al. 2004,[37] Block et al. 2005,[38] Block et al. 2006,[39] Bonelli et al. 2000,[42] Carey 2010,[45] Cocomazzo 2012,[46] Craig et al. 1996,[16] Craig et al. 2002,[47] Cream 2009,[48] Cream 2010,[19] Druce & Debney 1997,[49] Franklin et al. 2008,[21] Hancock & Craig 1998,[17] Hancock & Craig 2002,[57]Hancock et al. 1998,[18] Harris et al. 2002,[22] Harrison et al. 2004,[58] Hewat et al. 2006,[23] Iverach et al. 2009,[64] Jones 2000,[65] Lewis et al. 2008,[27] Lincoln et al. 1996,[77] Lincoln & Onslow 1997,[122] Menzies et al. 2008,[28] O'Brian et al. 2003,[84] O'Brian et al. 2008,[85] O'Brian et al. 2013,[86] Onslow et al. 1994,[29] Onslow et al. 1990,[88] Onslow et al. 1992,[89] Onslow et al. 1996,[90] Onslow et al. 2002,[123] Rousseau et al. 2007, [96] Trajkovski 2011, [104] Wilson 2004,[112] Woods 2002[113]
USA (26)	Amster & Klein 2008,[30] Berkowitz et al. 1994,[34] Blomgren et al. 2005,[39] Blood 1995,[40] Boberg & Kully 1994,[41] Elliott et al. 1998,[50] Foundas et al. 2013,[52] Gallop & Runyan, 2012,[56] Hasbrouck 1992,[59] Hudock & Kalinowski 2014,[60] Ingham et al. 2013,[62] Ingham et al. 2001,[63] Irani et al. 2012,[116] Mallard 1998,[79] Miller & Guitar 2009,[82] Pollard et al. 2009,[92] Riley & Ingham 2000,[94] Ryan & Ryan 1995,[97] Stidham 2006,[101] Stuart 2004,[102] Stuart 2006,[103] Wagaman 1993,[108] Wagaman 1995,[109] Yairi & Ambrose 1992,[114] Yaruss et al. 2006,[115] Zimmerman 1997[126]

Canada (11)	Armson & Stuart 1998,[119] Armson & Kiefte 2008,[120] Armson et al. 2006,[4] Gagnon & Ladouceur 1992,[55] Koushik et al. 2009,[69] Langevin & Boberg 1993,[71] Langevin & Boberg 1996,[72] Langevin et al. 2010,[73] O'Donnell et al. 2008,[87] Sicotte et al. 2003,[98] Smits-Bandstra & Yovetitch, 2003[99]
Germany (9)	Baumeister et al. 2003,[32] Latterman et al. 2008,[26] Lutz 2009[78] Pape-Neumann 2004,[91] Rosenberger 2007,[95] Unger 2012,[125] Von Gudenberg 2006,[106] Von Gudenberg et al. 2006,[107] Wille, 1999[111]
UK (8)	Allen 2011,[117] Bray & James 2009,[43] Bray & Kehle 1998,[44] Lawson et al. 1993,[75] Millard et al. 2008,[80] Millard et al. 2009, [81] Stewart 1996,[100] Ward 1992[110]
Netherlands (4)	De Veer et al. 2009,[20] Franken et al. 1993,[53] Franken et al. 2005,[54] Huinck et al. 2006[61]
Sweden (2)	Femrell et al. 2012,[51] Nilsen & Ramberg 1999[83]
Turkey (2)	Kaya & Alladin 2012,[66] Kaya 2011[67]
New Zealand (2)	Antipova et al. 2008,[118] Jones 2005[24]
Finland (1)	Laiho & Klippi 2007[70]
Ireland (1)	Leahy 1991[76]
India (1)	Reddy et al. 2010[93]
Poland (1)	Ratynska et al. 2012[124]
Belgium (1)	Van Borsel 2003[105]
Across countries (4)	Jones 2008,[25] Kingston 2003,[68] Koushik et al. 2011,[121] Langevin et al. 2006[73]

Intervention dosage

We endeavoured to identify from author report how many hours of intervention were provided in the included studies (see Table 6). Papers varied considerably in regard to the level of detail provided, and therefore the table below may not be completely accurate in representing intervention dosage, however is based on information we could glean. It can be seen that a sizeable proportion of the papers varied the number of hours of intervention according to individual need. This makes comparing effectiveness by dosage unfeasible. It can also be seen from the table that the contact time ranged from fewer than 10 hours, to more than 75 hours, again making the drawing of comparisons between different interventions on the basis of dosage problematic. The interventions which had shorter contact times tended to be those which were based on the use of technology (such as delayed auditory feedback systems). The interventions with longer contact time (perhaps unsurprisingly) tended to be those with multiple elements.

Table 6 Intervention dosage

Hours varied by individual participant. The range or mean is detailed where provided by authors (27)	Femrell et al. 2012[51] (9-46 visits) Franken et al. 2005[54] (mean 11.5 sessions) Gagnon & Ladouceur, 1992[55] Ingham et al. 2013[62] Ingham et al. 2001[63] Jones 2000[65] Jones 2005[24] Jones 2008[25] Kingston 2003[68] Koushik et al. 2009[69] (6-10 visits) Koushik et al. 2011[121] Latterman et al. 2008[26] (average 13 sessions) Lewis et al. 2008[27] (mean 49 consultations) Lincoln & Onslow, 1997[122] (mean 10.5 sessions) Lincoln et al. 1996[77] (median 12 sessions) Miller & Guitar 2009[82] (mean 19.8 sessions) O'Brian et al. 2003[84] (range 13-29 hours) O'Brian et al. 2013[86] (median 11 visits) O'Donnell et al. 2008[87] Onslow et al. 1994[29] (median 10.5 hours) Pape-Neumann 2004[91] Rousseau et al. 2007[96] Wagaman 1993[108] Wagaman 1995[109] (average 10 sessions) Wilson 2004[112] (range 3-26 consultations) Woods 2002[113] Yaruss et al. 2006[115]
Individual <10 hours (19)	Antipova 2008[118] Block et al. 2006[39] Bray & Kehle 1998[44] Carey 2010[45] Cream 2009[48] Elliott et al. 1998[50] Foundas et al. 2013[52] Franklin et al. 2008[21] Gallop & Runyan, 2012[56] Hudock & Kalinowski, 2014[60] Millard et al. 2008[80] Millard et al. 2009[81] O'Brian et al. 2008[85] Pollard et al. 2009[92] Stuart 2004[102] Stuart 2006[103] Unger 2012[125] Van Borsel 2003[105] Zimmerman 1997[126]
Unclear (16)	Allen 2011[117]

	Andrews 2012[31] Armson 1998[119] Armson 2006[4] Armson 2008[120] Bonelli et al. 2000[42] Bray & James 2009[43] Hewat et al. 2006[23] Langevin & Boberg 1996[72] Leahy 1991[76] Onslow et al. 1990[88] Onslow et al. 2002[123] Ratynska et al. 2012[124] Trajkovski 2011[104] Wille 1999[111] Yairi & Ambrose 1992[114]
Individual + group 30-75 hours (11)	Block et al. 2005[37] Block et al. 2006[38] Blomgren 2005[39] Craig et al. 1996[16] Cream 2010[19] Hancock et al. 1998[18] Irani et al. 2012[116] Iverach et al. 2009[64] Langevin & Boberg 1993[71] Lawson et al. 1993[75] Menzies et al. 2008[28]
Individual + group more than 75 hours (9)	Boberg & Kully 1994[41] Huinck et al. 2006[61] Langevin et al. 2006[73] Langevin et al. 2010[74] Nilsen & Ramberg 1999[83] Onslow et al. 1992[89] Onslow et al. 1996[90] Rosenberger 2007[95] Stewart 1996[100]
Individual 20-50 hours (8)	Block et al. 2004[36] Cocomazzo 2012[46] De Veer et al. 2009[20] Reddy et al. 2010[93] Riley & Ingham 2000[94] Sicotte et al. 2003[98] Stidham 2006[101] Ward 1992[110]
Individual 10-19 hours (6)	Beilby 2012[33] Harris et al. 2002[22] Harrison et al. 2004[58] Kaya & Alladin 2012[66] Kaya 2011[67] Ryan & Ryan 1995[97]
Individual more than 75 hours (4)	Blood 1995[40]

	Franken et al. 1993[53] Von Gudenberg 2006[106] Von Gudenberg et al. 2006[107]
Child group + parent group 10-19 hours (3)	Craig et al. 2002[47] Hancock & Craig 2002[57] Hancock & Craig 1998[17]
Child group + parent group 20-50 hours (3)	Druce & Debney 1997[49] (6.5 hours parents, children one week intensive) Mallard 1998[79] (2 week intensive) Smits-Bandstra & Yovetitch, 2003[99] (3 week semi-intensive)
Individual + parent group (2)	Berkowitz et al. 1994[34] (8 hours parents, children not clear) Laiho & Klippi 2007[70] (at least 30 hours)
Individual + group 10-20 hours contact time (2)	Amster & Klein 2008[30] Hasbrouck, 1992[59]
Parent group (1)	Lutz 2009[78] (12 hours)
Reported by length of treatment time only (1)	Baumeister et al. 2003[32] (3 weeks)

Intervention provider

In terms of the person delivering the intervention, 51 studies reported that clinicians provided the therapy. In all except three cases these clinicians were speech and language pathologists/therapists (two interventions were delivered by clinical psychologists and one jointly by a therapist and psychologist). Fifty papers were unclear in regard to who delivered the sessions; it was presumed that in most cases this was the author/s. Eleven studies reported that student clinicians had been used to provide therapy, with supervision by qualified staff.

Number and type of studies excluded

As can be seen from Figure 1, a large number of citations were excluded at initial screening of title and abstract. Many of these retrieved citations were excluded as not relating to stuttering. A large number of these had been retrieved by our searches as they included reference to fluency (for example reading fluency, fluency of movement), also the term “clutter” resulted in papers relating to untidiness in the home. In addition, we found reference to a number of medical conditions not related to communication which include the term “stutter”. Other factors which underpinned large numbers of exclusions were: papers consisting of general discussion rather than reporting data; articles relating to diagnosis and causation; and studies reporting the development or discussion of outcome measures.

Appendix 4 lists the studies initially identified as being potentially relevant but which were subsequently excluded at full paper stage. The rationale for the exclusion of each is provided.

Quality of the evidence available

Quality assessment of the included papers using the tool previously described resulted in 35 studies being categorised as being at lower risk of bias, and 77 studies were categorised as being at higher risk of bias. Note our earlier discussion regarding the use of higher/lower categorisation rather than high/low. Few of the studies used controlled designs, and of these the allocation process was frequently carried out by pseudo rather than completely randomised procedures. The areas which tended to distinguish studies rated as having higher potential for bias were 1) having samples of fewer than ten participants; 2) reporting data by individual rather than pooling findings; 3) using only descriptive statistics (means and standard deviations); 4) failing to blind assessors to the time point of data collection; 5) limited length of speech data samples; and 6) concerns regarding the process of data collection. See Appendix 2 for detail of the completed assessment for each study. In many of the smaller before and after studies (and some of those with larger samples) the process of selection of individuals whose data would be reported was unclear. It seemed likely (and was sometimes mentioned) that interventions had been delivered to larger numbers of PWS with only a sample of these being presented. The possibility that those recruited and reported may differ from those who were not, must be considered a potential significant source of bias in interpretation of the data for these studies.

Population

Table 7 presents the included studies categorised by the type of participants. As can be seen the greatest number of studies reported findings from interventions carried out with adults who stutter, followed by school age and then pre-school children. Nine studies delivered interventions to mixed age groups of participants.

Table 7 Studies by participant type

Pre-school [including children and parents] (15)	Bonelli et al 2000,[42] Femrell et al. 2012,[51] Franken et al. 2005,[54] Harrison et al. 2004,[58] Jones 2005,[24] Kingston 2003,[68] Lewis et al. 2008,[27] Millard et al. 2008,[80] Millard et al. 2009,[81] Miller & Guitar 2009,[82] Onslow et al. 1994,[29] Onslow et al. 1990,[88] Trajkovski 2011,[104] Yairi & Ambrose 1992,[114] Yaruss et al. 2006[115]
Parents only (1)	Lutz 2009[78]

Predominantly school age [greatest proportion of participants aged four to 11] (26)	Andrews et al 2012,[31] Berkowitz et al. 1994,[34] Bray & Kehle 1998,[44] Druce & Debney 1997,[49] Elliott et al. 1998,[50] Gagnon & Ladouceur, 1992,[55] Harris et al. 2002,[22] Jones 2008,[25] Jones 2000,[65] Koushik et al. 2009,[69] Koushik et al. 2011,[121] Laiho & Klippi 2007,[70] Latterman et al. 2008,[26] Lincoln et al. 1996,[77] Lincoln & Onslow 1997,[122] Mallard 1998,[79] O'Brian et al. 2013,[86] Onslow et al. 2002,[123] Riley & Ingham 2000,[94] Rousseau et al. 2007,[96] Smits-Bandstra & Yovetitch, 2003,[99] Von Gudenberg 2006,[106] Wagaman 1993,[108] Wagaman 1995,[109] Wilson 2004,[112] Woods 2002,[113]
School age and adolescents (8)	Baumeister et al. 2003;[32] Block et al 2004,[36] Craig et al. 1996; [16] Hancock et al 1998;[18] Rosenberger 2007, [95] Ryan & Ryan 1995,[97] Sicotte et al. 2003,[98] Wille 1999[111]
Adolescents [aged over 11] (5)	Craig et al. 2002,[47] Hancock & Craig 2002,[57] Hancock & Craig 1998,[17] Lawson et al. 1993,[75] Nilsen & Ramberg 1999[83]
Adults (47)	Allen 2011,[117] Amster and Klein 2008[30] Antipova et al 2008,[118] Armson & Stuart 1998,[119] Armson & Kiefte 2008,[120] Armson et al 2006,[4] Beilby et al 2012,[33] Block et al. 1996,[35] Block et al 2005,[37] Block et al 2006,[38] Blomgren et al 2005,[39] Blood 1995,[40] Bray & James 2009,[43] Carey 2010,[45] Cocomazzo 2012,[46] Cream 2009,[48] Cream 2010,[19] De Veer et al. 2009,[20] Foundas et al. 2013,[52] Franken et al. 1993,[53] Franklin et al. 2008,[21] Hasbrouck 1992,[59] Hudock & Kalinowski 2014,[60] Huinck et al. 2006,[61] Ingham et al. 2013,[62] Ingham et al. 2001,[63] Irani et al. 2012,[116] Iverach et al. 2009,[64] Kaya & Alladin 2012,[66] Kaya 2011,[67] Langevin & Boberg 1993,[71] Langevin & Boberg 1996,[72] Langevin et al. 2010,[74] Langevin et al. 2006,[73] Leahy 1991,[76] Menzies et al. 2008,[28] O'Brian et al. 2003,[84] O'Brian et al. 2008,[85] O'Donnell et al. 2008,[87] Onslow et al. 1996,[90] Pollard et al. 2009,[92] Reddy et al. 2010,[93] Stewart 1996,[100] Stidham 2006,[101] Unger 2012,[125] Van Borsel 2003,[105] Zimmerman 1997[126]
Mixed age (9)	Boberg & Kully 1994,[41] Gallop & Runyan 2012,[56] Hewat et al. 2006,[23] Onslow et al. 1992,[89] Pape-Neumann 2004,[91] Ratynska et al. 2012,[124] Stuart 2004,[102] Stuart 2006,[103] Von Gudenberg et al. 2006[107]
Unclear (1)	Ward 1992[110]

Cluttering

As outlined earlier, we took the decision to search for and include any work which examined interventions for people who clutter - a related speech fluency difficulty. We found only one paper which met our inclusion criteria and identified some of the participants as people who clutter.[72]

Assessment of clinical effectiveness analysed by intervention type

We grouped the effectiveness papers according to the content of the intervention. The literature we identified used a variety of terms to describe the intervention reported (for example "speak more fluently" versus "stutter more fluently", "indirect" versus "direct", "speech-restructuring" treatment, and "speech modification" therapy). In order to avoid potential confusion between different authors' use of terminology, we adopted the classification below which endeavours to categorise the approaches taken within the included studies. The categorisation consists of seven typologies: 1) feedback and technology interventions which aim to change auditory feedback systems (22 papers); 2) cognitive interventions which aim to lead to psychological change (six papers); 3) behavioural modification interventions which aim to change child or parental behaviour, or the behaviour of an adult who stutters (29 papers); 4) speech motor interventions (18 papers) which aim to impact on the mechanisms of speech production such as the respiratory, laryngeal or articulatory systems; 5) speech motor combined with cognitive interventions (18 papers); 6) multiple component interventions (11 papers); and 7) studies which compared interventions to each other (eight papers).

i) Feedback and technology interventions

Twenty two papers were included which described the effectiveness of a range of a technologies aiming to reduce the frequency or severity of stuttering in speech (see Table 8). The earliest of these papers was published in 1996, and the most recent in 2014, with 13 of the papers from North America. The greatest proportion of the technologies described were devices which alter the way that a PWS hears their own speech (altered auditory feedback [AAF]), by changing the frequency (frequency altered feedback [FAF]), and/or by introducing a delay before the speech is heard (delayed auditory feedback [DAF]). All but one of the included studies either compared stuttering level while using a device compared to stuttering level with no use of the device, or compared fluency level using different device settings. The other paper[52] compared use of a device in PWS to use by non-stuttering speakers. All but one of the papers[92] in this group was rated as being at higher risk of bias. The papers described the use of AAF under a variety of conditions including reading, monologue and conversation (either in person or via the telephone).

This type of intervention alters the auditory feedback process in PWS with the aim of reducing the proportion of stuttered speech. While the precise area of change and way that these interventions act to reduce stuttering is debated, it has been proposed that they may activate a “mirror neural system” to link perception with production, or alternatively that they impact on timing processes that control speaking rate. In the following synthesis we have detailed only the findings relating to conversational interaction (or monologue if no conversational measure was available). Many of the papers contained further detailed data regarding outcomes in terms of reading aloud.

Table 8 Feedback and technology interventions summary

Study detail	**Design**	**Risk of bias**	**Country**	**Population**
Antipova 2008[118]	Cross sectional	Higher	New Zealand	Adults N=8
Armson 1998[119]	Cross sectional	Higher	Canada	Adults N=12
Armson 2006[4]	Cross sectional	Higher	Canada	Adults N=13
Armson 2008[120]	Cross sectional	Higher	Canada	Adults N=31
Block et al. 2004[36]	Before and after	Higher	Australia	Age 10-16 N=12
Block et al. 1996[35]	Before and after	Higher	Australia	Adults N=18
Bray & James 2009[43]	Before and after	Higher	UK	Adults N=5
Bray & Kehle 1998[44]	Before and after	Higher	UK	Age 8-13 N=4
Cream 2009[48]	Before and after	Higher	Australia	Adults N=12
Cream 2010[19]	RCT	Lower	Australia	Adults N=89
Foundas et al. 2013[52]	Before and after	Higher	USA	Adults N=24
Gallop & Runyan, 2012[56]	Before and after	Higher	USA	Adults N=11
Hudock & Kalinowski, 2014[60]	Before and after	Higher	USA	Adults N=9
O’Donnell et al. 2008[87]	Before and after	Higher	Canada	Adults N=7
Pollard et al. 2009[92]	Before and after	Lower	USA	Adults N=11
Ratynska et al. 2012[124]	Cross sectional	Higher	Poland	Mixed N=335
Stidham 2006[101]	Before and after	Higher	USA	Adults N=10
Stuart 2004[102]	Before and after	Higher	USA	Adolescents and adults

				N=7
Stuart 2006[103]	Before and after	Higher	USA	Adolescents and adults N=9
Unger 2012[125]	Cross sectional	Higher	Germany	Adults N=30
Van Borsel 2003[105]	Before and after	Higher	Belgium	Adults N=9
Zimmerman 1997[126]	Cross sectional	Higher	USA	Adults N=9

Use of the SpeechEasy device was reported in six papers. These studies explored the use of the technology in laboratory, clinical, and naturalistic contexts and examined follow up for periods up to 59 months. Sample sizes ranged from seven to 31 individuals with no studies using a control group design. Five of the six papers were assessed as being at higher risk of bias, with only one[92] judged to have a lower risk of bias.

All studies reported some degree of effectiveness for this intervention. Armson et al.[4] found stuttering was significantly reduced having the device in place versus no device ($p=0.01$) with a small effect size of 0.108. There was considerable individual variation in response however, with the suggestion that those having lower initial stuttering had better outcomes. A second paper by Armson[120] also reported significant decreases in stuttering rate with SpeechEasy compared to without for all but two of 31 participants ($p<0.001$ effect size 0.724). The mean stuttering frequency pre-device was 16.4 and with device the mean was 2.3, an average reduction during monologue of 60.7%. Participant self-rating of stuttering severity also improved during the device condition (from 5.95 to 3.29 $p=0.028$ effect size 0.658). The paper examined whether stuttering reduction was at the expense of reduction in speech naturalness or rate and concluded that participants had a slower than normal rate both with and without the device. Naturalness ratings increased to just below normal levels with the device. The Foundas et al. paper[52] echoes these findings, with a significant reduction in stuttering frequency with the SpeechEasy device in place and activated, versus in place but not producing DAF or FAF ($p=0.014$ a 36.7% reduction). The paper examined the effect of different device settings, and concluded that the setting preferred by the participants was more effective than the default setting. In contrast to the findings above, individuals with more severe stuttering at baseline had a greater benefit.

Three papers examined longer term outcomes of SpeechEasy intervention. One[56] followed up device users following initial fitting. Eight of the 11 participants were still using the device at a mean of 37 months FU. The study found that level of dysfluency (for the seven that data was available for) was not significantly different at long term FU than it had been at first fitting (p=943). There was significant variation however with three having increased fluency, one was unchanged and three had worsened fluency since initial fitting. Analysis of data for all 11 PWS (those who continued to use the device and those who did not) found that all had significantly improved levels of fluency from before they were fitted with SpeechEasy to the current time point (p=0.017). The authors suggested that this indicates carry over effect from the device even when use discontinues. However, an alternative interpretation may question the long term value of using the device, in that continued users did not differ from non-users. In support of this, the study reports that at time of FU there was no difference in fluency whether the device was worn or not worn (p=0.92).

The second paper reporting longer term follow up data[92] similarly casts some doubt on the long term effectiveness of SpeechEasy, and this paper was judged to be at lower risk of bias. This study examining beyond-clinic data found a positive effect on %SS in the shorter term following fitting (p=0.02) however, no significant effect on %SS at four months FU (p=0.090). Self-report scores on SSI and OASES showed no difference pre-post however, the PSI scores had significantly improved (p<0.05). Only four of the 11 participants had purchased the device, eight reported they disliked the irritating background noise, and five that they disliked being unable to hear self/others. Six reported that using the device had increased their confidence in speaking and six that they had an overall increase in fluency using it.

The O'Donnell et al. paper[87] includes beyond-clinic measures using data obtained via the telephone. This study followed participants at regular intervals for 16 weeks after fitting and included speech data and participant self-report. Use of the device varied from 2 hours per day to 15 hours per day. Stuttering reduced for all participants at the baseline evaluation point (by 75.5%-97.9%) however, there was considerable variation in outcome between participants at the final follow up. Four stuttered less with the device compared to without, and three stuttered less without the device compared to with. Five of the seven stuttered more at FU than they had at baseline with the device in use (although all had reduced levels of stuttering when not using the device than they had previously). Analysis of the beyond-clinic telephone recordings indicated positive outcomes for five, with mean reduction in stuttering ranging from 20% to 94.4% conversing with the experimenter while having the device in place, compared to not using it. On self-report measures six participants described reduced struggle or avoidance behaviour with five participants identifying substantial benefit.

Six papers reported the use of other feedback devices combining DAF and FAF. All were considered to be at higher risk of bias. Antipova et al.[118] used The Pocket Speech Lab with eight participants and found all reduced the percentage of words stuttered using the device by an average of 3-4%. The paper details individual response under eight different AAF conditions with a significant difference between these and the no device condition (p=0.049) in terms of %SS. The authors report a trend for those with more severe stuttering to have a greater reduction however, they highlighted the significant individual variability in response. Unger et al.[125] found a significant reduction in SSI severity rating (p=0.000) for 30 participants using the VA 601i Fluency Enhancer or the SmallTalk devices. Individual variability in outcome was also emphasised in this study. The Digital Speech Aid was evaluated in a study with a larger sample of 335 individuals.[124] Statistically significant improvement in the number of dysfluent syllables was observed using the device compared to non-use (p<0.005). In dialogue, the odds ratio of exhibiting dysfluency without the device was 0.58, and with the device in use was 0.18. While moderate or considerable improvement was found for 84.5% of participants, deterioration or lack of improvement was found for 15.5%.

Use of the Edinburgh Masker in both clinic and home settings was evaluated by Block et al.[35] Results for the 18 participants showed a decrease in %SS for all across all conditions (conversation with experimenter 2.1%SS reduction, conversation familiar person 2.6%SS reduction, telephone 2.8%SS reduction). The authors reported that an ANOVA was performed which indicated a significant reduction in stuttering however, the details of this are not provided. Some individual differences in response are described (eight participants increased stuttering on at least one task), and while speaking rate was found not to be affected, speech naturalness appeared to be reduced using the device (p<0.01).

Companion papers[103 104] report four month and 12 month follow up data from intervention using a self-contained in-the-ear prosthetic fluency device providing both FAF and DAF. The earlier paper[103] describes three experiments using the equipment. The proportion of stuttered syllables was significantly reduced for the seven participants in experiment one when they used the device during monologue (p=0.011, reduction of 67%SS). Similarly, for eight participants in experiment two there was a significant reduction in proportion of stuttered syllables ($p=0.0028$). The third experiment focused on evaluating speech naturalness, and found that speech, while using the device, was rated as more natural sounding than without ($p<0.0001$), although scores were below that for normal speakers. The follow up paper similarly outlines three experiments. The first found that initial reductions in stuttered syllables reported at initial fitting with the device in place compared to no device, were repeated at 12 months ($p<0.0001$), with a 75% reduction in %SS using the device during monologue. Experiment two details significantly improved PSI scores at 12 months compared to scores prior to receiving the device. Participants were asked to self-report current levels and recall previous levels however, so the reliability of this data must be questioned. Experiment three examines speech naturalness and found an increased naturalness rating at 12 months compared to four months, and that speech while using the device was rated as more natural than without (although as with the earlier paper was less natural than normal speakers).

Three papers focused on the use of AAF devices to reduce stuttering during use of the telephone. The most recent paper[60] examined the effectiveness of different combination of DAF and FAF during scripted telephone conversations. While this study could be perceived to be using a reading aloud only outcome and therefore falls within the exclusion criteria, the script was considered to be similar to notes that a PWS may make in everyday life when making a telephone call, and therefore the study offered more functional outcomes. Stuttering frequencies in both AAF conditions for all nine participants were significantly lower than the non-altered feedback condition ($p<0.0001$, an average of a 65% reduction). These findings are similar to an earlier paper[126] which reported a reduction in stuttering frequency of 55-60% using AAF during scripted telephone conversations ($p=0.004$) with a positive effect for all nine participants. Bray and James[44] support the effectiveness of using an AAF device when making telephone calls. The Telephone Assistive Device evaluated in this study reduced stuttering frequency for four of five participants (group mean 8.28% pre device and mean 4.82 using device). The authors suggested some improvement in self-reported feelings and attitude following use of the device however, there is limited data to support this.

One paper reported the use of FAF only,[119] and another the use of DAF only.[105] Amson and Stuart[119] found that while some improvement to reading using FAF was observed, there was no significant effect on the number of stuttering events during monologue, with 10 of the 12 participants showing no benefit. Use of DAF over three months[105] was found to significantly reduce the percentage of stuttered words (when using the device compared to not using it) for non-functional speech tasks and picture description (p=0.050) however, not significantly for conversation (p=0.066). Levels of stuttering without the device in place were significantly reduced from baseline levels for all but conversation (p=0.0666). Overall levels of stuttering when using the device from baseline to 3 month FU had not significantly changed. Self-report perception of fluency (using median scores on summary table provided) was that fluency using DAF was better than fluency without DAF for four of nine participants (unchanged for four, worse for one).

Other types of technology evaluated in the literature were bone conduction stimulation and EMG. Stidham et al.[101] reported the use of bone conduction stimulation with DAF which participants used for at least four hours a day for four weeks. While baseline to immediate post provision of the device indicated a significant reduction in stuttering (P<0.001), the effect had faded at two week and six week follow up. Of the nine participants, slightly more than half reported that their speech had improved using the device (56%), and 66% rated it as helpful to some degree. The headband element of the device however was described as being uncomfortable and obtrusive.

Two papers examined the use of EMG feedback. One of these[16] compared EMG to two other interventions and will be outlined in detail later in the section on papers which evaluated interventions in comparison with each other. In summary this study found that for six of the ten children taking part that EMG reduced stuttering to less than 1%SS immediate post intervention, with four children remaining at this level at one year FU. The other paper[36] used EMG with 12 children and adolescents daily over a five day period. There was a reduction of mean 36.7% in stuttering after treatment (pre mean %SS 4.9 to mean %SS 4.4 post), however it was noted that rate of speech post-intervention was only around half that of a non-stuttering population. One participant had a worse %SS following intervention.

The final papers included in this categorisation of feedback and technology interventions were three papers outlining the use video self-modelling [VSM] (participant viewing of videos of themselves which have been edited to remove stuttering). The self-modelling intervention tested by Bray and Kehle[44] was carried out on seven occasions over six weeks. Results are reported descriptively by the four individual participants, with mean number stuttered words ranging from 5.9 to 9.1 at baseline and 0.3 to 3.2 at 8 week FU. A more recent paper[48] evaluated the viewing of edited videos daily over a one month period. This study investigated the potential use of this intervention with PWS that had received previous interventions but had relapsed. Results indicated a significant reduction of 5.4%SS ($p<0.0001$) post-intervention, an effect size of 1.1. Self-reported rating of severity also was significantly reduced ($p<0.0001$ ES 1.4), with no significant adverse effect on speech naturalness found. A second paper from this research team[19] evaluated VSM as part of the maintenance programme following a smooth speech/prolonged speech intervention. The study (which was judged as at lower risk of bias) compared standard maintenance with VSM over a four week post-intervention period. It found that there was no significant difference between standard maintenance and VSM outcomes in terms of %SS ($p=0.92$), self-rated anxiety ($p=0.12$), or avoidance ($p=0.69$), however self-reported rating of typical and worst severity were better in the VSM group ($p=0.062$ and $p=0.012$). Participants in this group rated their satisfaction with fluency as greater ($p=0.043$) and quality of life scores were higher ($p=0.027$).

ii) Cognitive interventions

This category of interventions may have content which includes: reduction of tension, anxiety, fear, shame, stress; or a greater acceptance or feeling of control over stuttering; improved self-esteem; or more positive perceptions of own communication and desensitisation to the stutter. The interventions aim to effect change in psychological or psychosocial processes in PWS. This type of intervention may be used alone or to support, optimise or prepare for other interventions, and may traditionally have been delivered by counsellors or psychologists. It is however increasingly being perceived as part of a Speech and Language Pathologists role, particularly in the UK. The anticipated outcomes may be direct speech gains, psychological well-being gains which lead to improved speech, or alternatively gains which do not aim to change the frequency or severity of the stutter but instead relate to living successfully with stuttering.

Six papers were identified within this intervention typology. There was one paper published in the early 1990's[76], with other articles published 2002-2012. The work originated from a broad range of countries (Ireland, Australia, The Netherlands, India, Turkey). All were judged to be at higher risk of bias (see Table 9).

Table 9 Cognitive interventions summary

Study details	**Design**	**Risk of bias**	**Country**	**Population**
Amster & Klein 2008[30]	Before and after	Higher	USA	Adults N=8
De Veer et al. 2009[20]	RCT	Higher	Netherlands	Adults N=37
Kaya & Alladin 2012[66]	Before and after	Higher	Turkey	Adults N=59
Kaya 2011[67]	Before and after	Higher	Turkey	Adults N=93
Leahy 1991[76]	Before and after	Higher	Ireland	Adults N=5
Reddy et al. 2010[93]	Before and after	Higher	India	Adults N=5

Two papers evaluated cognitive behaviour therapy (CBT). Reddy et al.[93] presented the study findings as a series of five descriptive case reports only. The article outlines that SSI scores improved between pre and post assessment. It presents a formula for calculating % of therapy change, however fails to include this data. Reportedly, three clients had clinically significant improvement in anxiety symptoms and dysfunctional cognitions, and there was some benefit in self-reported quality of life, however details of this are very limited. An intervention reported by Amster and Klein[30] was described as having cognitive behaviour therapy as the main focus, however also included stuttering modification treatment for the final eight of 12 sessions. The study found a significant decrease (p=0.035 ES 1.80) in participant self-rating of perfectionism during the early weeks of the treatment to mid-point which was maintained at 15 week FU (no pre-post data provided). Participants reported improved communication attitudes at the end of the programme and at FU (p=0.017). Speech fluency scores using SSI were mean 24.38 at baseline, mean 11.75 post-treatment and mean 13.75 at FU (ES 0.74 pre to mid and 0.51 mid to post).

Leahy[76] based a ten-session group intervention on personal construct psychology (PCP). Changes in SSI are reported by individual and range from 3-31 pre intervention, and from zero to 10 post intervention for the five participants. This evaluation of PCP however has a significant flaw as the clients received concurrent individual fluency therapy.

Two papers by Kaya[66 67] describe the use of hypnosis alone and hypnosis combined with diaphragmatic exercise for PWS. Rating of fluency pre and post intervention showed a significant effect ($p<0.000$) with informal patient report in the later paper that all but four participants were "doing well". While these papers have reasonably large sample sizes (93 and 59) the rating scale used for evaluating fluency has considerable limitations.

The Mindfulness-Based Stress Reduction program as a potential intervention for stuttering was examined by de Veer and colleagues.[20] While this is one of few studies identified that used a controlled design, the recruitment and allocation process together with only self-report measures resulted in a rating of higher potential for bias. The authors found a significant difference post-intervention between intervention and control groups in measures of stress ($p <0.001$), anxiety about speech situations ($p<0.01$), self-efficacy trust ($p<0.01$), locus of control ($p<0.001$), coping ($p < 0.05$) and attitude towards speech situations ($p<0.01$). Average effect sizes were found for self-efficacy beliefs, coping and attitude towards speech situations ($d=0.55$; 0.62; and 0.48, respectively). Effect sizes were large for stress, anxiety and locus of control. ($d=1.16$; 1.07; and 0.76 respectively). There was some maintenance of these positive outcomes at four week FU.

iii) Behaviour modification

The greatest number of papers identified which related to a single intervention was the Lidcombe Program (LP). This intervention is based on operant conditioning principles with the content focusing on training parents to provide feedback (verbal contingencies) for stuttered speech and stutter-free speech. The precise mechanism of change whereby verbal contingencies lead to a reduction in frequency of stuttering is unclear, and may include neural reorganisation, motoric alterations or changing system demands. In the LP thresholds of percentage syllables stuttered and stuttering severity determines progress from the first to the second stage of the intervention.

Twenty two papers considered aspects of the program including effectiveness in the short term and longer term, predictors of treatment time, predictors of responsiveness, applicability in different countries, and components of intervention delivery such as telehealth. These papers compared intervention with no intervention and originate predominantly from Australia. An additional paper[54] compared LP with Demands and Capacities intervention, therefore is considered in detail in the section on papers comparing programmes. This intervention type, as well as having the largest number of papers, also tended to be where the quality was higher with 12 papers assessed as being at lower risk of bias (see Table 10).

Behaviour modification programmes such as the LP are used largely with pre-school children. It is important to note that studies evaluating interventions in this population face the challenge of demonstrating not only if the intervention achieves change, but also need to fully consider the possibility of spontaneous remission of stuttering in participants. While there is some variation in reported rates of spontaneous improvement, the figure is generally recognised as being in the region of 80% of children.[114] The recovery figures relate to a general population however, with precise figures for spontaneous improvement in clinical populations currently unknown. The length of time since onset is believed to be a significant influencing factor in whether development stuttering resolves. In order to demonstrate clear evidence of effectiveness in populations of young children interventions therefore need to demonstrate not only evidence of effectiveness but change beyond a level of 80% recovery.

Table 10 Papers relating to the Lidcombe Program summary

Study details	Design	Risk of bias	Country	Population
Bonelli et al. 2000[42]	Before and after	Higher	Australia	Pre-school N=9
Femrell et al. 2012[51]	Before and after	Higher	Sweden	Pre-school N=10
Harris et al. 2002[22]	QuasiRCT	Lower	Australia	Children - age unclear N=23
Harrison et al. 2004[58]	Before and after	Lower	Australia	Pre-school N=38
Jones 2000[65]	Before and after	Lower	Australia	Pre-school N=216
Jones 2005[24]	RCT	Lower .	New Zealand	Pre-school N=54
Jones 2008[25]	RCT	Lower	Australia/NZ/ USA	School age N=28
Kingston 2003[68]	Before and after	Higher	UK	Pre-school N=78
Koushik et al. 2009[69]	Before and after	Lower	Canada	School age N=11
Koushik et al. 2011[121]	Cross sectional (retrospective case note analysis)	Higher	USA	Pre-school N=134
Latterman et al. 2008[26]	QuasiRCT	Lower	Germany	Pre-school N=45
Lewis et al. 2008[27]	RCT	Lower	Australia	Pre-school N=18

Lincoln & Onslow, 1997[122]	Cross sectional (follow up data only)	Higher	Australia	School age N=43
Lincoln et al. 1996[77]	Before and after	Higher	Australia	School age N=11
Miller & Guitar 2009[82]	Cross sectional (long term outcomes data only)	Lower	USA	Pre-school N=15
O'Brian et al. 2013[86]	Before and after	Lower	Australia	Pre-school N=57
Onslow et al. 1994[29]	Controlled before and after	Higher	Australia	Pre-school N=11
Onslow et al. 1990[88]	Before and after	Higher	Australia	Pre-school N=4
Onslow et al. 2002[123]	Cross sectional	Higher	Australia	School age N=8
Rousseau et al. 2007[96]	Before and after	Lower	Australia	Children – unspecified age N=29
Wilson 2004[112]	Before and after	Higher	Australia	Pre-school and school age N=5
Woods 2002[113]	Before and after	Lower	Australia	Pre-school and school age N=8

Of the 11 papers focussing primarily on clinical effectiveness of the LP, four reported early data from the 1990's.[29 77 88 123] These studies found positive effects on %SS for small groups of participants, and indicated benefits (achievement of less than 1.5%SS) continuing to 12 month FU. One of these papers highlighted ethical issues with control group designs for this population[29]. The seven more recent articles were published between 2000 and 2012, and confirm the effectiveness of the LP using larger groups and stronger study designs. Harris et al.[22] found a significant mean reduction in %SS of 39% ($p<0.001$) pre to post intervention in the nine children in the LP intervention group. This compared to a reduction of 16% for nine of the children who had not received the intervention, and an increase of 6-54 %SS in four other children in the control group. Due to the control group design this paper was able to demonstrate a greater improvement than spontaneous remission alone (although randomisation was quasi rather than fully randomised).

The papers by Jones et al.[24 25] present data from a randomised controlled trial with immediate, 12 month and up to five year FU. The first paper reported a reduction of 2.3%SS at nine months, and the second paper reported that 16 of 19 participants who had completed the intervention and could be contacted had zero to 1.1%SS at five year FU. Three had relapsed to pre-intervention levels, however the reduction between pre-intervention and FU remained significant ($p<0.0001$). Parental satisfaction was high and none of the children had received treatment other than the LP. Of the few participants in the control group who could be contacted five of the eight were reported to have recovered spontaneously.

Four papers published between 2008 and 2012 add further strength to the evidence of effectiveness of the LP. Latterman et al.[26] evaluated use of the program in Germany using a randomised design and a sample of 46 children. The intervention group decreased %SS by 6.9% at home measurement compared to the comparator waiting list group reduction of 1.6%SS at 16 weeks post intervention. The in clinic measures showed a similar reduction of 6.8%SS for the intervention group compared to 3.6%SS in the comparator group at 16 weeks post intervention, with a significant effect ($p=0.003$ home and $p=0.025$ clinic). The reduction in %SS was not at the expense of a reduction in rate of speech.

Femrell et al.[51] reported outcomes at two years following intervention with the LP in Sweden. Eight of the ten participants completed the program with a significant reduction in mean %SS from 7.6% to 0.1%, a large effect size of $d=2.9$. The two drop outs withdrew early as parents were satisfied with the benefits achieved. Parents had been offered the choice of receiving the LP or an alternative intervention, all had chosen the LP. Koushik et al.[69] investigated use of the programme with older children (aged 6-10). Mean %SS at baseline was 9.2% and 1.9%SS at FU, with no adverse effect on speech rate.

O'Brian et al.[84] explored the use of the LP in community clinics, rather than specialist centres. The study found a mean parental rating of severity at baseline of 5.2 and at nine months FU parental rating of severity was mean 2.1. At nine months the mean %SS was 1.7% (no baseline provided) with a range of 0.1 to 13%SS and 47% below 1%SS. Some individual variation was highlighted, with six of the 37 completing stage one reportedly having high severity ratings of 5-7. In addition to effectiveness, this paper examined factors contributing to outcome. It reported that the clinician having a high level of specialist training was important in achieving optimal outcomes, and that more severe stuttering was associated with longer intervention duration and higher dosage.

Nine further papers relating to the LP consider implementation issues and predictors of outcomes. Miller and Guitar[82] replicated findings of effectiveness (an 86% reduction in stuttering severity measured by SSI $p<0.001$ ES 3.7) reported in other papers when the program was delivered by less experienced but specifically trained clinicians assisted by student clinicians. Children with more severe stuttering pre-intervention (5%SS or higher) required a longer treatment time. Pre-treatment severity also predicted number of clinic sessions received in the Koushik et al.[121] and Rousseau et al. [96] studies. In another Koushik paper[69] there was no association between gender, or age, or onset to treatment time and outcome, however there was a seemingly counter-intuitive association between more frequent attendance and longer treatment time. Two further papers[65 68] echoed the association between severity and time needed for treatment ($p<0.001$ odds ratio 3.5 for more severe stutter to take longer to treat). Eleven sessions was the typical length of treatment to complete stage one. While the earlier paper found a lack of association between onset to treatment time and outcome, Kingston et al.[68] (which combined data with the Jones study) detected an association between children stuttering for longer before treatment and reduced treatment time (OR 0.52).

Papers by Woods et al.[113] Onslow et al.[123] and Bonelli et al.[42] explored the outcomes and impact of the LP. The first of these[113] reported no evidence of an adverse effect on child behaviour, child mental health or parent-child relationship over the course of intervention for eight children and their mothers. The second[42] found a positive effect on maternal speech rate following the program for nine mothers (who had taken part in earlier studies). Onslow et al.[123] concluded that there was no evidence of an adverse impact on speech timing or language function in eight children (two of whom were in the Bonelli study[42] and six in earlier studies). Harrison et al.[58] aimed to evaluate which components of the LP may be the more important factors underpinning outcome. The authors evaluated four weeks of parental requests to self-correct (verbal contingencies), compared to four weeks with no parental correction, and four weeks of parents completing severity ratings, versus four weeks of no rating. They concluded that parental verbal contingencies were likely to be the active element, rather than completion of rating checklists.

The final two papers examining the LP investigated the potential for delivery of the program via telehealth. Lewis et al.[27] concluded that telehealth delivery was effective (73% reduction in stuttering compared to a no intervention group $p=0.02$) however required additional clinician input (costing around three times more than the standard version). A later paper[112] in a small study with high dropout rates confirmed the effectiveness but need for greater number of consultations for telehealth delivery of the programme.

Other interventions which we categorised as behaviour modification focused on changing behaviours within the family, predominantly parent behaviour and parent-child interaction. Four papers were identified which evaluated these interventions in children, all were rated as being at higher risk of bias. As with the LP, they were primarily targeted at pre-school children and thus need to consider spontaneous recovery within their assessment of outcomes. Two additional papers in this category evaluated behaviour modification programmes with adults (see Table 11).

Table 11 Non-Lidcombe behaviour modification interventions summary

Study detail	Design	Risk of bias	Country	Population
Franklin et al. 2008[21]	Quasi RCT	Higher	Australia	Adults N=60
Hewat et al. 2006[23]	Quasi RCT	Lower	Australia	Adolescents and adults N=30
Lutz 2009[78]	Before and after	Higher	Germany	Parents N=11
Mallard 1998[79]	Before and after	Higher	USA	School age N=28
Millard et al. 2008[80]	Before and after	Higher	UK	Pre-school N=6
Millard et al. 2009[81]	Before and after	Higher	UK	Pre-school N=10
Yaruss et al. 2006[115]	Before and after	Higher	USA	Pre-school N=17

Two papers from the UK by Millard[80 81] evaluated Parent-Child Interaction therapy. This intervention combines helping parents to manage their child's stuttering through parent-identified interaction targets (such as reducing their rate of speech or complexity of language), with family strategies to develop confidence. In the earlier paper which reports data by individual participant, 6 children were followed up for a 12 month period. Three of these had reduced their stuttering severity on a 0-7 scale from 2, 3 and 5 respectively to zero (normal speech), one had reduced from 2 to 1, one was unchanged and one reportedly did not reduce with this intervention, but reduced from 5 to 2 with a period of direct intervention. The later study aimed to use a randomised design however was forced to remove this comparator condition mid-way through. Data are reported by individual participant using cusum charts. Of the six children in the intervention group, four reportedly showed systematic reductions in stuttering frequency from baseline to follow up at 12 months, that may be attributable to the intervention. One of the four control group children showed a systematic reduction. From chart data, parental ratings of child fluency and confidence in managing stuttering appeared to increase.

Yaruss et al.[115] report a family-focused treatment targeting parent communication modification and parent and child understanding and acceptance of stuttering. Following the training there was a significant reduction in the 17 children's dysfluencies ($p<0.001$) as rated by the clinician. Parental rating scale data also indicated improved fluency, and overall satisfaction with the treatment. The parent education component was rated as the most helpful element. Eleven of the children were discharged from therapy without requiring direct child intervention. Another study examining parent understanding and acceptance was reported by Lutz.[78] This weaker quality paper reported that following a weekend parent workshop, 92% of participants rated themselves as having changed their attitude towards stammering.

The Rustin program was evaluated by Mallard.[79] This is a family-oriented intervention which includes a range of elements encompassing speech skills, transfer skills and social skills, which is delivered via children groups and parent groups. The therapy emphasises that families need to find the most appropriate intervention methods for them, with assistance from the clinician. The children in this study were school-aged (5-12) rather than pre-school and the paper reports that 23 of the 28 families (82%) did not receive any further intervention following the programme. The authors noted that the areas of the programme rated as most important by parents "had nothing to do with speech modification", and instead were "letting the child take responsibility", "family discussion", and "listening".

While all the above interventions are used with children, an additional intervention that we categorised as behaviour modification is used with adults who stutter. Self-imposed time-out treatment is, like the LP, based on an operant conditioning approach. This intervention was evaluated in two papers that met our inclusion criteria, one rated as lower and one as higher risk of bias. This treatment involves participants learning to modify their behaviour by pausing for a moment after a stuttering episode. Hewat et al.[23] found individual diversity in response to the intervention. The mean reduction in %SS scores from pre-treatment to post-Stage 1 was 53.6%. More than half (from figure total 13 of 22) the participants reduced their stuttering frequency by more than 50%. Six participants reduced by 50-60%, three participants by 60-70%, and four had an 80-90% reduction (numbers are approximate as taken from figure). Speech naturalness was judged as being poorer than non-stutterers post intervention however, compared favourably to people who had completed prolonged speech treatment. Participants reported general satisfaction with the intervention.

The second paper assessing time-out[21] found a significant reduction in %SS between baseline and post-treatment (mean 5.8%SS versus 3.9%SS $p<0.007$). A control group increased their stuttering in same time frame (from baseline 4.9%SS to 6.4%SS $p<0.007$). There was no adverse effect on speech rate, with the intervention group increasing SPM post-intervention. There was evidence of an association between stuttering severity and outcome (more severe responded better), and amount of previous therapy and outcome (more previous therapy responded better).

iv) Speech motor interventions

Eighteen papers evaluated interventions which we classified in our typology as speech motor interventions. The content of these interventions is focused on the mechanisms of speech production (breathing, vocal fold vibration, articulation of sounds), with reduction in the severity or frequency of stuttering achieved by altering speech motor patterns. PWS may be taught to change their speech pattern for example by prolonging sounds, reducing speech rate, or making articulation more soft or smooth. These interventions are referred to variously in the literature as “behavioural treatments”, “talk more fluently approaches”, “speech restructuring”, “fluency shaping”. In order to be clear within our typology we have labelled them as “speech motor” rather than “speech behaviour”, in order to avoid confusion between these therapies and interventions targeting parent/child behaviour. These interventions typically include a clinician modelling the desired pattern and teaching the participant to use it. As the approach entails changing a participant’s usual pattern of speech, an important aspect to consider when evaluating speech motor interventions is not only the degree to which the therapy reduces the frequency or severity of stuttering, but also whether the speech produced using the changed motor pattern is acceptable to the speaker (and listeners), or whether it sounds slow and unnatural.

While these interventions were given various labels, the largest group were described as consisting of teaching prolonged speech (PS). This included the Camperdown Program which is based on control of stuttering using PS. Seven papers from a team at The Universities of Sydney and La Trobe in Australia outline results from evaluation of PS treatment. These papers were published between 1992 and 2012, with four (mostly older papers) graded as being at higher risk of bias,[84 85 89 90] and three graded as being at lower risk of bias.[38 46 47] See Table 12 for a summary of these studies.

Table 12 Speech motor interventions summary

	Design	Risk of bias	Country	Population
Andrews 2012[31]	Before and after	Higher	Australia	School age N=10
Block et al. 2005[37]	Before and after	Lower	Australia	Adults N=80
Block et al. 2006[38]	Before and after	Lower	Australia	Adults N=80
Carey 2010[45]	Before and after	Lower	Australia	Adults N=40
Cocomazzo 2012[46]	Before and after	Lower	Australia	Adults N=12
Druce & Debney 1997[49]	Before and after	Lower	Australia	School age N=15
Franken et al. 1993[53]	Before and after	Higher	Netherlands	Adults N=32
Ingham et al. 2013[62]	Before and after	Higher	USA	Adults N=30
Ingham et al. 2001[63]	Before and after	Higher	USA	Adults N=5
Iverach et al. 2009[64]	Before and after	Lower	Australia	Adults N=64
O’Brian et al. 2003[84]	Before and after	Higher	Australia	Adults N=30
O’Brian et al. 2008[85]	Before and after	Higher	Australia	Adults N=10
Onslow et al. 1992[89]	Before and after	Higher	Australia	Adolescents and adults N=14
Onslow et al. 1996[90]	Before and after	Higher	Australia	Adults N=18
Trajkovski 2011[104]	Before and after	Lower	Australia	Pre-school N=17
Von Gudenberg 2006[106]	Before and after	Higher	Germany	Unclear N=unclear
Von Gudenberg et al. 2006[107]	Before and after	Higher	Germany	School age N=32
Yairi & Ambrose 1992[114]	Before and after	Higher	USA	Pre-school N=27

The lower quality papers reported improvement in %SS following intervention and at up to 12 months FU. O'Brian et al.[84] for example found pre-treatment mean 7.9 %SS reduced to 0.4 %SS at 12 months maintenance, and Onslow et al.[90] found %SS scores generally at or near zero for 9 of the 12 clients (the other 3 scored above 1%), also mean 82% reduction in stuttering frequency from baseline to immediate FU and 74% reduction at 6 months.[85] Evaluation of mean naturalness scores indicated that post-intervention there was no significant impact on naturalness,[89] [90] however one paper noted that PWS could be distinguished from non-stuttering speakers (mean 4.5 versus matched control participants mean 3.6, $p = 0.025$) although the difference was less than one naturalness scale value.[84] Speech rate also did not appear to be adversely affected, for example all participants increased speech rate with the group mean increased from 184 SPM to 228 SPM.[85]

The three papers judged as being at lower risk of bias, similarly reported positive effects of prolonged speech intervention. Block et al.[38] reported a pre-treatment mean %SS of 4.9 (SD 4.4). Levels of stuttering reduced to a mean of 0.9 (SD 1.4) %SS immediately post-treatment, and 1.5 (SD 2.2) %SS at 3 months FU. At 12 months the mean %SS was 2.6 (significant difference from baseline $p=0.04$), and at 3.5–5 years, during a surprise telephone call, the mean %SS was 1.6. Carey et al.[45] echoed positive outcomes using a telehealth delivery and conventional delivery of the Camperdown Program. Cocomazzo et al.[46] used supervised student clinicians to deliver the intervention and found that similar outcomes could be achieved to that obtained by qualified clinicians (pre-treatment %SS 5.7, immediate post-treatment 1.0%SS, 12 months FU 2.4%SS ES 0.61-0.75). Speech naturalness scores echoed the earlier work, in finding that participants who completed the treatment had scores averaging one scale point below (less natural) than non-stuttering speakers. Variation in effect on naturalness however was described by Cocomazzo et al.[46]

The Block et al. paper[38] examined possible predictors of successful outcomes, and concluded that only baseline stuttering severity and short term response to intervention predicted longer term outcomes. Age, gender, perceived locus of control, attitude to communication or previous treatment did not predict long term outcome. The authors highlighted that 46% of variance between participants at long term FU was unaccounted for.

Another paper which evaluated speech motor programmes in adults, examined a Smooth Speech intensive treatment.[37] The study found the reduction of %SS following treatment was statistically significant (pre-treatment 5.4%SS and post-treatment 1.8%SS, large ES 0.86) and at 3.5 to five year FU the mean stuttering rate was 1.6%SS. A paper from the Netherlands[53] found an improvement from 27.7%SS pre-intervention, to 5.8%SS post-intervention, and change from baseline, but considerable relapse to 16.3%SS at six month FU. There was no impact on speech rate and some positive effect on rating of speech distortion, however dynamics/prosody rating was no nearer to non-stuttering speakers post-intervention than it has been before the therapy. An Iverach et al. study[64] examined whether the presence of a mental health disorder impacted on outcomes following speech motor intervention. The authors found that stuttering frequency and situation avoidance were significantly worse for participants who had a mental health disorder.

Two papers by Ingham et al. judged to be at higher risk of bias examined the use of Modified Phonation Intervals. Ingham et al. (2001) [63] described five adults as achieving stutter-free and natural sounding speech immediately and at 12 months FU after completing the intervention. The later paper[62] focused on examining brain activity as a potential predictor of outcome following MPI or PS intervention however, reports some positive outcome data (a pre-treatment mean of 7.1 %SS and end of treatment mean %SS 1.0).

Speech motor interventions are not only used with adolescent and adult populations, but also with children. Von Gudenberg[106] and Von Gudenberg et al.[107] evaluated Kasseler Stuttering Therapy; Yairi and Ambrose[114]describe slow speech therapy outcomes; and Druce and Debney[49] describe their intervention as most closely approximating the Gradual Increase in Length and Complexity of Utterances model. This was the only paper evaluating speech motor interventions with children that was rated as being of lower risk of bias.[49]

All papers reported positive outcomes. The Von Gudenberg et al.[107] paper from Germany found large effect sizes for their treatment comparing baseline to one year FU (d=0.96 for 9 to 13 year olds, and d=0.88 for 14-19 year olds). The other paper evaluating the Kassel smooth speech and prolonged speech treatment[106] reported no adverse effect on speech naturalness or speech rate, and improved self-perception of their speech amongst participants. Druce and Debney[49] also reported positive outcomes. From pre intervention, to after the intensive week intervention the mean %SS for the group decreased by 7.6 to 1.75 %SS (p = 0.0015).

The Yairi and Ambrose paper[114] differs from the others in the group, by using a natural history approach to compare pre-school children who received an intervention with no-intervention controls, rather than evaluating the effectiveness of a specific intervention. The study highlights the importance of considering natural recovery in this population, as it found that while the intervention group reduced their level of stuttering, that there was no significant difference between this group and untreated children over time. Both had a downward trend in dysfluency and there was no significant difference between them (p=0.4).

The final papers in this group examined interventions for pre-school and school aged children termed Syllable Timed Speech (STS). The paper judged at lower risk of bias[104] evaluated STS, and reported a mean stuttering reduction of 96% in beyond-clinic conversations from pre-treatment 6%SS to 12 month FU 0.2%SS (large ES 1.8). In another evaluation of STS, Andrews et al.[31] found the group mean %SS reduced from 14.4% at baseline to 6.7% at FU (p =0.015 medium ES 0.7). Data on self-reported severity, situation avoidance, and quality of life confirmed these positive outcomes however, the authors noted considerable individual variation in response to the intervention.

v) Speech motor combined with cognitive elements

As mentioned above, cognitive interventions may be used as an intervention type in isolation, or alternatively may form part of a programme. Eighteen papers reported interventions which combined speech motor therapy with elements of cognitive interventions (see Table 13). In contrast to the cognitive interventions only category, where all papers were considered to be at higher risk of bias, a third of these papers combining cognitive with speech motor elements were judged to be at lower risk of bias.

Table 13 Speech motor plus cognitive interventions summary

	Design	**Risk of bias**	**Country**	**Population**
Baumeister et al. 2003[32]	Before and after	Higher	Germany	School age and adolescents N=37
Beilby 2012[33]	Before and after	Lower	Australia	Adults N=20
Berkowitz et al. 1994[34]	Before and after	Higher	USA	School age N=8
Blomgren 2005[39]	Before and after	Lower	USA	Adults N=19
Boberg & Kully 1994[41]	Before and after	Higher	USA	Adolescents and adults N=49
Huinck et al. 2006[61]	Before and after	Lower	Netherlands	Adults N=25

Irani et al. 2012[116]	Mixed method	Higher	USA	Adults N=7
Laiho & Klippi 2007[70]	Before and after	Higher	Finland	School age N=21
Langevin & Boberg 1993[71]	Before and after	Higher	Canada	Adults N=10
Langevin & Boberg 1996[72]	Before and after	Lower	Canada	Adults N=4
Langevin et al. 2006[73]	Before and after	Lower	Canada and Netherlands	Adults N=25
Langevin et al. 2010 [74]	Before and after	Lower	Canada	Adults N=17
Lawson et al 1993[75]	Before and after	Higher	UK	Adolescents N=15 & 19
Nilsen & Ramberg 1999[83]	Before and after	Higher	Sweden	Adolescents N=13
Rosenberger 2007[95]	Before and after	Higher	Germany	School age children and adolescents N=19 & 15
Smits-Bandstra & Yovetitch, 2003[99]	Before and after	Higher	Canada	School age N=3
Stewart 1996[100]	Before and after	Higher	UK	Adults N=12
Ward 1992[110]	Before and after	Higher	UK	Unclear N=4

The Comprehensive Stuttering Program for adolescents and adults was evaluated in six papers, with all but one of these from a research team in Canada. This intervention incorporates speech motor techniques with cognitive strategies to impact on emotional and attitudinal aspects in addition to speech fluency. Of the three papers published in the 1990's[41] [71] [72] only the later paper[72] was rated as being at lower risk of bias. All papers reported a substantial reduction in client %SS following intervention. The later paper[72] reported that four participants improved stuttering by 55-99% following the CSP, mean %SS at baseline was 61.3% and 12.5% at immediate FU. Langevin and Boberg (1993)[71] reported a pre-treatment mean of 15.3%SS during a telephone call, 0.8% post-treatment, and 2.4%SS at 12-14 months FU telephone call. Boberg and Kully[41] found pre to immediate post treatment mean %SS decreased from 19.59 to 1.29 for the adult group and 14.32 to 1.75 for the adolescent group. As with the Langevin and Boberg (1993) paper,[71] this study indicated some fading of effect, as %SS had increased from 1.29 immediate post-intervention to 4.27 at 4 months and 6.03 at 12 months for the adult group, and from 1.75 at immediate post treatment to 3.65 at 4 months and 3.89 at 12 months for the adolescent group. The authors found no adverse effect on speech fluency following the CSP, with the mean SPM increasing from 126.5 pre-treatment to 140.7 post-treatment. The Langevin and Boberg (1993)[71] paper is interesting in that it reported data for people who exhibit cluttering in addition to stuttering, as a separate group to PWS. They noted that adults who clutter respond more poorly to intervention.

The three more recent papers all had stronger designs, and were judged to be at lower risk of bias. One reports long term outcomes in Canada, another considers predictors of outcomes in The Netherlands, and the third compares the findings across Canadian and Dutch populations. Langevin et al. (2010)[74] present five year FU from eighteen adults following treatment with CSP (including some participants that were reported in the 1993 and 2006 studies). Since the earlier study eight individuals had attended refresher sessions, and 10 had not. Pre-intervention mean %SS was 15.86 and immediate post %SS was 0.90 (pre-post $p<0.001$ ES $d= -2.07$), with one year FU mean %SS 3.59. At subsequent yearly time points %SS remained reasonably stable (4.38, 3.81, 3.76, 4.98) with pre to five year FU reduction significant differently ($p=0.02$ ES $d= -1.16$). Other measures (S24, SESES, PSI) also indicated self-report benefits for participants at two years post-intervention, and SPM increased following treatment. Langevin et al. (2006)[73] compared data sets from Canada and The Netherlands, with effect sizes of $d=0.52$ (Dutch), $d=0.86$ Canada, and $d=0.69$ (pooled). For the Dutch group 71% were categorised as maintaining clinically significant reductions at two years, and 86% in the Canadian group. Both groups of participants had mean naturalness ratings that were within the range of mean ratings reported for non-stutterers (2.3-3.6).

Individual variation in patterns reported in studies of the CSP was investigated by Huinck et al.[61] They found that those with the most severe stutter pre-intervention had the most immediate gain, however tended to be more likely to regress. Severity of stuttering did not predict severity of negative emotions, with people having more negative emotions tending to rate their stutter as worse than it actually was.

In three papers authors described their intervention for adults or adolescents and adults as being based on stuttering modification techniques used by Van Riper. The Successful Stuttering Management Program includes confrontation of stuttering (targeting attitudes and perceptions), stuttering modification techniques (prolongation, cancellation and pull outs) and maintenance. Blomgren et al.[39], in a study judged to be at lower risk of bias, found statistically significant improvements at 6 months post-treatment on client-reported perceptions (the Avoidance and Expectancy subscales of the PSI $p<0.001$), and two specific affective functioning measures (the Psychic and Somatic Anxiety subscales of the MCAI–IV $p= 0.078$ and 0.036 respectively). However, statistically significant reductions were not evident on objective measures of dysfluency for the adult participants (during monologue mean 17.8% pre to 11.8 post, and 13.8 six months post intervention). Another intervention drawing on Van Riper's methods for therapy with adults was outlined in Lawson et al.[75] This method was described as combining block modification, avoidance reduction and elements of personal construct psychology. The study found positive changes in avoidance on PSI however no change in %SS, struggle or expectancy. The positive effect on avoidance was unchanged at one month FU.

Laiho and Klippi[70] evaluated an intervention drawing on Van Riper's methods with children and adolescents. The intervention had a positive effect on stuttering severity (a reduction in %SS) for 14 of the 21 participants (mean %SS pre 4.45 and post 2.7%, a 38% improvement $p=0.001$). The amount of avoidance behaviour also reduced for 13 participants ($p=0.001$) and positive feedback was received from participants. Rosenberger et al.[95] combined stuttering modification with social interaction activities and awareness tasks for children who stutter. Positive effects were found for stuttering rate ($p<0.001$) and anxiety ($p<0.025$).

Other papers reporting outcomes from programmes for children which combined speech motor and cognitive elements were: Berkowitz et al.,[34] Smits-Bandura and Yovetich,[99] and Baumeister et al.[32] The Smits-Bandura and Yovetich programme achieved some reduction in behavioural and attitudinal stuttering symptoms however, it was reported that 90% of the participants required further therapy after two months. Berkowitz et al.[34] outlined findings following intervention with the Cooper Personalized Fluency Control Therapy Program. While there appeared to be some benefit, the results are reported as scores on individual tests and general description only. Baumeister et al.[32] found a significant reduction in stammer frequency following an intensive summer camp encompassing speech, cognitive and social elements. The data is limited by analysis of different groups of participants at different time points however indicates a reduction from 22.2%SS to 9.5%SS (ES 1.29).

Other papers reporting outcomes for adults from speech motor and cognitive interventions were: Nilsen and Ramberg;[83] Ward (1992); Stewart;[100] and Irani et al.[116] All were rated as being at higher risk of bias. The Irani paper[116] is notable as the only study we identified that used a mixed method study design. The paper has therefore been included in both the review of effectiveness and the qualitative review. The intervention combined cognitive and speech motor elements including CBT in an intensive programme. The %SS pre to post during conversation was significantly improved with a large effect size of 1.12. S24 scores (ES 1.19) and LCB assessment (ES 0.75) also indicated benefits pre to post-intervention. Participants were interviewed at two to six years FU with improvement compared to baseline sustained (ES 1.97, ES 1.25, 0.07). The table of participants details however that three of the seven participants received more than one course of intervention.

Ward (1992) evaluated SIFT (semi-intensive fluency therapy) which is described as similar to CSP with identification, prolongation, and transfer phases. Pre-intervention %SS for the group during conversation was 10.2 and post intervention %SS was 3.3. Stewart[100] examined attitude change during therapy and maintenance. At baseline the mean percentage of words stammered was 30.6 (SD 28.28). After attitude change sessions the percentage of words stammered group mean was 30.7 (SD 34.5). After 1 year the group mean was 12.6 (SD 25.78) and after 2 years the group mean was 19.7 (SD 18.9). The author noted that the specific attitude change sessions did not seem to result in significant changes, however change was apparent in most of the attitude measures following the technique sessions. During transfer and maintenance the group maintained speech gains however a small number of participants had poor maintenance. A paper from Sweden[83] used independent listener and therapist ratings of change. Overall 12 of the 13 participants were rated as having improved on at least one aspect measured. The most recently published paper in this final group of studies was Allen (2011).[117] This paper from the UK examined email as a component of a speech modification and counselling intervention. The limited evaluation data outlines that of the sixteen clients who used email as part of therapy, eleven were discharged (two due to non-response), and five clients remained on the caseload.

The final paper in this group assessed the effectiveness of Acceptance and Commitment Therapy.[33] The intervention was carried out weekly over eight weeks and included mindfulness skills in the programme. While this study used a before and after design with no comparator group and a large number of self-report measures, it included speech data and exhibited rigor in collection and analysis of data, and was therefore rated as comparatively at lower risk of bias. Results from this study showed statistically significant gains across all measures from pre-treatment to post treatment and at three months follow-up. Percentage stuttered syllables reduced from pre mean 6.42 to post mean 1.39 and mean 1.77 at FU ($p<0.001$). Psychological measures such as OASES also improved significantly post intervention and at FU ($p<0.001$)

vi) Multiple elements

Eleven papers described interventions which included multiple components across our typology of interventions, or were papers which evaluated a range of interventions (see Table 14).

Table 14 Papers reporting multiple component interventions summary

	Design	Risk of bias	Country	Population
Allen 2011[117]	Cross sectional	Higher	UK	Adults N=16
Blood 1995[40]	Before and after	Higher	USA	Adults N=4
Craig et al. 2002[47]	Before and after	Higher	Australia	Adolescents N=6
Elliott et al. 1998[50]	Before and after	Higher	USA	School age N=5
Gagnon & Ladouceur, 1992[55]	Before and after	Higher	Canada	School age N=4 & 4
Hancock and Craig 2002[57]	Before and after	Lower	Australia	Adolescents N=12
Hasbrouck, 1992[59]	Before and after	Higher	USA	Adults N=117
Pape-Neumann 2004[91]	Before and after	Higher	Germany	Adults N=100
Sicotte et al. 2003[98]	Before and after	Higher	Canada	School age N=6
Wagaman 1993[108]	Before and after	Higher	USA	School age N=8
Wagaman 1995[109]	Before and after	Higher	USA	Adolescents N=7

Three treatment programmes included EMG feedback, one for children, and two for adolescent clients. Hancock and Craig[57] and Craig et al.[47] examined a re-treatment programme for adolescents who were experiencing difficulty maintaining fluency following intervention. The therapy included EMG, smooth speech, relaxation, cognitive and self-management components. The follow up level of %SS at 12 months was no different for the retreatment intervention compared to the initial intervention. The retreatment intervention however resulted in significantly lower %SS at two years FU than the initial intervention two year FU had. The SPM scores were also significantly better for re-treatment at two year FU than initial treatment 2 year FU. Narrative in the Craig et al. paper describes individual difference in response, with two participants showing immediate improvement after the relapse programme however they had relapsed to more than 5%SS at two year FU. Two other participants reportedly improved quickly and gains were maintained ("well below 5% SS") at two years. The final two participants reportedly improved more slowly however at two years remained "well below" 5%SS. Hasbrouk[59] also described a treatment programme including EMG combined with airflow training, relaxation and de-sensitisation used with adult military service personnel. The mean number of stutters for the 151 participants reduced from 5.34% to 0.18% with all reaching the criterion level of less than 1% stuttered words. The author noted that the programme was less effective for those with more severe stuttering at baseline.

The intervention reported by Blood[40] involved motor speech changes assisted by a biofeedback computer program together with POWER, a relapse management prevention approach targeting self-efficacy and cognitive behaviour modification. At the end of phase one all participants had reduced stuttering to the criterion level of less than 3%SS. Two increased %SS to above 3% during the second and third phases however, did not relapse to pre-treatment levels. The feeling and thinking scales all showed positive changes which were maintained at 6 and 12 months.

Four other papers included regulation of air flow in the intervention components. These papers from North America report intervention with five to 11 year old children. The interventions included regulated breathing, awareness training, social support, easy speech and relaxation. Positive outcomes following intervention were reported for the majority of participants across the studies. Elliott et al.[50] found four of the five children reduced stuttering to less than 3% stuttered words, Gagnon and Ladouceur[55] described a similar reduction with gains retained at six months FU. Wagaman et al.[108] reported that all eight children reduced the proportion of stuttered words to less than 3% and that parents rated the intervention as acceptable. A paper reporting longer FU data from this study[109] found that for five of seven participants, the follow up mean %SS at three to five year FU was lower than at one year FU. For the other two participants the mean %SS had increased from one year FU level, however the score remained well below their pre-intervention stuttering levels.

Pape-Neuman[91] evaluated interventions which were chosen by clinicians rather than examining a particular therapy type. For any intervention delivered to children, data indicated a reduction in stammering frequency of ES 0.63 post-intervention. For adolescents and adults the effect size across any intervention was 0.77. A positive impact on avoidance of communication, attitude towards communication, self-judgement of stammering in social situations, and everyday life was also recorded across the therapies. Sicotte et al.[98] examined the feasibility and application of telemedicine across an unspecified typical therapy for six children and adults who stutter. Data are limited however all participants improved fluency with some benefits retained at six month FU.

vii) Papers comparing interventions

Our final typology contains papers which had the purpose of directly comparing interventions with each other. We identified eight papers which compared interventions with one another (rather than having no comparator, or comparing an intervention with no intervention). These papers were generally of reasonable quality, with only two considered to be at higher risk of bias (see Table 15).

Table 15 Papers comparing interventions summary

	Design	**Risk of bias**	**Country**	**Population**
Craig et al. 1996[16]	QuasiRCT	Lower	Australia	Children and adolescents N=97
Franken et al. 2005[54]	Before and after	Lower	Netherlands	Pre-school N=23
Hancock et al.1998[18]	Cross sectional (further analysis of RCT data)	Lower	Australia	Children and adolescents N=77
Hancock & Craig 1998[17]	Cross sectional (further analysis of RCT data)	Lower	Australia	Adolescents N=97
Menzies et al. 2008[28]	RCT	Lower	Australia	Adults N=30
Riley & Ingham 2000[94]	Before and after	Higher	USA	School age N=12
Ryan & Ryan 1995[97]	Before and after	Lower	USA	School age and adolescents N=24

Wille 1999[111]	Before and after	Higher	Germany	School age and adolescents N=14

Franken et al.[54] in a paper judged as being at lower risk of bias compared the Lidcombe Program to Demands and Capacities Model (DCM) treatment for pre-school children. For the LP the mean stuttering frequency within an audio-recorded sample decreased from 7.2% (S.D. 2.0) at baseline to 3.7% (S.D. 2.1) post-intervention. For the DCM treatment, the means decreased from 7.9% at baseline (S.D. 7.1) to 3.1% (S.D. 2.1) post-intervention. Stuttering severity was rated on a scale by clinician and parent with a significant effect pre to post ($p < 0.01$) for both interventions with no significant difference between them ($p>0.10$).

Menzies et al.[28] in another higher quality study compared speech motor intervention alone to speech motor combined with CBT. Post-treatment %SS at FU was around half that at baseline. The authors found no difference in %SS between the two groups, with the additional CBT treatment having no additional impact on the stuttering reduction, than speech restructuring treatment alone. While not affecting speech outcome the group who received the CBT showed greater improvement on measures of anxiety and avoidance.

Bioresonance therapy was compared with standard speech therapy in a study from Germany.[111] The groups received one therapy for 10 sessions and then swapped to the other therapy for the second 10 sessions. There was some improvement of fluency during the first 4 months of therapy, but no further improvement in the second therapy phase where intervention programmes changed. Data are limited and there was considerable variation in individual response to the intervention, making it not possible to conclude whether or not bio-resonance therapy was more effective.

The method of gradually increasing length and complexity of utterances was compared with DAF by Ryan and Ryan.[97] The study found that, while both interventions achieved a significant reduction in %SS ($p<0.01$), the GILCU programme was slightly superior in terms of generalisation of fluency. Riley and Ingham[94] compared the effect of speech motor training (emphasis on speech motor skills) to extended length of utterance intervention (response-contingent feedback without direct speech motor training), specifically on vowel duration measures and stuttering frequency. Across both interventions there was a median decrease in %SS of 3.19 (41%), with 37% reduction for SMT and 64% reduction for ELU (the ELU intervention had a significantly greater effect $p=0.04$).

The Craig et al. study[16] mentioned earlier in the section on feedback and technology interventions, compared EMG to intensive smooth speech and home based speech for children and adolescents. All the therapies included reward and response contingencies, overcorrection, transfer, maintenance and self-monitoring. The study found that %SS was significantly reduced baseline to post-intervention and at 3 month and 12 month FU. The three treatments were found to be equally effective ($p=0$). Two further papers[17] [18] examined longer term outcomes and possible predictors of relapse following these interventions. At four to six year follow up there continued to be no significant difference between the interventions in terms of effectiveness. An association was suggested between having a more severe stutter pre-intervention and being less anxious immediately post-therapy, with having a higher level of stuttering in the long term.

Summary of effectiveness evidence

The review of intervention effectiveness found a substantial body of work (112 papers), which we divided into a typology of seven categories. Across the set of papers, the predominant finding was a report of some degree of positive outcome for PWS resulting from these interventions. While the potential for reporting bias must be a consideration, the overall conclusion from examining this literature is that a diverse range of intervention types have some evidence of effectiveness underpinning their use for people who stutter.

It is important to note however that the literature has considerable variation in quality, with around three quarters of the studies rated as being at higher risk of bias. The set of papers generally reported small numbers of participants, with few using designs with comparator groups. It is important to note that our criteria of higher versus lower quality is comparative across the set of papers, with only a small proportion of the literature using the highest quality controlled designs and very few achieving the “gold standard” of full randomisation. As a whole therefore there is little that could be considered to be at very low risk of bias. Results from the higher quality studies however did not seem to be contradictory to those with greater potential risk of bias. Also on a positive note, the body of work does contain a sizeable number of studies with lengthy follow up periods. Twenty five papers had a follow up period of two years or more providing evidence that while some fading of effect was likely that positive outcomes could persist in the longer term. The only group of interventions where effects were of more short term duration was the feedback and technology group which seemed to offer PWS a more immediate gain in fluency to be used in particular situations of difficulty such as talking on the telephone.

Measurement of effectiveness

The most significant challenge in comparing clinical effectiveness between different studies and interventions however, is the vast range of outcome measures used to evaluate change following an intervention. Outcomes measured include those relating to the frequency or severity of stuttering (number or percentage of words stuttered; number or percentage of syllables stuttered; rating of stuttering severity; number of stuttering events); perceived self-efficacy/control/esteem; anxiety/stress/depression level; self-perceptions of or attitude to speech/stammer; perception of self/others as being a stutterer; avoidance of words/situations; parent verbal interaction; rate of speech; and perceived naturalness. The literature used three main strategies to evaluate the effect on these outcomes: firstly, by comparing percentage change pre to post; secondly, by reporting level of frequency at baseline and again post intervention then using statistical means to examine the difference; and thirdly, by descriptively comparing the severity level or need for further intervention pre-post.

Much of the literature reports the percentage of reduction in stuttered speech pre to post intervention (for example baseline and follow up assessment of percentage of syllables or words that are stuttered). These “degree of change” measures however have a significant limitation, in that baseline stuttering severity will influence how substantial any positive change can be. An examination of baseline levels of stuttering amongst participants across studies reveals a high level of variation in the fluency of participants prior to the intervention, both between studies, and importantly within a study. For example Lincoln et al.[77] reported a baseline mean amongst participants ranging from 5%SS to 18.9%SS whereas Langevin and Boberg (1993)[71] found a baseline stuttering rate ranging from 3.6 to 9.4%SS. Participants in the Rousseau et al.[96] study appeared to have a low baseline of 3%SS. Many studies highlighted that there was considerable individual variation in outcome[31] [38] [52] with some linking this to baseline level of severity (for example O’Brian et al. 2013).[86]

While caution is thus required when comparing reports of positive percentage reductions pre-post intervention between papers with participants who have differing baseline stuttering levels, analysis of %SS reductions within each intervention typology reveals evidence of reduction across intervention approaches. Within the “feedback and technology” group authors reported percentage reductions in syllables stuttered of between 3% and 87%. In the "behaviour modification" typology, percentage reductions in syllables stuttered ranged from 69%SS to 97% for the LP, and 53% for the one paper reporting this measure using other interventions. In the "speech motor" group %SS reductions were reported varying from 22% to 96%. For "speech motor plus cognitive" the one paper using this measure found a 22% reduction in %SS. Amongst the "multiple components" group, reductions of 52% and 89% were described, and a 36.5 and 63.5% improvement in a comparison paper evaluating ELU and SMT interventions.

In addition to the requirement to consider baseline stuttering levels when evaluating these papers, it is also important to consider the impact of any change for the person who stutters. This requires consideration of not only change but clinical (or personal) impact of the improvement. It has been proposed that in order to be clinically significant, an intervention should result in a 50% reduction in stuttering.[93] Examining the set of papers reporting percentage change in syllables stuttered with this criterion reveals that six of the eight "feedback and technology" group, all five of the Lidcombe papers, one non LP behaviour modification paper, five of the six "speech motor" papers and both of the multiple component interventions reached this level, again confirming that a range of intervention approaches identified could result in clinically significant improvement.

The second method for evaluating change, was to report the level of stuttering frequency at baseline and again post intervention. These papers reported effectiveness in terms of p values or effect sizes rather than percentage change. In the "feedback and technology" group an effect size of 0.14 was reported for stuttering (during monologue only) in one paper, and an effect size of 1.1 for reduction of stuttering frequency in another[48] and statistically significant changes were reported in nine papers. In the "cognitive" group an effect size of 0.74 for reduction in stuttering was found in one study[30] and three papers reported statistically significant differences. In the behaviour modification group effect sizes of 2.9, 2.3, 2.3 are described,[24] [51] [82] and eight papers provided evidence of statistically significant effects. Speech motor and speech motor plus cognitive approach papers reported effect sizes of 0.7, 0.86, 1.8, 0.96, 0.88, 1.29, 1.12, 6.86, 14.96 [31] [37] [104] [106] [32] [116] [73] [74] and seven reported statistically significant effects. One multiple component paper reported an effect size of 0.63,[91] and three comparison papers described significant effects for each of the interventions they evaluated. This set of findings thus supports the conclusion that a range of interventions may be effective for PWS. As with the percentage change evaluations described above statistical significance may differ from clinical (or personal) significance and mask individual variation in outcomes. Statistical significance is also heavily dependent upon sample size as very small effects can be statistically significant with a large sample, while relatively large effects may not be statistically significant with a smaller sample.

The third approach to evaluating outcomes considered level of stuttering before and again after an intervention, or whether further intervention was required. While there is some debate regarding what is a “good outcome” in terms of the level of stuttering following an intervention, many studies use a 3%SS or less level as being an acceptable degree of dysfluency, and thus may be a target for interventions to achieve.[55] Four papers in the “cognitive” group used severity scales to evaluate difference (two a scale developed by the author and two the SSI), these studies found positive outcomes. The papers reporting the LP often included data from severity rating scales, and the programme uses threshold levels of %SS in order for participants to move through the intervention stages. Four non LP “behaviour modification” papers reported positive outcomes in terms of parent report, stuttering severity or need for further therapy post-intervention. Five “speech motor” papers report reduced levels of %SS post-therapy (to 0.9%SS, 1.6%, 1%, 0.4%, near 0%), three “speech motor plus cognitive” (to 1.29%, 0.53%, 0.1-3.8%), six multiple component papers (to less than 3% in four papers, less than 2% in two). These papers further confirm that using this approach to measuring effectiveness, there is evidence of positive outcomes for PWS across a range of intervention approaches.

While stuttering frequency or severity measures were the most frequent outcome data reported, a smaller number of papers considered wider effects on the person who stutters or self-rated perceptions of stuttering. One feedback and technology paper[92] used PSI scores. This paper found however that the significant effect of the technology immediately post-fitting was not maintained at follow up. The “cognitive” interventions group (as may be expected) tended to use a wider range of measures to evaluate efficacy. They indicated that the intervention could impact on not only stuttered speech but also self-perceptions and attitudes. De Veer et al.[20] for example reported large effect sizes on anxiety and locus of control. In the “speech motor and cognitive category” Lawson et al.[75] found change in PSI scores, with reduction in avoidance the greatest area of change.

Dose response outcomes

We endeavoured to examine the included literature to explore whether the number of hours of intervention could be linked to outcomes for PWS. The heterogeneity in measures used, and variation in time points assessed, made this type of analysis problematic, however in order to explore this potential relationship we tabulated papers which included statistical analysis (p values or effect sizes), see Table 16. It can be seen that not only did different measures preclude drawing robust conclusions regarding a relationship, but also there was a substantial body of literature which reported that intervention hours varied between individuals receiving the same intervention. Interventions varied from only a few hours (mostly technology and feedback) to more than 75 hours. Where interventions included residential components, time was estimated as being more than "working day hours" as many reported including evening social activities. For these studies however, potentially all waking hours could be considered intervention hours making the estimate of "more than 75 hours" potentially considerably below that actually received.

Conclusions regarding any dose-response relationship are therefore limited due to challenges extracting accurate information from studies and issues of differing outcome measurement. Interestingly, there was little discussion regarding how the contact hours had been determined for interventions with pre-designed schedules. Papers relating to the LP reported that individuals with more severe stuttering tended to require a greater number of contact hours, and those with greater time since onset tended to require more sessions. There was no clear evidence that increasing contact hours for all participants led to more positive outcomes. Dose-response relationships seemed to be associated with characteristics of the PWS rather than the type and dosage of intervention.

Table 16 Examination of dose-response.

Reported by length of treatment time only	Baumeister et al. 2003 (3 weeks):[32] reduction 22.2% to 9.5%, ES 1.29.
Individual <10 hours	Cream 2009:[48] ES1.1 reduction in stuttering frequency. Mean %SS 7.7 pre-intervention and 2.3 post-intervention. Franklin et al. 2008:[21] post-treatment %SS intervention group mean 3.9 (0.5-25.6 SD 5.6). Control group 6.4 (0.5-20.7 SD 5.1). Gallop & Runyan 2012:[56] comparison of pre-fitting of device with current use or non-use of the device significant decrease in stuttering [F (1,6) = 17.44, p = .006]. Pollard et al. 2009:[92] statistically significant effect of

	SpeechEasy immediately post-fitting compared to baseline (PSI score t(16) = 3.13, p = 0.014). Effect not maintained at FU. No other pre-post assessments reached significance (p >0 .05 for SSI & OASES). Stuart 2004:[102] statistically significant main effect of device [F (1,6)~13.2, Huynh–Felt p~0.011, g2~0.69]. The proportion of stuttered syllables was reduced by approximately 90% during reading and 67% during monologue. Unger 2012:[125] statistically significant main effect in the occurrence of stuttered syllables between the control (No Device) and active DAF/FAF conditions F(1.76, 51.08) = 4.89, p = .014, η^2_p = .145. Van Borsel 2003:[105] conversation with an examiner significantly improved z= -1.051, p=0.293 Zimmerman 1997:[126] significant main effect of the AAF condition F(2,8) = 13.56, p= 0.0004 $\hat{w}^2$ = 0.48.
Individual 10-19 hours	Harris et al. 2002:[22] treatment group improved significantly more than the control group (F = 5.02,P < 0.05). The intervention group therefore improved twice as much as controls. Kaya 2011:[67] baseline stuttering rank judged as 3.06 (SD 1.33), after intervention 8.06 (SD 1.08). Mean difference minus 4.99 (SD 1.63). Pre- and post-measurements statistically significant (p<0.000).
Individual 20-50 hours	De Veer et al. 2009: [20] ES average for self-efficacy beliefs, coping and attitude towards speech situations (d = 0.55; 0.62; and 0.48, respectively). ES large for stress, anxiety and locus of control. (d = 1.16; 1.07; and 0.76 respectively). Riley & Ingham 2000:[94] 63.5% reduction (p<0.04). Difference between SMT and ELU intervention significant (p=0.04).
Individual more than 75 hours	Von Gudenberg et al. 2006[107] after 1 year: 9-13 years old show an effect of d=0.96, and 14-19 years old of d=0.88. All ES large.
Individual + group 10-20 hours contact time	Amster & Klein 2008:[30] d=0.74 (pre-treatment to mid-treatment) and d=0.51
Individual + group 30-75 hours	Block et al. 2006:[37] %SS data pre-treatment was 5.4 and immediately post-treatment was 1.8%SS. ES large 0.86. The mean 3.5–5 year follow-up stuttering rate

	was 1.6%SS. Craig et al. 1996:[16] Significant differences between control group and all treatment groups across all contexts (p<0.001). Pre-treatment scores differed significantly from immediate post-treatment (p<0.001). Cream 2010: [19] there was an apparent difference between groups for the primary outcome %SS at Assessment 4. However, when adjusted for %SS at Assessments 1 and 2, this difference was not statistically significant (mean difference: 0.06 %SS with 95% CI: –1.3 to 1.4 %SS, p =0.92). Irani et al. 2012:[116] %SS pre to post conversation – ES 1.12 CI minus 0.07 to 2.17. Pre to time of interview 1.97 CI 0.59 to 3.09. Lawson et al 1993:[75] avoidance scores before the course significantly higher than post (F[1,42] = 13.99, p <0.001). Significant overall improvement on the PSI for all areas although avoidance greatest change. Struggle (F[3,122] = 3.03, p <0.05), avoidance (F[3,122] = 14.02, p <0.001), expectancy (F[3,122] = 4.80, p <0.01).
Individual + group more than 75 hours	Huinck et al. 2006: [61] %SS pre-post mean difference 9.17 (SE 1.655 p<0.0001), pre to FU1 3.09 (SE 0.913 p<0.001) pre to FU2 3.79 (SE 0.866 p<0.0001). Langevin et al. 2006:[73] ES at 2 years = 6.86. ES at 2 years = 7.62. Langevin et al. 2010:[74] Pre mean %SS 15.86 immediate post mean %SS 0.9, 5 year FU mean %SS 4.98. Pre-post significant p<0.001 (large ES -14.96), pre-5year FU p=0.002 (large ES -11.49). Rosenberger 2007:[95] reduction of stammer rate (p<0,001) for T1, T2, and T3
Individual + parent group	No studies
Child group + parent group 10-20 hours	Hancock & Craig 1998:[17] Significant difference (p<0.001) pre to post initial intervention for %SS at immediate post, 3 months post, 12 months post and 2 years post.
Child group + parent group 20-50 hours	Druce & Debney 1997:[49] (6.5 hours parents, children one week intensive) From pre intervention, to after the intensive week, the mean %SS for the group decreased by 7.6 to 1.75 %SS with a standard error of 0.54,

	change in the %SS with treatment statistically significant p = 0.0015, 95% C.1.' = - 11.7 to -3.5.
Parent group	No studies
Unclear	Andrews 2012: [31] ES=0.7. Armson 1998:[119] Significant difference only for number of stuttering events during monologue p=0.10 ES 0.14. Not significant - number syllables p=0.41 ES 0, or percent stuttering p=0.46 ES 0. Trajkovski 2011: [104] ES = 1.8
Hours varied by individual participant	Femrell et al. 2012: [51] (9-46 visits) Significant [t(7) = 4.3, p<0.01] decrease in mean %SS before and after treatment (7.6 [SD 4.9] vs.0.1% [SD 0.2], respectively) with large ES (d = 2.9) an average reduction of 97.8% after stage 2. Franken et al. 2005: [54] (mean 11.5 sessions) the means decreased from 7.2% (S.D. = 2.0) to 3.7% (S.D. = 2.1). For DCM treatment, the means decreased from 7.9% (S.D. = 7.1) to 3.1% (S.D. = 2.1). Jones 2005: [24] ES 2.3% of syllables stuttered (95% confidence interval 0.8 to 3.9, p = 0.003) Jones 2008: [25] mean difference 55.5 %SS, (p,0.0001), an 80% reduction in stuttering frequency. Koushik et al. 2009: [69] (6-10 visits) mean % syllables stuttered baseline = 9.2 (SD 7.8) and 1.9 (SD 1.3 range 0.2% to 3.8%) at follow up significant difference (p= 0.0002). Latterman et al. 2008:[26] (average 13 sessions), F(1,41) = 10.300, p =0 .003, partial $\eta 2$ = 0.201, the improvement in the treatment group significantly more than control group. Lewis et al. 2008:[27] (mean 49 consultations) estimated to be a 73% decrease in stuttering. (95% CI = 25%–90%, p =0.02). Miller & Guitar 2009: [82] (mean 19.8 sessions) Significant pre-post change p < 0.001. ES 2.3. Pape-Neumann 2004:[91] stammer frequency ES= 0.63, naturalness of speech ES= 0.60, speech rate ES=0.37. ES for avoidance of communication, attitude towards communication, self-judgement of stammering in social situations, and impact on all day life all =1.70

	Rousseau et al. 2007:[96] %SS scores significant reduction ($p < 0.0001$). Yaruss et al. 2006:[115] baseline mean stuttering frequency 16.4% (SD 6.6%), after treatment 3.2% (SD 2.0%). Significant reduction (Z=j3.517 $p<0.001$).

Long term effects

Fifty one papers reported data at follow up of one year or more following intervention. The feedback and technology group, perhaps unsurprisingly due to the nature of the interventions, tended to report immediate follow up, with the effect of this technology demonstrated as a "quick fix" method to reduce the percentage of syllables stuttered. Studies predominantly reported effects in laboratory rather than everyday settings, however there was evidence to demonstrate its value in situations such as using the telephone. The other typologies provide evidence of long term benefits (one study[73] for example reports 71-86% of participants maintained gains) although there is evidence of fading of effect for many studies, and substantial individual variation in the degree of preservation of effect. One study[38] described that 46% of variance in effect at long term follow up between participants could not be accounted for.

Having considered the range of outcomes measured and examined evidence of positive outcomes across intervention approaches, a key question resulting from the review is that if these diverse types of intervention can all be effective then what is it about interventions that achieve change, what is the active ingredient that may be common across these differing programmes? Having analysed the intervention typologies and the outcomes, we then turned to the qualitative findings to seek further understanding of how these interventions may lead to their intended outcomes, and whether the individual variation in outcomes reported may be explained by this literature.

CHAPTER 4 RESULTS OF THE REVIEW OF PERCEPTIONS OF PEOPLE WHO STUTTER AND STAFF PROVIDING SERVICE

The qualitative review used the same systematic review process of searching, selection, extraction and synthesis as the review of clinical effectiveness however, this review differed in terms of inclusion/exclusion criteria and the method of synthesis as outlined in the Methods section. Papers were quality appraised using the Critical Appraisal Skills Programme tool outlined earlier.[9] The research question for the qualitative review was: what are the factors that may enhance or mitigate against successful outcomes for people who stutter following intervention? It included data from individuals who have completed an intervention for stuttering where papers reported views and perceptions regarding potential obstacles to them achieving successful outcomes following intervention. This included PWS, their parents, carers, partners and staff providing interventions.

As outlined in the Methods section, qualitative data were synthesised using thematic synthesis methods to develop an overview of recurring perceptions within the data. This method comprises familiarisation with each paper and coding of the finding sections. We analysed the themes to identify firstly perceptions of interventions by type and secondly, to examine data across the lifespan. In this section we will report the recurring themes relating to view of interventions, by firstly population subgroup (children, adolescents, adults, older adults), and then describe data outlining perceptions of stuttering across the lifespan.

Quantity of the research available

From an initial 4490 citations, 4265 were rejected on inspection of title/abstract. Twenty citations were deemed relevant to the second research question. Of these, six were excluded on reading the full paper (n=14). A second search produced a further eight citations of which one was unable to be sourced (n=7). The reference lists of all included papers were scrutinised for further relevant citations. Thirty eight citations were identified as potential inclusions, of which six were deemed relevant on further inspection. Of these, five were included on reading the full paper. See Figure 1 (page 31) for an illustration of the process of selection of papers. The total number of qualitative papers included in the review of views and perceptions was 25. One mixed method paper also contributed data to this element of the review giving a total of 26 included studies. In three cases two papers reported findings from the same study, giving 23 unique studies. A list of exclusions following the reading of full papers is presented in Appendix 4.

Type of research available

Study design

All but one of the included studies used semi-structured interviews to collect data; two studies used repeated interviews, two included telephone as well as face-to-face interviews and one study used only web-conferencing technology to collect interview data. One study supplemented interviews with questionnaires, two studies added focus groups and a further study used only focus groups. Eleven studies described a phenomenological approach to analysis, and two used Grounded Theory. Seven studies reported using Thematic Analysis, one Framework Analysis and one Content Analysis. A further three did not report a specific method of analysis, though two of these described stages representing a thematic approach.

All included studies examined lived experiences and coping strategies of being a PWS or a spouse/mother/parent of a PWS; one focused on reflections of childhood experiences of stuttering by adult PWS. One study focused on ethnicity, and another on the client / therapist relationship. Five studies assessed views following therapy or self-help conference; two of these explored parental views about the Lidcombe programme and two explored adult experiences of Prolonged Speech (PS) therapy. One study reported adolescent perceptions of a range of therapies including an intensive week-long course in Prolonged Speech, an intensive week-long course in Smooth Speech, individual Prolonged Speech therapy and the Camperdown approach. One study assessed the experience of late recovery from stuttering.

Population

Of the included papers, four were published in the UK, 11 in the US, three in Canada, six in Australia and two in South Africa. Populations in all but one study were adults (one assessed the views of adolescents and young adults who stuttered). Of these, two studies included parents (one included mothers only) of children who stutter and two assessed the views of spouses (one included both fluent and dysfluent partners) of people who stutter. One study focused on the interaction between stuttering and ethnicity, with a sample of African American males. No papers described participants as being clutterers.

Quality of included papers

All included papers were quality assessed using the tool described in the Methods section. Appendix 4 details the completed assessment for each paper. Of the 26 included studies, 18 were assessed as being at lower risk of bias. Eight studies were assessed as being at higher risk due predominantly to a lack of reporting of elements. See Table 17 for a summary of the papers.

Table 17 Summary of qualitative studies

Author Country	Sample	Data collection Method	Population	Focus of research	Data analysis methods as reported
Anderson 2003[127] USA	N=6	Interviews	Adults	Experiences of late recovery from stuttering	Thematic analysis
Beilby 2013[128] Australia	N=20 (10 dyads)	Mixed methods: Interviews Questionnaires	Dyads (adults who stutter and their current life partner)	Impact of stuttering on adults who stutter and their partners	Phenomenology
Boberg 1990[129] Canada	N=15	Interviews	Wives of people who stutter	How spouses are affected by their spouse's stuttering.	Not reported
Bricker-Katz 2010[130] Australia	N=11	Focus Groups	Adults over 55 years	PWS perceptions of limitations to activity and participation.	Thematic analysis
Butler 2013[131] UK	N=38	Focus Groups (self-help meetings) and interviews	Adults	PWS perspectives on and responses to their speech dysfluency.	Grounded theory
Corcoran 1995[132] Canada Corcoran 1998[133] Canada	N=7 N=7	Interviews	Adults	Experiences of adults who stutter.	Immersion and crystallization in the data to identify what is meaningful.
Cream 2003[134] Australia Cream 2004[135] Australia	N=10 N=10	Interviews	Adults	Experiences of adults who stutter	Phenomenology Line-by-line, holistic and selective thematic analysis.
Crichton-Smith	N=14	Interviews	Adults who have / have	The communicative experiences and	Framework analysis

2002[136] UK			not received therapy	coping strategies of adults who stammer.	
Daniels 2006[137] USA	N=10	Interviews	African American men who stutter	How African American men who stutter view communication, identity and life choices.	Thematic analysis
Daniels 2012[138] USA	N=21	Interviews and focus groups	Adults who stutter	Primary and secondary school experiences of adults who stutter.	Phenomenology
Goodhue 2010[139] Australia / NZ	N=16	Repeat face-to-face and telephone interviews (9 with each participant)	Mothers of children who stutter	Mothers experiences of implementing the LP with their child.	Phenomenology Thematic analysis
Hayhow 2009[140] UK	N=16 (14 children)	Repeat face-to-face interviews (interviews repeated once with 6 participants)	Parents of children who stutter	Parent's experiences of implementing the LP with their child.	Thematic analysis Use of NVivo
Hearne 2008[141] Australia	N=13	Focus groups and interviews	Adolescents and young adults who stutter	Experience of stuttering and therapy for stuttering during the adolescent years. Reasons for reticence in seeking out therapy.	Not described as a particular analysis method. The steps described include familiarisation and categorisation of themes.
Hughes 2011[142] USA	N=7	Interviews	Adults who stutter	Exploration of family experience of PWS related to their interactions with family members, speech therapy and stuttering management.	Phenomenology Thematic analysis
Irani 2012[116] USA	N=7	Interviews via web-conferencing technology.	Adults who stutter	To gain a deeper understanding of clients' perceptions of an Intensive Stuttering Clinic for Adolescents and Adults (ISCAA)	Phenomenology Thematic analysis

				programme and measure long-term treatment outcomes.	
Kathard 2004[143] South Africa	N=7	Biographical interviews	Adults who stutter	To explore processes shaping self-identity formation and the actions of people who stutter.	Cross case and thematic analysis
Klompas 2004[144] South Africa	N=16	Interviews	Adults who stutter	Life experiences of a group of South African adults who stutter and the impact of stuttering on their quality of life.	Content analysis
Plexico 2005[148] USA	N=7	Interviews	Adults who stutter	Understanding of how adults have been able to successfully manage their stuttering.	Phenomenology Thematic analysis
Plexico 2009a[146] and 2009b[147] (companion papers) USA	N=9 N=9	Interviews	Adults who stutter	To identify patterns of coping responses by adults responding to the stress resulting from the threat of stuttering. To develop a model of coping and a better understanding of the complexities within the coping responses of people who stutter.	Grounded Theory
Plexico 2010[148] USA	N=28	Interviews	Adults who stutter	The underlying factors that contribute to a successful or unsuccessful therapeutic interaction between clients and their clinicians.	Phenomenology
Plexico 2012[149] USA	N=12	Interviews	Parents of children who stutter	To describe in detail the underlying factors that may be relevant to being a parent of a child who stutters.	Phenomenology

Stewart 2004[150] UK	N=8	Interviews	Adults who stutter	Experiences of adults who have completed a course of therapy for stammering.	Phenomenology
Trichon 2011[151] USA	N=12	Interviews	Adults who stutter	To understand the lived experience of individuals who attended a self-help conference(s) for PWS from the perspective of a PWS	Phenomenology

Data relating to views of interventions

We analysed studies according to the type of interventions described (where possible) to differentiate experiences. This allowed us to map qualitative and quantitative findings for later meta-synthesis across the two reviews. We also categorised papers which reported views of interventions by population, to identify therapeutic experiences that might contrast or overlap between children who stutter and adults who stutter. For each population we examined potential barriers and facilitators to outcomes following therapy, together with factors which may be influential on the longer term impact of interventions.

Views about interventions aimed at children

Eleven included papers provided data about experiences and views following childhood interventions for developmental stuttering. None of these studies included participants that were children at the time of the research. Nine papers included retrospective data relating to childhood experiences in adult samples.[127, 132, 136, 137, 138, 142, 143, 144, 145] Three further papers described parental experiences of supporting their children through therapy.[139, 140, 149] Two papers[139, 140] evaluated parental experiences of implementing the Lidcombe Program which was developed specifically for early stuttering intervention. The program comprises parental training to give appropriate and timely feedback to the child on stuttering instances. The treatment mechanism is reinforcement of non-stuttered speech through parental praise which needs to outweigh reminders not to stutter by at least five instances to one.[123]

Potential barriers and facilitators to positive outcomes from therapy for children

Barriers and facilitators identified related to: accessing therapy; therapy techniques; therapist-client relationship; parental expectations and perceptions about their own involvement; children's experiences; and perceived effectiveness.

Accessing therapy

Issues of access included reported difficulty in attending appointments at a clinic, and accessing therapy during childhood. For children engaged in the Lidcombe Program, weekly clinic visits were described by some parents as being burdensome. One suggested way of overcoming this was to provide a combination of clinic visits and distance therapy.[140] While retrospective data highlighted a general lack of suitable speech therapy during childhood, there was evidence from the studies of changing approaches to childhood therapy, with more activity within schools in relation to treating speech impairments. In one paper it was suggested that an important aspect for children was for them to know who they can speak to in school to access support.[138] In another paper, an adolescent participant spoke retrospectively of receiving positive support at school, due to his teacher having experienced stuttering. This teacher not only exhibited experiential awareness, he also provided advice about finding assistance.[141]

Therapy techniques

Aspects of childhood speech therapy that were reported as having been unhelpful in hindsight included: an undue focus on behavioural techniques; ignoring the emotional aspect of treatment, and a lack of attention to the individuality of each pupil.[132 138] Specific strategies advised by therapists during childhood such as avoidance were, in retrospect, identified by PWS as not benefitting long term recovery, with some taught techniques having to be un-learned later. Some approaches which were viewed as being unhelpful had also been recommended to family members who had tried to assist the child. Unhelpful approaches could lead to frustration which could in turn de-motivate the client to continue with therapy.[142]

Therapist-client relationship

The relationship between therapist and client was reportedly an important aspect of a positive therapy experience. However, in one study some therapists were perceived as not having wanted to become involved in the treatment process.[132] The suggestion of having access to a life counsellor to provide emotional and practical support to cope with life stages, in addition to sessions with a speech therapist was viewed positively.[142] In another study it was suggested that school teachers should receive training in the current guidelines so that they can better support pupils who stutter.[138]

Parental expectations and perceptions about their own involvement

Two papers provide detailed descriptions of parental expectations and perceptions of the Lidcombe Program. All but one mother in the first study reported that they had expected that the LP would deliver improvements in speech quickly, and that their child would be "fixed."[139] The mothers described in this paper, and one mother in the second study[140] reportedly did not expect to have to deliver the therapy themselves, nor did they anticipate the sustained effort and commitment required. Authors of the first paper described low expectations of outcome amongst participants (based on perceptions of the program being comprised of only relatively simple methods), however these initially low expectations had been surpassed in reality.[139] Parents were described as expressing surprise at how little commenting on speech was encouraged on the programme, apart from during "talk time", how much stuttered speech was allowed to continue, and how the children were encouraged to discover strategies for themselves.[140]

Hayhow[140] described some parents being very enthusiastic about the LP, whereas others appeared to have no strong feelings either positive or negative. One parent was sceptical about it prior to registering, however she voiced satisfaction once she perceived that the programme could achieve benefit. Other parents were described as wondering why they had not thought of the positive reinforcement aspect themselves prior to joining the programme. Mothers reportedly found the programme easy to carry out in theory but sometimes reported difficulty remaining focused, especially when speech improved.[139] There were concerns voiced about the responsibility of correctly implementing the treatment with their child which created feelings of anxiety and pressure, as well as feelings of failure when therapy was unsuccessful.[139 140] However, other parents reported positive feelings in that they could assist in their child's therapy rather than leave it all to professionals.[140]

There was also a reported lack of understanding about the long term aims of the LP and where their progress was heading. A suggested solution to this was for documentation to be provided for parents at the beginning of therapy to advise them about what to expect and the timing of incremental steps of the LP, as well as having something that could inform their partner. However one participant stated that the benefits of this approach depend on the individual's learning style.[139] For some mothers, documentation about the LP and a support group was suggested as a way of sharing experiences, and gaining contact with other parents who were implementing the LP.[139 140]

One paper describing perceptions of other (unspecified) interventions found that some parents whose children received therapy arranged through the school system reported feeling dissatisfied.[150] In particular, they reported feeling uninformed and uninvolved in their child's therapy. There was also a perception that group therapy was not satisfactory, as it did not address individual needs. Some of the techniques that parents were advised to carry out by therapists could be perceived as frustrating and unrealistic, in terms of time required and the way that techniques produced unnatural sounding speech.

Ch*ildren's experiences*

Two papers[139 149] reported parental perceptions regarding their children's experiences during therapy. A further two studies[132 138] outlined adult memories of experiences from their own childhood. In the first paper, which examined the LP, more than half the mothers reported that the children enjoyed the programme, both in therapy sessions and at home, and that the children were instrumental in reminding their mothers about therapy and about receiving rewards. Praise from the mother was cited as a positive factor. However, in contrast other children reportedly did not like consistently hearing feedback on their speech, and in some cases mothers reported sensitivity and annoyance at hearing the word "smooth." In order to address this issue other terms had been introduced, such as "great talking." In the other study which included data relating to children's experiences, some parents reported that they did not think that the therapy they had undertaken had been suited to their child's needs.[150]

Studies examining adult reflection on past childhood experiences of therapy reported general dissatisfaction. This may be due to the relatively undeveloped nature of therapeutic services historically compared to current provision. Participants in two papers reported that the speech therapy which they had received as a child during their school years, generally focussed on behavioural techniques, and did not acknowledge the emotional impact of stuttering.[132 138] Participants reported that more discussion about such aspects of stuttering, and perhaps a support group would have been appreciated. One participant commented that for young children, methods that incorporate relaxation and cognitive restructuring would be useful. Encouragement to practice talking at a young age was also mentioned as important.[138]

Perceived effectiveness

Goodhue et al.[139] found that most mothers enrolled on the LP perceived that it was effective in reducing stuttering. Only one mother reportedly questioned the effectiveness, as her child had not shown consistent progression over the six months of therapy. Parents in another study (that did not specify which particular programmes children had received) reported variability in perceptions of effectiveness. Some parents could see improvement while others perceived that the therapy was unhelpful.[150]

Parents reported that increased quality time with their child was a major benefit of the LP, particularly in the early stage.[139 140]. It was not specifically the amount of time spent but the exclusive time together that was reported to enhance the bond between child and parent.[139] In addition, parents gained skills in managing stuttering as well as in parenting generally. Other benefits included raised awareness for the child about their speech fluency and an ability later in the process to adapt therapy at home according to the needs of their child.[139 140]

The children's confidence was also reported to increase, particularly when stuttering was reduced. Increased confidence was manifested in being more willing to try new things and being less shy. Being able to speak more fluently at home increased confidence to do so with other people.[139]

Retrospective accounts of therapy received showed varied views of effectiveness. A participant in one study[127] attributed recovery at least in part to therapy received as a child, while in other studies there was evidence that childhood therapy was not perceived as being helpful.[132 141 143] Techniques suggested in one paper to enhance young children in increasing their fluency included relaxation, cognitive restructuring and generally encouraging talking.[138]

Obstacles to long term impact: *maintenance in the "real world"*

In addition to examining perceptions of interventions which had been received, the qualitative studies considered factors which may influence whether or not short term gains were maintained in the longer term, to achieve long term impact. Factors identified which could be influential in achieving longer term benefit were: parental experiences; perceived family support; and perceived support from the school.

Parental experiences

Although the techniques of the LP were reported to be easy to understand and implement in theory, in practice mothers reported difficulty keeping up the momentum in the face of setbacks such as relapse.[140] They reported having insufficient time to carry out the objectives regularly as they were busy, often fitting in treatment around work and caring for siblings. Caring for siblings meant that concentration on treatment was often disrupted so that even a 10 minute dedicated time slot with the child who stutters was difficult to achieve. Forgetting to praise their child all the time, especially when stuttering showed signs of improvement, was also an issue.[139]

Reported solutions to these barriers included using a previously established routine such as “story time” as a time to implement structured conversations, and breakfast/walking to school as a time to implement unstructured conversations. To overcome forgetting to implement treatment, visual reminders around the house for the child and mother were suggested, such as the promise of a toy reward that sits on top of the fridge or obtaining a star on a pin board when the child has achieved a set goal. Regular clinic sessions and telephone calls from the therapist also served as reminders to mothers. In respect to caring for siblings, it was reported that having a family member such as the father or grandparent around to take the sibling to a different room, or to involve the sibling in an activity or with toys, or to carry out conversations whilst a younger sibling was asleep was useful during conversation sessions. Success with these strategies depended on the sibling’s personality, developmental stage and mood.[139]

Some mothers expressed concern that treatment was being carried out properly by them, with confidence in their own ability to implement therapy fluctuating according to the severity of the child’s stuttering. While a mother’s confidence improved with their child’s improved fluency; conversely it waned when fluency deteriorated. Signs of improved speech motivated mothers to carry on with the therapy, whereas when speech deteriorated mothers felt lost for solutions.[139] In addition, some parents experienced difficulty taking a firm lead in the process, resulting in therapy being conducted on the child’s terms.[140] Hayhow[140] speculated that positive progress influenced parent’s ability to persist with treatment. She also suggested that sessions could be arranged without the child present to allow the therapist to explore progress with the parents.

Some parents held beliefs about stuttering that were at odds with the underpinning theories of the LP. Difficulty implementing some of the procedures was reported by parents that had initially been ambivalent about the programme.[140] Some parents described a reluctance to discuss stuttering at home, due to feelings of discomfort and embarrassment for the child, a perceived lack of knowledge about the subject and the perception that nothing could be done; that there was no clear end point. Where speech therapy was discussed in the family it was often instigated by the attendance at speech therapy sessions, which made parents feel more comfortable about discussing the subject.

A consistent theme across parental samples was the reported need for support to help them cope with having a child who stutters and/or with the commitment required to support therapy.[139] [149] Such support was usually sought from significant others, such as partners or mothers, or from friends. Mothers were reported to provide emotional support whilst friends gave advice. Whilst support could be obtained through a formal group, one parent stated that on arrival it frightened her to meet with parents of teenage children who had been attending therapy for years.[150]

Perceived family support

Retrospective accounts highlighted the desire for parental support for children's emotional experiences so that they could discuss feelings openly in a caring environment, or for family members who could act as role models in the area of stuttering. For example, one participant found meaningful support from his brother who also stuttered.[142] However, another participant reported that speech therapy was arranged for her brother but not for herself until a relative of the family suggested to her mother that therapy might be useful. [132]

There were cases reported of silence within families in respect to stuttering, perhaps due to an inability to confront the emotional implications of dysfluency.[132] [142] As children however, participants often perceived pressure from family members to be fluent, perhaps due to reactions from family members that indicated that stuttering was unacceptable. One participant reported retrospectively that as a child he felt he could not stutter in front of his mother, because she was the one taking him to therapy sessions and discussing his progress with the therapist.[142] Where family-based discussion did take place, there was evidence that it tended to be at the surface level, which included practical aspects but not the underlying nature of stuttering and therapy. Practical support reported from family members related to: finding a therapist; providing transport to and from therapy sessions; and paying for stuttering therapy.[142] Well-meaning attempts by family members to intervene with stuttering behaviour such as asking the child to slow their speech or concentrate on breathing were in retrospect reported as not beneficial and/or frustrating.[142]

Perceived support from school

Initial progress with the aims of the LP could be disrupted by changing circumstances such as experiences at school.[140] There were mixed views in one study about educating school children generally about stuttering to try and improve understanding and reduce the extent of teasing and bullying that can take place. Whilst this suggestion was received positively by some, for others there was a perception that being educated about stuttering was not the same as experiencing stuttering and therefore would make little difference. Written information might be ignored by their peers, and in some cases children who stuttered were not keen to let others know about their "problem."[141]

Views about interventions aimed at adolescents

Three included papers provided evidence relating to therapy for stuttering during adolescence.[127 132 141] Compared to the extent of available evidence about childhood and adult therapy, evidence about adolescent therapy was limited.

One participant in the Anderson & Felsenfield study[127] attributed their recovery from stuttering as partly due to therapy received during childhood, but also to taking public speaking courses during adolescence. Another interviewee[132] reported starting to receive therapy in grade 8, though there was dissatisfaction that therapy focussed on techniques without addressing psychological issues. Only one study reported on perceptions about therapy experiences in the adolescent age group.[141]

Potential barriers and facilitators to outcomes

As with the interventions for children barriers reported to successful intervention for adolescents were: accessing therapy; therapy techniques; and therapist-client relationship. An additional theme of acceptability of therapy was identified for the adolescent group.

Accessing therapy

Adolescents who participated in one study[141] identified a number of factors that might hinder the initiation of therapy in adolescence. There was a reported lack of awareness about what stuttering is or whether they did in fact “stutter.” Participants did not tend to know other people who stuttered, and one participant reported not feeling able to read about stuttering through embarrassment should someone see the book. With a lack of outlets to discuss their stuttering due to silence and lack of awareness, one participant reported not mentioning his stuttering, and stated that he may have been in denial himself. Another participant reflected that they thought stuttering was an emotional problem, and another that they did not have a label for what they were experiencing. These participants could not identify the need to seek help to reduce dysfluency. However, identifying with an adult who has experienced stuttering could be beneficial; one participant recalled such a teacher who encouraged her to seek help.

Another issue that was reported in the study with adolescents was a desire not to feel different, and having therapy would mean admitting difference, particularly within the family.[141] However, when the decision to attend therapy was made, it was reported to be important that it was their own decision. To have attended for intervention at an earlier stage in life was regarded as inappropriate in their case, as they did not feel ready to take this step, nor did they want to be dictated to by parents.

Therapy techniques

Adolescents in the Hearne et al. study[141] found transfer tasks particularly useful during the therapy process. These include undertaking tasks outside the centre, such as in shops, where questions were asked in the real world.

Therapist-client relationship

A suggestion made by adolescents about therapy was to swap clinicians so that participants could experience talking to a range of people.[141]

Acceptability of therapy

One study focussed on the adolescent age group following experiences with a range of intensive group and non-intensive individual therapies including Smooth Speech, Prolonged Speech and the Camperdown Program. [141] Participants realised the benefits of therapy but did not enjoy some aspects of the process. Hearne et al.[141] found that adolescents overwhelmingly reported having a preference for group therapy for several reasons. Firstly, there were benefits from attending group sessions with other adolescents because they tended to have similar interests, such as sport. It was also reported to be beneficial to attend with other people who stuttered as they could learn from each other and see that they were not alone in having problems with fluency. Being with other PWS in this setting made it feel easier to speak out loud, even if the stutterer was not familiar with the therapeutic technique. The minority of participants in this study that preferred individual therapy, felt that one-to-one sessions should come first until the participant gained some confidence and then attend group therapy, which would be helpful in making comparisons of progress within the group.

There was positive feedback from attending an intensive one week therapy course, as this meant that techniques could be reinforced each day and there was little time to forget. Attending therapy once every two weeks was regarded as less acceptable, because the gap between meant that techniques could easily be forgotten. Evidence suggests that, although evaluations of specific therapies for the adolescent age group have not been published recently, views of adolescent therapy highlight the importance of addressing social and psychosocial needs at this stage of life.[141]

Obstacles to long term impact: m*aintenance in the "real world"*

Adolescents in one study[141] identified the challenge of maintaining techniques for stuttering once regular therapy visits were finished. There was a distinct difference between the environment at clinics, which were reported to feel supportive, and the "real world" which was less predictable. Some participants reported relapses following the end of regular visits. Relapses were associated with lack of practice due to forgetting, being busy, for example having other competing commitments such as sport, or feeling self-conscious about using a technique. Speaking with family and friends was reported to feel more comfortable and therefore did not require fluency techniques. Some participants admitted that they "couldn't be bothered" to practice, or that they "got lazy." For this age group, practicing speech could easily slip down the list of priorities. It was suggested by participants that the maintenance aspect of therapy needed to be worked on in the weeks following the sessions. More follow ups was suggested during this time, perhaps once a month.[141]

Perceived support

For adolescents there was a reported lack of awareness about stuttering in significant people around them, such as parents, teachers, friends and classmates.[141] Coupled with their own lack of awareness about stuttering, it was reported to be difficult to express what they felt or explain what was happening to others. As for childhood recollections, adolescents in this study reported experiencing silence within the family regarding stuttering as well as ineffective intervention by teachers at school. There was also one report of having been spoken to by parents as if stuttering was their own fault. In these cases attending therapy was not deemed to be well supported by significant others.

Educating peers about stuttering was a concept that generated mixed views. Some thought this might reduce teasing, whilst others thought that even if their peers were more aware, they would still not know what it was like experientially to stutter. Others did not necessarily want to admit that they had a stutter, so were not keen on the idea of providing peers with literature about the topic, though another participant held the view that educating his parents in this way would have been helpful.

While it was important for all but one adolescent participating in this study, to make decisions about therapy attendance on their own, support from the family, when given in a positive way, was acknowledged as helpful. For example, one mother made the phone calls necessary to arrange therapy. Families were also reported to give support by reminding participants to practice techniques.

Views about interventions aimed at adults

Nineteen included papers reported on studies that focused on the adult experience of stuttering and therapy.[116 127 128 129 131 132 133 134 135 136 137 143 144 145 146 147 148 150 151] Of these, three explored experiences of Prolonged Speech (PS) therapy,[132 134 135] one[116] evaluated a 15 day residential intensive programme, and another focused on the implications of group therapy.[150] The remaining studies included some data about specific therapies and strategies though the study did not focus on any intervention in particular.

One study[151] included attendees of a self-help conference, and another[136] compared a group that had received therapy and one that had not. Plexico et al.[148] assessed characteristics of speech therapists from the attendee perspective, and Boberg and Boberg[129] interviewed wives of stutterers. Two studies focused on ethnicity and its interaction with stuttering.[138 143]

Potential barriers and facilitators to outcomes

As with the children and adolescent reports, themes relating to barriers and facilitators to adult therapy included: accessing therapy; therapy techniques; therapist-client relationship; perceived effectiveness; and acceptability of therapy.

Accessing therapy

As already described, the need for therapy was often identified by a partner.[127] [128] Certain life events might also motivate change, such as getting married and having to make a speech, or having children[129]. Awareness about the availability of therapy was reported to increase the perception that something could be done to help. For one participant this knowledge of the ability to change became an important part of life and motivation for attending therapy.[147] Adult PWS reported that they were willing, once motivated, to travel large distances if necessary, to obtain therapy. In one case a participant was willing to travel from the US to the UK, though therapy was eventually provided closer to home.[147]

Therapy techniques

Using Prolonged Speech techniques slowed down speech so that participants spoke more fluently. However, this was reported to feel as if the PWS was “passing themselves off” as someone who is fluent, which felt to some extent fraudulent. This feeling led to anxiety that they would be caught out if they stuttered.[134] Fear of difficult speaking situations was reported to dispose PWS toward escape mechanisms rather than facing their stuttering. One of the most feared situations for PWS is speaking on the telephone. Two ways of addressing this fear were desensitization for this situation[116] and disclosure about stuttering at the beginning of the call.[144] Once fear diminished, these mechanisms could be replaced with approach methods that involved challenging the self, taking risks and problem solving. Facing difficult situations also began a process where participants reported that they could almost forget that they stuttered in the sense that they no longer felt consumed by stuttering and its consequences.[147]

Within the literature were reports of PWS using techniques and strategies that they perceived would assist their fluency, or their ability to cope in uncomfortable situations. According to Corcoran & Stewart[133] PWS are trying to protect themselves from harmful consequences that could arise from stuttering. Stuttering was reported as posing a threat to a positive self-identity[131] and held the risk of being discredited by others, so that ways of preventing stuttering by any means were attempted.[131 134] Strategies included avoidance of situations or particular words,[133] or by using physical techniques to exert some control over breathing.[131] Strategies were sometimes suggested by the lay community or by therapists, or they were invented by the PWS. PWS reported that they used self-therapy outside the therapeutic environment. Self-disclosure was used frequently with the consequence of a reduction in fear for both the PWS and the listener. Disclosing to the listener eliminated surprise for them, and allowed the PWS a sense of freedom in not feeling the need to use avoidance behaviours.[145]

There were reports of epiphany, moments when PWS suddenly gained an insight into what was happening for them, combined with an understanding of stuttering itself.[132 144 150] One participant reported that once they had removed the fear of speaking through talking to others and understanding more, fluency improved. However, positive changes in self-identity and confidence could lead to reactions from partners who were used to less assertion in the relationship.[132] Heightened awareness and accountability for speech goals was also reported to enhance fluency. This was important whether PWS were carrying out formal therapy or self-directed techniques.[146]

In included studies, participants referred to enrolling onto drama and elocution classes as well as consulting psychotherapists and hypnotism specialists[144] or counsellors[145] or joining self-help groups in order to try and control their stuttering.[135]

Therapist-client relationship

A reported influence on the acceptability of therapy was the attitude of the therapist, and the relationship between client and therapist.[132 136 142 144 148] Participants identified the most helpful and unhelpful aspects of therapists who deliver interventions to PWS. Client-centred therapists were described as most helpful as they customised programmes to meet individual needs (for example techniques such as fluency shaping or speech modification techniques may be more or less suitable to different people). Effective therapists were reported to be professional, passionate, committed and confident. They understand and believe in the therapeutic process and the PWS's ability to change. They actively listen to the PWS and are patient, non-judgemental and caring. This builds feelings of confidence, acceptance, understanding and trust, which motivates attendance at therapy sessions. Irani et al.[116] reported that attendees' experiences and perceived benefits from an intensive therapy course were positively or negatively affected by the therapists' responses and demeanour. For Daniels et al.[138] effective therapists also took into account socio-cultural aspects of the PWS experience.

There were however, reports within the literature of therapists who gave the impression that they did not want to work with PWS.[132] Ineffective therapists were associated with a lack of understanding about the stuttering experience and a lack of patience, as if they were only "attending to earn their pay cheque." They focused on isolated skills and activities regardless of their effectiveness instead of taking the person and their needs and preferences into account. This could reportedly leave a PWS feeling misunderstood, inadequate, shameful and discouraged. Judgemental attitudes were quoted as leaving one PWS feeling as if they were "under the microscope." There were reports of therapists blaming or chastising PWS for dysfluencies, that they perceived were out of their own control. In addition, there was a reported lack of understanding about how taught techniques might transfer into the real world, so that PWS felt embarrassed when they practised them in social situations.[148]

Experiences with ineffective clinicians were reported to result in PWS feeling negative toward the therapeutic process with emotions of frustration, anger, embarrassment and guilt. Such therapists were reported to be ineffective in conveying a sense of acceptance, understanding and trust so that a therapeutic alliance was not fostered. For the PWS, this decreased their motivation to attend therapy sessions and practice fluency techniques, regarding their therapy experiences as a waste of money.[148]

Effectiveness of therapy

It was reported that the frequency and severity of stuttering tended to decrease following PS therapy, though stuttering did not cease[133] When control of stuttering occurred using PS, it was associated with a rise in self-esteem and confidence.[134 135] In an evaluation of a 15-day residential intensive programme, various strategies such as easy onsets, PS and pull-outs were taught that were perceived as helpful. Counselling strategies (CBT was a component of the programme) allowed a positive attitude to be adopted that impacted on the participant's ability to manage stuttering and confront feared situations through desensitization. Transferring skills to the "real world" was also reported to be advantageous. The authors report that completing these activities contributed to participant perceptions that the treatment was effective. [116]

In one study[150] group therapy was reported as effective, with change only occurring when they had joined the group. One participant found group therapy more effective than individual sessions, improving his confidence and self-esteem. Similarly, other participants reported changes in their life including employment and social activities, based on increased confidence. Another participant became more fluent because he felt so comfortable with the group. Desensitisation was reported to be effective, allowing participants to overcome their fears. However, in this study, relaxation, rate control, and focusing on the content of utterances were also reported to be effective by different PWS, with individuals reporting different experiences.[136 150] There was no consensus between participants about which technique generally was the most beneficial. For this reason, authors of one paper emphasise the importance for individuals to design their own "toolbox" of strategies.[150] Strategies were also reported to change according to different situations, for example, the workplace environment demanded more attention to speech than being at home.[116 136]

One interesting finding was that more stuttering was reported by PWS when they perceived that they were under pressure not to stutter. When the therapy/therapist did not make this demand, stuttering was reported to decrease.[116] Similarly, Plexico et al.[145] reported that PWS felt better when they stopped trying to hide their stutter, so that effective therapy was in part a process of accepting the stutter.

Increasing the knowledge of PWS about stuttering was reported to have a positive effect on confidence which in turn raised the ability to be able to take action and put behavioural interventions into place. There was a reported shift from an emotional response to stuttering to a cognitive response. Emotions were regarded as unreliable compared to cognitive aspects of stuttering that were perceived as more stable and therefore easier to control.[147]

Attending speech therapy sessions reportedly "opened up" the opportunity to talk about stuttering and to gain some control over it.[136] In the outside world, therapy encouraged PWS to take risks and take responsibility for their speech by adopting a positive attitude.[145] Attendance at a self-help conference was reported to enhance self-disclosure and discussion about stuttering outside the conference environment.[151]

Therapy also allowed adult PWS to meet with other PWS.[129 136] Couples met other couples who were in a similar situation and discussed experiences. Speaking about stuttering at therapy could also improve communication channels between couples, particularly where stuttering had not been openly discussed previously.[129] Therapy in particular was reported to encourage interaction between PWS,[116 150] as was attendance at a self-help conference.[151]

Though there were reports of support from significant others such as partners, Boberg & Boberg[129] found that suggestions from family members and partners about how to deal with stuttering might be ignored. However, similar advice made by a therapist was taken on board by participants, perhaps because the therapist is regarded as more knowledgeable on the topic of stuttering.

Acceptability of therapy

Prolonged Speech (PS) techniques were described as sounding unnatural to the PWS and listeners, and as removing the variability, spontaneity and passion in normal speech. Use of PS could result in the participant feeling even more “different” following therapy than they did previously, making it less acceptable in some ‘”real world” situations. There was the reported perception that speaking more slowly than people who do not stutter, created a difference that was of limited acceptability, particularly for younger adults. Using a less pronounced form of PS brought an increased risk of stuttering and associated anxiety with being discredited whilst trying to appear fluent. PS was described as being burdensome as it requires work on two levels; the content of the conversation as well as the technique of speech. This effort could sometimes be reported as overwhelming.[134] In addition, there was a reported skills gap in that PS required training to use it effectively, and participants expressed frustration when this training was not available.[134]

Evaluation of a 15-day residential intensive programme highlighted the importance of being with other people who stutter. This allowed shared experiences as well as the feeling that participants were not alone with their problem. The intensity of the programme was positively compared to one-hour sessions by one participant because more time could be spent working on techniques[116].

Participants of group therapy assessed by Stewart & Richardson[150] reported that meeting other PWS and sharing experiences reduced their feelings of isolation. Some participants reported that they had made lasting friendships from the group sessions. However, there were reports that the group situation was “artificial” compared to outside, with a suggestion that therapy should include independent ideas, even if they are not useful for all the group members. Another participant reported a lack of attention to psychological approaches.[150] Generally participants reported that the setting within which therapy is delivered is important to improve fluency. Settings that are relaxed and non-judgemental are more likely to result in improvement.[146]

There were reports in a South African study of the unhelpfulness of therapy in the majority of participants from one study. Therapy was also perceived as boring by some, and techniques were reported to be difficult to carry out in real life situations. Strategies that were perceived by most participants to be less difficult as well as helpful included the Easy Relaxed Approach (ERA), and the Easy Relaxed Approach Smooth Movement (ERASM), shortening sentences, changing words or phrases, utilising airflow, interjections or filler sounds, light contacts, advertising and deep breathing, although air-flow, deep breathing and rehearsing were reported as more difficult by three participants.[144]

Obstacles to long term impact: m*aintenance in the “*real world*”*

In one study[150] a suggestion was made to follow up group therapy sessions with booster sessions, advanced sessions or day courses to allow participants to take their techniques further. This may assist participants who are not able to remember the tools for maintenance following therapy.[150] Similarly, an evaluation of an intensive therapy course identified the benefits of follow-up to reinforce the learning that has been carried out.[116]

Learning and maintaining techniques to control stuttering was reported to require extraordinary amounts of effort and energy.[135] [136] This effort was due to the constant need to remain aware and attentive whilst in speaking situations to prevent “falling off the fluency wagon.” [127] PWS reported feeling responsible for such fluency lapses because of their lack of dedication to practising taught techniques and tendency to revert to habitual speaking patterns.[136]

PWS reported feeling less in control over situations in which there was more than one other person present, such as social events, as this decreased predictability and reliability about how and when they might be able to respond to varied interactions.[135] [147] Conversely, with one person present there was usually some degree of shared understanding of the situation for the PWS.[134] Fear and anxiety were reported to have a detrimental effect on carrying out behavioural techniques.[147] For example, speaking from a less knowledgeable position or a less socially validated role increased dysfluency.[131] Once a PWS felt more comfortable with themselves and fear diminished, techniques became easier. One participant remarked that no matter what technique was used to improve fluency, having self-confidence (which had to be worked at) was important to maintaining the behaviour and remaining in the situation.[147]

When stuttering occurred during a period of relative fluency, it was reported to have the potential to evoke early memories of being discredited or laughed at, creating anxiety and more dysfluency. The authors describe this as being trapped in a loop of responding to the reactions of others.[134]

Techniques were often reported not to be used in a consistent way following therapy; PWS reported choosing when and where to use them, depending on their audience. For example, there may not be a perceived need when amongst family or friends.[144] There was a reported tendency to practice techniques in situations that were less threatening, such as alone or with one other person. This meant that speaking in situations where more than one person was present (described by the authors as “riding the ‘four-way-rocker”) continued to instill feelings of loss of control.[135]

Another factor that impacted on maintenance was having previous success with a technique. Success was reported to improve confidence in continuing to use that technique.[147] However, the absence of practice in, for example making small talk, telling jokes, using irony and generally conversing in different situations over many years, meant that adult PWS were still working on these aspects of speech as well as on their fluency. There was also a reported fall-off of motivation as techniques became habitual following therapy without any further increase in fluency.[134]

Perceived support

Adult PWS describe experiencing support from their therapist where there is a positive client-therapist alliance, from their partners, and, through group therapy or friendships, from other PWS.[132 150] One participant reported being transformed from a state of confusion about their stuttering to a better understanding by talking to a fellow PWS.[132] PWS reported that isolation could be reduced by seeking out informational, emotional and protective support, the latter of which acted as a buffer for PWS from discrediting by others. Therapy provided informational as well as technical support to modify stuttering, while family and friends were likely to provide emotional and protective support. To provide emotional and protective support required a neutral or empathic non-judgemental attitude towards stuttering.[147] Life partnerships were not always reported to be based on honesty about stuttering, leaving the PWS feeling isolated in an environment of silence.[129]

Conversely, where partners and other significant people were supportive and accepting, PWS reported this as crucial to their recovery. Two participants reported that their partners were instrumental in encouraging them to attend therapy sessions.[127] [128] Spouses were also reported as potentially supportive in regard to emotional issues and practicing techniques. However, whilst spousal involvement in therapeutic efforts was regarded as mainly positive, reducing the spouses' feelings of being peripheral to the process, it could be difficult for spouses to attend therapy due to work or child care commitments. Also, in some relationships the presence of a spouse could be distracting rather than helpful for the PWS, or could hinder progress toward independence.[129]

Other support systems identified in the included studies were professional counselling, support groups, mentors and the church.[145] [147] One reported motivator for change was meeting successful people who stutter. Counselling was reported to be helpful in the transitional process to eliminate negative attitudes.[145]

Interventions aimed at older adults

One included study[130] focused on stuttering experiences in older adults, although no specific therapy was assessed. Many of the issues for older adults will be shared with adults in general, so this section only comments on the impact of older adulthood on stuttering intervention.

Potential barriers and facilitators to outcomes

Perceived effectiveness of therapy

Older adults in the Bricker-Katz et al. study[130] had managed their stuttering in different ways over the years, either through taught strategies such as smooth speech or their own adaptations. For example, stopping and taking a deep breath was described as a self-directed technique and one participant used writing to communicate when the words would not come through speech. Some participants reported that they had tried a range of therapies but felt “let down” as they didn’t offer the “magic bullet” that was hoped for.

Acceptability of therapy

While group therapy was acknowledged as a useful way of delivering therapy later in the process, this group preferred individual sessions to begin with. This would allow work to be carried out on “deep seated things” in privacy and build confidence before joining group sessions. It was important that the therapist be experienced and knowledgeable about stuttering in older people and that the PWS feels understood by them.[130]

Obstacles to long term impact: m*aintenance in the “*real world*”*

Similar to adult PWS, older adults found implementing taught techniques challenging in the real world as strategies to improve fluency hindered spontaneity. The ongoing work required by PWS to maintain fluency had been off-putting and there was a sense that older participants would only continue seeking the “magic bullet” if there was a guarantee of success without complexity or undue time commitment. According to Bricker-Katz et al.[130] stuttering was managed in much the same way by older adults as when they were younger, but changes to health status in later years may affect the ability to maintain the cognitive and physical effort required to achieve fluency. In some ways the impact of stuttering was reduced, because more allowance was made for older people in terms of communication proficiency since, for example, many older adults are known to manage impairments resulting from strokes.

Perceived support

Older adults in this study had similar fear-based issues that needed to be reduced to build confidence. Self-disclosing their stuttering to others was reported to be useful in easing communication, thus reducing fear. Support from others who understood their stuttering was also important.

Stuttering across the lifespan

From the 26 included papers there was evidence to suggest that PWS are impacted by life stages in relation to how they address their stuttering. To some extent the way that stuttering is addressed is influenced by interactions with other people in day to day situations. It is also influenced by growing maturity and acceptance of the self as a stutterer.

Childhood - *stuttering as "*mysterious and uncontrollable*"*

Evidence from included studies showed that the majority of participants reflected upon their school years as the most difficult period.[128] There were reports of teasing or bullying from other children as well as a lack of understanding by teachers[130 144 147] and general negative reactions.[136] As a child, stuttering was regarded as "mysterious and uncontrollable".[147]

Teachers might speak to parents about potential treatments, leaving the child out of the discussion.[141] For one mother of a young child receiving therapy, starting school was reported to have a negative impact on progress.[140] For children from ethnic minority backgrounds, the feeling of being "other" was increased due to the combined effects of ethnicity and stuttering.[137] The lack of a suitable role model was reported to be a barrier to being able to negotiate life as a child stutterer.[142] During school years, reading aloud in front of the class could be a particular source of distress that was reported to distract from learning.[138 141 143] There was a reported anguish regarding being accepted, therefore behaviour would be adjusted to fit into the mainstream environment.[138]

In one study[130] older participants reflected on the missed opportunity for treatment when they were young children, comparing this situation to current practice. This might have helped PWS to develop coping strategies much earlier in life. In one study PWS reported that their parents did not know what to do about their stuttering when they were young, and speech therapists were not available through school.[132] However, there were also reports of a lack of interest in attending therapy as a child.[147]

PWS also reflected on how their stuttering was addressed by the family, with mixed findings. Some adults reflected on their childhood as a positive experience and cited ways that parents had been supportive.[138 142] Whilst some parents were reported to be supportive of their child and instrumental in arranging and transporting their child to speech therapy sessions, others reported an atmosphere of silence and denial about stuttering, perhaps due to a lack of information.[132 143 145] Even well intentioned parents did not always behave in ways that were practically or emotionally helpful to the child with PWS.[131 132] Parents reported not knowing whether the stuttering was abnormal or serious enough to address, especially when the child was young. It was hoped that the child would "grow out of it" and only when this was clearly not going to happen would parents seek help.[149]

Experiences of speech therapy during childhood were also varied. There were accounts in the studies of therapy addressing practical issues with practical solutions, whilst the emotional side of stuttering was not explored.[132]

Adolescence - *getting* "sick of stuttering"

Children reaching adolescence following therapy might have improved their fluency, but still reported feeling isolated or "hollow inside," understanding themselves to be different.[145] Stuttering could remain a predominating feature of the self-concept at this age.[147] Adolescence is a stage where entering college education or employment as well as developing relationships and socialising become important.[131] [138] Situations that involved communicating with a number of listeners were reported to be particularly challenging.[146] Expectations about fluency therefore changed with life events such as work, social events and relationships.[131] [141] Often it was such changes that created an impetus for seeking therapy as well as the idea that it was up to themselves to make the change.[147]

Conversely, some participants felt that adolescence was not an optimum time to start attending therapy, particularly if they were being told to do so by parents. Young people would be more likely to attend when they felt ready and could arrange appointments themselves.[141] One participant reported not feeling mature enough to be able to open up to a therapist at this age.[116] Another study highlighted a general lack of motivation to work with their speech at this stage of life.[147]

Strategies such as avoidance of situations that required speaking in front of others or to strangers learned as a child sometimes continued through adolescence, creating a limited environment for personal and professional growth.[133] For participants entering the world of employment, speaking on the telephone and giving presentations were activities most reported to be feared.[134] In one study, 50% of participants did not regard stuttering as a barrier to finding work, though for four participants stuttering was regarded as a barrier because communication was an important part of their chosen career.[144]

Prolonged Speech was evaluated in three papers.[133] [134] [135] One of the issues for young people was the perceived unnaturalness of speech following PS therapy, as speech is slowed down.

One participant discussed the conflict he experienced between this type of speech and his usual passionate personality.[134]

Adulthood - *Stuttering as "a hind*rance*"*

From included studies, there was a sense that PWS gradually gained a sense of self as they matured and that this incorporated being a stutterer. There was acceptance of the fact that they would not likely be rid of stuttering but would continue to manage it through life.[128 145] Participants reported that as adults they understood more about stuttering and also more about themselves. Feeling easier in one's skin allowed therapy to become easier to carry out. One participant reported that stuttering had been a lesson in how to deal with adversity.[147]

However there was also a reported sense of pressure to overcompensate for stuttering through a range of achievements such as having a nicer car or obtaining a good degree at University.[138 144] For PWS from an ethnic background this pressure was reported to be magnified.[137] Having a stutter in the workplace increased PWS perceptions that clients would think they were not knowledgeable.[143] There was a continued fear of using the telephone and speaking up in the presence of others.[146] Significant events, such as starting a new career, meeting a partner, getting married or having children could be the impetus to attend therapy where this had not happened before.[134 141 147] Support and involvement from partners was a significant influence on the success or otherwise of therapy.[129]

The slow speech effects of Prolonged Speech were perceived as no longer such an issue once participants reached 50 plus years, since by this time listeners would be more confident in what is being said. [134] Attending NSA Conferences was reported by PWS to ease embarrassment about discussing their stuttering.[151]

Late Adulthood - *a "*certain degree of acceptance*"*

The theme of acceptance was notable in the narratives of older adult participants. However, acceptance was not necessarily related to improved speech, but also to a shift in attitude. There were reports from some of less fear of the negative evaluations of others, becoming less self-conscious and expecting less effectiveness from attempts to treat stuttering as the years progressed. Participants also reported that the perceptions of others may also be less fearful because ageing is commonly associated with other health issues that could affect speech, such as a stroke. There was still hope expressed by some that speech therapy might unlock new insights well into later life.[130]

There was also less impact due to no longer being a part of the workforce,[130] a stage of life that, for some younger participants, included carrying out dreaded activities as well as the effort required in attempting to project a professional and knowledgeable image to others.[134] [136] For older adults who were still working, the impact of this remained; some participants found stuttering more difficult to cope with as they grew older due to having less emotional energy to deal with stressful situations.

Summary of qualitative evidence

The review of qualitative papers found a limited body of work (26 papers) focusing on retrospective perceptions of adults who stutter, adolescents, or parents of children who stutter. We did not find any studies eligible for inclusion that examined perceptions of children regarding interventions being received. We also did not find any literature meeting our criteria that reported the views of staff delivering the interventions. The literature had variation in quality predominantly due to elements being not reported, however around two thirds were judged as being of a higher standard.

The literature provides insight into the barriers and facilitators that may enhance or mitigate positive outcomes from stuttering interventions. Table 18 provides a summary table of these factors operating at an individual level, factors relating to the intervention, and interpersonal and social elements.

Table 18 Barriers and facilitators to successful outcomes

Domain		Barriers	Facilitators
Individual (PWS or parent)	Emotional	Fear elicited by negative situations. Anxiety /apprehension about current / future communication -threat to self-identity. Avoidance of situations. Denial of stuttering.	Attending to emotional, psychological and knowledge-based needs. Breaking out of the cycle of fear – epiphany. Leads to increased confidence and acceptance.
	Informational	Lack of knowledge. Lack of skills.	Raising awareness in schools. Information from therapist. Shared experiences with

			other PWS.
	Practical	Extent of effort/commitment. Lack of time. Forgetting to practice.	Adopting strategies such as integrating practice into daily routines, visual reminders, asking for practical support.
Interventions	Approaches to Therapy	Limited to techniques only. One-size fits all approach. Unrealistic aims. Difficult to implement in “real world.”	Encompass emotional/ psychological/social. Tailored to clients needs. Accessible aims. Incorporates “real world” practice.
	Maintenance	Practice not reinforced. Long periods without therapy.	Strategies to reinforce practice. Intensive courses. Regular follow-up sessions.
Interpersonal /social	Therapist characteristics	Lacking knowledge. Lacking patience. Blaming.	Client-centred approach.
	External Support	Lack of knowledge. “Silencing” stuttering. Non-acceptance of dysfluency. Teasing/ bullying /socially discrediting.	Involving parents, teachers, partners and peers in therapeutic process. Meeting other PWS and their parents /partners. Raising public awareness.

In the individual domain, i.e. the PWS or parent delivering the intervention, barriers to implementation and potential facilitators to overcome or prevent barriers were reported at the emotional, informational and practical levels. At the emotional level, previous negative experiences could lead to fear and anxiety of situations where verbal communication was required. Fear and anxiety were temporarily relieved by avoiding such situations and /or by attempting to deny stuttering as a part of the self. Therefore to facilitate effective implementation of therapies, it was reported that emotional challenges require attention before practical strategies to reduce stuttering are introduced. At the informational level, lack of information and skills to deal with stuttering were reported as barriers that could be overcome through greater awareness in schools for both pupils and parents. This would also reduce feelings of isolation for the child PWS. Effective therapists also helped PWS to improve their knowledge and skills, and frequent contact with other PWS increased learning through shared experiences. At the practical level, the continued effort required was hampered by perceived lack of time as well as forgetting to practice. Strategies to overcome these barriers were suggested in the literature; these were mainly centred round integrating practice into everyday routines so that they become less of an effort to remember and to implement. Other suggestions include designing a self-reminder system and requesting support from others.

Reported barriers in the intervention domain included the tendency to focus on single techniques without paying attention to the emotional, psychological and practical needs of the PWS as described above. There was evidence from the literature that individually tailored therapies were more acceptable, as PWS have a broad range of early experiences, arriving at therapy with a diverse range of skills and challenges. Some therapies were also reported to be difficult to implement in the “real world” compared to the therapeutic environment. Efforts to incorporate therapeutic practices into everyday situations, such as shopping trips were therefore valued. Maintaining strategies to reduce dysfluency was reported to be challenging, particularly where long periods of time elapsed between sessions. Intensive engagement with therapy such as a residential course allowed PWS continuity of therapy over a period of time. Regular follow ups were suggested as a way of reinforcing therapeutic aims once initial sessions were completed.

Interpersonal/social barriers were reported in therapeutic relationships that were perceived as unhelpful. For example, where a therapist lacks knowledge or is not interested in stuttering or in the emotional needs of the PWS. There were histories of negative experiences with therapists that had impacted on the PWS motivation to continue therapy. From the literature, a client-centred approach addressed these issues, creating an environment of shared learning. Similarly, interactions with family, peers, friends and figures of authority at school and work could impact PWS feelings of competence in social and formal situations. The literature suggested that silence or blame around stuttering had been a common experience that isolated PWS, further emphasising the feeling of difference and stigma. This was likely due to a lack of awareness among family members and school/work peers. Increased exposure to PWS and their families’ stories was reported to help reduce these feelings. Similarly, raised public awareness and knowledge about stuttering experiences create an environment where the phenomenon becomes less mysterious, encouraging people around PWS to understand and provide support for therapy.

Chapter 5 Integrating the findings: meta-synthesis of effectiveness and qualitative studies

In this section we will draw the two review elements together in an overarching synthesis. We present a conceptual model that has been developed by combining data from the review of intervention effectiveness, together with findings from the review of qualitative literature (Figure 2). The model illustrates elements of the complex pathway from interventions to long term impacts for PWS, identifying links in the chain of reasoning underpinning assumptions regarding how and why an intervention may achieve positive outcomes. The model details intervention types, intervention content, outcomes, and factors influencing outcomes along the pathway from intervention to long term impact.

In the protocol we had planned to carry out a meta-synthesis of the two review elements by tabulating and comparing data across intervention and qualitative papers. However, this method of meta-synthesis was not possible as we identified only one paper which used mixed methods design to report both elements of an intervention and views of participants. The qualitative literature also tended to describe general perceptions of interventions without identifying them, rather than exploring views of specific interventions that we could compare and contrast with the effectiveness findings.

The construction of the conceptual diagram draws on logic modelling techniques[15] which aim to set out the mechanisms whereby an intervention may lead to its intended impact. The diagram is read from left to right, with individual elements of the model drawn from the literature that we included in this review and have been described in previous sections of this report. It should be noted that the arrows in the diagram do not represent a cause-effect relationship between factors, but instead indicate where associations can be made and the flow of if...then reasoning. The evidence base also currently does not permit individual elements to be conclusively linked to successive elements in the pathway, for example the precise mechanism whereby parental contingencies lead to improvement in children's fluency is currently unclear.

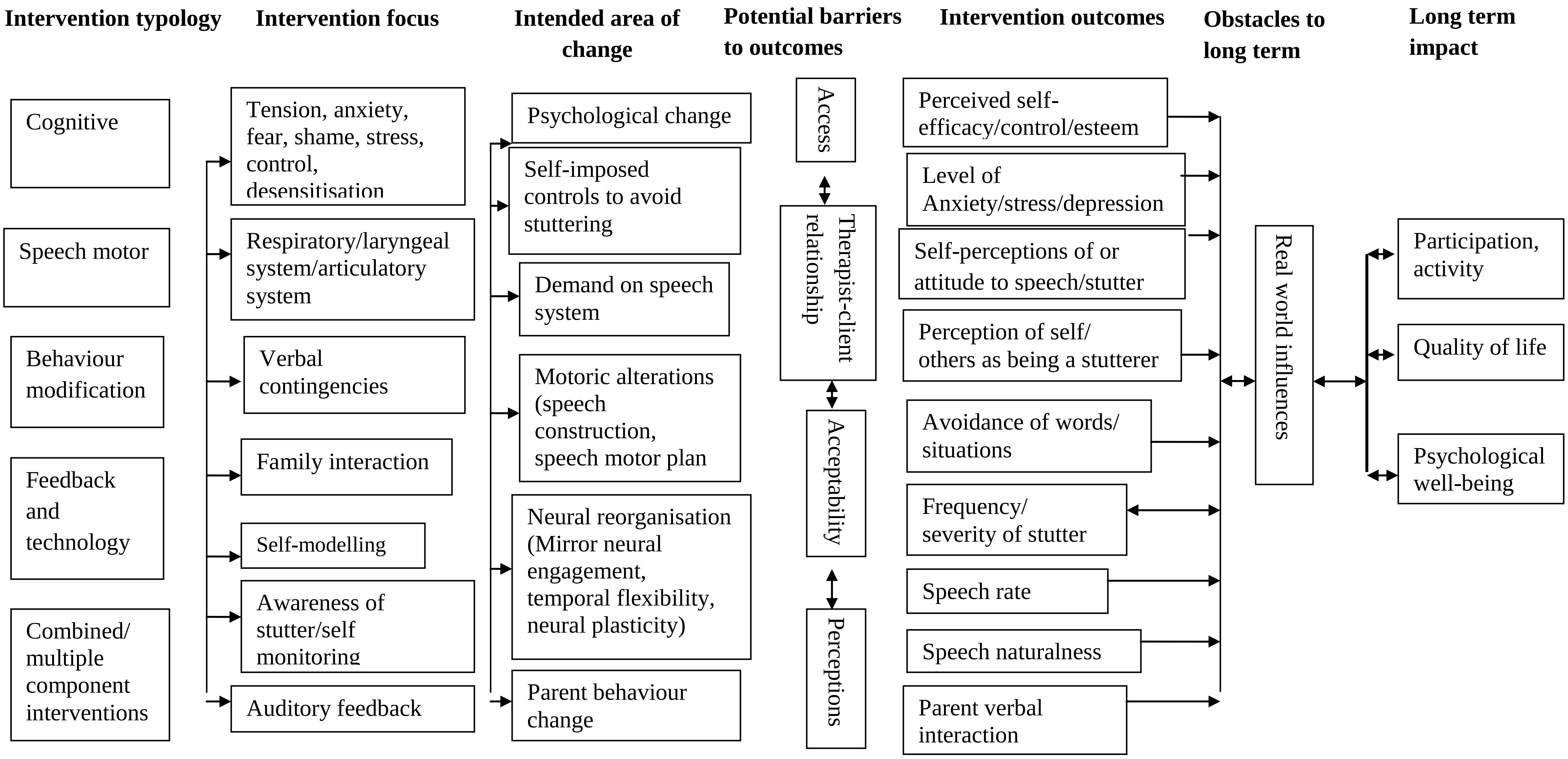
The first column summarises the typology of interventions that we identified and described in chapter three, categories of intervention which we termed feedback and technology, cognitive, speech motor, combined interventions and other interventions. The second column outlines the content of these different types of interventions. The third column indicates the presumed mechanisms outlined by authors in the included literature that may be the "active ingredient” in why an intervention effects a change on a PWS. The literature is currently unclear regarding how exactly interventions produce positive outcomes therefore in the diagram individual interventions have not been linked to these effects. Instead the model indicates that the group of interventions may be associated with these areas of change.

The fourth column draws on the qualitative literature detailed in chapter four, to identify elements that may act as barriers or facilitators to the interventions having a positive outcome in the short term (during or immediately following an intervention). The fifth column details the outcomes that were measured and reported in the effectiveness literature that we scrutinised. While the frequency/severity of the observed stuttering behaviour was the most commonly measured outcome it can be seen how wide ranging the outcomes were that studies used to evaluate an intervention. This column illustrates how establishing what a “good outcome” following an intervention should be is challenging. The relationship between individual elements in this column is also complex, as the frequency/severity of stuttering may be a direct outcome, but also an indirect effect of changes in other outcomes and in turn may influence other elements. This outcome is therefore indicated as a bi-directional arrow.

The sixth column again draws on the qualitative literature to highlight the elements that were described by parents and PWS which could impact on longer term positive outcomes. The real world influences which were described may be significant in helping to explain the individual variation in outcomes reported in the intervention studies. The qualitative review also highlighted that different real world factors impacted at different stages of the life course.

The final column details the long term aims for PWS, to achieve participation and engagement in activities of life, quality of life and psychological wellbeing. The diagram highlights the complexity of the pathway from the first column interventions to this end point.

Figure 2. Summary diagram detailing elements of the pathway between interventions and outcomes



Chapter 6 Discussion and conclusions

This wide-ranging review of the literature on interventions for people who stutter identified a sizeable body of work and included 138 papers in the evidence synthesis. The review classified around one third of the included work as being at lower risk of bias, providing stronger evidence that these health technologies are able to produce positive outcomes. The review found evidence of effectiveness for a range of intervention types, with most intervention studies able to demonstrate a positive effect for at least some participants.

The individual variability in response however was significant, with little evidence that any intervention would be successful for all who received it. In the generally positive reporting of study findings there was in many cases a sizeable number who did not achieve benefit, and in the lower quality studies the potential for participants reported to differ from those not recruited and/or reported cannot be ruled out. In relation to interventions for children who stutter, the natural recovery rate remains an issue, with research unable to conclusively differentiate those who will spontaneously recover from those who will have long term stuttering requiring intervention.

The comparison of stuttering interventions with each other is adversely affected by variation in systems of measurement, and variation in intervention contact hours. There is little available research which compares the effectiveness of different interventions and thus a very limited pool of evidence for clinicians and PWS to draw on in selecting an optimal intervention. Currently, core outcomes for stuttering have not been established and studies that we identified used a range of outcomes including clinician-measured counts, independent listener counts, and rating by the PWS. The challenge in establishing what a “good outcome” following intervention should be is a key issue for the field. While a sizeable body of studies included in this review reported effectiveness in terms of percentage reduction in dysfluency, it is debateable how significant a reduction of for example 2-3 syllables per 100 syllables might be for the everyday functioning of a PWS, or indeed whether this reduction in overt stuttering level was the issue of most concern for the PWS. While there is some evidence of increasing involvement of PWS in the determination of outcomes, the field remains dominated by measures of overt stuttering behaviours, in particular the percentage of syllables that are stuttered. The qualitative literature highlights the different views of PWS regarding their stutter, and their differing needs at different stages of the life course, with a reduction in overt stuttering only being one aspect. Further understanding regarding how and to what degree intervention outcomes relate to the everyday lives of PWS is needed. Only a small number of papers (all relating to the LP) considered whether interventions could have a potential adverse impact.[113] [127] Studies describing speech motor interventions often considered the effect on speech naturalness, however rating was often carried out by an independent listener, with few including rating or perceptions from the PWS. The qualitative literature included descriptions of PWS engaging in an ongoing process of weighing up the decision whether or not to use taught techniques to reduce the stutter, at the expense of sounding “different”.

This systematic review did not include consideration of the economic aspects of these health technologies. If questions regarding the cost effectiveness of interventions for stuttering are to be investigated, further understanding of the short and long term outcomes is needed. The conceptual model we developed which summarises the pathway from interventions to impacts highlights both the complexity of outcome measurement and the need for greater understanding regarding how and why these interventions may lead to positive effects.

Analysis of the robustness of the results and limitations

The review findings are based on data from a substantial number of published studies, and consider both quantitative and qualitative evidence. The work included a range of study designs encompassing both controlled and non-comparator studies. The body of work reporting single cases and multiple case studies was however excluded, together with surveys. While case studies are able to potentially contribute useful data, their inherent propensity for bias and the availability of a large volume of higher quality designs underpinned our decision to exclude them from this review.

The body of work that we included encompassed both studies that we categorised as being at higher risk of bias, and those at lower risk. Around two thirds were considered to be at higher risk of bias. We considered whether to use quality criterion as a basis for rejection, however this would have precluded analysis and reporting of a large quantity of literature. Few of the studies used controlled designs and of these the allocation process was frequently carried out by pseudo rather than completely randomised procedures. In total there were 14 randomised controlled designs in the set of studies. The quality of the evidence available was limited by many studies having small sample sizes, reporting data by individual rather than pooling findings, and failing to blind assessors to the time point of data collection. In many of the smaller before and after studies (and some of those with larger samples) the process of selection of individuals whose data would be reported was unclear. It seemed likely (and was sometimes mentioned) that interventions had been delivered to larger numbers of PWS with only a sample of these being presented. The possibility that those recruited and reported may differ from those who were not must be considered a potential significant source of bias in interpretation of the data for these studies.

We had intended to carry out a meta-analysis of the effectiveness data however the heterogeneous nature of the literature and variability in outcome reporting meant that we completed a narrative synthesis. The lack of mixed method designs and qualitative papers which described specific interventions precluded our planned meta-synthesis approach which juxtaposes quantitative and qualitative results. Instead we used the two sets of data to develop a conceptual model which sets out components of the pathway from interventions to impacts, and which we believe provides a useful tool to aid understanding the results of the review

Implications for healthcare

The review indicates that a variety of interventions can produce positive outcomes for people who stutter. The evidence does not permit recommendation of programmes which are more effective versus those that are less effective, all intervention types seemed able to lead to benefit for some participants. The heterogeneity in outcomes measures and interventions meant that we were only able to compare intervention efficacy at a narrative level. The wide range in outcomes reported by the intervention studies suggests a lack of consensus between researchers and clinicians about what are the critical outcomes following therapy, with the qualitative literature also highlighting variation in what outcomes may be most important to individual patients. We were unable to demonstrate any clear dose-response relationship, meaning that currently interventions with many hours of contact did not seem to offer substantially different outcomes to those with fewer. The qualitative literature provides some insight in to factors that are perceived to facilitate successful outcomes (see Table 18) these include: ensuring that interventions encompass emotional/psychological/social aspects; incorporating “real world” elements; having follow-up sessions; and interacting with other people who stutter.

The effectiveness evidence highlights the individual variation in response across all intervention typologies and different methods/doses of delivery. The qualitative evidence suggests a need for individual choice in selecting a programme that best meets a person’s needs, with variation in outcome potentially linked to factors at the level of the individual, the intervention and interpersonal/social factors.

Recommendations for research

1. While finding a substantial number of studies the literature tended to be limited in breadth, with the greatest majority of papers reporting before and after evaluations of a particular intervention using a small number of participants. The field therefore has a good body of small sample baseline-follow up investigations suggesting that alternative study designs are required in the future such as research comparing interventions. Around two thirds of the intervention studies were classified as being at potential higher risk of bias with more robust study designs needed. Development of research in the area would be enhanced by greater collaboration between different teams. Recruitment of larger samples of participants would be easier across multiple research teams, particularly in order to establish more homogenous groups for study. The comparison of interventions with each other similarly requires greater collaboration between different teams.

2. There seems to be a research gap around aspects of process evaluation such as intervention fidelity; practitioner specific effects, acceptability, and feasibility. We noted that the relationship between dosage and response was unclear, with programmes providing little or no rationale for pre-defined contact hours. Little of the literature included consideration of resource and training implications of interventions – information that is needed in order to inform commissioning as well as clinical decisions.

3. While the literature currently has a tendency for focusing on demonstrating that a particular intervention is effective, the evidence base suggests a need instead to explain how and why therapy works, and in particular a need to further investigate individual variation in response. The use of more mixed method research could help to address these evidence gaps by exploring in depth participant experiences and factors underpinning outcomes.

4. The measurement of outcomes in the field is a considerable obstacle to the evaluation of effectiveness. While different studies continue to use varied measures of stuttering, comparison between them remains challenging. While measures of overt stuttering behaviours continue to dominate evaluation, the establishment of core outcomes which are of importance and relevance to people who stutter seems to be an urgent priority. Here again

greater collaboration between different research teams is needed in order to learn more about the impact on sub-groups of participants, and optimal measures of change.

5. A gap in the qualitative literature concerns the views of children receiving therapy. While the issues relating to young people taking part in research are not insubstantial, a reliance on retrospective recall of adults regarding their childhood means that views will inevitably be of historic approaches and potentially affected by later experiences.

6. Another recommendation for future studies concerns the recruitment of less heterogeneous participants. While it is recognised that investigators have a limited pool to recruit from, many studies had variation in baseline characteristics of participants which adds to the challenge of investigating why and for whom interventions are most successful. Factors such as severity of stuttering and length of onset have been suggested as being influential in outcomes. It would be useful for future studies to recruit with limited variance on these variables in order to explore other elements of individual variability. Demonstration of the efficacy of paediatric interventions continues to be impacted by uncertainty regarding spontaneous recovery. Investigation of response by particular subgroups may add additional insight in to this area.

7. An issue for research in the area was highlighted by the qualitative literature. An element described as facilitating successful outcomes for PWS was a client-centred approach and an individually tailored intervention. This is at odds with some of the programmes evaluated in the included literature which offer a carefully structured and planned product. If “real world” interventions in clinical practice are bespoke and tailored for each individual client drawing on a variety of approaches and techniques, research should ensure that studies that are able to contribute evidence that is applicable to practice.

8. We were able to identify only one study which specifically reported participants who were cluttering. Research on interventions for this disorder seems to be very underdeveloped.

9. A further gap concerns the lack of qualitative studies regarding professional views and experiences of interventions.

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Contributions of authors:

Susan Baxter, Research Fellow, was principal investigator, responsible for study management and led the review of effectiveness and meta-synthesis.

Maxine Johnson, Research Fellow, led the review of qualitative evidence and contributed to the metasynthesis.

Lindsay Blank, Research Fellow, contributed as a senior reviewer to all elements of the review.

Anna Cantrell, Information Specialist, developed the search strategy and led the searching and identification of literature.

Shelagh Brumfitt, Professor, provided topic expertise in the field of stuttering.

Pam Enderby, Professor, provided expertise in research methods and translation of findings for professionals and patients.

Elizabeth Goyder, Professor, acted as senior methodologist.

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Appendix 1 search strategy

1st search iteration: Ovid Medline search conducted August 2013

1. Stuttering/

2. stutter$.tw.

3. stammer$.tw.

4. clutter$.tw.

5. (fluency adj2 disorder$).tw.

6. non-fluen$.tw.

7. dysfluen$.tw.

8. (syllable adj2 (repet$ or repeat$)).tw.

9. (word adj2 (repet$ or repeat$ or block$ or avoid$)).tw.

10. or/1-9

11. language therapy/ or speech therapy/

12. ((speech or language) adj2 therap$).tw.

13. Family Therapy/

14. ((famil$ or parent$ or child$) adj4 (treatment$ or therap$ or intervention$ or program$ or group$ or counsel$)).tw.

15. (indirect adj2 (approach$ or treatment$ or therap$ or intervention$ or program$)).tw.

16. demands-capacity model$.tw.

17. response$ contingenc$ approach$.tw.

18. exp Behavior Therapy/

19. (behavio?r adj2 (therap$ or modification or conditioning)).tw.

20. (conditioning adj therap$).tw.

21. Conditioning, Operant/

22. (operant adj2 conditioning$).tw.

23. (instrumental adj2 learning$).tw.

24. lidcombe.tw.

25. (cognitive adj2 restruct$).tw.

26. (manag$ or modification).tw.

27. Cognitive Therapy/

28. (cognitive behavio?r therap$ or cbt).tw.

29. ssmp.tw.

30. "successful stuttering management program$".tw.

31. "voluntary stuttering".tw.

32. "iowa approach".tw.

33. pseudostutter$.tw.

34. desensiti?$.tw.

35. (fluen$ adj2 shap$).tw.

36. (speech adj2 restructur$).tw.

37. (gradual increase adj6 utterance).tw.

38. gilcu.tw.

39. "extended length utterance program$".tw.

40. elu.tw.

41. ((language or speech) adj2 training$).tw.

42. ((metronome or rhythm) adj conditioned speech).tw.

43. (speech adj2 (prolong$ or smooth$ or slow$)).tw.

44. stretch$ syllable$.tw.

45. control$ rate$.tw.

46. "intensive smooth speech".tw.

47. iss.tw.

48. "home based smooth speech".tw.

49. hss.tw.

50. "speech motor training".tw.

51. ((breath$ or airflow or (air adj1 flow)) adj2 regulat$).tw.

52. (self model adj2 fluent speech).tw.

53. shadowing.tw.

54. Electromyography/

55. ("electromyograph$ feedback" or emg).tw.

56. ("excessive muscular tension technique$" or eng).tw.

57. (feedback adj2 (system or app$)).tw.

58. auditory feedback.tw.

59. ("masking auditory feedback" or maf).tw.

60. ("delayed auditory feedback" or daf).tw.

61. "frequency altered feedback".tw.

62. ("altered auditory feedback" or aaf).tw.

63. speecheasy.tw.

64. prolong$.tw.

65. "monterey fluency program$".tw.

66. token economy/

67. "token economy".tw.

68. (token adj2 (system$ or reinforcement$)).tw.

69. "synergistic stuttering therap$".tw.

70. "comprehensive stuttering program$".tw.

71. "intensive treatment program$".tw.

72. "fluency plus program$".tw.

73. ("intensive stuttering clinic$" or uuisc).tw.

74. "fluency rules program$".tw.

75. support group$.tw.

76. Self-Help Groups/

77. self help group$.tw.

78. exp Acupuncture Therapy/

79. acupuncture.tw.

80. "camperdown program$".tw.

81. "american institute for stuttering program$".tw.

82. "precision fluency shaping program$".tw.

83. 11 or 12 or 13 or 14 or 15 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 40 or 41 or 43 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 or 70 or 71 or 72 or 73 or 74 or 75 or 76 or 77 or 78 or 79 or 80 or 81 or 82

84. 11 or 12 or 13 or 14 or 15 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 40 or 41 or 43 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 66 or 67 or 68 or 70 or 71 or 74 or 75 or 76 or 77 or 78 or 79 or 80 or 82

85. 10 and 83

86. 10 and 83

87. 10 and 84

88. limit 85 to yr="1990 -Current"

2nd search iteration: Cochrane Library search conducted October 2013

#1 MeSH descriptor: [Stuttering] explode all trees

#2 stutter*:ti,ab,kw (Word variations have been searched)

#3 stammer*:ti,ab,kw (Word variations have been searched)

#4 cluttering:ti,ab,kw (Word variations have been searched)

#5 fluency disorder*:ti,ab,kw (Word variations have been searched)

#6 disorder* fluency:ti,ab,kw (Word variations have been searched)

#7 non-fluen*:ti,ab,kw (Word variations have been searched)

#8 dysfluen* or disfluen*:ti,ab,kw (Word variations have been searched)

#9 syllable (repet* or repeat*):ti,ab,kw (Word variations have been searched)

#10 word (repet* or repeat* or block* or avoid*):ti,ab,kw (Word variations have been searched)

#11 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10

#12 MeSH descriptor: [Language Therapy] explode all trees

#13 MeSH descriptor: [Speech Therapy] explode all trees

#14 (speech or langauge) therap*:ti,ab,kw (Word variations have been searched)

#15 MeSH descriptor: [Family Therapy] explode all trees

#16 ((famil* or parent* or child*) and (treatment* or therap* or intervention* or program* or group* or counsel*)):ti,ab,kw (Word variations have been searched)

#17 indirect (approach* or treatment* or therap* or intervention* or program*):ti,ab,kw (Word variations have been searched)

#18 demands-capacity model*:ti,ab,kw (Word variations have been searched)

#19 response* contingenc* approach*:ti,ab,kw (Word variations have been searched)

#20 MeSH descriptor: [Behavior Therapy] explode all trees

#21 ((behaviour or behavior) and (therap* or modification or conditioning)):ti,ab,kw (Word variations have been searched)

#22 conditioning therap*:ti,ab,kw (Word variations have been searched)

#23 MeSH descriptor: [Conditioning, Operant] explode all trees

#24 operant conditioning*:ti,ab,kw (Word variations have been searched)

#25 instrumental learning*:ti,ab,kw (Word variations have been searched)

#26 lidcombe:ti,ab,kw (Word variations have been searched)

#27 cognitive restruct*:ti,ab,kw (Word variations have been searched)

#28 manag* or modification:ti,ab,kw (Word variations have been searched)

#29 MeSH descriptor: [Cognitive Therapy] explode all trees

#30 cognitive (behavior or behaviour) therap*:ti,ab,kw (Word variations have been searched)

#31 cbt:ti,ab,kw (Word variations have been searched)

#32 ssmp:ti,ab,kw (Word variations have been searched)

#33 "successful stuttering management program*":ti,ab,kw (Word variations have been searched)

#34 "voluntary stuttering":ti,ab,kw (Word variations have been searched)

#35 "iowa approach":ti,ab,kw (Word variations have been searched)

#36 pseudostutter*:ti,ab,kw (Word variations have been searched)

#37 desensiti*:ti,ab,kw (Word variations have been searched)

#38 fluen* shap*:ti,ab,kw (Word variations have been searched)

#39 speech restructur*:ti,ab,kw (Word variations have been searched)

#40 gradual increase utterance:ti,ab,kw (Word variations have been searched)

#41 gilcu:ti,ab,kw (Word variations have been searched)

#42 "extended length utterance program*":ti,ab,kw (Word variations have been searched)

#43 elu:ti,ab,kw (Word variations have been searched)

#44 (language or speech) training*:ti,ab,kw (Word variations have been searched)

#45 (metronome or rhythm) conditioned speech:ti,ab,kw (Word variations have been searched)

#46 speech (prolong* or smooth* or slow*):ti,ab,kw (Word variations have been searched)

#47 stretch* syllable*:ti,ab,kw (Word variations have been searched)

#48 control* rate*:ti,ab,kw (Word variations have been searched)

#49 "intensive smooth speech":ti,ab,kw (Word variations have been searched)

#50 iss:ti,ab,kw (Word variations have been searched)

#51 "home based smooth speech":ti,ab,kw (Word variations have been searched)

#52 hss:ti,ab,kw (Word variations have been searched)

#53 "speech motor training":ti,ab,kw (Word variations have been searched)

#54 "speech motor training":ti,ab,kw (Word variations have been searched)

#55 (breath* or airflow) regulat*:ti,ab,kw (Word variations have been searched)

#56 air flow regulat*:ti,ab,kw (Word variations have been searched)

#57 self model fluent speech:ti,ab,kw (Word variations have been searched)

#58 shadowing:ti,ab,kw (Word variations have been searched)

#59 MeSH descriptor: [Electromyography] explode all trees

#60 "electromyograph* feedback":ti,ab,kw (Word variations have been searched)

#61 emg:ti,ab,kw (Word variations have been searched)

#62 "excessive muscular tension technique*":ti,ab,kw (Word variations have been searched)

#63 eng:ti,ab,kw (Word variations have been searched)

#64 feedback (system or app*):ti,ab,kw (Word variations have been searched)

#65 auditory feedback:ti,ab,kw (Word variations have been searched)

#66 "masking auditory feedback":ti,ab,kw (Word variations have been searched)

#67 "delayed auditory feedback":ti,ab,kw (Word variations have been searched)

#68 "frequency altered feedback":ti,ab,kw (Word variations have been searched)

#69 "altered auditory feedback":ti,ab,kw (Word variations have been searched)

#70 maf or daf or aaf:ti,ab,kw (Word variations have been searched)

#71 speecheasy:ti,ab,kw (Word variations have been searched)

#72 prolong*:ti,ab,kw (Word variations have been searched)

#73 "monterey fluency program*":ti,ab,kw (Word variations have been searched)

#74 MeSH descriptor: [Token Economy] explode all trees

#75 "token economy":ti,ab,kw (Word variations have been searched)

#76 token (system* or reinforcement*):ti,ab,kw (Word variations have been searched)

#77 "synergistic stuttering therap*":ti,ab,kw (Word variations have been searched)

#78 "comprehensive stuttering program*":ti,ab,kw (Word variations have been searched)

#79 "intensive treatment program*":ti,ab,kw (Word variations have been searched)

#80 "fluency plus program*":ti,ab,kw (Word variations have been searched)

#81 "intensive stuttering clinic*":ti,ab,kw (Word variations have been searched)

#82 uuisc:ti,ab,kw (Word variations have been searched)

#83 "fluency rules program*":ti,ab,kw (Word variations have been searched)

#84 support group*:ti,ab,kw (Word variations have been searched)

#85 MeSH descriptor: [Self-Help Groups] explode all trees

#86 self help group*:ti,ab,kw (Word variations have been searched)

#87 MeSH descriptor: [Acupuncture Therapy] explode all trees

#88 acupuncture:ti,ab,kw (Word variations have been searched)

#89 "camperdown program*":ti,ab,kw (Word variations have been searched)

#90 "american institute for stuttering program*":ti,ab,kw (Word variations have been searched)

#91 "precision fluency shaping program*":ti,ab,kw (Word variations have been searched)

#92 #12 or #13 or #14 or #15 or #16 or #17 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #37 or #38 or #39 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #63 or #64 or #65 or #67 or #69 or #70 or #71 or #72 or #74 or #75 or #76 or #79 or #84 or #85 or #86 or #87 or #88 or #89

#93 #11 and #92

90. limit 87 to (humans and yr="1990 -Current")

91. limit 85 to yr="1990 -Current"

Appendix 2 Quality appraisal of intervention studies

	1. Selection bias - Method used to generate the allocation sequence, method used to conceal the allocation sequence, **Presence of control, characteristics of participants at baseline, +/- 10 sample**	**2. Performance bias –** Measures used to blind participants and personnel and outcome assessors, presence of other potential threats to validity. **Collection and assessment of speech sample**	**3. Attrition bias –** Incomplete outcome data, high level of withdrawals from the study. **High drop out rate (above 15%)**	**4. Detection bias -** Accuracy of measurement of outcomes, length of follow up. **Reliable tool used, adequate speech sample, outside laboratory recording, immediate versus longer term follow up**	**5. Reporting bias –** Selective reporting, accuracy of reporting, **Use of inferential versus descriptive statistics, pooled or individual reporting**	Overall risk of bias. **Lower/Higher**	**Detail of concerns**
	Risk of bias Yes / No/ Unclear						
Allen 2011[117]	Yes	Yes	No	Yes	Yes	Higher	Small sample. Unclear research questions and recruitment justification. Poor reporting.

Amster 2008[30]	Yes	Yes	No	Yes	No	Higher	Small sample. No control. Volunteered sample.
Andrews 2012[31]	Yes	Yes	Yes	No	No	Higher	Small sample. No control. Volunteered sample.
Antipova 2008[118]	Yes	Yes	No	Yes	No	Higher	Small sample. No control. Volunteered sample.
Armson 1998[119]	Yes	Yes	No	Yes	No	Higher	Small sample. Experimental design with no follow up. Single session tests. Kappa scoring methods not described reliability/results
Armson 2006[4]	Yes	Yes	No	Yes	No	Higher	Small sample. Experimental design with no follow up.
Armson 2008[120]	Yes	Yes	No	Yes	No	Higher	Mid-sized sample. Experimental design with no follow up. First 31 people taken into study.
Baumeister et al. 2003[32]	Yes	Yes	Yes	No	No	Higher	Large sample, but no control group. Participants showed different severity of disorder which influenced results. Some participants dropped out or were not assessed at baseline.
Beilby 2012[33]	No	Unclear	No	No	No	Lower	Unclear if raters were blinded to time point, 3 month follow up.
Berkowitz et al. 1994[34]	Yes	Yes	No	No	No	Higher	Very small sample, no control, no blinding in assessment, self-reports used
Block et al. 2004[36]	No	No	No	Yes	Yes	Higher	Sample 12. 5 min conversation 5 min reading. Unclear who

							recorded away from clinic. Basic results for post-treatment periods, 3 month FU, limited analysis
Block et al. 2005[37]	No	No	No	No	No	Lower	Large sample . Self-report inventory used at 3.5 year follow up with 87% of sample response rate. Unclear length of speech sample
Block et al. 2006 [38]	No	No	No	No	No	Lower	Same study as 2005 paper with further examination of variables
Block et al 1996[35]	No	No	No	Yes	No	Higher	Larger sample, no dropout, immediate measurement during intervention, experimental setting, 5 minute samples.
Blomgren 2005[39]	Yes	Unclear	No	No	No	Lower	Sample 19. Some use of self-reported outcome measures post study. Sample 4 minutes of speech, unclear if rater blinded, 6 month FU
Blood 1995[40]	Yes	Yes	No	Yes	Yes	Higher	Extremely small sample. Flawed recruitment. Use of self-reported outcomes
Boberg & Kully 1994[41]	No	Unclear	No	Yes	Yes	Higher	Sample 42. No control. Telephone call sample 2 minutes. Unclear if raters blind to time point, percentage change reported.
Bonelli et al. 2000[42]	Yes	No	No	No	Yes	Higher	Sample of 9 selected from earlier study, no pooling of data reported by individual only

Bray & James 2009[43]	Yes	Yes	No	Yes	Yes	Higher	Small sample. Use of self-reported outcomes.
Bray & Kehle 1998[44]	Yes	Yes	No	Yes	Yes	Higher	Small sample (4) volunteers. Content of speech sample & listener varied between individuals and time, descriptive data by individual only
Carey 2010[45]	No	No	No	No	No	Lower	20 per trial arm, with 7.5% loss to follow up, 12 months FU, 10 minute recording via telephone, blinded assessment
Cocomazzo 2012[46]	No	No	Yes	Unclear	No	Lower	12 participants and drop outs, blinded rating, beyond clinic recordings made by participant but asked to make only one. 12 months FU.
Craig et al. 1996[16]	No	No	No	Yes	No	Lower	Larger sample. Raters blinded. 12 months FU, 5 minute speech samples.
Craig et al. 2002[47]	Yes	Yes	No	Yes	No	Higher	Small sample (6) selected from previous study, 2 yr follow up, descriptive data for individuals only, home measure potential for bias.
Cream 2009[48]	Yes	No	Yes	Yes	No	Higher	Sample of 10, 5 minute recordings, Use of some self-reported outcomes. 2 drop outs in small sample, blinded assessor, immediate post assessment.

Cream 2010[19]	No	No	No	No	No	Lower	Randomised sample with acceptable dropout rate, blinded assessment, 6 month FU
De Veer 2009[20]	Yes	Yes	No	Yes	No	Higher	Selection of potential participants by researchers. No detail of randomisation. No measure of fluency, self-report measures only.
Druce 1997[49]	Yes	No	No	Yes	No	Lower	Sample 15 with adequate follow up, 2 minute speech sample, raters blinded
Elliott et al. 1998[50]	Yes	Yes	No	No	Yes	Higher	Small sample (5) 5 minute conversation sample, reported by individuals, limited analysis
Femrell et al. 2012[51]	Yes	Yes	Yes	Yes	No	Higher	Sample 10 with 2 loss to follow up,10 min conversation, assessed by clinician, not blinded
Foundas et al. 2013[52]	No	Unclear	No	Unclear	No	Higher	Sample 24 (10 control) with control and experimental conditions. Immediate outcomes, length of sample not reported. Unclear whether blinded.
Franken et al. 1993[53]	No	No	No	Yes	No	Higher	Fair sized sample, (32) 6 month FU, rating scale used, blinded assessment, control normal speakers, 5 minute recordings, purpose to compare normal to post intervention rather than evaluate interventions per se.

Franken et al. 2005[54]	No	No	Yes	Yes	No	Lower	Small sample randomised to one of two arms. Loss to follow up, recordings made by parents, blinded assessors
Franklin et al. 2008[21]	No	Yes	No	Unclear	No	Higher	Larger sample, however, participants were not randomised to each condition, assessment carried out by authors not blinded, immediate FU. Sample 1500 syllables
Gagnon & Ladouceur, 1992[55]	Yes	Unclear	No	Unclear	Yes	Higher	Small samples used in separate studies. Data presented by individual, lack of clarity regarding data collection and evaluation
Gallop & Runyan, 2012[56]	Yes	Unclear	Unclear	Yes	Yes	Higher	Sample 11 participants) no control, no explanation of recruitment criteria, 15 minute telephone samples, not reported if blinded, informal follow up
Hancock & Craig 1998[17]	Yes	No	No	No	No	Lower	Larger sample (77 participants). 12 months follow up. Pseudo-randomisation, 5 minute speech sample, in clinic at distance via phone
Hancock et al 1998[18]	Yes	No	No	No	No	Lower	Same study as other paper. This paper reports some different outcomes.
Hancock & Craig 02[57]	Yes	No	No	Yes	No	Lower	Sample (12) selected from earlier study. 5 minute only speech sample,
Harris et al.	No	No	Yes	No	No	Lower	Small study. 29 participants, 6

2002[22]							dropped out (21%).
Harrison et al. 2004[58]	No	No	Yes	No	No	Lower	46 participants, 8 dropped out
Hasbrouck 1992[59]	Unclear	Yes	No	No	Unclear	Higher	Larger sample. No control. No blinding. Very sparse details given about recruitment, attrition,, analysis.
Hewat et al. 2006[23]	No	No	Yes	Yes	No	Lower	30 participants recruited, dropout varied from 27%-40% at different stages of the study, in clinic recording and participant selected recording, rating blinded
Hudock & Kalinowski 2014[60]	Unclear	No	No	Yes	Yes	Higher	Small study (9) no detail of recruitment, scripted telephone conversations, immediate measurement,
Huinck et al. 2006[61]	Unclear	No	No	No	No	Lower	25 participants. No details given about recruitment methods.
Ingham et al 2013[62]	Yes	Unclear	Yes	Yes	No	Higher	Volunteer participants, 9 of 21 did not complete. 3 min monologue, 3 min conversation, Study purpose to compare normal to PWS however contains before and after data. No detail of whether raters blinded, immediate FU, in-clinic rating.
Ingham et al. 2001[63]	Yes	No	No	Yes	No	Higher	Small sample (5 participants). Use of some self-reported measures, participants

							submitted own recording for beyond clinic measure, not detailed whether raters blinded, data reported by participant.
Irani et al 2012[116]	No	Unclear	No	Yes	No	Higher	Mixed method study some self reported measures, use of inferential statistics, small sample (7) little detail of speech sample analysis
Iverach et al. 2009[64]	No	No	No	Yes	No	Lower	Larger sample (64 participants). Use of some self-reported measures
Jones 2000[65]	No	No	No	No	No	Lower	Large sample (261 children, 4%dropout rate, all explained).
Jones 2005[24]	No	No	No	No	No	Lower	Larger sample (54 children, 13% dropout rate, all explained)
Jones 2008[25]	No	No	Yes	No	No	Lower	This is a 5-year follow up of the earlier study 31% of the original treatment group could not be recontacted, and 68% of the control group.
Kaya & Alladin 2012[66]	Yes	No	No	Yes	No	Higher	No comparator group. No detail regarding how stuttering occurrences defined. Immediate assessment at final session
Kaya 2011[67]	Yes	Yes	No	Yes	No	Higher	Assessment via 2 minute speech sample only, rating scale measure used very limited.
Kingston	No	Yes	No	Yes	No	Higher	Larger sample (78 children).

2003[68]							Assessment was done by the clinician/researcher with no blinding. Purpose of paper to examine associations (predict treatment time) rather than outcomes.
Koushik et al. 2009[69]	No	No	No	No	Yes	Lower	Sample 12 children, 1 dropped out.
Koushik et al. 2011[121]	Unclear	Unclear	No	Unclear	No	Higher	Pooled data from 5 clinical sites. Larger sample (134 participants in final analysis). Retrospective file audit. Purpose of study to examine associations rather than evaluate outcomes.
Laiho & Klippi 2007[70]	No	Yes	No	Yes	No	Higher	Sample 21, no control, assessment via video by author, parent-report data for beyond clinic data. Follow up data only parent report
Langevin & Boberg 1993[71]	Yes	No	Yes	No	No	Higher	Small sample, high drop-out rate (21 participants, 11 dropped out) data reported by individual.
Langevin & Boberg 1996[72]	Yes	No	Yes	No	No	Lower	25 in one group, 16 in other. Two year FU, some loss to FU. 2/3 minute samples of speech in clinic and via telephone. Raters probably blinded
Langevin et al. 2006[73]	No	No	No	No	No	Lower	18 participants, no control. Small loss to FU.
Langevin et	Yes	No	Yes	No	No	Lower	5 year follow up of earlier

al. 2010[74]							study.
Latterman et al. 2008[26]	No	No	No	No	No	Lower	Sample 46, blinded rating
Lawson et al 1993[75]	No	No	No	Yes	No	Higher	Self-report measures only used, 1 month follow up, some drop out.
Leahy 1991[76]	Yes	Yes	No	Yes	Yes	Higher	No comparator group, small sample size n=5. Measures taken by student clinician carrying out intervention. Longer FU only for 2. Reporting by individual only.
Lewis et al. 2008[27]	No	No	No	No	No	Lower	Small sample (8 in intervention group, 10 in control group).
Lincoln et al. 1996[77]	No	No	No	Yes	Yes	Higher	Sample of 11, high drop out of potential participants (22 recruited). Some pooled data, some reporting of individuals only, 12 month follow up, parent-recorded speech data.
Lincoln & Onslow 1997[122]	No	Yes	Yes	Yes	Yes	Higher	Long term outcomes of earlier studies. Large initial drop out of potential participants. Parents collected speech sample, parent report questionnaire, descriptive data.
Lutz 2009[78]	Yes	Yes	No	Yes	No	Higher	Findings from a workshop for parents using before and after questionnaires
Mallard 1998[79]	No	Yes	No	Yes	Yes	Higher	Only measure of success was “is child in S&L therapy 1 year after intervention?” No control

							group, limited analysis.
Menzies et al. 2008[28]	No	No	No	No	No	Lower	Smaller sample – 32 participants, 2 dropped out, 16 in each condition.
Millard et al. 2008[80]	No	No	Yes	No	No	Higher	Small sample (9) high dropout rate (30%), blinded rating, in clinic assessment, 12 month FU, data by individual only.
Millard et al. 2009[81]	No	No	Yes	No	Yes	Higher	Small sample (10) high dropout rate, parent-recorded video data, Control group for initial allocation but removed part way, no pooled data descriptive statistics only.
Miller & Guitar 2009[82]	No	No	No	No	No	Lower	Long term follow up, many participants at minimum level. Only 2 drop outs from 15, limited speech sample,
Nilsen & Ramberg 1999[83]	No	No	No	Yes	No	Higher	2 drop outs from 13, use of some scales with limited scoring and analysis, data reported by individual
O'Brian et al. 2003[84]	No	No	No	Yes	Yes	Higher	5 drop out from 30. Reasonable sample, no comparator, participant-selected recordings, limited statistical analysis,
O'Brian et al. 2008[85]	No	No	Yes	No	Yes	Higher	16 of 30 completed, Descriptive analysis.
O'Brian et al. 2013[86]	No	No	No	No	No	Lower	No control.
O'Donnell et al. 2008[87]	Yes	No	No	No	Yes	Higher	Small sample (7), 5 from previous study who had shown

							most benefit. Data reported by individual participant
Onslow et al. 1994[29]	Unclear	No	Yes	Yes	No	Higher	High withdrawal for control and intervention, no detail of allocation, audio recordings made by parents, descriptive statistics.
Onslow et al. 1990[88]	Yes	Yes	No	No	Yes	Higher	No comparator group, sample size n=4 Presentation of findings via figures only, no grouping of data
Onslow et al. 1992[89]	Unclear	No	No	No	No	Higher	Focuses on speech naturalness data only comparing PWS and non stutterers, no control group, immediate follow up, recruitment process unclear
Onslow et al. 1996[90]	Unclear	No	Yes	No	No	Higher	Data reported for only 18 of 32 recruited
Onslow et al. 2002[123]	Yes	No	No	No	Yes	Higher	Small sample (8) six of whom in previous studies. For 2 parent-only recordings. Descriptive data presented by individual only. Purpose of paper to evaluate one aspect of intervention outcome.
Pape-Neumann 2004[91]	Yes	Yes	Yes	Yes	Yes	Higher	This is a pilot study which presents data from a range of interventions
Pollard et al. 2009[92]	No	Yes	No	Yes	No	Lower	Sample 11, no drop out, samples collected at non lab locations, non-blinded scoring,

							immediate outcomes
Ratynska et al. 2012[124]	Yes	Yes	No	Unclear	No	Higher	Large sample found other treatment ineffective, no drop out, no blinding of assessment, incomplete description of data collection
Reddy et al. 2010[93]	Unclear	Unclear	No	Unclear	Unclear	Higher	Small sample (5), limited reporting of findings beyond description of cases
Riley & Ingham 2000[94]	Unclear	Unclear	No	Unclear	Yes	Higher	Sample 12, pseudo randomisation, no blinding of assessors, unclear beyond clinic data collection, unclear whether 12 or 6 participants being reported, no reporting of control group outcomes.
Rosenberger 2007[95]	Yes	Yes	Yes	No	No	HIgher	Two groups were compared which have an uneven number of participants. Some drop-out. Limited blinding and speech measures.
Rousseau et al. 2007[96]	No	Yes	No	No	No	Lower	Reasonable sample large proportion of parent-recorded samples, no analysis of drop outs
Ryan & Ryan 1995[97]	No	Yes	Yes	No	No	Lower	Reasonable sample (24, 20 completed all elements), Pseudo-randomisation, no blinding of speech evaluation.
Sicotte et al. 2003[98]	Yes	Yes	No	Yes	No	Higher	Sample 6, rating scales only. Purpose of study evaluate intervention fidelity rather than

							outcomes
Smits-Bandstra & Yovetitch 2003[99]	Yes	Unclear	No	Yes	No	Higher	Small groups. Each time point presented separately in table form, limited discussion of trends over time. Six participants had received other intervention immediately prior. 3 minute sample, assume no blinding, limited statistical analysis.
Stewart 1996[100]	No	Yes	No	Yes	No	Higher	Reasonable sample (15) no blinding of assessment, 3 minute conversation, limited analysis of speech behaviour data, no outside clinic measure, reasonable follow up
Stidham 2006[101]	Yes	Yes	No	No	No	Higher	Volunteers recruited, small sample (9), immediate follow up, no blinding as assessment, in lab evaluation
Stuart 2004[102]	Unclear	Yes	No	No	No	Higher	No detail of recruitment, non blinded assessment, in lab evaluation, limited speech sample
Stuart 2006[103]	Unclear	Yes (for some elements)	No	Yes	No	Higher	No detail of recruitment, no blinding of assessment for first studies, limited speech sample (300 syllables), reasonable follow up, in clinic assessment
Trajkovski 2011[104]	No	No	Yes	Yes	No	Lower	8 of 17 completed, data provided for drop outs, limited pooled data, parent-collected

							recordings
Unger 2012[125]	Yes	Yes	No	Yes	No	Higher	Volunteer participants, reasonable sample, in clinic only, immediate follow up, no blinding of assessment 2x5 min monologues
Van Borsel 2003[105]	Yes	Yes	No	No	No	Higher	Volunteer participants, in-clinic data, no blinding of recordings, small sample (9),
Von Gudenberg 2006[106]	Yes	Yes	Yes	Yes	Yes	Higher	No clear description of any measurement, participants or methods used; more a evaluation of collected data up to now
Von Gudenberg et al. 2006[107]	Yes	Yes	Yes	Yes	Yes	Higher	Detailed description of the therapy reasons why this therapy may be effective and a good approach for young adults. However, presented results are outcomes with no clear description of methodology and limited analysis
Wagaman 1993[108]	Yes	No	No	No	No	Lower	Follow up data from study
Wagaman 1995[109]	Yes	No	No	Yes	No	Higher	Small sample; no long term follow up.
Ward 1992[110]	Yes	Yes	No	Unclear	No	Higher	No long term outcomes. Reports pilot study findings only. Small sample.
Wille 1999[111]	Yes	Yes	Yes	Yes	Yes	Higher	No clear description of method, data collection, data analyses;

							no reference to other literature
Wilson 2004[112]	No	Yes	Yes	No	Yes	Higher	Small sample Drop outs and lack of data.
Woods 2002[113]	Yes	No	No	No	No	Lower	Small sample (8), one month FU. No speech data, study focuses on cognitive and language assessments.
Yairi & Ambrose 1992[114]	No	Unclear	Yes	No	No	Higher	Reasonable sample (27) 2 year FU, speech sample small (around 500 words), 6 drop out, unclear whether speech assessors blinded, in clinic data,
Yaruss et al. 2006[115]	No	Yes	No	Yes	No	Higher	Sample 17, speech rated by clinician, FU up to 2 years with no drop out, at least 200 word sample unclear how collected, limited analysis.
Zimmerman 1997[126]	No	Unclear	No	Yes	No	Higher	Small sample (9). no long term follow up, scripted conversations, unclear if rater blinded

Appendix 3 Quality appraisal of qualitative studies

	1. Was there a clear statement of the aim of the research? Y/N	**2. Is a qualitative methodology appropriate to address the aims of the research? Y/N**	**3. Was the recruitment strategy appropriate to the aims of the research? Y/N/Unclear**	**4. Were the data collected in a way that addressed the research issue?Y/N/Unclear**	**5. Has the relationship between researcher and participant been adequately considered? Y/N**	**6. Have ethical issues been taken into account? Y/N/ Unclear**	**7. Was the data analysis sufficiently rigorous? Y/N**	**8. Is there a clear statement of findings? Y/N**	**Overall Lower/higher risk of bias. Detail of concerns**
Anderson 2003[127]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Lower
Beilby 2013[128]	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	Yes	Higher, recruitment and data analysis unclear
Boberg 1990[129]	Yes	Yes	Unclear	Yes	No	No	Not reported	Yes,	Higher, detail of data missing
Bricker-Katz 2010[130]	Yes	Yes	Yes	Yes	Partial	Partial	Yes	Yes	Higher, detail missing
Butler 2013[131]	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Lower

Corcoran 1995[132]	Yes	Yes	No	Yes	Yes	No	Unclear	Yes	Higher- lack of detail, unclear recruitment
Corcoran & Stewart 1998 [133]	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Lower
Cream 2003[134]	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Lower
Cream 2004[135]	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Lower
Crichton-Smith 2002[136]	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Lower
Daniels 2012[137]	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Lower
Daniels 2006[138]	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Lower
Goodhue 2010[139]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Lower
Hayhow 2009[140]	Yes	Yes	Partial	Yes	Partial	Unclear	Yes	Yes	Higher Lack of detail
Hearne	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Lower

2008[141]									
Hughes 2011[142]	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Lower
Irani 2012[116]	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Lower
Kathard 2004[143]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Lower
Klompas 2004[144]	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Higher, lack of detail and superficial analysis
Plexico 2005[145]	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Lower
Plexico 2009a[146]	Yes	Yes	Partial	Yes	Yes	No	Yes	Yes	Lower
Plexico 2009b[147]	Yes	Yes	Partial	Yes	Yes	No	Yes	Yes	Higher
Plexico 2010[148]	Yes	Yes	Partial	Yes	Yes	No	Yes	Yes	Lower
Plexico 2012[149]	Yes	Yes	Partial	Yes	Yes	No	Yes	Yes	Lower
Stewart 2004[150]	Yes	Yes	Yes	Yes	Partial	No	Yes	Yes	Lower
Trichon 2011[151]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Higher, detail missing

Appendix 4 Studies excluded at full paper review

Authors, date	Reason
Armson 1997	Laboratory investigation of FAF during reading aloud
Bajaj et al. 2005	Alludes to outcomes of therapy, that children use therapy terms to describe their speech but nothing directly relevant
Blood, 95	Case series 3 participants
Bothe et al. 2007	Letter to editor reply to critique of previous paper. May need to include and link to Finn et al. 2005
Butcher et al.	Design - case series
Cai et al. 2012	No intervention, relates to diagnosis
Carey et al. 2012	3 Participants
Carr et al.	Describes fidelity of intervention. May be relevant for qualitative review?
Craig & Calver 91	Survey data
Craig & Kearns, 95	Two case studies
Dayalu et al. 807	Laboratory assessment of vowel insertion during reading aloud
De Vries 1990	Book chapter, general discussion
De Vries, 1990	General description of intervention only
Eichstadt et al	Non OECD Country
Foundas et al. 2004	Laboratory assessment of DAF during reading aloud
Freeman & Armson 1998	Examines choral speech producing temporary reduction during experiment
Fry et al. 2014	Data for 3 participants
Gabel et al. 2002	No intervention
Green et al 1997	Not qualitative or effectiveness study
Guntupalli et al. 2011	Survey
Hayasaka 1993	Examines links with improvement but outcome data not possible to identify from reporting
Hearne et al. 2008	Case series 3 participants
Helgadottir et al. 2009	Design
Hudock et al. 2011	Emphasis on evaluating if visual speech feedback adversely impacts on speech rate
Ingham et al. 1997	Case series
Ingham et al. 2001	Case series 3 participants
Ingham et al. 2001	Duplicate of 798
Ingham et al. 2001	Duplicate of 794
Ingham et al. 2006	Compares effect of chorus reading on speech effort in stutterers vs normal speakers
Ingham et al. 2009	Compares self-rated speech effort in stutterers vs normal speakers
Iverach et al. 2009	Minor correction to previous paper only
Kalinowska 1996	Laboratory assessment of DAF during reading aloud
Kalinowska 2000	Laboratory assessment of visual coral speech during memorised reading aloud
Kalinowski et al. 1993	Examines elements of auditory feedback
Kalinowski et al. 2000	Letter, no data

Kalinowski et al. 2002	Letter, no data
Kalinowski et al. 99	Examines types of auditory feedback
Kathard 2001	Discusses life history research, mentions need to engage with feelings and significance of stuttering in life but no data of direct relevance
Keifte al. 2008	Compares choral speech with AAF when reading
Kuniszyk-Jozkowiak et al. 96	Explores different types of auditory feedback
Langevin et al. 2010	Impact of stuttering on parents, no data regarding interventions.
Lincoln et al. 2010	Explores DAF in different conditions
Macleod et al. 95	Explores types of DAF
Metten et al. 2011	Laboratory testing prior to case series with three participants
Miltenberger 96	2 case studies
Nakao et al. 2001	Letter to the editor, no data
Neiman & Rubin, 1991	Less than 50% stuttering participants
Nejati et al. 2013	Non OECD (Iran)
Nicholas & Millard 1998	Conference abstract only
OBrian & Onslow 2011	General overview
Onslow & O'Brien, 97	General discussion
Onslow et al. 1997	General discussion of Lidcombe
Onslow et al. 2001	2 case studies
Onslow et al. 97	3 case studies
Packman et al. 2012	Overview of Lidcombe evidence
Paden et al. 2002	Examines phonological development in stuttering children
Petrunik et al 1980	Published prior to cut off date
Ramig 93	Survey
Remi & Diederich 2005	Examines reading with reversed speech
Saltuklaroglu et al. 2004	Examines visual speech/choral speech
Saltuklaroglu et al. 2004	Examines nature of stuttering
Saltuklaroglu et al. 2009	Compares different types of DAF
Sassi & Andrade 2004	Non OECD country (Brazil)
Simon 1997	Survey (Conference abstract)
Snyder et al. 2009	Examines laboratory use of visual speech feedback
Snyder et al. 2009	Examines use of self-generated visual feedback on overt stuttering during reading aloud
Sparks et al. 2000	Examines effect of different rates of speech using DAF
St Louis et al. 1996	Two case studies
St Louis et al. 2004	Explores listener judgement of fluency in cluttering
Stewart & Brosh 1997	Case study of two particpants.
Story et al. 1996	Case series 3 participants
Stuart & Kalinowski 2004	Describes nature of speech naturalness no intervention
Stuart 2008	Duplicate (with Stuart 1470)
Stuart et al. 1997	Examination of DAF frequency alterations during reading
Stuart et al. 1997	Examines use of a passive resonator during reading a passage
Stuart et al. 2008	Examines links between FAF and stuttering type
Stuart et al. 96	Examines types of DAF
Swift 2011	Case series 3 participants

Teshima 2010	Participants are non-stutterers, no intervention.
Trajkovski 2009	Case series 3 participants
Waddell et al. 2012	Laboratory examination of tactile feedback during reading of a passage
Webber et al 2004	Case series 3 participants
Sandrieser 2003	Description only no data
Natke 2000	Evaluation of reading aloud under laboratory conditions
Fry et al. 2014	3 participants

Appendix 5 Extraction tables effectiveness studies

Allen 2011 **Country:** UK **Study design:** Cross sectional **Data collection method:** Record of email content **Aim:** To evaluate email as a component of a therapy programme **Detail of participants (number, any reported demographics):** Sixteen clients aged 19–52 years 14 M & 2 F. Severity of their overt and covert stammering ranged from mild to severe.	**Methods:** Therapeutic intervention was based on individual presentation, blending speech modification techniques and counselling support in both face-to-face appointments and email exchanges. Email served two functions: administrative and therapeutic. **Number of hours:** Email time **Delivered by who?** Clinician **Control:** None **Length of follow up:** None **Response and/or attrition rate:** 2 clients did not complete the intervention	**Outcome measures:** Number of emails sent Content of emails Outcome of therapy	**Main results:** A total of 472 email messages was exchanged with the group, of which 328 (69%) were primarily administrative, in arranging face-to-face appointments. The other 144 email messages (31%) were primarily therapeutic, in monitoring ongoing treatment goals or offering problem-solving guidance. Often email messages contained both administrative and therapeutic elements. Of the sixteen clients who used email as part of therapy, eleven were discharged (two due to non-response). Five clients remained on the caseload. The paper describes a range of benefits but these have no data underpinning them.	**Limitations/comments**
Amster 2007 **Country:** UK **Study design:** Before and after **Data collection method:** Questionnaire/assessment evaluations **Aim:** to determine if a modified cognitive behavioural therapy approach alone and combined with Stuttering Modification could help reduce perfectionist tendencies and stuttering behaviours. **Detail of participants (number, any reported demographics):** N=8 5 M & 3 F age 27–56 years (M=44 years, SD=9.9 years)	**Method:** Modified CBT with and without stuttering modification therapy. **Hours:** Treatment consisted of six individual one-hour sessions and six 90-minute group sessions with the authors serving as clinicians. At week four, stuttering modification was introduced and reviewed in both individual and group sessions. **Delivered by**: Authors (clinicians) **Control:** None **Length of follow up:** 15 weeks Compared at pre-treatment, mid-treatment (3 weeks), after 6-weeks of treatment, and at 15 weeks	**Outcome measures:** Burns Perfectionism Scale, SSI Modified Erikson Communication Attitude Scale	**Main results:** From pre-treatment to post-treatment stuttering severity and perfectionism significantly decreased. Participants related that they did not care as much about making mistakes when they spoke. They reported that their fears about stuttering reduced, and that they were no longer striving to speak perfectly. At pre-treatment all participants met criteria for stuttering on the SSI-3 ranging from very mild to very severe. Pairwise comparisons as	**Limitations/comments**

	follow-up, after treatment was withdrawn. **Response and/or attrition rate:** All participants attended all 12 sessions during the 6-week time frame.		measured by the Wilcoxon Signed Ranks Test reflected statistically significant improvements in participants' speech fluency from pre-treatment to mid-treatment (when CBT was the sole treatment). Participants significantly decreased stuttering (Z=−2.3; p=.021). SSI-3 scores for PWS at pre-treatment were M=24.38, SD=9.01; and at mid-point, SSI-3 scores were M=16.88, SD=11.11. At post-treatment, SSI-3 scores were M=11.75, SD=8.79; and at follow-up, SSI-3 scores were M=13.75 and SD=8.63. Effects sizes using Cohen's d were.74 (pre-treatment to mid-treatment) and .51 (mid-treatment to post-treatment). At pre-treatment all participants performed within the perfectionist range on both current (M=9.75; SD=5.1) and child recollection (M=9.75; SD=8.5) formats. Participants decreased an average of 13 points on the Burns Perfectionism Scale (a 40 point scale). The Wilcoxon Test indicated that Perfectionism scores for PWS at pre-treatment (M=9.75, SD=5.06) significantly decreased by mid-treatment (M=−2.38, SD=8.09), Z=−2.1; p=.035. The effect size using Cohen's d was 1.80. From mid-point to end of treatment when stuttering modification was introduced, perfectionism continued to decline, however not significantly (Z=−1.7; p>.05). Perfectionism continued to decline after treatment	

			was withdrawn (Z=−2.2; p=.027) By post-treatment, participants had significantly more positive attitudes about communication (pre-treatment M=19.00, SD=3.46, mid-treatment M=17.00, SD=5.15, and post-treatment M=12.38, SD=4.95). Attitudes did not significantly change by the mid-point of the treatment, but by the end of the 6-week program participants showed a significant improvement in their attitude towards speaking as they found it easier to talk with others, were more confident about their speaking ability, and less nervous or embarrassed to talk (pre-treatment to post treatment Z=−2.38, p=.017). This was maintained at follow-up (M=12.13, SD=6.33).	
Andrews 2012 **Country:** Australia **Study design: Before and after** **Data collection method:** Parent rating **Aim:** To determine the outcomes of a simple syllable-timed speech (STS) treatment for school-age children who stutter. **Detail of participants (number, any reported demographics):** N=10 8 M & 2 F age 6 - 12 years (mean = 8.8 years). Seven participants had received previous Lidcombe Program treatment of varying duration and with variable success.	**Method:** Syllable Timed Speech Treatment involved training the children and their parents to use STS at near normal speech rates. The technique was practiced in the clinic and at home with the parents during everyday conversations. The only additional procedures being prompts to use the speech pattern and reinforcement for using it. The treatment was delivered by a parent and was supervised by an SLP. Treatment was provided in two stages. The aim of Stage 1 was to instate a low level of stuttering with STS; the aim of Stage 2 was to maintain this low level of stuttering for the long term.	**Outcome measures:** %SS. Parent severity rating using the 10-point Lidcombe Program scale. Participant self-reports of stuttering severity, avoidance, speech satisfaction, and quality of life.	**Main results:** Nine months after commencing treatment, stuttering had decreased by >50% for half of the children, with 2 children attaining 81% and 87% reduction. Intention-to-treat analysis showed a clinically and statistically significant reduction in stuttering for the group even when a withdrawn participant was included. These results were mostly confirmed by self-reported stuttering severity ratings and were supported by improved situation avoidance and quality-of-life scores. There was considerable individual variation in response to the treatment. The group mean %SS at	**Limitations/comments**

	Hours: **Delivered by**: **Control:** none **Length of follow up:** 9 months. Assessment 1 occurred within 2 weeks before the start of treatment; Assessment 2 occurred 9 months after the start of treatment. **Response and/or attrition rate:** One child withdrew from treatment before Assessment 2.		Assessment 1 was 14.4 (SD = 16.5) and at Assessment 2 was 6.7 (SD = 6.8). This difference was significant, t(9) = 2.99, p = .015. The Cohen d effect size (Cohen, 1988) was medium, at 0.7. Half of the children reduced their stuttering by >50%, with two children attaining 81% and 87% reduction. Three children attained reductions in the 30%–50% range. Two children showed no reduction. Self-reported stuttering severity. The group mean SR at Assessment 1 was 5.4 (SD = 1.4) and at Assessment 2 was 2.8 (SD = 1.1). This difference was significant, t(9) = 4.85, p = .00089. Eight of the 10 children reported reduced avoidance of speaking situations at Assessment 2, with a reduction for the group from 14.7 to 11.7. This difference was significant, t(9) = 2.87, p = .018. Individual results are presented in Table 2. All children except Participant 9 were reportedly more satisfied with their speech at Assessment 2. The group mean decreased from 6.0 to 2.7. This difference was significant, t(9) = 5.14, p < .001. Quality-of-life scores improved for all but one of the children (Participant 3). The mean dropped from 54 at Assessment 1 to 40 at	

			Assessment 2. This difference was significant, t(9) = 3.37, p < .005.	
Antipova 2008 **Country:** NZ **Study design:** Cross sectional **Data collection method:** Speech samples from DVD recording **Aim:** To investigate the immediate effects of eight altered auditory feedback (AAF) parameters on stuttering frequency during monologue speech production on two occasions. **Detail of participants (number, any reported demographics):** N=8 participants aged 16–55 years (mean 35 years, standard deviation 12.95).	**Method:** The Pocket Speech Lab (Casa FuturaTechnologies®) was used to produce auditory feedback alterations. Six types of combined delayed auditory feedback (DAF) and frequency shifted auditory feedback (FAF) and two types of DAF alone were tested. **Hours:** 3x 90 min sessions: an introductory session and 2 testing sessions. **Delivered by**: **Control:** No AAF compared to eight altered auditory feedback conditions. **Length of follow up:** Immediate **Response and/or attrition rate:** None	**Outcome measures:** Stuttering frequency. Lidcombe Behavioural Data Language (LBDL) to identify stuttering moments.	**Main results:** The present study found that AAF is an effective means to reduce stuttering frequency during monologue speech production. All eight AAF experimental conditions reduced stuttering frequency however, there was substantial variability in the stuttering reduction effect across experimental conditions and across participants. The type of speech task had no significant effect on stuttering frequency [t = 1.77; d.f. = 7; p = 0.119]. The reduction of stuttering frequency varied across individuals from 23 to 97% during the first testing session and from 3 to 88% during the second one. There was also instability in stuttering reduction across the two testing sessions. On average, a 75ms time delay on its own and a combination of the 75 ms time delay and a half octave downward frequency shift were found to be more effective than other combinations of AAF parameters	**Limitations/comments**

			that were investigated.	
Armson 1998 **Country:** Canada **Study design:** Cross sectional **Data collection method:** **Aim:** To examine the effect of frequency altered feedback **Detail of participants (number, any reported demographics):** N=12 10 M & 2 F age range 20-50 mean 35 years. Four currently receiving treatment others had received in past between 1 month and 15 years previously. 5 mild, 6 moderate 1 severe. 6 no previous experience of AAF, 2 had used Edinburgh masker, 1 DAF, 5 briefly used in previous study.	**Methods:** Recruited via a local clinic and self-help group. Each individual recorded for 5 minutes without FAF then 10 minutes with FAF then 5 minutes without FAF. **Number of hours: N/A** **Delivered by who?** FAF device **Control:** None **Length of follow up:** None **Response and/or attrition rate:** N/A	**Outcome measures:** Stuttering episodes, Syllables produced % stuttering Speech rate	**Main results:** FAF effective for some participants during reading only. Significant difference when using FAF for total number of syllables produced increased, number of stuttering episodes decreased and percent stuttering decreased for reading. Number stuttering events – $p<0.001$ ES 0.62, number syllables $p=0.0071$ ES 0.39, percent stuttering $p=0.0056$ ES 0.41. Ten of the twelve participants showed no positive effect on stuttering frequency of FAF during monologue. Significant difference only for number of stuttering events during monologue $p=0.10$ ES 0.14. Not significant - number syllables $p=0.41$ ES 0, or percent stuttering $p=0.46$ ES 0. Considerable variation between participants. Three showed large reduction in stuttering during FAF returning to baseline following FAF. Six showed initial large reduction in stuttering which faded during the intervention, the final 3 experienced little effect of the intervention.	See Bloodstein 1999 critique See Armson 1999 response to this

Armson 2006 **Country:** Canada **Study design: Cross sectional** **Data collection method:** One of two graduate students in speech-language pathology counted stuttering episodes for each sample. **Aim:** To evaluate the effect of SpeechEasy **Detail of participants (number, any reported demographics):** N=13 adults	**Method:** SpeechEasy Stuttering frequencies in two baseline conditions were compared to stuttering frequencies with the device fitted according to the manufacturer's protocol. For each of the four conditions—the two baseline and two experimental conditions— participants produced speech in three contexts: oral reading, monologue, and conversation. Each participant was fitted with a programmable SpeechEasy Basic BTE unit. The BTE model is an external device that is worn behind the pinna and connects to a mould that fits in the ear canal. SpeechEasy software permits manipulation of settings for three variables: FAF, DAF, and volume. **Control:** none **Length of follow up:** N/A **Response and/or attrition rate:** None	**Outcome measures:** Stuttering episodes %SS	**Main results:** Relative to the initial baseline condition stuttering was reduced by 74%, 36%, and 49% for reading, monologue, and conversation respectively in the second baseline. In comparison, stuttering was reduced by 42%, 30%, and 36%, respectively with the device in place, but before participants were instructed to deliberately prolong vowels. Raw stuttering frequencies and differences across participants, task, and condition were evaluated. There were highly significant differences for participant (F12,124 = 32.4; p < .001), speech task (F2,124 = 6.6; p < .002), and condition (F3,124 = 25.54; p < .001). Although mean stuttering levels increased in the post-device condition relative to levels in the device conditions they failed to reach pre-device levels, suggesting some degree of treatment carryover effect.	**Limitations/comments**

Armson 2008 **Country:** Canada **Study design:** Cross sectional **Data collection method:** Data were collected during the course of an otherwise routine initial dispensing session with a client to demonstrate the product. **Aim:** To measure the effects of SpeechEasy **Detail of participants (number, any reported demographics):** N=31 adults;11 F & 20 M. Age 18-51 years, (mean 27.7 years). With one exception, all participants had received or were currently receiving some form of behavioural therapy An additional 30 adult volunteers were recruited to evaluate speech naturalness of samples collected from the participants who stutter.	**Method:** SpeechEasy device, Speech measures were compared for samples obtained with and without the device in place in a dispensing setting. Settings for three variables can be programmed in the device: volume, delayed auditory feedback (DAF), and frequency altered feedback (FAF). For each of the two conditions, participants produced speech in two contexts: reading and monologue. For the reading task, participants read aloud two 300-syllable passages taken from Grade 8 and 9 social studies and science texts—a different passage for each condition. For the monologue task, participants were asked to talk continuously for 3 min about a topic of their choice. If they hesitated or paused noticeably, they were prompted by the SLP. **Control:** None **Length of follow up:** Immediate **Response and/or attrition rate:** None	**Outcome measures:** Participant self-rating of stuttering severity Stuttering frequency, Speech rate, Speech naturalness.	**Main results:** Mean stuttering frequencies were reduced by 79% and 61% for the device compared to the control conditions on reading and monologue tasks, respectively. Means for stuttering frequency in the No Device condition were 16.4 and 15.8 stuttering events per 100 syllables for the reading and monologue tasks, respectively (medians: 11.3 and 10.0, respectively) while, for the Device condition means were 2.3 and 5.9 stuttering events per 100 syllables for reading and monologue tasks, respectively (medians: 1.3 and 4.0, respectively). Average reduction in stuttering frequency for all participants during the reading task was 78.8% (S.D. = 28.8%), while average reduction in stuttering across conditions for all participants during the monologue task was 60.7% (S.D. = 35.5%). Mean severity self-ratings decreased by 3.5 points for oral reading and 2.7 for monologue on a 9-point scale. Despite dramatic reductions in stuttering frequency, mean global speech rates in the device condition increased by only 8% in the reading task and 15% for the monologue task, and were well below normal. Further, complete elimination of stuttering was not associated with normalized speech rates.	**Limitations/comments**

			Nevertheless, mean ratings of speech naturalness improved markedly in the device compared to the control condition and, at 3.3 and 3.2 for reading and monologue, respectively, were only slightly outside the normal range.	
Baumeister et al. 2003 **Country:** Germany **Study design:** Before and after **Data collection method:** 4 assessment points: baseline (T1); pre-treatment (T2); post-treatment (T3); follow-up (T4) **Aim:** To evaluate the therapy concept of an intensive stammer-camp and to estimate if this concept is transferable to current practical work **Detail of participants (number, any reported demographics):** 37 participants: 33 male, 4 female; with different severity of stammering (mean 21,1%); age: 9-19 years	**Methods:** Stammering summer-camp. 70 direct therapy sessions; Indirect therapy sessions (social networking, short therapeutic interventions) **Number of hours:** 3 weeks (for children under 12 just 2 weeks) **Delivered by who?** Clinican **Control:** None **Length of follow up:** 2 months **Response and/or attrition rate:** 12 participants did not complete the baseline because of local difficulties; 20 participants did not complete the follow up, because of local difficulties, most of the participants who completed the follow up were participants who showed a severe stammering at baseline or pre-treatment assessment	**Outcome measures:** Frequency of stammering: Speech rate Naturalness of speaking Non-verbal naturalness Attitude towards communication Avoidance of stammering Influence of social situations & Influence of mood	**Main results:** Significant reduction of stammer frequency between T2 & T3 (d=1.87) and T3 &T4 (d=1.43) Speech rate (was measured by words per minutes in performances of tasks for stammer frequency): General improvement of speech rate between T2 & T3 (d=-0.65 – 0.79) and T3 &T4 (d=-1.41 – 1.75); some of the effect sizes were significant, however, results are influenced by missing participants to different assessment points; some participants showed significant slower performances in reading tasks Naturalness of speaking & Non-verbal naturalness: Significant improvement in naturalness of speaking (T2 & T3: d=1.20 – 1.31; T3 & T4: d=1.41) and significant improvement in non-verbal naturalness (T2 & T3: d=0.94 – 1.13; T3 & T4: d=1.11) Attitude towards communication: Significant positive improvement about attitudes from each assessment point to the next one	**Limitations/comments** Results were analysed in different steps as not all participants could be included for every analyses (in general, one group T2 & T3 analyses, another group just T3 & T4 analyses.

			Avoidance of stammering: Significant positive self-evaluation improvement (T2 & T3: d=0.82 – 1.03; T3 & T4: d=-0.36) between T3 & T4 no significant improvement Influence of social situations & Influence of mood: Significant improvement of influence of social situations (T2 & T3: d=0.71 – 0.74; T3 & T4: d=-0.25) but no improvement of influence of mood (T2 & T3: d=0.26 – 0.30; T3 & T4: d=-0.40)	

Beilby 2012 **Country:** Australia **Study design:** Before and after **Data collection method:** **Aim:** To assess the effectiveness of an Acceptance and Commitment Therapy group intervention program for adults who stutter. **Detail of participants (number, any reported demographics):** N = 20 10 M & 10 F (mean = 28.75 years; SD = 11.07 years; range = 19–65 years).	**Method:** Integrated ACT program The program consisted of 2-h therapeutic sessions conducted weekly for eight consecutive weeks. It was an integrated program designed to improve: (a) psychosocial functioning, (b) readiness for therapy and change, (c) utilisation of mindfulness skills and psychological flexibility, and (d) frequency of stuttering. **Hour**s: 2 hours for 8 weeks **Delivered by?** **Control:** none **Length of follow up:** three months post-treatment **Response and/or attrition rate:** none	**Outcome measures:** Stuttered speech frequency Overall assessment of speaker's experience of stuttering Modified stages of change questionnaire Mindful scales	**Main results:** Results from this study showed statistically significant gains across all measures of interest from pre-treatment to post treatment and continuing on to three months follow-up. Prior to the commencement of the ACT intervention program, half (50%) of AWS demonstrated a stutter frequency rating of <5%SS with the remaining 50% demonstrating stuttered frequency rating of >5%SS. The repeated measures ANOVA indicated that frequency of the stuttered speech was reduced and maintained significantly over time. At the post-treatment time point, three participants (15%) were assessed with a stuttered frequency ratings ranging from 3% to 3.5%, with the remaining participants 85% demonstrating stuttered frequency ratings of <2%SS. At the follow-up treatment time point, two participants (10%) were assessed with a stutter frequency rating ranging from 4% to 4.5%, with the remaining participants (90%) demonstrating stuttered frequency ratings of <2%SS.	**Limitations/comments**

Berkowitz et al. 94 **Country:** US **Study design: Before and after** **Data collection method:** Assessment scales, views of parents **Aim:** To evaluate a fluency programme delivered in a school setting **Detail of participants (number, any reported demographics):** N=8 6 M & 2 F age range 5:11 to 13:8.	**Methods:** Cooper Personalized Fluency Control Therapy Program used with children – emphasis on attitudes and control. Phase one assessment of attitudes and behaviour, phase two identification of behaviours and attitude, phase three changing behaviours (modifying and controlling speech and concomitant behaviours eg gentle air stream adjusting volume, changing intonation). Phase four transfer and maintenance. Parent program included focus on attitudes, issues and beliefs and change in behaviour. Considerable amount of time on attitudinal issues before changing behaviours. **Number of hours:** 1.5 hours once per week after school children's group, 2 hours once a week evening for parents over one month. **Delivered by who?** Authors **Control:** None **Length of follow up:** Immediate **Response and/or attrition rate:** Not reported	**Outcome measures:** SSI Cooper Personalized Fluency Control Therapy Revised Parent perceptions	**Main results:** Results given as scores on the different measures pre and post only rather than any descriptive or inferential statistics. Positive change in attitude towards stuttering. Reduction in verbal and non-verbal behaviours associated with stuttering for all students on SSI. Parents reported a greater level of knowledge and awareness, and acceptance and attitudes towards stuttering.	**Limitations/comments**

Block et al. 2004 **Country:** Australia **Study design:** Before and after **Data collection method:** Observer speech rating **Aim:** To replicate previous studies on electromyograph biofeedback using larger sample **Detail of participants (number, any reported demographics):** N=12 aged 10-16 years (mean age 13). None had received biofeedback treatment, 6 had received prolonged speech treatment.	**Methods**: EMG intervention. Each day, participants were randomly assigned to one of two groups of six. One group received the EMG procedures and the other group engaged in speaking activities, in and out of the clinic setting. The groups alternated between EMG biofeedback and the generalization activities throughout the day, and each group received an equal amount of time with each. Participants kept speech diary, parents joined activities for last hour of the day. Sweets given as rewards for EMG session. **Number of hours:** 6 h per day over five consecutive days. The EMG treatment comprised ten 45-min sessions. Homework assignments each evening. **Delivered by who?** 2 clinicians and 2 students **Control:** None **Length of follow up:** Immediate post treatment, one week, 3 months **Response and/or attrition rate:** None	**Outcome measures:** %SS Syllables per minute	**Main results:** Mean %SS in conversation at home 1 week pre-treatment and 1 day pre-treatment were 7.1 and 7.6 respectively. Mean %SS in conversation at home 1 week post-treatment and 3 months post-treatment were 4.9 and 4.4 respectively. Pooling pre-treatment and post-treatment measures, these data constitute a reduction of 36.7% in stuttering severity. Reduction in stuttering during reading was 48.9%. Participants who had not received prior prolonged speech treatment made greater gains following EMG intervention (67.1% versus 30.1% reduction). Mean SPM in conversation at home 1 week pre-treatment and 1 day pre-treatment were 115 and 102.5 respectively. Mean SPM in conversation at home 1 week post-treatment and 3 months post-treatment were 113.5 and 109.5 respectively. Pooling pre-treatment and post-treatment measures, these data constitute an increase of 2.5% in SPM after the EMG treatment.	
Block et al. 2005 **Country:** Australia **Study design:** Before and after **Data collection method:** Assessment measures/observation **Aim:** To evaluate a student-delivered intervention	**Methods:** Block and Dacakis programme - a prolonged speech intervention. Programme is conducted in two stages.12–15 participants, aged at least 16 years in each programme. **Number of hours:** Stage 1, participants attend the	**Outcome measures:** %SS Self-report inventory Attitude to Communication	**Main results:** Stuttering was significantly lower immediately after treatment, both within and beyond the clinic, and also at the 3 months post-treatment FU stuttering in the clinic. During conversation stuttering was significantly higher within the clinic	**Limitations/comments** Reports same study as Block 2006, this one reports intervention detail in more depth and one additional measure

Detail of participants (number, any reported demographics): N= 80 adults who had completed the programme between 1998 and 2000. 68 M & 14 F age range 16 to 70 mean age 28 years	clinic for 9 h each day for 5 days. Stage 2, weekly individual and group follow-up sessions conducted for 2 h a week for 7 weeks. Total approx 60h. Clients have unlimited access to a number of voluntary 7-h 'booster' days, which occur at 6-monthly intervals. **Delivered by who?** Student clinicians supervised by clinical educator **Control:** None **Length of follow up:** Immediate (after stage one), 3 months (after stage two), 6 months and 3.5 to 5 years **Response and/or attrition rate:** 2 were lost at follow up. 50% of home data was not available at 3 months and 50% of clinic and home data not available at 12 months. 87% of data available at long term FU. Return rate for speech naturalness questionnaire at 3-5 year FU was 44%.	(S24) Locus of Control of Behaviour Scale Speech naturalness	than beyond the clinic. %SS data pre-treatment was 5.4 and immediately post-treatment was 1.8%SS. Effect size large 0.86. The mean 3.5–5 year follow-up stuttering rate was 1.6%SS. Speech naturalness mean pre-treatment 3.8 (SD 51.3, range 51.6–7.1). Mean immediately post-treatment 4.5 (SD 51.3, range 51.9–8.7). Medium effect size of 52. ??0.52 Self-report inventory data single time point reported by comparison with another study. Self rating of how stuttering was before programme mean 6.5 (1=no, 9=extremely severe). Stuttering now 3.2.	
Block et al. 2006 **Country:** Australia **Study design:** Before and After **Data collection method:** Assessment measures/observed rating **Aim:** To investigate whether stuttering rate, attitude to communication and LOC are predictive of long term outcomes **Detail of participants (number, any reported demographics):** N= 80 adults who had completed the programme between 1998 and 2000. 68 M & 14 F age range 16 to 70 mean age 28 years	**Methods:** Block and Dacakis programme - a prolonged speech intervention. Programme is conducted in two stages.12–15 participants, aged at least 16 years in each programme. To gather the follow up data an investigator unexpectedly telephoned the participants and conducted a 10-min conversation with them, **Number of hours:** Stage 1, participants attend the	**Outcome measures:** %SS Attitude to Communication (S24) Locus of Control of Behaviour Scale Speech naturalness rating	**Main results:** Pre-treatment mean %SS was 4.9 (SD 4.4). Levels of stuttering reduced to a mean of 0.9 (SD 1.4) %SS immediately post-treatment, and 1.5 (SD 2.2) %SS at 3 months FU. At 12 months the mean %SS was 2.6, and at 3.5–5 years, during a surprise telephone call, the mean %SS was 1.6. The pre-treatment rate of stuttering predicted immediate post-treatment rate. Regression modelling using two	**Limitations/comments**

	clinic for 9 h each day for 5 days. Stage 2, weekly individual and group follow-up sessions conducted for 2 h a week for 7 weeks. Total approx 60h. Clients have unlimited access to a number of voluntary 7-h 'booster' days, which occur at 6-monthly intervals. **Delivered by who?** Student clinicians under the supervision of clinical educators **Control: None** **Length of follow up:** Immediate, 3 months, 6 months and 3.5 to 5 years **Response and/or attrition rate:** 2 were lost at follow up.		predictors (pre-intervention %SS and 3 months follow up %SS) predicted 54% of the variance in 3.5–5 year data, with the latter predicting nearly 50% of the variance. %SS at long term follow up was only predicted by immediate post-intervention %SS and 3 month FU %SS. Pre-treatment stuttering rate, attitude to communication, LOC, post-intervention speech naturalness and number of booster sessions attended were not predictors of long term outcome. Authors highlight that 46% of variance at long term follow up remains unaccounted for	
Block et al. 1996 **Country**: Australia **Study design**: Before and after **Data collection method**: Reading, monologue, telephone, conversation tasks audiotaped. Half time masker activated half not. **Aim:** To evaluate the Edinburgh masker **Detail of participants (number, any reported demographics):** N=18 4 F & 14 M aged 18-58. 14 had received previous treatment with a variety of therapies. 16 sound/syllable repetitions and 2 severe blocking.	**Methods:** Edinburgh Masker **Number of hours:** 200 minutes of operation **Delivered by who?** Device **Control:** None **Length of follow up:** Immediate **Response and/or attrition rate:** None	**Outcome measures:** %SS Mean speech rate Speech naturalness rated by students	**Main results:** More stuttering in non-masked condition (mean 5.1%SS across all conditions) than in masked condition (2.6 %SS). Stuttering rate reduced by mean 50% in masking condition during conversation with familiar person. Increase in speaking rate when using masker for reading however reduction in rate for all other conditions. Mean rate across all condition during masking 184.4,	**Limitations/comments**

			non masking 192.9. Listener judged masked speech to be less natural sounding.	
Blomgren 2005 **Country:** USA **Study design:** Before and after **Data collection method:** Recorded speech samples **Aim:** To evaluate an intensive stuttering program **Detail of participants (number, any reported demographics):** N=19 15 M & 4 F. Mean age 26.3 years (range = 16–52, SD = 10.1). Seven of the participants had a prior history of fluency shaping therapy, averaging 9.6 years prior to participation in the SSMP (range = 1–22, SD = 7.3).	**Method:** A 3-week intensive stuttering modification treatment program (the Successful Stuttering Management Program [SSMP]). The program consisted of three phases of treatment: (a) confrontation of stuttering, (b) modification of stuttering, and (c) maintenance. Therapy was conducted within the Speech and Hearing Clinic at The University of Utah, and transfer practice took place in nearby public settings such as shopping malls. **Hours:** The duration of each of the two SSMP offerings was 3.5 weeks. Group and individual therapy was offered for 3.5 hr (1 p.m. to 4:30 p.m.) during the weekdays. Clients were assigned numerous speaking tasks to complete during the mornings (usually in the form of conducting surveys). Group activities were also arranged on Saturdays. **Delivered by?** Clinicians/students **Control:** none	**Outcome measures:** SSI PSI Locus of Control of Behavior Scale; Beck Depression Inventory Multicomponent Anxiety Inventory IV (MCAI–IV) State-Trait Anxiety Inventory.	**Main results:** Statistically significant improvements were observed on 4 of the total 14 measures immediately following treatment and on 4 measures at 6 months post-treatment. Statistically significant improvements observed immediately post-treatment included scores on the SSI and the Struggle, Avoidance, and Expectancy subscales of the PSI. Sustained statistically significant improvements at 6 months post-treatment were observed only on client-reported perceptions of stuttering (the Avoidance and Expectancy subscales of the PSI $p<0.001$) and 2 specific affective functioning measures (the Psychic and Somatic Anxiety subscales of the MCAI–IV $p= 0.078$ and 0.036 respectively).	**Limitations/comments** See Reitzes & Snyder 2006 for critique of Blomgren et al. 2005 It is suggested that Blomgren et al. used inappropriate treatment efficacy measures (core stuttering behaviours only) making the data difficult to interpret. Stuttering treatment efficacy measures should include client-reported treatment satisfaction data and self-measurement ratings and data pertaining to the values and priorities of those within the stuttering population. See also Ryan 2006 Critique of Blomgren et al. 2005

	Length of follow up: 6 months Speaking samples were collected immediately pre and post treatment, and 6 months post treatment at the beginning of the 2-day refresher program. **Response and/or attrition rate:** None			The treatment program was not described clearly(would not be easily replicable), the participants did not improve their speech fluency, and the treatment time was extensive (estimated 6.5 hr per day × 6 days per week × 7 weeks plus a 2-day refresher of 12 hr = 284 hr × 2 clinicians per client = 568 hr of clinician time per client) See Blomgren 2006 Response and discussion of terminology
Blood 95 **Country:** US **Study design:** Before and after **Data collection method:** **Aim:** To evaluate the efficacy of a behavioural-cognitive treatment program **Detail of participants (number, any reported demographics):** N=4 Age 20-25 years all had received many years of prior therapy.	**Methods:** Behavioural cognitive program. 1st phase change in motor speech behaviour using the Computer Aided Fluency Establishment Trainer program. This targets diaphragmatic breathing, continuous airflow, pre-voice exhalation, easy onset, initial prolongation, continuous phonation, phrasing and monitored speech. Immediate feedback provided on computer screen. 2nd and 3rd phases use POWER relapse management program based on Bandura's self-efficacy model working on feelings and attitudes. **Number of hours:** 93-124 hours. Phase 1 46-55 hours using computer program over maximum	**Outcome measures:** %SS SPM SSI Personal Report of Communication Apprehension scale Assertiveness Scale Self-Efficacy Scale for Adult Stutterers S-24 Scale	**Main results:** At end of phase one all had reduced stuttering to criterion level of less than 3% SS. Two increased %SS to above 3% during second and third phases however did not relapse to pre-treatment levels. S1 221%SS baseline to 3% at 6 and 12 month FU S2 13%SS baseline to 3% at 6 and 12 month FU S3 18%SS baseline to 1-2% at 6 and 12 month FU S4 20%SS to 1- 2% at 6 and 12 month FU Feeling and thinking scales all showed positive changes which were maintained at 6 and 12 months. Individual scale scores	**Limitations/comments**

	of 3 weeks 2 or 3 times per week. Phase 2 and 3 50 minute sessions 3 times per week for 6-8 months. Asked to maintain contact and return for assessment at 6 and 12 months. **Delivered by who?** Not reported **Control:** None **Length of follow up:** 6 and 12 months **Response and/or attrition rate:** None		reported for each individual participant only.	
Boberg & Kully 1994 **Country:** US **Study design: Before and after** **Data collection method:** audio recorded speech samples during telephone calls **Aim:** **Detail of participants (number, any reported demographics):** N=49 - 2 groups adolescents and adults. Adults 14 M & 3 F mean age 24.59 years range 18-36. Adolescents 20 M & 5 F mean age 14.28 years range 11-17.	**Methods:** 3 week intensive Comprehensive Stuttering Program. Behavioural strategies to teach prolongation, easy onset, soft contacts, appropriate phrasing, continuous airflow/blending. Gradual increase in syllable rate using techniques during establishment phase. Includes teaching of self-monitoring and transfer phase using speech outside clinic in situations of increasing difficulty. Includes identification of fears and reduction of avoidance, discussion with family/friends and social skills. Home maintenance program for after the course. Self help group, weekend and 5 day refresher clinics available. **Number of hours:** 7 hours x 15 days. First two weeks residential final week choose residential or not. **Delivered by who? C**linican **Control:** None **Length of follow up:** Some had completed the intervention 24 months earlier some 12 months earlier.	**Outcome measures:** %SS Speech Performance Questionnaire	**Main results:** Pre to immediate post treatment mean %SS decreased from 19.59 to 1.29 for the adult group and 14.32 to 1.75 for the adolescent group. During follow up period mean %SS for adults increased from 1.29 to 4.27 at 4 months and 6.03 at 12 months. For those 7 who had received intervention 2 years before mean %SS 2.03 at 24 months. During follow up period mean %SS for adolescent group 1.75 at immediate post treatment to 3.65 at 4 months and 3.89 at 12 months, for the 8 who had completed intervention 2 years earlier increase to 7.3 %SS at 24 months. Individual variation in patterns, difficult to identify sub-categories of individuals associated with different treatment outcomes. Immediate post-treatment 93% indicated they were satisfied or very satisfied with their speech. At 12/24 months 80% described speech as fair or good and 80% poor or terrible. 50% reported almost always able to speak normally	

	Response and/or attrition rate: 7 not available at follow up, data available for 42. Questionnaires available for 30.		without thinking about controlling their speech. 40% reported they always or almost always felt like a normal speaker. 77% reported skills learned in the clinic were effective most or all of the time. 23% reported they no longer considered themselves to be stutterers.	
Bonnelli et al. 2000 **Country:** Australia **Study design:** Before and after **Data collection method:** Tape recorded interactions **Aim:** To investigate any changes in parental or change language following the intervention **Detail of participants (number, any reported demographics):** N=9 age 34 months – 60 months Taken part in the studies reported in Onslow 90 and 94	**Method:** Lidcombe Program **Hours:** Not reported in this paper **Delivered by:** Not reported in this paper **Control:** None **Length of follow up:** Immediate post intervention **Response and/or attrition rate:** None	**Outcome measures:** % syllables dysfluent Articulation rate Time between speaker turns Mean length utterance Development sentence score Number different words Requests for clarification Requests for information	**Main results:** Data reported by individual participant only All children showed a reduction in %SD post intervention. No clear pattern in rate change for children with 5 showing reduction and 4 increase. Seven mothers showed increase in rate of articulation post intervention. No pattern of change in speaker's turn time for children or mothers. No clear pattern for children or mothers in regard to MLU. No clear pattern for development sentence score, number of different words, No clear pattern for parental requests for clarification. Seven of mothers showed reduction in requests for clarification. Children's language within normal limits both before and after treatment.	**Limitations/comments**

Bray & James 2009	**Methods:**	**Outcome measures:**	**Main results:**	**Limitations/comments**
Country: UK **Study design:** Two baseline measures before intervention. Third measure using device. **Data collection method:** Recording of telephone calls **Aim:** To evaluate the use of a telephone assistive device **Detail of participants (number, any reported demographics):** N=5 age 40.6 to 70.5 years (mean 54.46 years, SD 11.57). 3 M & 2 F All participants had had speech and language therapy at some time in their lives one receiving therapy at time of the study. One participant some experience in using an altered auditory feedback device.	VA609 TAD an altered auditory feedback device (DAF) that is used with a regular landline telephone. Participants asked to make three phone calls prior to receiving device (a) to someone who the participant felt comfortable speaking to (b) to someone who was less comfortable to speak to and (c) a formal call, for example to request a brochure. After receiving this recorded data a request was made for three further recordings one month later. Following receipt of these second set of baseline recordings the device was delivered and participant asked to use the device as much or little as they wished and to record three further calls. **Number of hours:** Data not reported regarding how much participants used the device **Delivered by who?** Altered feedback device **Control:** None **Length of follow up:** Immediate **Response and/or attrition rate:** None	Wright and Ayre Stuttering Self-Rating Profile Speaking Task Response Questionnaire Stuttering frequency Naturalness	WASSP scores at the start of the study were: mean 97.4 SD 14.74, and at the end of the study these had dropped to: mean 80 SD 22.02. Changes in this general scale were minimal and variation in scores was considerable. Frequency of stuttering - group means and standard deviations baseline 1, mean 8.62% SD 3.73 and baseline 2, mean 8.28% SD 3.74. Using device during call led to reduction in the group mean to 4.82% SD 2.54. Individual reduction for four of the five participants. No specific trend could be found before or after use of the TAD in speech naturalness. STRQ - Trend towards more positive ratings of self when using the TAD. Change from 63.3% (SD 15.88) to 82% (SD 9.96). Descriptive statistics only Large individual variation in usage of device hinted at in discussion. No data on usage reported so difficult to identify impact of device. Participants returned 3 recordings of their choice for analysis – bias in selection of these?	

Bray & Kehle 1998 **Country:** UK **Study design:** Before and after **Data collection method:** Video taping of sessions + observations around school **Aim:** To evaluate a self-modeling intervention **Detail of participants (number, any reported demographics):** N=4 3 M 1 F, age 8 , 9, 11 & 13, 2 learning disabilities. 3 moderate and 1 severe stutter.	**Method:** Self-modeling – repeated viewing of oneself on edited videotape. Two 5 minute videos per participant of themselves exhibiting stutter free speech. **Hours**: 7 fifteen minute sessions over 6 weeks **Delivered by:** Not reported authors? **Control:** None **Length of follow up:** 4-8 weeks **Response and/or attrition rate:** None	**Outcome measures:** Speech rate %SS Speech naturalness rating scale SSI Participant satisfaction scale	**Main results:** Data reported by individual only. All participants reduced stuttering – S1 mean baseline 7.7 FU mean 2.6 S2 mean baseline 5.9 FU mean 1.5 S3 mean baseline 9.1 FU mean 3.2 S4 mean baseline 8.0 FU mean 0.3 SSI scores at baseline range 5-7.5. At FU 1-3.8. Gains “generalised to everyday situations” (data not reported) Students satisfied with the intervention. Mean 4.8 on 5 point scale.	**Limitations/comments**
Carey 2010 **Country:** Australia **Study design:** Before and after **Data collection method:** Speech sample analysis. **Aim:** To investigate whether tele-health delivery of the Camperdown Program provides a non-inferior alternative to face-to face treatment **Detail of participants (number, any reported demographics):** N=40 None had received speech-restructuring treatment within the past 12 months.	**Method:** Camperdown Program. This includes four components: (1) Individual Teaching Sessions, (2) Group Practice Day, (3) Individual Problem Solving Sessions, and (4) Maintenance. Participants in the tele-health arm received a slightly modified programme which was adapted for tele-health delivery, however all the concepts of the original programme were retained. **Hours contact:** Tele-health 221 minutes **Delivered by**: Clinician/tele-health **Control:** 2 intervention arms only no control 20 in tele-health arm and 20 in face-to-face arm **Length of follow up:** 12 months post treatment **Response and/or attrition rate:** Three (7.5%) of the 40 randomized participants did not complete the trial.	**Outcome measures:** %SS Contact hours Speech naturalness Self-reported stuttering severity, Treatment satisfaction.	**Main results:** There was no statistically or clinically significant difference in %SS between the two groups at 9 months post-randomization. Analysis of covariance adjusting for baseline %SS showed tele-health had 0.8% absolute lower %SS stuttered than face-to-face. (95% one-sided confidence interval: 0.7 higher %SS at most). There were also no differences in %SS between groups immediately post-treatment, or at 6 months and 12 months post-treatment (p = 0.9). In the second primary outcome measure, the tele-health group used statistically less contact time (221 min) on average than the face-to-face group (95% confidence interval -387 to -56 min, p = 0.01).	**Limitations/comments**

			The key findings of the post-treatment questionnaire were (1) participants in both groups were equally likely to describe talking on the telephone as ‘extremely easy’ (p = 0.4), (2) learning the speech restructuring pattern was ‘extremely easy’ (p = 0.5), and (3) getting to know the speech pathologist was ‘easy’ (p = 0.2). The tele-health treatment was described significantly more frequently as ‘extremely convenient’ (p = 0.018).	

Cocomazzo 2012 **Country:** Australia **Study design:** nonRCT **Data collection method:** **Aim:** Phase I trial of the Camperdown Program **Detail of participants (number, any reported demographics):** N=12 10 M & 2 F age 21-47 years (mean 29 years).	**Method:** Modified version of the Camperdown Program adapted for use in a student training clinic. The programme was modified in the following ways: (1) all treatment was provided by speech pathology students, under the supervision of clinical supervisors experienced in stuttering treatment; and (2) the programme was adapted to fit into a 20- h clinic during a 10-week period, instead of time in treatment being performance contingent and therefore individualised to client need. **Hours contact**: 10 weeks, total 20 hours. **Delivered by?** Student clinicians Prior to commencement of treatment, student clinicians were familiarized with the Program, and attended a 2-h preparatory session with the clinical supervisors. **Control:** not clear **Length of follow up:** 12 months **Response and/or attrition rate:** None	**Outcome measures:** %SS Speech naturalness	**Main results:** Pooled %SS scores pre-treatment were 5.7, at immediate post-treatment were 1.0, and at 12 months post-treatment were 2.4. Mean %SS within-clinic pre-treatment was 5.9 (SD = 7.8), 0.8 (SD = 0.7) immediately post-treatment and 2.6 (SD=3.1) at 12 months post-treatment.Mean%SS beyond clinic pre-treatment was 5.5 (SD = 6.9), 1.2 (SD = 1.8) immediately post-treatment and 2.1 (SD = 2.2) at 12 months post-treatment. The group speech naturalness scores post-treatment did not increase to a clinically significant extent. The mean NATscore was 4.1 at pre-treatment and 4.5 immediately post-treatment. This difference was not significant [t(9) =–0.897, p=0.393]	**Limitations/comments**
Craig et al. 1996 **Country:** Australia **Study design:** nonRCT **Data collection method:** speech samples in clinic at home and on the telephone, psychological measures **Aim:** To test the effectiveness of three interventions	**Methods:** Compared three interventions electromyography (EMG) feedback which focussed on speech muscle control through the use of computer feedback, intensive smooth speech which emphasised intensive treatment and rating sessions at gradually increasing speeds without	**Outcome measures:** %SS % improvement across time Speech naturalness	**Main results:** No significant difference on stuttering scores between treatment groups across the three time points. Significant differences between control group and all treatment groups across all contexts (p<0.001) Pretreatment scores differed	**Limitations/comments** Breathing techniques were observed directly in this study, whereas in previous studies these measures were self-reported.

Detail of participants (number, any reported demographics): N=97 Age 9-14. Mean age 10.5 to 11.4 across the groups. 75-88% male across the groups. Two thirds had received previous treatment in most cases consisting of response contingent stimulation or breathing and relaxation methods. None had received intervention in previous 3 months.	intensive parental feedback, home-based smooth speech emphasised parental involvement and conducted in a home environment. **Number of hours:** ISS - 5 hours practice, one week group intensive. HBSS – 1xweek over 4 weeks 6.5 hour sessions EMG – one week 6.5 hours per day. **Delivered by who?** Clinicians **Control**: 20 children on waiting lists treatment delayed for 3 months **Length of follow up:** Immediate, 3 months, 1 year **Response and/or attrition rate:** None dropped out of the treatment. 3 lost to follow up at 3 months.	State and trait anxiety inventory Speech rate	significantly from immediate post-treatment (P<0.001). Stuttering no better or worse depending on context measured (clinic or home). Speech rate significantly increased for all intervention groups (p<0.001 conversation and telephone p<0.05 home). Intervention groups significantly increased speech rate compared to controls (p<0.001). Decrease in % improvement across follow up periods post-treatment 90-95% %SS, 75-80% 3 months FU, 65-75% one year FU. No improvement in stuttering for controls over this time period. ISS - 9 out of 10 children reduced stuttering to less than 1% immediate post-treatment, this reduced to 1 out of 10 at one year FU. EMG and HBSS 6 out of 10 children reduced stuttering to less than 1% immediate and 4 in 10 at one year FU. These two treatments superior at long term follow up if 2% threshold also applied. These two interventions therefore had less immediate effect but greater long term effect than the intensive course. Those more severe at baseline higher risk of relapse, immediate post results not an indicator of long term outcome, age and gender not predictors. Child and parent ratings of naturalness were lower than clinician ratings of naturalness (p<0.01). Significant difference in naturalness baseline to 3 months for all interventions (p<0.001). Significant difference baseline to	

			one year FU in State and Trait anxiety for all intervention groups compared to control ($p<0.05$/$p<0.01$).	
Craig et al. 2002 **Country**: Australia **Study design**: Before and after **Data collection method**: Audio taped speech sample in clinic, telephone, home Aim: To evaluate a relapse management programme for adolescents **Detail of participants (number, any reported demographics):** N=6 adolescents who had taken part in an intervention at least 2 years earlier and had substantially increased their %SS following the intervention. Age 11-17 years. 5-12.5 %SS. 2 had received EMG intervention and 4 speech fluency shaping with 12 months maintenance sessions.	**Methods:** Group intervention including at least one parent consisting of combination of smooth speech, EMG feedback, self-management skills (importance of self-responsibility, self-evaluation, self-effort and motivation), and cognitive techniques (self-talk, self-mastery enhancement/ perceived control, methods of coping, resilience), and physical relaxation. Transfer activities such as games and shopping/phone calls days 2 to 5, specific relapse management skills taught from day 2 encompassing self-control techniques and relaxation as well as CBT aimed at enhancing perceptions of control. **Number of hours:** Twice a week over 2 weeks 9.30 to 4pm with option of 5th day is inadequate transfer. **Delivered by who?** Clinician initially, parents trained and assumed role of therapist **Control:** None **Length of follow up:** 2 years following relapse programme **Response and/or attrition rate:** None	**Outcome measures:** %SS Speech naturalness judged by an independent clinician Child/parent rating of naturalness State-Trait anxiety Inventory for Children Communication Attitude Test-revised	**Main results:** All participants had relapsed following their initial therapy 2-6 years earlier. Narrative describes 2 participants showing immediate improvement after the relapse programme however relapsed to more than 5%SS at 2 year FU, 2 participants improved quickly and gains maintained (“well below 5% SS”) at 2 years, 2 participants improved more slowly and at 2 years remained “well below” 5%SS. Speech naturalness increased for 5 and decreased for 1. Anxiety scores well below normal range for all participants. However no trend for anxiety to be associated with relapse. The 2 participants who relapsed showed abnormally high CAT-R scores at 2 year FU.	**Limitations/comments**

Cream 2009 **Country:** Australia **Study design:** Before and after **Data collection method:** Conversation samples **Aim:** To investigate whether the use of video self-modelling using restructured stutter-free speech reduces stuttering in adults who had learnt a speech restructuring technique and subsequently relapsed. **Detail of participants (number, any reported demographics):** N=12 8 M & 4 F aged 27-69 years (mean 50). All had previously had speech-restructuring treatment for stuttering and relapsed.	**Method:** Participants were video recorded for 1 hour within the clinic, practising their speech-restructuring technique. The videos were then edited to remove all observable stuttering. Participants then viewed the resulting video of themselves using restructured stutter-free speech each day for 1 month and were instructed to speak as they did on the video. **Hours:** 1 hour in clinic, 1 month home practice **Delivered by?** Clinician/self **Length of follow up:** There were two assessments: pre-intervention, several days to 2 weeks before the 1- hour videoed speaking session, and post-intervention, at the completion of the 4- week viewing period. **Response and/or attrition rate:** Two of the 12 participants withdrew during the trial.	**Outcome measures:** %SS Self-reported severity ratings from nominated representative situations Speech naturalness.	**Main results:** Very large effect sizes were found. The mean per cent syllables stuttered was 7.7 pre-intervention and 2.3 post-intervention. For all but one participant there was a reduction in stuttering from pre-intervention to post-intervention. These results were verified with self-report data. Speech naturalness was not compromised by the video self-modelling procedure. For the ten participants who remained in the study, mean stuttering frequency was 7.7%SS pre-intervention and 2.3%SS post-intervention; a difference of 5.4%SS (95% CI 51.89–8.89%SS, t(9)53.49, p<0.001). For self reported severity the group mean SR was 5.2 pre-intervention and 3.5 post-intervention; a difference of 1.7 (95% confidence interval51.35–2.13, t[9]510.15, p<.0001). The mean naturalness score for the five raters for each sample was calculated. The grand mean was 3.8 for the pre-intervention speech samples and 3.9 for the post-intervention samples. This difference was not significant (t(9)50.86, p.0.05). Half the participants increased their NAT scores (speech was less natural) while half remained stable or decreased their NAT scores	**Limitations/comments**

			(speech was more natural)	
Cream 2010 **Country:** Australia **Study design:** RCT **Data collection method:** Conversational samples **Aim:** To evaluate the efficacy of video self-modeling (VSM) following speech restructuring treatment to improve the maintenance of treatment effects. **Detail of participants (number, any reported demographics):** N=89 adults aged 12-74 years. Four times as many men as women. All had undertaken intensive speech restructuring treatment.	**Method:** All participants received 5 consecutive days of intensive group speech restructuring treatment followed by a maintenance program of seven weekly clinic visits. These maintenance visits were individual and small group sessions. Three of the sites used the La Trobe smooth speech program and three of the sites used a modified version of the Camperdown program. Participants in the VSM intervention arm viewed stutter-free videos of themselves each day for 1 month. **Hours:** 5 days followed by 7 visits **Delivered by:** Clinician **Control:** Two treatment arms - randomly assigned to either standard maintenance and standard maintenance plus VSM **Length of follow up:** 6 months **Response and/or attrition rate:** Five adults did not complete the study, and their data were analysed with intention to- treat procedures	**Outcome measures:** %SS Self-rated anxiety. Self-rated stuttering severity. Avoidance. Satisfaction with fluency. Quality of life.	**Main results:** The addition of VSM did not improve speech outcomes, as measured by percent syllables stuttered, at either 1 or 6 months post-randomisation. At Assessment 2, the %SS had decreased considerably for both groups. At Assessment 3, the mean %SS was slightly higher for the VSM group; however, this difference was not statistically significant: 1.1 %SS (95% CI: –0.03 to 2.3 %SS, p = .056). There was an apparent difference between groups for the primary outcome %SS at Assessment 4. However, when adjusted for %SS at Assessments 1 and 2, this difference was not statistically significant (mean difference: 0.06 %SS with 95% CI: –1.3 to 1.4 %SS, p = .92). However, at the latter assessment, self-rating of worst stuttering severity by the VSM group was 10% better than that of the control group, and satisfaction with speech fluency was 20% better. Quality of life was also better for the VSM group, which was mildly to moderately impaired compared with moderate impairment in the control group.	**Limitations/comments**

De Veer et al. 2009 **Country:** Netherlands **Study design:** RCT **Data collection method:** **Aim:** To examine the psychological impact of the Mindfulness program **Detail of participants (number, any reported demographics):** N=37 29 M & 8 F mean age 36.57 (SD = 12.97). All had undergone speech therapy, psychotherapy and a number of different stutter therapies.	**Method:** Mindfulness-based Stress Reduction Program. A training course that has a focus on teaching its participants how to relax attentively. It aims to reduce stress, anxiety, trait anxiety, self-efficacy beliefs and develop coping responses and positive attitude towards speech situations. Included the following exercises: (1) a body scan, meant to get them to pay systematic attention to the whole body and simultaneously perceive sensations in various parts of the body, (2) yoga exercises involving stretching and striking poses to increase awareness of the muscular system and (3) sitting meditation, during which the participant's attention is drawn to breathing, physical sensations, thoughts and emotions. After the first, third and fifth session the participants were also given a compact disc with the body scan, yoga and sitting meditation exercises. **Hours:** 8 weeks of 2.5 hour sessions. Participants expected to spend at least 45 minutes a day, six days a week doing one or more of the exercises. **Delivered by:** First author who had attended a training programme for delivering the intervention **Control:** Delayed intervention group	**Outcome measures:** Perceived Stress Scale Speech Situation Checklist PSI SESAS Condensed S Scale Locus of Control of Behavior	**Main results:** Post-intervention there was a significant difference between intervention and control in measures of stress (F = 16.95, p < .001), anxiety about speech situations (F = 13.81, p < .01), self-efficacy trust (F = 10.66, p < .01), locus of control (F = 11.83, p < .01), coping (F = 5.05, p < .05) and attitude towards speech situations (F = 14.47, p < .01). No significant difference was found in self-efficacy fluency (F = 3.29, p = .08). Effect sizes average for self-efficacy beliefs, coping and attitude towards speech situations (*d* = 0.55; 0.62; and 0.48, respectively). Effect sizes large for stress, anxiety and locus of control. (*d* = 1.16; 1.07; and 0.76 respectively). At 4 week FU no difference from immediate post-intervention for anxiety (t = 1.65, p = .12; M = 1.99, SD = .32 and M = 2.10, SD = .51, respectively), self-efficacy trust (t = .18, p = .86; M = 72.23, SD = 11.75 and M = 72.43, SD = 9.90, respectively), locus of control (t = 3.15, p = .76; M = 75.00, SD = 7.59 and M = 75.38, SD = 8.37, respectively) and attitude towards speech situations (t = .42, p = .68; M = 12.11, SD = 4.67 and M = 11.95, SD = 4.62, respectively. At 4 week FU stress was significantly lower than immediate	**Limitations/comments**

	Length of follow up: 4 weeks **Response and/or attrition rate:**		post (t = -2.78, p < .05; M = 19.35, SD = 3.74 and M = 17.82, SD = 4.28, respectively), self-efficacy fluency was significantly higher than immediate post (t = -2.40, p < .05; M = 63.80, SD = 8.80 and M = 68.15, SD = 10.82, respectively) and coping was significantly higher than immediate post test (t = -2.65, p < .05; M = 13.26, SD = 3.57and M = 14.58, SD = 3.81, respectively). Some difference between response to intervention for both groups with the delayed intervention group self-efficacy effect fading at second FU more than results obtained for the 1st group. No other difference in response of the two groups to the intervention.	
Druce 1997 **Country:** Australia **Study design:** Before and after **Data collection method:** Videotaped speech sample **Aim:** To investigate the effects of an intensive, behaviourally-oriented treatment program for 6- to 8-year-old children who stutter. **Detail of participants (number, any reported demographics):** N=15 13 M & 2 F. Age range 6 years 9 months – 8 years, 1 month (mean age 7 years 4 months).	**Method:** The program began with children identifying stutters in the speech pathologist's speech, and then in their own speech and a peer's speech. Fluency acquisition phase followed where each child individually worked through a regimen of repeating single words, naming pictures, and then producing monosyllabic words in response to a verbal cue followed by producing phrases of gradually increasing length, retelling a story first with pictures and then without the aid of a visual cue. Monologue tasks, asking and answering questions, and conversational tasks. Reinforcement of the child's success at each step was through a reinforcement system of stickers, games, and social praise. **Hours**: Intensive week. Parents attended two one hour workshops	**Outcome measures:** %SS Speech naturalness, Subjective stuttering severity	**Main results:** From pre intervention, to after the intensive week, the mean %SS for the group decreased by 7.6 to 1.75 %SS with a standard error of 0.54. This change in the %SS with treatment was statistically significant p = 0.0015, 95% C.1.' = -11.7 to -3.5). Pre intervention to immediate post intervention speech rate increased by a mean of 20.5 syllables per minute (from 92.3 to 112.8 syllables per minute (p < 0.0001, 95% C.I. = 13 to 28).	**Limitations/comments**

	during the program in addition to a 45-minute session each day where they observed their child in an individual and group setting and had an opportunity to discuss issues with the speech pathologist. **Delivered by**: SLP **Length of follow up:** 18 months **Response and/or attrition rate:** None			
Elliott et al. 1998 **Country:** US **Study design:** Before and after (multiple baseline assessments) **Data collection method:** observed speech, assessment scales **Aim:** To evaluate the simplified regulated breathing method **Detail of participants (number, any reported demographics):** N=5, 5 M aged 5- to 11-years. All referred by SLTs. Number of words stuttered greater than or equal to 5%of the total words spoken, stuttering behaviours had occurred for at least 1 year. 2 participants had been receiving therapy and had achieved lower stuttering rates however had relapsed to these rates since ending treatment. 1.5 to 8 years of stuttering, 1 to 6 years of previous treatment.	**Method: The** simplified regulated breathing method. One hour session conducted individually in the home with parent present. Included awareness training, competing response (regulated breathing techniques), and social support procedures (praise/feedback). Delivered by clinical psychology students. Parents asked to carry out and record daily 10 minute practice sessions. **Number of hours** One to five half hour booster sessions provided for three participants for 6-9 months post-treatment. These participants had less than 3% stuttered words at end of treatment period. **Delivered by** Clinical Psychology students **Control:** None **Length of follow up:** 9 months longest **Response and/or attrition rate:** No attrition although reported one child poor co-operation during therapy and refused practice sessions	**Outcome measures:** % stuttered words Rate of speech SSI (physical concomitants and duration scales) Abbreviated acceptability rating profile (AARP) Treatment credibility scale Social perception scale	**Main results:** Four of the five participants reduced their stuttering to below 3% of words (reading only, three only below 3% in conversation) after one session of intervention and this was maintained for up to 9 months with periodic booster sessions for three. Baseline mean % stuttered words for conversation 8.58 post-treatment 3.43. For reading baseline 9.22 and post-treatment 2.86. During conversation, rate of speech increased, from a baseline mean of 120.91 to a post-treatment mean of 136.36 words per minute across participants. SSI - During conversation, the baseline mean of 1.27 dropped to 0.79 following treatment. All subjects decreased the mean length of their blocks, with a mean rating of 2.29 during baseline to 1.17 during post-treatment All the parents found the treatment protocol to be credible and	**Limitations/comments** Booster sessions provided “as needed” also seem to have been provided at different times for each participant according to figure. Descriptive statistics only. Two children had achieved low rates following previous therapy.

			acceptable. The average rating of acceptability was 42.6 before treatment, and 42.5 following treatment implementation. The average rating of credibility was 38.9 before treatment, and 43.6 following treatment implementation. Social perception ratings - The baseline mean of 19.11 (range 7.67 - 29.33) was lower than the post-treatment mean of 30.25 (range, 26.17 - 32.33). Parents compliant with carrying out the practice sessions, one child non-compliant with the treatment and practice, parents discontinued practice.	
Femrell et al. 2012 **Country:** Sweden **Study design:** Before and after **Data collection method:** Observed speech and questionnaire **Aim:** To report long term follow up data **Detail of participants (number, any reported demographics):** N= 10 age from 2: 9 to 5 mean age 4.4. 8 M & 2 F. Had been stuttering for 0: 9 to 3: 3 years. Mean stuttering frequency of 10.1% syllables stuttered (%SS; 0.8–33.9) before treatment.	**Method:** Lidcombe programme. Children referred to the clinic recruited consecutively. **Number of hours** The median number of treatment visits at stage 1 was 32.5, the range being 9–46 visits (SD = 14.9; mean = 30.5). The median time spent at stage 1 was 55.5 weeks. Children placed in stage 2 when they achieved less than 1%SS and the parents' daily severity ratings 1 or 2, with at least four of these being 1, for about 3 weeks. Stage 2 included 9 visits over a period of almost 2 years (2, 2, 4, 4, 8, 8, 16, 16, 24 weeks between clinic visits). **Delivered by** Treatment provided by the paper authors. **Control:** None	**Outcome measures:** % SS Parent and teacher rating of child speech	**Main results:** Significant [t(7) = 4.3, p<0.01] decrease in mean %SS before and after treatment (7.6 [SD 4.9] vs.0.1% [SD 0.2], respectively) with large effect size (d = 2.9) an average reduction of 97.8% after stage 2. Questionnaire data – significant difference (p<0.01 or p<0.05) parent and teacher rating stuttering rate, struggling with words, stuttering variation, parent worry about child stuttering. No significant difference rating of child bothered by speech, inhibited by stuttering, teacher worried about stuttering, child enjoys talking, child self confidence 62.5% of the parents reported treatment too time consuming	**Limitations/comments**

	Length of follow up: 2 years **Response and/or attrition rate:** 2 did not complete the programme as parents satisfied with progress made at 30 and 35 week stage.			
Foundas et al. 2013 **Country:** US **Study design:** Before and after **Data collection method:** Observed speech **Aim:** To evaluate SpeechEasy in adults **Detail of participants (number, any reported demographics):** N=24 males, 20–46 years of age, 14 who stuttered 10 non-stutters. Stutterers had conversational speech that contained three or more stutterings per 100 words, and had stuttered continually to the present with the onset before 8 years of age	**Method:** SpeechEasy is an electronic device designed to alleviate stuttering by manipulating auditory feedback via time delays and frequency shifts. Control condition – participant wore device but not switched on, two experimental condition device operating at manufacturers default setting with the DAF set at a 60 ms delay, and the FSF set at +500 Hz., and device set to individual preference for comfort level. **Number of hours** Not specified, one session **Delivered by** Electronic device, session overseen by paper authors **Control:** Normal speakers **Length of follow up:** None **Response and/or attrition rate:** N/A	**Outcome measures:** Stuttering rate	**Main results:** Among PWS, there was a significantly greater reduction in stuttering (compared to baseline) when wearing the SpeechEasy with custom settings (M = - 2.35, SE = .54) compared to the non-altered feedback (control) condition (M = -1.72, SE = .48; p = .014). Decreased stuttering was found for all device settings compared to baseline for PWS, The effect was most pronounced with the use of the self-prescribed (custom) setting. Despite this statistical effect, the mean reduction of 2.3 stuttering events per 100 syllables for the device- custom setting reflected a relatively small change in actual frequency of stuttering. Stuttering was reduced the most during reading, followed by narrative and conversation. Those individuals with a more severe stuttering rate at	**Limitations/comments**

			baseline had a greater benefit from the use of the device compared to individuals with less severe stuttering.	
Franken et al. 1993 **Country:** Netherlands **Study design:** Before and after **Data collection method:** Recorded speech samples **Aim:** To examine the quality of post-treatment speech in stutters compared to nonstutterers **Detail of participants (number, any reported demographics):** N=32 male stutterers mean age 25.3. range 15-46. Severe stuttering, speech motoric component outweighed emotional components 20 non-stutterers matched.	**Method:** Dutch adaptation of Webster's Precision Fluency Shaping Program. A systematic speech motor training program that deals with the reconstruction of behaviour details involving respiration, voicing, and articulation. Included overlearning,exaggeration, immediate informational feedback about response correctness, fading, parallel transfer, and client self-reliance and self control. After fluency has been established in the clinic, it is generalized to the stutterer's daily environment via "transfer-activities". **Number of hours** About 120 treatment hours followed by "elaborate home treatment programme" **Delivered by** Clinician **Control: nonstutterers** **Length of follow up: 6 months** **Response and/or attrition rate:**	**Outcome measures:** %SS Syllables per second 14 listener rating scales grouped in to 3 dimensions - distorted speech, dynamics/prosody voice.	**Main results:** %SS pre 27.7, post 5.8 , FU 16.3 Syllables per second pre 2.1, post 2.1, FU 2.3 Post-therapy the stutterers' scores on the Distorted Speech dimension are just about as low as those of the normal speakers due to reduction in frequency of stuttered syllables. The judgments for the three conditions of the stutterers on nearly all rating scales show a V-shape, or inverted V-shape: A clear improvement or deterioration in the post-therapy condition. followed by a relapse or recovery in the follow-up therapy condition. Only two scales, Unpleasant versus Pleasant and Unnatural versus Natural, show a small but steady improvement going from pre-therapy to follow-up therapy. The speech of treated stutterers is different from the speech of non-stutterers, on the Dynamics/ Prosody dimension the post-therapy stutterers did not move closer to the non-stutterers than the pre-therapy stutterers rating.	**Limitations/comments**

Franken et al. 2005 **Country:** Netherlands **Study design:** Before and after **Data collection method:** audio recording and questionnaires **Aim:** A pilot study to examine the feasibility of comparing the effectiveness of two programmes **Detail of participants (number, any reported demographics):** N=23 mean age 4 years 3 months, mean age at onset 2 years 9 months, 17 M	**Method:** Lidcombe Program (LP) treatment or a Demands and Capacities Model (DCM) treatment. Recruited via SLTs. **Number of hours** LP - The mean number of treatment sessions was 11.5. Treatment lasted fewer than 12 weeks for 2 of the 11 children. DCM - The mean number of treatment sessions was 11.0. Treatment lasted fewer than 12 weeks for 3 of the 12 children. **Delivered by** Therapist **Control:** 2 intervention arms only **Length of follow up:** Immediate **Response and/or attrition rate:** 30 randomised 4 did not complete the intervention, further three did not collect all the required data	**Outcome measures:** %SS Stuttering severity rating Bristol Stammering Questionnaire	**Main results:** Stuttering frequency - For LP treatment, the means decreased from 7.2% (S.D. = 2.0) to 3.7% (S.D. = 2.1). For DCM treatment, the means decreased from 7.9% (S.D. = 7.1) to 3.1% (S.D. = 2.1). Stuttering severity - significant effect of time (pre to post), *F* (1, 21) = 15.18, *p* < .01 No significant difference between interventions p>0.10. Parent ratings and Therapist ratings - effects of time (pre to post) for the parent *F*(1, 21) = 85.50, *p* < .01, and for the therapist, *F* (1, 21) = 73.73, *p* < .01, No effects that involved the type of treatment (*p* > .10). Both treatments were found to be highly acceptable on all dimensions. No significant differences between the interventions in terms of acceptability.	**Limitations/comments**

Franklin et al. 2008 **Country:** Australia **Study design:** QuasiRCT (randomised consecutively) **Data collection method:** Tape recorded speech **Aim:** To evaluate the effectiveness of time out response contingencies **Detail of participants (number, any reported demographics):** N=60 adults treatment participants averaging 32 years (range 16–61, SD=13 and controls averaging 33 years range =17–61, SD=12. treatment participants averaged 26 months of previous treatment (range=0–120, SD=28), and controls 36 months (range=1–120, SD=35). All participants had received prolonged speech treatment 14 treatment group and 7 controls had received therapy in the last year.	**Method:** Time-out individuals were instructed to cease talking whenever the red light was illuminated and to re-commence conversation once it was switched off. The light remained on for five seconds and was contingent on each stuttering episode, as identified by the experimenter. During the time-out period, all social reinforcers in forms of eye contact, smiles, nods and conversation comments were ceased. **Number of hours** 2x 20 minute sessions of spontaneous speech **Delivered by** First author **Control:** Individuals had same 2x20 minute sessions with no response contingencies, encouraged to keep talking **Length of follow up:** Immediate re-test **Response and/or attrition rate:** None	**Outcome measures:** %SS Number of syllables stuttered and spoken fluently Total percentage of word and part-word repetitions (%WPWR).	**Main results:** Baseline %SS intervention group mean 5.8 (range 1.2-28.3 SD 6.4). Control group 4.9 (0.7-23.3 SD 5). Post-treatment %SS intervention group mean 3.9 (0.5-25.6 SD 5.6). Control group 6.4 (0.5-20.7 SD 5.1). Baseline syllables per minute intervention group mean 211 (70-296 SD 57). Control group 236 (107-317). Post-treatment intervention 234 (77-300 SD 51) control 229 (102-325 SD 54). Baseline %WPWR mean intervention 19.6 (0-66.7 SD 16). Control 32 (0-100 SD 29.5). Post-treatment intervention 30 (2.7-87.3 SD 22). Control 31.7 (2.5-100 SD 27.7). A between groups analysis showed a significant difference between the two groups in %SS during the treatment condition, U=85.5, p<0.007, as well as a significant difference between the groups during post-treatment, U=234.5, p<0.007. Time-out participants did not slow down their speech, but instead increased it. The increase in SPM relative to baseline was significant during both the treatment phase, F(1, 58)=4.09, p<0.05, and post-treatment, F(1, 58)=13.75, p<0.05. Strong association between	**Limitations/comments**

			baseline stuttering severity and treatment outcomes, negative association between baseline speech rate and outcome, better responsiveness to this intervention moderately associated with higher amount of past therapy (but not a unique predictor).	
Gagnon & Ladouceur, 1992 **Country:** Canada **Study design:** Before and after **Data collection method:** speech sample, scaled measures **Aim:** To evaluate Modified Regulated Breathing Method intervention **Detail of participants (number, any reported demographics):** Study one - N=4,male, aged 10-11 years, 3 moderate and one severe stutterer Study two N=4 male aged 6-7, none received previous therapy, all classed as severe stutterers Study three N=3 male aged 7-11 none previously received therapy, all at least 5%SS (range 14-35), none received previous therapy	**Methods:** Sessions consisted of awareness training, also Modified Regulated Breathing Method whereby children are instructed to stop speaking when a stutter occurs and to exhale and then inhale a deep breath. Built up from words to sentences and then conversation. Sessions also included EasySpeech – demonstration of tension/relaxation of facial muscles, and generalisation activities. Parents present for all sessions, received information and advice re attitudes and behaviours. Study three also included group activities, three-weekly booster sessions and parents taking part in sessions, moving to parents taking the entire session. **Number of hours: Study one** 2x1 hr per week, 7 sessions needed to reach “clinically significant” reduction of 3% in SS. From graph ?25 sessions delivered in total **Study two** 5-41 sessions needed to reach 3% reduction (Mean 29 sessions). **Delivered by who?** Student therapist **Control: None**	**Outcome measures:** %SS SPM Assessment of stutterer or not Ryans Stuttering Severity Scale	**Main results:** Study one Clinically significant (-3%SS) improvement in all at one and six month follow up. Also clinically significant (160 SPM) maintained at both follow ups. R(n) significant reduction pre-immediate post $p<0.05$. No data regarding significance reported for following time points. Judges did not identify as stutterers. Study two R(n) significant reduction $p<0.05$. Not reported at which time point. Below 3%SS maintained at first follow up for three), fourth 3.5%SS. At second follow up 2 participants remained below 3%SS. SPM above 160 SPM for all participants at all follow ups. Three classed as mild stutters post-intervention, one normal. Study three Clinically significant reduction after 4 sessions for all participants, gains maintained at both follow ups. No further statistical detail. SPM in normal range at end of treatment and FUs	**Limitations/comments** Limited statistical analysis

	Length of follow up: one and 6 months **Response and/or attrition rate:** None			
Gallop & Runyan, 2012 **Country:** US **Study design:** Before and after **Data collection method:** Telephone interview **Aim:** To examine the long term effectiveness of SpeechEasy **Detail of participants (number, any reported demographics):** N=11 7m & 4F aged 11–51 (mean 28 years).	**Methods:** SpeechEasy in ear auditory feedback device the DAF was set at 150 ms delay and the FAF setting was +500 Hz; **Number of hours: N/A** **Delivered by who?** Device **Control: None** **Length of follow up:** 13 - 59 months. (mean 37months) **Response and/or attrition rate:** Data available for 7 who were ongoing users of the device. Full data not available for one and three had ceased usage.	**Outcome measures:** Stuttering frequency	**Main results:** All participants had exhibited reduction in stuttering frequency at the time of the fitting while wearing the device as compared to when they were not wearing the device. Comparison of pre-fitting of device with current use or non use of the device showed a significant decrease in stuttering [F (1,6) = 17.44, p = .006]. Significant difference (t = 2.851; p = .017) for the group between baseline stuttering frequency prior to being fitted with the device and current stuttering frequency while not wearing the device. Nine maintained or had reduced stuttering level. Individual variation - Two participants with the highest frequency of stuttering when fitted with the device showed the greatest improvement over time; the two with lesser dysfluency at fitting showed lesser change, and the remaining three who exhibited minimal dysfluency when first fitted with the device, exhibited an increase in dysfluency after having worn the device for almost four years or longer. For the eight participants who were still using the device however,	**Limitations/comments**

			significant benefits were not found while wearing the device compared to not wearing the device (t = 1.949, p = .092). For six the device had a positive impact for two it worsened the %SS. There was no significant difference (t =−.074; p = 943) between stuttering frequency when first fitted with the device and current stuttering frequency with the device in place, indicating initial gains were maintained.	

Hancock & Craig 1998a **Country:** Australia **Study design:** Further associations analysis of RCT data **Data collection method:** Examination of RCT data **Aim:** To examine predictors of intervention outcome **Detail of participants (number, any reported demographics):** N=77 aged 9–14 years (51 subjects were 9–11 years, 26 were 12–14 years) mean age 10.8, 64 N=M & 13 F. Two thirds had received previous therapy.	**Methods:** See Craig et al. 96 for details of interventions. Those who stuttered on at least 2% of their syllables (%SS) were classified as having relapsed. **Number of hours**: See Craig et al. 96 **Delivered by who**? See Craig et al. 96 for details of interventions. **Control:** See Craig et al. 96 **Length of follow up:** 1 year **Response and/or attrition rate:** N/A	**Outcome measures:** 12 predictor variables including demographics, history of stammer, family history, previous therapy, anxiety %SS SPM Anxiety	**Main results:** Variables that significantly correlated with %SS at one year follow up were pre %SS (p , 0.01), age (p =0.05) and years stuttered (p=0.05). Those who had high pre-treatment %SS scores, were aged 12–14 years, and had been stuttering longer were likely to have higher 1 year post treatment %SS scores. However, although age and years stuttered were moderately correlated to long-term %SS, they had little predictive value in the regression analysis. In regression analysis only two of the independent variables contributed significantly to prediction of long-term %SS (at p<0.01), including pre %SS (sr^2 =0.144), and post-trait anxiety (sr^2=0.08). Pre-treatment stuttering severity contribution to long-term outcome was 14.4%. The immediate post-trait anxiety measure contributed 8% to stuttering severity 1 year post-treatment. The 13 variables explained 33% (21% adjusted) of the total variance in long-term %SS scores.	**Limitations/comments**

Hancock and Craig 2002 **Country**: Australia **Study design**: Before and after **Data collection method**: Assessment of talking in clinic, on phone, in home environment. Method not described in this paper. Aim: To examine the effectiveness of re-treatment for adolescents who had previously received an intervention **Detail of participants (number, any reported demographics):** N=12, at least 2%SS. 1 F & 11 M aged 11-17 years (mean 14). Had received EMG or smooth speech treatment as part of trial 2 to 6 years earlier. All had attended maintenance sessions post-treatment for 12 months.	**Methods:** Group of up to 4 children and parents. Combined smooth speech and EMG intervention with CBT components such as relaxation, self-management and attitude or cognitive therapy. Main emphasis on the psychological-based techniques with use of speech diary. Transfer activities such as games and shopping/phone calls. Groups for younger children more emphasis on games, older more group conversation. **Number of hours:** Twice a week over 2 weeks 9.30 to 4 pm, optional 5th day if insufficient transfer of skills. Evening completion of self-rating scale. **Delivered by who?** Experienced clinician **Control:** None **Length of follow up:** Immediate, 3 months, 12 months, 2 years following the second period of treatment. **Response and/or attrition rate:** 22 (32%) of previous trial participants eligible, 2 unwilling to participate, 6 other commitments.	**Outcome measures:** Child and parental and independent listener rating of speech naturalness on Likert scale %SS SPM State-Trait Anxiety Inventory for Children Communication Attitude Test-Revised Perceptions of Control scale	**Main results:** *Initial intervention outcomes* Significant difference (p<0.001) pre to post initial intervention for %SS at immediate post, 3 months post, 12 months post and 2 years post. Significant difference for SPM (p<0.001) also at all post initial intervention time points. *Re-treatment outcomes* 4 of group scored higher than 2% SS immediate post re-treatment, 5 at 3 months, 6 at 12 months and 3 at 2 years. Significant difference pre to post intervention for %SS (p<0.001 or p<01 across the different contexts). SPM only sig diff for at home measure (p<001). Clinician rating of naturalness significantly increased (p<0.01) pre-post. No significant difference for	

			state/trait, communication attitude or perception of control scores over time. However mean anxiety scores were within normal limits at baseline and maintained at follow up. Immediate post retreatment 5 participants considered to have negative communication attitudes, 6 at 12 months and 5 at 2 years. Follow up level of %SS at 12 months was no different for retreatment intervention compared to initial intervention. Retreatment intervention however resulted in significantly lower %SS at 2 years FU than initial intervention 2 year FU had. SPM scores also significantly better for re-treatment at 2 year FU than initial treatment 2 year FU.	
Hancock et al 1998b **Country:** Australia **Study design:** FU of RCT **Data collection method:** speech samples, psychological measures **Aim:** To evaluate long term outcomes of an RCT comparing 3 interventions **Detail of participants (number, any reported demographics):** N=97, 27 intensive smooth speech, 25 home based smooth speech, 25 EMG treatment, 20 control 7 had received additional treatment since the original RCT, none in previous 3 months. Age at follow up – range 11-18 mean 14.8 years. Mean time since assessment 4.2 years (median 4 years). Original inclusion criterion had been less	**Methods**: Follow up of Craig 96, that paper gives details. Intensive smooth speech, home based smooth speech, EMG interventions. **Number of hours:** See Craig paper **Delivered by who?** See Craig paper **Control:** no treatment for 3 months **Length of follow up:** 2-6 years **Response and/or attrition rate:** 77 one year follow up, 62 of these (81%) assessed at 2-6 years FU	**Outcome measures:** %SS SPM Speech naturalness Parent judgement Stait-Trait Anxiety Inventory for Children Communication Attitude Test-Revised	**Main results:** At 12 months had been no difference between effectiveness of the interventions, all had been more effective than control. At 4-6 year follow up continued no significant difference between the interventions in terms of effectiveness. Speech rate for all intervention groups had increased from one year post-treatment, no significant difference between any intervention and others. Long term rates of improvement were similar to one year FU levels (75-79% long term versus 70-74% 1 year). Relapse rates of around 30%	**Limitations/comments**

than 2% syllables stuttered.			similar at long term follow up to that reported at one year. At 2-6 year follow up around half the children stuttered less than 1% syllables, 7 out of 10 children less than 2%SS. Variability in parent report of whether child had relapsed, 71% reported speech varied at different times (was cyclical). Mean score of CAT-R on long term follow up was 12.4 (SD=8.1), similar for all interventions. This is reported as slightly higher than non-stuttering children but lower than reported for stuttering children generally. Anxiety scores similar to 12 month FU, no significant difference between intervention types.	

Harris et al. 2002 **Country:** Australia **Study design: QuasiRCT** (recruited consecutively) **Data collection method:** Recorded speech **Aim:** To evaluate the Lidcombe program compared to no intervention **Detail of participants (number, any reported demographics):** N=23 children stuttering at a rate of 3.0%SS or greater. 19 M & 4 F. Mean %SS 8.5 (across both groups) at baseline. Mean time since onset 11 months.	**Methods:** The Lidcombe Program. **Number of hours:** 12 weeks of clinic visits **Delivered by who?** Not reported **Control:** 12 week wait for intervention **Length of follow up:** Immediate post-intervention **Response and/or attrition rate:** 29 randomised	**Outcome measures:** %SS	**Main results:** Intervention group mean %SS 8.4 at baseline, mean %SS 3.5 (S.D. = 2.8; range, 0.6–9.2) post-intervention. Control group mean %SS 8.4 at baseline mean %SS 5.8 (S.D. = 3.6; range, 2.3–15.3), post intervention. There was a significant decrease in stuttering from baseline to second measure for both intervention and no intervention groups. The treatment group improved significantly more than the control group ($F = 5.02, P < 0.05$). The intervention group therefore improved twice as much as controls. 9 of the 10 intervention children reduced %SS between pre and post measures. Nine of the 13 control children reduced %SS between pre and post measures. The other participants increased scores in this time period.	**Limitations/comments**

Harrison et al. 2004 **Country:** Australia **Study design:** Each group received period of intervention then period of no intervention. Before and after **Data collection method:** Recorded speech **Aim:** To evaluate two components of the Lidcombe Program **Detail of participants (number, any reported demographics):** 38 pre-school children, stuttering rate more than 2% SS, no previous treatment with Lidcombe, onset at least 6 months earlier. 27 M & 11 F, mean age onset 33 months (range 12-44)	**Methods:** Evaluates parental contingencies and parental severity rating **Number of hours:** weekly clinic visits for 4 weeks of treatment **Delivered by who?** **Control:** Four groups – treatment with and without verbal contingencies and with and without parental severity rating **Length of follow up:** Immediate post-treatment and 4 week FU **Response and/or attrition rate:** 46 were randomised	**Outcome measures:** %SS	**Main results:** The two groups whose treatment included parental verbal contingencies either maintained the same level of reduced stuttering or decreased it further during the 4-week follow-up (mean 8.9 baseline, 4.9 immediate post and 4.1 at 4 week FU and second group mean 5.6, 3.6, 3.7) . The two groups that did not receive parental verbal contingencies for stuttering increased %SS at the 4-week follow-up (mean 6.8, 3.8 and 5.2 and 7.0, 4.1, 6.3). This suggests parental contingencies may have more of an effect on outcome than the severity rating component. However, neither the difference between PVCS and no PVCS (F(1,34)=0.85, p=0.77), nor the difference between SR and no SR (F(1, 34)=0.23, p=0.63) were significant. The authors associate this with the study being under-powered.	**Limitations/comments**
Hasbrouck, 1992 **Country:** US **Study design:** Before and after **Data collection method**: Sample of spontaneous speech **Aim:** To evaluate an intensive program **Detail of participants (number, any reported demographics):** N=117. Age 18-41 (mean 25.7), 111 M & 6 F.	**Methods:** Groups of 3-5, individual and group sessions. Program included graded airflow procedure in 19 stages (learn to initiate utterance with airflow and maintain continuous flow). Participants required to reach criteria before moving forward in program. Program also included relaxation group sessions using tension/relaxation procedures. EMG biofeedback used during airflow procedure. Final stage a hierarchical desensitisation	**Outcome measures:** Mean number of stutterings Number of words Mean %stuttered words, Mean number of WPM.	**Main results:** All reduced % stuttered words to below 1%. 42 of the 57 followed up had maintained this level. Mean no. stuttering pre 123.77, post 4.58, FU 30.14. Mean % stuttered words pre 5.43, post 0.18, FU 2.11 Mean WPM pre 141.21 post 143.86, FU 153.16 Further statistical analysis only compares those that regressed with those that maintained rather than	**Limitations/comments**

	procedure (SD procedure) whereby each was discussed until the power of each to effect stuttering was perceived as being reduced. **Number of hours:** 7 hours a day for first 2 days **Delivered by who?** Clinicans **Control:** None **Length of follow up:** 3 to 36 months FU. **Response and/or attrition rate:** 57 patients followed up, 25 at 6 months, 32 at 1 year, 10 at 18 months, 5 at 2 years, 7 at 2.5 years and 5 at 3 years.		pre and post for all participants.	

Hewat et al. 2006 **Country:** Australia **Study design:** NonRCT **Data collection method:** Audio and video recording **Aim:** To evaluate the self-imposed time out intervention **Detail of participants (number, any reported demographics):** N=30, 22 had received therapy however no previous therapy for preceding 12 months, Age range 14 – 52 years (mean age 29.7). 22 M & 8 F. Also mentions 23 controls but little information.	**Methods:** SITO has two stages: instatement and generalisation; and maintenance. Stage one individuals are taught the technique and clinician administers time out in situations from single word to conversation followed by assignments away from the clinic. Group day then self-rating phase and then participants use technique everyday and bring recordings to clinic sessions. Stage two focuses on self-management , problem-solving and ongoing monitoring of fluency. Criteria for end of each stage specified. **Number of hours:** Stage one Individual sessions plus an intensive 8-hour group day with up to six participants. Number of sessions not provided. Stage 2 six x monthly visits **Delivered by who?** Clinician **Control:** 11 matched controls, and 12 stutters at various stages of prolonged-speech treatment. No further information about these participants **Length of follow up:** 3 measures pre-treatment, one 1 week post and one six months post **Response and/or attrition rate:** 22 completed stage one.	**Outcome measures:** %SS SPM Speech naturalness Type of stuttering using Lidcombe Behavioural Data Language Self-report inventory developed for study	**Main results:** For the participants who completed Stage 1, the mean reduction in %SS scores from pre-treatment to post-Stage 1 was 53.6%. More than half (from figure total 13 of 22) the participants reduced their stuttering frequency by more than 50%. Numbers taken from figure - 6 participants 50-60%, 3 60-70%, 4 80-90% reduction. There was a wide range of responsiveness to the intervention, with some participants responding very well and others responding to a quite limited extent. Range taken from figure 0-90% reduction in %SS. The SITO participants were judged to sound more unnatural after treatment than the control subjects, but more natural than the subjects who were using prolonged-speech There was no change in the relative proportions of repeated movements, fixed postures, or superfluous behaviours pre to post intervention. Indication that participants whose stuttering was more severe tended to benefit more from SITO than those whose stuttering was less severe. Sixteen of the 17 respondents answered ‘‘yes’’ to the question, ‘‘Would you recommend SITO to other people who stutter?’’; 14 of the 17 respondents answered ‘‘yes’’	**Limitations/comments** Two versions of the programme (one no group day), paper reports results for each similar so have been pooled. Limited analysis. Described as clinical trial but no real control group. See James 2007 review critiques this paper. Highlights already known that combining fluency training enhances effect of TO. Also lack of reporting of SPM means reduction in stuttering frequency may be result of slower rate. Also no data reported on whether participants did use TO or not. No claim for treatment being more effective when stuttering more severe due to Law of Initial Value. Ratings of speech naturalness influenced by frequency and severity of stuttering moments not valid therefore to measure only during fluent speech samples therefore. Packman et al. 2007 refutes these criticisms. Speech rate may be an unreliable measure for naturalistic samples. The optimal check for speech rate issues is speech naturalness, and the

	Complete data across all time points for 18		to the question, ''Is SITO difficult to do?''; and 12 of the 17 respondents answered ''sometimes'' to the question ''Were you using SITO 6 months after Stage 1?'', with two answering ''yes'' to this question and three answering ''no''.	purpose of this assessment requires examination of stutter free speech only. The paper included %improvement only as a secondary outcome to show individual variation with %stuttered as primary. Treatment fidelity was included and was a criterion for progression.

Hudock & Kalinowski, 2014 **Country:** USA **Study design:** Before and after **Data collection method:** Recordings of scripted telephone conversations **Aim:** To evaluate DAF and FAF combination interventions **Detail of participants (number, any reported demographics):** N=9 8 M & 1 F, mean age 35.1 range 21-72. Greater than 5% stuttering.	**Method**: 2 different combinations of DAF and FAF – condition one 50 ms delay and plus one half ocatave frequency - second condition encompassed above condition together with 200 ms delay and minus one half octave. Speech collected via microphone, and altered signal sent via digital signal processer to monaural receiver held to ear by participant. **Control:** None **Length of follow up:** Immediate **Response and/or attrition rate:** None	**Outcome measures:** Total spoken and total stuttered syllables	**Main results:** Both conditions had significantly lower proportions of stuttered syllables than no altered feedback. No AF and condition one average 63% reduction $p<0.05$ NAF and condition two $p<0.05$ average 72% reduction. Second condition lower proportion of stuttered syllables than condition one.	**Limitations/comments** Scripted telephone conversation

Huinck et al. 2006 **Country:** Netherlands **Study design:** Before and after **Data collection method:** Video and audio recording of speech during interview, self report **Aim:** To identify the impact of stuttering intervention by individual subgroup **Detail of participants (number, any reported demographics):** N=25 17 M & 8 F. Mean age 29.6 years; (range 17–53 years). Participants did not attend another treatment program in at least 1 year before onset of the study. 13 severe & 12 mild stutterers	**Methods:** Comprehensive Stuttering Programme integrates fluency enhancing techniques, tension, and stuttering modification techniques, and cognitive behavioral strategies to deal with the emotional and attitudinal aspects of stuttering. 73.3% of the therapy time was devoted primarily to skill-training exercises targeting speech motor control (e.g., prolongation or smooth blending); 26.7% was devoted primarily to the reduction of the negative emotions and cognitions associated with stuttering. **Number of hours:** 3 week residential programme, 2 follow up sessions **Delivered by who?** Author, clinicians, students, clinical co-ordinator at the centre **Control:** None **Length of follow up:** Immediate, 1 year and 2 year **Response and/or attrition rate:** None	**Outcome measures:** Nijmegen Speech Motor Test Naturalness judgments SSI PSI Inventory of Interpersonal Situations %SS Distorted speech scale of the Speech Situation Checklist The emotional reaction scale of the Speech Situation Checklist Speech satisfaction rating scale S24 attitude scale	**Main results:** Significant overall main effect of therapy on all three measures of speech (%SS, Brutten DS, and DDK). %SS pre-post mean difference 9.17 (SE 1.655 $p<0.0001$), pre to FU1 3.09 (SE 0.913 $p<0.001$) pre to FU2 3.79 (SE 0.866 $p<0.0001$). Although the mean scores of all speech measures showed a clear regression at both follow-ups significant gains relative to pre-treatment levels were maintained. Significant effect of stuttering severity on the speech-related treatment results (F 9.17 $p<0.01$). Severe stutterers at baseline gained more from the intervention but higher levels of regression at follow up than the mild stutterers ($p<0.001$). No significant difference between severe and mild stutterers in terms of severity of emotional and cognitive reactions.	
Ingham et al. 2013 **Country:** USA **Study design:** Before and after **Data collection method:** Within and beyond clinic audio visual recordings and a PET	**Method:** Modifying Phonation Intervals and Prolonged Speech programs. Contained 5 phases – pretreatment, establishment, transfer, maintenance and follow up.	**Outcome measures:** %SS	**Main results:** This study considered only pretreatment, establishment and	**Limitations/comments**

scanning session **Aim:** To explore brain activity changes following intervention **Detail of participants (number, any reported demographics):** N=30 (22 stutterers and 8 controls) 17 M & 5 F. Age range 20-64 mean 35.9 years. All had stuttered since childhood and had “chronic stuttering” at least 3% SS. All had received a range of previous therapies, but none in the previous 3 years. Participants were part of a larger study.	MPI – Participants taught to reduce voicing. participants required to meet performance criteria on speaking tasks with feedback via response-contingent auditory signals and counts in the boxes. If participants failed a task the program returned the participant to an earlier stage. PS – Participants taught to use prolonged speech at 40, 70, 100 and 130 spm. They read aloud with an audio model followed by speaking tasks to gradually shape towards natural sounding speech. Same establishment phase as MPI but no feedback. Both programs contained transfer phase with speaking tasks beyond the clinic. **Hours:** Varied across participants**.** Average 8 weeks pretreatment, 8 weeks establishment, 27 weeks transfer and 64 weeks maintenance. **Delivered by who?** Clinician **Control:** 8 participants not sutterers. 12 stutters received MPI and 10 PS program. **Length of follow up:** To completion of transfer phase average 33 weeks. **Response and/or attrition rate:** 1 failed to complete establishment phase, 10 of the 22 failed to complete to transfer phase. 4 in MPI program and 5 in PS program.	Stutter free SPM Self rating on a naturalness scale PET scans	transfer phases. Data analysis compares the group who completed the intervention with those who did not and non stutterers therefore aiming to consider a different question. However from the tables For reading - pretreatment mean %SS 8.8 for those completed. At transfer phase end those who completed 0.9 mean %SS. For monologue - pretreatment mean 7.1 %SS for those who completed. At transfer phase end mean %SS 1.0 for those completed. Reading - For those who completed baseline 186 stutter free SPM and end transfer phase 225. Monologue – 175 pre and 199 post. Naturalness baseline 4.8 and post 2.9.	

Ingham et al. 2001 **Country:** US **Study design:** Before and after (multiple baseline measures) **Data collection method:** recording during speaking tasks **Aim:** To evaluate the MPI program **Detail of participants (number, any reported demographics):** N=5 Male	**Methods:** Modifying Phonation Intervals a computer-based program which trains stutterers to reduce the frequency of short phonation intervals (maintain a continuous speech flow). Includes establishment, transfer and maintenance. The MPI includes software and an accelerometer and preamplifier which are worn on the throat. The system records speech and provides immediate auditory and visual feedback. **Number of hours:** Establishment phase daily or bi-daily 2-3 hour sessions over 2-3 weeks. Transfer phase average 25 minutes per week over 8 weeks. 12-19 months required for maintenance phase. **Delivered by who?** Clinician directs pre-treatment phase, treatment largely carried out by individual stutterer **Control: None** **Length of follow up:** 1 year and 2 year **Response and/or attrition rate:** None	**Outcome measures:** %SS Stutter free SPM Speech naturalness Target range phonation interval frequency	**Main results:** All participants achieved stutter free speech and natural-sounding speech at the completion of maintenance.	**Limitations/comments**
Irani et al. 2012 **Country:** US **Study design**: Mixed methods **Also included in qualitative review** **Data collection method:** Interviews, clinical data (measures on assessments) **Aim:** To understand client perceptions of an intensive programme.	**Method:** Phenomenological approach, retrospective clinical data and interviews **Control:** None **Length of follow up:** Participants had attended the programme in 2003/4/5/6/8/9	**Outcome measures:** Clinical data from case notes gathered retrospectively – Questionnaire assessing feeling	**Main results:** Clinical outcomes – SSI effect size pre to post 1.19 (Cohen's d) CI 95% minus 0.01 to 2.24. Pre to time of interview 1.25 CI 0.04 to 2.31. S-24 effect size pre to post 1.79 CI 0.46 to 2.89. Pre to time of interview 0.70 CI minus 0.42 to 1.73. LCB effect size pre to post 0.75 CI	**Limitations/comments** Not certain exactly when interviews were carried out, presumably 2011 or 2012? Follow up interview up to 7 or 8 years for some, 2 or 3 years for others. CI data across zero for many measures.

Detail of participants (number, any reported demographics): 7 participants average age 27 years (22-39). 5M & 2F. All had attended the programme, three once or twice previously. Two had not received follow up therapy. 4 were students, one a residential specialist, one a teacher and one a SLP.	**Response and/or attrition rate:** N/A **Intervention:** 9 or 15 day intensive therapy programme conducted during the summer. Utilises both fluency shaping and stuttering modification approaches in addition to CBT. Sessions last 5 to 7 hours each day with both group and individual sessions. Provided by graduate students, overseen by fluency specialist and clinicians on a 1:1 patient/clinician ratio. 4 phases of therapy – awareness of stuttering behaviours, process of reducing stuttering behaviours, techniques to modify and improve fluency, developing a personal maintenance programme. Follow up therapy in form of weekend intensive workshops, regular therapy or telepractice.	and attitudes (Locus of Control of Behavior Scale, Erickson S-24, OASES). Speech samples – conversation, phone call, reading analysed for %syllables stuttered, type of dysfluency, secondary behaviours, SSI. Current clinical data – LCB, S-24, OASES, speech sample, attitudes questionnaire, SSI-3. Treatment outcomes measured via attitudes questionnaire and before/after speech sample Views and perceptions	minus 0.38 to 1.78. Pre to time of interview 0.07 CI minus 0.99 to 1.11. %SS pre to post Conversation – effect size 1.12 CI minus 0.07 to 2.17. Pre to time of interview 1.97 CI 0.59 to 3.09. Reading pre to post 0.59 CI minus 0.52 to 1.62. Pre to time of interview 0.98 CI minus 0.19 to 2.02. Phone call pre to post 0.72 CI minus 0.40 to 1.75. Pre to time of interview 2.22 CI 0.78 to 3.38. Descriptive attitude data indicates improvement on measures of attitude change pre-post.	
Iverach et al. 2009 **Country:** Australia **Study design:** Before and after **Data collection method:** Questionnaires and speech sample **Aim:** To investigate whether the presence of mental health disorders contributes to poor long term maintenance **Detail of participants (number, any reported demographics):** N=64 51 M & 13 F age range 18 to 73 years	**Methods:** Intervention consisted of prolonged speech and problem-solving to incorporate fluency in everyday life. Four sites used Camperdown Program others La Trobe Smooth Speech Program. Following the intervention half viewed a DVD of themselves using speech restructuring with no stuttering for 10 min twice daily for 6 months,	**Outcome measures:** Computerized Version of the Composite International Diagnostic Interview The International Personality Disorder	**Main results:** There was no significant difference between groups in regard to the additional DVD element. 66% of participants were categorised as having a personality disorder. 30% were identified as having an anxiety disorder. 19% had a mood disorder. The presence of mental health disorders was not associated with	**Limitations/comments**

(mean = 32.2, S.D. = 12). Pre-treatment stuttering severity range 0.3 to 27.6%SS (mean = 8.3%SS, S.D. = 6.5). 78% (50) had received previous treatment for stuttering.	whereas the other half did not. **Number of hours:** 1-week intensive group speech-restructuring program followed by seven 2-h weekly follow-up group sessions. **Delivered by who?** At four of the sites, treatment was conducted by speech-language pathology students under supervision, while treatment at the other sites was conducted by experienced speech-language pathologists. **Control:** None **Length of follow up:** 6 months **Response and/or attrition rate:** None	Examination Questionnaire %SS Self-rated stuttering severity Self-reported avoidance of speaking situations	higher or lower pre-treatment %SS. No single mental health disorder had an effect on short-term treatment outcome in terms of %SS. However, a test for trend suggested that an increase in the number of mental health disorders of any type was associated with poorer short-term treatment outcome for %SS. Did not reach significance however (p = 0.039). There was a significant association between having a mental health disorder of any type and poorer medium-term treatment outcome (p = 0.007). There was no significant association between having a personality, anxiety or mood disorder and medium-term treatment outcome in terms of self-rated stuttering severity. Not possible to identify accurately from the data presented the overall effect of the intervention. Reported by disorder only. Effect sizes (%SS) for these individuals with a disorder versus individuals without a disorder ranged from minus 0.4 to 1.3 immediate post and minus 1.1 to 2.2 at 6 month follow up. From graph mean %SS for those without disorder approx 7 pre-treatment, 0.5 post and 1 FU.	

Jones 2000 **Country:** Australia **Study design:** Before and after **Data collection method:** NR **Aim:** To examine potential predictors of stuttering intervention outcome. **Detail of participants (number, any reported demographics):** N=216.Mean age 46 months (SD 9.4 months). 192 M & 58 F.	**Method:** Lidcombe Program **Control:** none **Length of follow up:** Immediate **Response and/or attrition rate**: 250 of 261 completed the programme.	**Outcome measures:** Age Gender Period from onset to treatment Stuttering severity	**Main results:** A median of 11 clinic visits was required to achieve zero or near zero stuttering. There was a significant relationship between stuttering severity (%SS at first treatment session) and time needed for treatment OR 4.1, 95% CI 2.1-7.8 (p<0.001) There was no association with increasing age on increasing time to onset with longer treatment times.	**Limitations/comments**
Jones 2005 **Country:** NZ **Study design: RCT** **Data collection method:** Recorded speech samples **Aim:** To evaluate the efficacy of the Lidcombe Program in a controlled trial. **Detail of participants (number, any reported demographics):** Stuttering preschool children age 3-6 years and frequency of stuttering of at least 2% syllables stuttered. 12 F & 43 M. None had received treatment for stuttering during the previous 12 months. 54 randomised: 29 to the Lidcombe programme arm and 25 to the control arm.	**Method:** Lidcombe Program. **Control**: Delayed intervention. Parents told they could receive treatment during the trial at other clinics providing it was not the Lidcombe program while they were waiting. **Length of follow up:** 9 months **Response and/or attrition rate:** Seven (13%); the participants withdrawing were on average nine months older (p = 0.015).	**Outcome measures:** Frequency of stuttering was measured as the proportion of syllables stuttered, from audiotaped recordings of participants' conversational speech outside the clinic.	**Main results:** Analysis showed a highly significant difference (p = 0.003) at nine months after randomisation. The mean proportion of syllables stuttered at nine months after randomisation was 1.5% (SD 1.4) for the treatment arm and 3.9% (SD 3.5) for the control arm, giving an effect size of 2.3% of syllables stuttered (95% confidence interval 0.8 to 3.9, p = 0.003) This effect size was more than double the minimum clinically worthwhile difference specified in the trial protocol. In an exploratory analysis of the proportion of children with less than 1.0% syllables stuttered at nine months after randomisation. The proportion was higher in the Lidcombe arm than in the control arm when adjusted for the baseline severity score in a logistic	**Limitations/comments** Because of difficulty with recruitment it was decided to stop the trial before it had obtained the target 110 participants. Three participants allocated to the control arm received other treatment.

			regression model: OR 0.13 (95% confidence interval 0.03 to 0.63, p=0.011).	
Jones 2008 **Country:** Australia/NZ/USA **Study design:** RCT (additional follow up data) **Data collection method:** Audio recorded speech via telephone conversation and parental interview and questionnaires **Aim:** To follow up the children in the Jones 2005 trial to determine extended long-term outcomes of the programme. **Detail of participants (number, any reported demographics):** N= 28. Average age of the children was 9 years (range 7–12 years). Details given in Jones 2005 not repeated in this paper.	**Method:** Lidcombe Program. This paper linked to Jones 2005. For the treatment group, the telephone interview involved questions relating to the children's speech from the time they completed the Lidcombe Program until the time of the assessment, as well as how satisfied parents were with the Lidcombe Program and with the current speech of the children. Parents of the control children were asked about the treatment history since the children completed the trial. **Control:** Children not in the trial **Length of follow up:** Average 5 years since randomisation (up to 7) **Response and/or attrition rate:** Twenty of the 29 (69%) children in the treatment arm and eight of the 25 children in the control (no treatment) arm were able to be contacted.	**Outcome measures:** %SS Frequency of stuttering. Parental report.	**Main results:** Of the children in the treatment group, one (5%) failed to complete treatment and 19 had completed treatment successfully and had zero or near-zero frequency of stuttering. Three of the children (16%) who had completed treatment successfully had relapsed after 2 or more years of speech that was below 1% syllables stuttered. Overall, there was a significant reduction in frequency of stuttering from randomization to the time of extended follow-up for the 20 children (paired t-test: mean difference 55.5 %SS, p,0.0001). This represents an 80% reduction in stuttering frequency. Meaningful comparison with the control group was not possible because an insufficient number of control children were located and some of them received treatment after completing the trial. Results from the parent questionnaires indicated that eight (40%) children had stuttered at some time during the previous month and twelve (60%) children had not. Ten (50%) children had stuttered at some time since completing treatment and ten	**Limitations/comments**

			(50%) children had not. Nineteen (95%) parents were satisfied or very satisfied with the Lidcombe Program and one (5%) parent was not satisfied. Seventeen (85%) parents were satisfied or very satisfied with their child's speech and three (15%) parents were not satisfied.	
Kaya & Alladin 2012 **Country:** Turkey **Study design:** Before and after **Data collection method:** Video recording of treatment sessions **Aim:** To evaluate a hypnosis intervention **Detail of participants (number, any reported demographics):** N=59, 28 had received therapy previously but with little benefit.	**Method:** Purpose of hypnosis to alleviate anxiety, boost self-confidence and increase motivation for intervention. Consisted of hypnotic induction, relaxation, hypoamnesia, hyperamnesia, past and forward projections, hallucinations. While in deep hypnosis participants practiced speaking fluently with positive reinforcement. Also included discussion of transferring fluency and confidence outside sessions. After each session participants practiced abdominal weightlifting (with a dumbbell) to strengthen respiratory muscles and improve movement of the diaphragm. **Hours:** 8 sessions spread over 8 days each session 60-90 minutes. After each session abdominal weightlifting practiced for 15-20 minutes in the clinic and 2 hours at home. **Delivered by:** Not reported ?hypnotherapist **Control:** None **Length of follow up:** Followed up one year later by phone call	**Outcome measures:** Occurrences of stuttering ranked on a scale of 1-10 by "experienced judges".	**Main results:** At baseline stuttering severity ranked as 2.10 (SD 0.31) [30-46 occurrences], immediately following intervention stuttering rank 8.25 (SD 0.39) [5-8 occurrences]. Mean difference minus 6.15 (SD 0.5) p < 0.000. One year FU "all improving well except 4 patients helped by family therapy". These 4 reported that their stuttering had recurred after 2 months post-intervention and attributed this to family-related stress particularly criticism from the family.	**Limitations/comments**

	Response and/or attrition rate: None			
Kaya 2011 **Country:** Turkey **Study design:** Before and after **Data collection method:** Video recorded speech sample **Aim:** To investigate the combined effect of hypnosis and diaphragmatic exercises in the management of stuttering **Detail of participants (number, any reported demographics):** N=93 79 M & 14 F mean age 23 (SD 7.95). 35 % had received intervention previously which they reported had achieved little or no benefit.	**Method:** The purpose of the hypnotherapy component was to alleviate anxiety, boost self-confidence and increase motivation for abdominal weightlifting training. After each hypnotic session, the patient was instructed to practice abdominal weightlifting for two hours at home. The abdominal weightlifting exercises involved lifting a dumbbell (2.0-4.0kg) with the abdomen for two hours in order to strength the respiratory muscles and the diaphragm. Hypnotic suggestions were utilized to increase motivation for the patient to practice abdominal weightlifting at home. **Hours:** The hypnotherapy consists of eight sessions spread over eight days and each session ranged from 60 to 90 minutes. **Delivered by:** Not clear ?Author **Control:** None **Length of follow up: I**mmediate **Response and/or attrition rate:** None	**Outcome measures:** Occurrences of stuttering ranked on a scale of 1-10 by "experienced judges".	**Main results:** At baseline stuttering rank judged as 3.06 (SD 1.33), after intervention 8.06 (SD 1.08). Mean difference minus 4.99 (SD 1.63). Pre- and post-measurements were found to be statistically significant (p<0.000).	**Limitations/comments**

Kingston 2003 **Country:** UK **Study design: Before and after** **Data collection method:** **Aim:** To determine how long treatment is likely to take and whether treatment time can be predicted. This study, conducted independently in the UK, was designed to replicate an Australian study. **Detail of participants (number, any reported demographics):** N=78 20 F & 46 M. Children who began treatment before 6 years of age: 66 completed stage 1. Mean age at first Stage 1 clinic visit was 52 months (range 32–71 months).	**Method:** Lidcombe program The data from both British and Australian cohorts were pooled in a meta-analysis. **Control:** none **Length of follow up:** **Response and/or attrition rate:** 12 (15.3%) did not complete Stage 1	**Outcome measures:** Number of clinic visits required to complete Stage 1 of the programme.	**Main results:** Per cent syllables stuttered was a significant predictor of time to complete Stage 1 (p=0.029), with an odds ratio of 3.8. There was a non-significant trend suggesting that onset-to-treatment interval is related to treatment time (p=0.084) OR 0.33. For the combined cohort (total), both %SS and onset-to-treatment interval are significant. There was a significant correlation between treatment time and both %SS at the first clinic visit (OR 3.5, p<0.001) and onset-to treatment interval (OR 0.52, p=0.013).	**Limitations/comments**
Koushik et al. 2009 **Country:** Canada **Study design:** Before and after **Data collection method:** Lidcombe scale, audio recorded speech sample, parent interview **Aim:** To evaluate the Lidcombe program **Detail of participants (number, any reported demographics):** N=11 Mean age =9 (range 6-10) 9 M & 2 F. Pre-treatment %SS ranged from 2-27%.	**Method:** Lidcombe Program - a behavioural treatment Involving verbal response contingent stimulation (acknowledgment, praise and request for self-evaluation) administered by parents **Number of hours:** Weekly visits to clinic and parent home intervention. Median 8 clinic visits (range 6-10). **Delivered by who?** Clinician and parents **Control:** None **Length of follow up:**	**Outcome measures:** %SS SPM Parent rating of severity	**Main results:** Mean % syllables stuttered baseline = 9.2 (SD 7.8) and 1.9 (SD 1.3 range 0.2% to 3.8%) at follow up significant difference (p= 0.0002). No association between length of follow-up period and stuttering rate. Explained only 0.04% of the variance pre-post. Mean SPM baseline =145.8 (SD 22.7) and 179.3 (SD 20.5) FU. Significant difference pre to post intervention (p=0.0097) Parent data – 70% rated child's stuttering as no or extremely mild	**Limitations/comments**

	Mean 70 weeks (range 9-187) **Response and/or attrition rate:** One child removed from analysis as required supplement to standard programme		stuttering post intervention. All parents reported enjoying taking part in the programme although 60% reported finding time to practice difficult	
Koushik et al. 2011 **Country:** US **Study design: Cross sectional** **Data collection method:** Retrospective examination of case note data **Aim:** To examine predictors of length of treatment for the Lidcombe program. Replicates Jones et al. (2000) US study and combines data from an Australian and a UK study. **Detail of participants (number, any reported demographics):** N=134 105 M & 33 F before one clinic (4 children) excluded. All were children who attended one of 4 clinics 2002–2009 and had achieved requirement for stage 2 of the program. %SS less than 1.0 within the clinic and Severity rating scores for the previous week of 1or 2. Mean age at first clinic visit 49.7 months (range 31-71)	**Method:** Lidcombe program **Number of hours:** Examines this data **Delivered by who?** Fifteen clinicians with varying levels of experience all received 2 day Lidcombe workshop **Control:** None **Length of follow up:** Immediate **Response and/or attrition rate:** 165 cases examined 27 (13.5%) had not progressed to stage 2. Drop out for all but 5 due to families not attending sessions, 5 due to perception of slow progress.	**Outcome measures:** Number of clinic visits %SS	**Main results:** Median number of clinic visits by which 50% of all children reached near-zero stuttering were 11, 10, 14, and 23 visits for each clinic. Median across all was 12 visits. Mean across all clinics 14.1 (SD 7.5 range 4-44). Mean not including outlier 12.4 (SD 5.8 range 4-44). No evidence of an association between number of clinic sessions and age, gender, or onset-to-treatment interval. Strong evidence that higher severity associated with more clinic visits (p=0.004). Children with stuttering severity of 5%SS or more approximately a 4-fold increased odds of requiring 12 or more visits. Some evidence that frequent clinic attendance associated with more clinic visits to Stage 2 (p=0.04). Children who attended more than every 11 days had more than twice the odds of requiring longer than 12 clinic sessions compared to children who attended the clinic infrequently.	**Limitations/ comments**

			Association between frequency of attendance and number of clinic sessions was not significant (OR 0.47 p=0.07). Association severity and number sessions OR=0.37 p=0.01. Meta-analysis of data from this study and two others (n=444 cases) indicated no evidence of a correlation between age, gender, onset-to-treatment interval, and treatment duration. Strong evidence of correlation between stuttering severity and treatment duration with increasing severity associated with increased number of clinic visits (p=0.0001).	
Laiho & Klippi 2007 **Country:** Finland **Study design:** Before and after **Data collection method:** Video-taped speech sample, questionnaires **Aim:** To evaluate an intensive stuttering intervention **Detail of participants (number, any reported demographics):** N=21 age 6.8-14 years, 16 M & 5 F. Two groups those under 10 years (n=8) and those over (n=13). Four no previous therapy others 5-40 previous sessions. 29 parents.	**Method:** Based on Van Riper and Dell methods. Included practising oral motor abilities, examining the speech production system, and exploring the movements of tongue and lips and other articulators during speech. Included pantomime and pseudostuttering. Aimed also to deal with feelings and attitudes related to stuttering and to improve self-esteem and share information about stuttering. Parents worked in group while children worked in speech groups. **Number of hours:** Under 10s course 14 days and over 10s 18 days 2.5-3 hours per day. Also, parents practised therapy methods for 7.5 hours. Evening group social activities. Held in 2 parts beginning of summer holiday and end of	**Outcome measures:** %SS Characteristics of moments of stuttering Length of stuttering Escape behaviour Avoidance behaviour Above measures combined into stuttering severity classification % improvement	**Main results:** Immediate post intervention %SS had fallen in the case of 14 participants, no change four participants, three participants had a small rise. The mean baseline %SS as 4.4% and post 2.7%, (38.6% improvement). Statistically significant change (p=0.01). Amount of avoidance reduced pre-post 13.1 to 9.5% spoken syllables (p=0.01) Proportion of repetitions reduced, prolongations and blocks rose slightly. Half had greater proportion of prolongations and repetitions at the end of the course than the beginning. Only avoidance statistically significant change in stuttering behaviour.	**Limitations/comments**

	summer holiday. **Delivered by who?** Speech therapist and a psychologist **Control:** None **Length of follow up:** 9 months. During FU period 6 no other therapy, 7 had 1-4 sessions, 2 had 12 sessions, 4 had 20-30 sessions and one had 45 sessions. **Response and/or attrition rate:** None		Increased use of repair behaviours pre-post p=0.01 Four categorised as severe, 14 moderate, 3 mild pre-course, post none severe, 14 moderate, three mild, one fluent. 22 parents rated speech as more fluent. At 9 month FU 24 parents rated speech as "more fluent" however no reported changes were statistically significant at 9 month FU.	
Langevin & Boberg 1993 **Country:** Canada **Study design:** Before and after **Data collection method:** Video and audio taped telephone speech samples **Aim:** To evaluate the CSP intervention **Detail of participants (number, any reported demographics):** N=10 8 M & 2 F age 16 - 38 (mean 24.2 years).	**Method:** Comprehensive Stuttering Program **Number of hours:** 3 week intensive, 6.5 h per day. Residential for 2 weeks participants choose where to live for 3rd. One refresher weekend included in the programme. **Delivered by who?** Not reported **Control:** None **Length of follow up:** 12-14 months **Response and/or attrition rate:** None Data reported on 10 of 21 who completed the intervention, others incomplete data	**Outcome measures:** %SS SPM Revised Communication Attitude Inventory (S24) Perceptions of Stuttering Inventory Self-Efficacy Scaling by Adult Stutterers Speech Performance Questionnaire,	**Main results:** Substantial decrease in %SS for all participants. Mean %SS during video recording reduced from 14.2 pre-treatment, to 0.53 post-treatment. 8 participants stuttered on less than 1 % of total syllables. The mean SPM increased from 126.5 pre-treatment to 140.7 post-treatment. Small increase in mean %SS (2.4) at FU telephone call compared to telephone call immediately after treatment (0.8). Pre-treatment telephone call mean %SS 15.3. S-24 scale scores revealed very negative attitudes (19.6) before treatment. After treatment communication, attitudes were normal (8.4) and remained so during follow-up (12.4). PSI - Before treatment high levels of struggle, expectancy and avoidance (56.3%). These levels decreased after therapy to 15.4%	**Limitations/comments**

			and showed only a small increase to 23.2% during the follow-up period. On the SESAS scale, pre-treatment scores showed a low confidence mean rating of 47%. This score almost doubled to 84.9% after therapy, and then declined to 70.5 at follow-up. 80% were very or generally satisfied with their speech at the time of follow up. 80% rated their current speech fluency as generally good.	
Langevin & Boberg 1996 **Country:** Canada **Study design:** Before and after **Data collection method:** Video taped conversation and reading, telephone speech sample **Aim:** To evaluate the outcomes of an intervention for clutter-stutterers **Detail of participants (number, any reported demographics):** N=4 of a group of 39 who had taken part in an intervention. 4 M age 18-42.	**Method:** Comprehensive Stuttering Program. **Number of hours:** Not reported in this paper **Delivered by who?** Not reported in this paper **Control:** None **Length of follow up:** 1 year, but limited data **Response and/or attrition rate:** None	**Outcome measures:** %SS SPM %improvement S24 PSI SESAS	**Main results:** Pre %SS during conversation were 5.6, 9.4, 8.4, 3.6. Post were 1.7, 0.1, 3.8, 1.4. Compared to stuttering participants, half the cluttering participants decreased more than stutterers and half less. The %improvement scores were lower for clutterers than stutterers. Non-speech data indicate that attitude and confidence scores improved for both groups, however the clutterer group improved less.	**Limitations/comments** Before-immediate post data for all participants however long term follow up data only for one. Limited presentation of data
Langevin et al. 2006 **Country:** Canada & Netherlands **Study design: Before and after** **Data collection method:** Video recorded in-clinic speech samples, telephone speech samples **Aim:** To compare treatment outcomes across cultures **Detail of participants (number, any reported demographics):** N=25 in Netherlands Mean age 29.6 years; (range 17–53)17 M & 8 F.	**Method:** Comprehensive Stuttering Program. Combination of individual, small-group, and large-group activities that targeted speech restructuring, stuttering management, self-management goals and attitudinal-emotional change. Three phases: acquisition of fluency and cognitive behavioural skills (weeks 1 and 2); transfer (week 3);	**Outcome measures:** %SS SPM Speech naturalness scale Maintenance of gains	**Main results:** Dutch group mean pre-post %SS 1.18 to 0.75 in-clinic measure. Effect size at 2 years 6.86. Beyond clinic telephone measure pre intervention mean 12%SS (SD 10.73), post intervention 3.24%SS (SD 5.25), 2 year FU 7.04% (SD 8.99). ES at 2 years Canadian group beyond clinic	**Limitations/comments**

All 25 had received therapy previously, all but one more than 5 years earlier. N=16 (FU data available for 14) in Canada Mean age 24.6 years (range = 15–42) 13 M & 3 F. 15 reported previous therapy, all but one more than two years earlier.	maintenance in months and years following the programme. Self-management integral to the programme. Dutch programme residential, Canadian students choose where to be housed on campus. **Number of hours:** 3-week intensive group-therapy. Clients received 90 h of therapy (6 h per day). **Delivered by who?** A clinical team that includes senior ISTAR staff, student speech-language pathologists, and practicing speech-language pathologists who wish to obtain specialized experience. Clinician-client ratio varied over the course of the treatment day from 1:1 to 1:3 **Control:** None **Length of follow up:** 2 years **Response and/or attrition rate:** 2 of 18 Canadian cohort lost to immediate follow up, 2 further to long term	Revised Communication Attitude Inventory (S24) Perceptions of Stuttering Inventory Self-Efficacy Scaling by Adult Stutterers Speech Performance Questionnaire,	telephone measure pre intervention mean 11.99%SS (SD 5.72), post intervention 0.91%SS (SD 0.83), 2 year FU 4.38% (SD 7.31). ES at 2 years 7.62. 17 (71%) of Dutch group classified as maintainers, 12 (86%) of Canadian group. The %SS *d* effect sizes were medium or typical (0.52) for the Dutch group, larger than typical (0.86) for the Canadian group, and typical to larger than typical (0.69) for the global treatment effect. Dutch group mean naturalness rating at 2 year FU 4.03 (S.D. = 0.79; Median = 4.17; Range = 2.69–5.19). Canadian group mean naturalness rating at 2 year FU 2.85 (S.D. = 0.73; Median = 2.86; Range = 1.70–3.77). These scores in range of that reported for non-stutterers. At 2 years post-treatment both groups were maintaining statistically significant reductions in stuttering frequency and improvements in attitudes, confidence, and perceptions.	
Langevin et al. 2010 **Country:** Canada **Study design:** Before and after **Data collection method:** Recorded telephone calls, postal questionnaires **Aim:** To explore long term impacts of an intervention	**Method:** Comprehensive Stuttering Program. Integrates: prolongation and the use of other fluency enhancing techniques, stuttering management skills and cognitive-behavioural skills. Self-management strategies include goal setting, self-measurement, self-evaluation,	**Outcome measures:** %SS SPM Maintenance of treatment gains at 5	**Main results:** Ten had not accessed any refresher sessions, those who had varied from one weekend to two week refresher courses. Statistically significant and clinically significant reductions in %SS and	**Limitations/comments**

Detail of participants (number, any reported demographics): Long term data from N=17 (or 16 according to table?) 18 pre-post. 14 M & 4 F. Mean age 23.8 years; (range = 17–42 years). 17 had received therapy previously up to ten years earlier.	self-monitoring, and problem solving. Three phases: acquisition of fluency and cognitive-behavioral skills; transfer; maintenance. Includes refresher sessions, self help groups. **Number of hours:** Three week intensive programme. No further details. **Delivered by who?** Institute for Stuttering Treatment and Research, no further detail. **Control:** None **Length of follow up:** Up to 5 years **Response and/or attrition rate:** 21 potential participants 3 lost to immediate FU - 2 not contactable, one multiple disorders. 1 further lost to 5 year FU?	year FU Revised Communication Attitude Inventory (S24) Perceptions of Stuttering Inventory Self-Efficacy Scaling by Adult Stutterers Speech Performance Questionnaire	increases in SPM were achieved at immediate post-treatment and were maintained over the 5-year follow-up period. Pre mean %SS 15.86 immediate post mean %SS 0.9, 5 year FU mean %SS 4.98. Pre-post significant p<0.001 (large effect size minus 14.96), pre-5year FU p=0.002 (large ES minus 11.49). Pre mean SPM 117.81 immediate post mean 147.86. Pre-post significant p=0.005 (large ES 30.05) pre-5 year FU p=0.004 (large ES 30.79 15 of the 18 (or 17/16?) participants classified as maintained speech gains at 5 year FU. There were no significant differences among the immediate post-treatment and five follow-up measures, indicating that speech gains achieved by the end of the treatment program were stable over the follow-up period Low return rate for questionnaires (28%) for 5 year FU therefore longer term data not reported. Statistically and clinically significant reductions in S24 and PSI scores and improvements in SESAS scores were achieved at immediate post intervention measure and maintained at one year.	

Latterman et al. 2008 **Country:** Germany **Study design:** RCT **Data collection method:** Recorded speech sample at home by parent and in clinic, parent rating scale **Aim:** To evaluate the LIdcombe program in Germany **Detail of participants (number, any reported demographics):** **N=45 Aged** 3-5:11. Mean age intervention group 53 months and in control 48 months. 42 M & 3 F, 9 had received previous therapy	**Method:** Lidcombe Program **Number of hours:** Average 13 sessions attended once per week for 45 minute session. 15 minute daily home practice **Delivered by who?** 1st author SLP and high level of training in program, carried out by parent at home **Control:** Waiting list. Assigned consecutively. **Length of follow up:** Immediate post **Response and/or attrition rate:** 58 recruited, 12 did not meet inclusion criteria, one further excluded as incomplete data	**Outcome measures:** %SS at home and in clinic	**Main results:** Home measures At baseline – Mean %SS 7.5% (SD 4.7, range 1.8–20.2) for the wait-contrast group and 9.5% (SD 5.5, range 2.8–26.6) for the treatment group. Post intervention mean %SS 6.2% (SD 4.7, range 0.7–17.4) for the control group and 2.6% (SD 1.9, range 0.0–7.3) for the treatment group. Mean reduction in intervention group 6.9%, reduction in disfluency rate of mean 70.3% from baseline. Control group mean reduction in %SS score of 3.6%, a reduction in disfluency rate of mean 17.6% from baseline. ANCOVA- Very significant effect for the interaction group by assessment occasion, $F(1,41) = 10.300$, $p =0 .003$, partial $\eta 2 = 0.201$, the improvement in the treatment group was significantly more than in the control group. Clinic measures Mean reduction of 6.8% SS control group, a reduction in disfluency rate of mean 70.6% from baseline. Control group mean reduction of 1.6% SS, a reduction in disfluency rate of mean 25.4% from baseline. ANCOVA - The difference in improvement between the groups was significant - interaction group	**Limitations/comments**

			by assessment occasion, *F*(1,41) = 5.400, *p* =0 .025, partial *η*2 =0 .116. Both the treatment and control group increased their articulation rates from T1 to T2, Treatment group mean of 3.49 at baseline to 3.58 syllables/s post intervention, the control group from 3.16 at baseline to 3.28 syllables/s.	
Lawson et al 1993 **Country:** UK **Study design:** Before and after **Data collection method:** participant self-evaluation questionnaires, video recording for study 2. **Aim:** To evaluate attitudinal changes following an intensive course **Detail of participants (number, any reported demographics):** Study 1 – N= 15 11 M & 4 F. Mean age 16.8 (SD 2.4, range 12-21). 4 severe, six moderate, 2 mild, 2 very mild. Study 2 – N=19 5 F & 14 M. Mean age 16.5 (SD 3.9, range 11-25). 3 severe, 7 moderate, 4 mild 5 very mild.	**Method:** Groups of similar age. Based on avoidance reduction and block modification. Some elements of PCP. **Number of hours:** 5 days intensive further details not reported in this paper **Delivered by who?** 2 therapist with students assisting **Control:** None **Length of follow up:** One month **Response and/or attrition rate:** 22 recruited incomplete follow data from 4, 3 withdrew from course. 27 recruited for study 2, 4 did not attend, incomplete data for other 4.	**Outcome measures:** PSI Rate of speech %SS	**Main results:** Study 1 No significant change pre-post in struggle or expectancy scores. Avoidance scores before the course were significantly higher than post (F[1,42] = 13.99, p <0.001). No significant change in scores immediate post-intervention to one month FU. Study 2 Significant overall improvement on the PSI for all areas although avoidance greatest change. Struggle (F[3,122] = 3.03, *p* <0.05), avoidance (F[3,122] = 14.02, p <0.001), expectancy (F[3,122] = 4.80, *p* <0.01). No significant change in rate of speech or %SS (no further data reported).	**Limitations/comments**

Leahy 1991 **Country:** Ireland **Study design:** Before and after **Data collection method:** Speech samples using SSI. Completion of self-character sketch and repertory grid **Aim:** To evaluate a group intervention **Detail of participants (number, any reported demographics):** N=5 male age 20-26.	**Method:** Group therapy underpinned by Kelly's personal construct theory. Exploration of theories and views, relationship between change in behaviour and in anticipation explored. Included conversation skills during role play, experimenting with different fluency techniques, feedback on what most and least useful for individuals. **Hours:** **Delivered by:** Student clinician supervised by authors **Control:** None **Length of follow up:** 2 clients attended 5 month FU **Response and/or attrition rate:** None	**Outcome measures:** SSI Self-character sketch Situations grid	**Main results:** Data reported for each client individually only. SSI at baseline 3, 24, 14, 10, 31. Post intervention SSI 0, 10, 4, 0, 10. Character sketches received from 3 clients only and situation grids from 3 clients only. No major changes in these detectable. Informal feedback from clients – for 2 fluency no longer of concern (1 fluency not changed but didn't see it as much of a problem, other speech poorer but brushed it aside). Further participant reported speech really improved at work but other primary concerns (exams). One reported complete fluency, and another reported feeling more optimistic about fluency control. 4 reported technique work as important element, agreement regarding usefulness of focus on communication skills. At 5 months the 2 who attended had SSI of 4 (post intervention 4) and 8 (post intervention 10). 2 did not attend but reported fluency going well, one emigrated.	**Limitations/comments**
Lewis et al. 2008 **Country:** Australia **Study design: RCT** **Data collection method:** Audio recorded speech sample by parents at home, parent questionnaire **Aim:** To evaluate telehealth delivery of the Lidcombe Program **Detail of participants (number, any reported demographics):** N=18, 8 intervention, 10 controls. Age 3-6 years	**Methods:** Lidcombe Program. Regular telephone calls typically weekly, video demonstration, support via telephone/email, feedback on audio recordings. **Number of hours:** Those who successfully completed stage 1 required mean 49 consultations over mean 62 weeks, of mean duration 33.1 minutes. **Delivered by who?**	**Outcome measures:** %SS A responder to treatment defined as a child who showed greater than an 80% reduction in %SS scores from time of randomization to 9	**Main results:** Baseline mean, pooled %SS scores 6.7 intervention group and 4.5 controls. Mean 9-month %SS scores 1.1 for the experimental and 1.9 for controls. ANCOVA- 69% decrease in frequency of stuttering intervention compared to controls (95% confidence interval [CI] = 13%–89%, p =0.04). Adjusted	**Limitations/comments**

14 M & 8 F began intervention (4 withdrew).	1st author, experienced with program **Control:** Waiting list for 9 months **Length of follow up:** 9 months (and 12 months data for intervention group) **Response and/or attrition rate:** 37 recruited – 7 recovered, 5 services locally, 2 parents withdrew. 1 child in intervention and 3 control lost due to non-compliance.	months	treatment effect (gender, age, family history, severity) estimated to be a 73% decrease in stuttering. (95% CI = 25%–90%, p = 0.02). 6 of the 8 experimental children responded, while only 2 of the 10 control children met the responder criterion through natural recovery (p= 0.054). 87% of parents reported telehealth process had been positive. At 6 months and 12 months 100% of parents rated themselves as very satisfied with their child's speech.	
Lincoln & Onslow, 97 **Country**: Australia **Study design**: Follow up data only **Data collection method**: Parent collected tape recording, request and details of how to collect sent annually **Aim**: To collect long term FU data **Detail of participants (number, any reported demographics)**: N=43 recruited from 2 treatment centres. Mean age 6:4, range 4:9 to 9:8 years.	**Methods:** Lidcombe Program **Number of hours:** Mean 10.5 clinic sessions. **Delivered by who?** N/A **Control:** None **Length of follow up:** 7 year data for 2 children, 4 year FU data for others. **Response and/or attrition rate:** 59 of 123 invited agreed to participate. 16 failed to supply recordings required and were removed from study.	**Outcome measures:** %SS Parent questionnaire	**Main results:** Reported as 2 groups, one group who had taken part in previous research (n=9) and second group who had received program but not taken part in a research study. Group one reported by individual child range 0 to 1.4 %SS, mean 0.3. Group two mean 0.5 %SS range 0.3-0.5. Parent report – no children had attended for treatment for stuttering in previous year, 44% reported carrying out techniques during previous year, 71% reported child had begun to stutter in previous year. 95% reported that someone	**Limitations/comments**

			had told them that their child may be stuttering in the previous year.	
Lincoln et al. 96 **Country**: Australia **Study design**: Before and after **Data collection method**: Tape recorded speech sample during clinic visit, parent rating of severity, parent collected tape recording **Aim:** To evaluate an operant treatment for school-age children **Detail of participants (number, any reported demographics):** N=11 1 F & 10 M age range 6:10 to 12:4 mean age 8:3. 3 severe, 5 moderate, 3 mild stutter.	**Methods:** Lidcombe Program. Operant program using parent-treated response contingent stimulation. Parents praised stutter free speech in a warm and enthusiastic manner. Stuttered speech corrected by requesting the child to repeat. Ratio of praise to correction individualised for each child. Following instatement phase child enrolled in maintenance program when achieved 1or 1.5 %SS. If child failed to meet performance criteria causes discussed with parent and child and strategies implemented. **Number of hours:** Weekly one hour sessions during instatement program. 3-4 week maintenance program designed for each child, typically visit 2x 2-weekly then 2x 4-weekly, then 2x 8-weekly, then 2x 16-weekly, then 2x 32-weekly. Median 12 sessions to reach maintenance (range 4-39) **Delivered by who?** 3 clinicians. Both parents trained for 3	**Outcome measures:** %SS SPM Rating scale 1=normal speech, 10 extremely severe stuttering Parent survey	**Main results:** Baseline mean 5 %SS to 18.9 %SS. 1 week to 12 months FU mean 0 to 5.1 %SS (data presented as Figure only). Additional data for 3 children treatment most successful for and least successful. All children maintained decreased stuttering rates at 12 months FU. Reduction in %SS was not at the expense of SPM reduction.	**Limitations/comments**

	participants, mothers only for 5 and fathers only for 3 **Control:** None **Length of follow up:** 2 years **Response and/or attrition rate:** 22 recruited, 9 did not comply with data collection requirements, 2 did not comply with treatment program requirements. 7 continued to participate in maintenance program, 4 withdrew from study before completing maintenance due to personal circumstances.			
Lutz 2009 **Country:** Germany **Study design:** Before and after **Data collection method:** assessment through standardised questionnaires before and after the treatment, 3 month follow up; also assessment of parents who were not involved in the workshop and speech and language therapists who were external therapists of the children from the parents who took part in the study **Aim:** To evaluate if the participation at a workshop for parents of children who stammer changes the thinking of parents positively, changes the support of parents in intervention positively, and has a positive effect on the stammer symptomatic of the child **Detail of participants (number, any reported demographics):** 11 parents of children who stammer	**Methods:** Conversations between parents of children who stammer; lessons about the theory of stammering; removal of taboos about stammering; change of attitude towards stammering; tricks and tips for parents – through tasks for self-awareness training, talks, reflections, and group works **Number of hours:** 1 weekend workshop a 12 hours **Delivered by who?** Speech and language therapist specialised in stammering **Control:** Yes, parents of children who stammer who did not take part in the workshop	**Outcome measures:** Change of attitude towards stammering Feedback about contents of the workshop Understanding of intervention program Changes in symptomatic of stammering of the child	**Main results:** Change of attitude towards stammering: 92 % of the 11 participants confirmed that their attitude towards stammering has changed immediately after the workshop and 3 month later Feedback about contents of the workshop: 83% of the participants were happy about the contents of the workshops In comparison to the control group a distinct difference is observable between the attitude of the parents from the control group and the parents who took part in the workshop: parents who took part in the workshop changed their attitude towards the phenomenon stammering	**Limitations/comments**

	Length of follow up: 3 month **Response and/or attrition rate:** no drop outs		External speech and language therapists were asked about the parents understanding of the intervention program. 5 of 6 speech and language therapist confirm a distinct improvement of parents understanding; 4 of 6 describe more interest of parents towards the therapy 5 of 7 children observed a positive qualitative improvement of the stammering symptomatic of their child	
Mallard 1998 **Country:** US **Study design:** Before and after **Data collection method:** Parent report **Aim:** To evaluate a family-orientated therapy programme **Detail of participants (number, any reported demographics):** N=28 children. 21 M & 7 F age range 5–12 years. 34 parents.	**Methods:** South West Texas Program/Rustin Program. Emphasises social skills training and parental involvement. Parent groups and child groups. Fluency-shaping speech skills (such as adopting a slower rate of speech than normal, proper breathing, and starting the voice gently and stuttering modification procedures) and social skills in week one. Transfer, problem-solving and negotiation in week two. Each family developed a plan for managing stuttering upon their return home with tasks. **Number of hours:** 2 weeks intensive **Delivered by who?** Therapist. Both parents and stuttering child had to attend and siblings also encouraged. **Control:** None **Length of follow up:** At least one year **Response and/or attrition rate:** None	**Outcome measures:** Percentage of children no longer needing formal therapy	**Main results:** 23 children (82%) did not require further therapy. Of the 5 enrolled in further therapy three received treatment for other speech and language problems. Most frequently mentioned topic identified by parents as most important for them in managing stuttering following therapy was letting child take responsibility (25 parents) followed by family discussion (13), listening (12) and desensitisation (11).	**Limitations/comments**

Menzies et al. 2008 **Country:** Australia **Study design:** RCT **Data collection method:** Video recording and recorded telephone speech samples **Aim:**To study the effects of speech restructuring treatment on social anxiety, and study the effects on anxiety and stuttering of a cognitive-behavior therapy package **Detail of participants (number, any reported demographics):** N=30. 25 M & 5 F. Age range 18 to 66 years. 16 had never received treatment for their stuttering,14 had received some form of treatment for their stuttering but not in the previous 12 months. Complete follow up data only for 14. At baseline mean stuttering severity 8.0%SS (SD = 5.0, range 0.9–27.6).	**Methods:** Intervention arm received speech restructuring and CBT. CBT focused on reducing speech-related anxiety. It incorporated cognitive restructuring, graded exposure, and behavioural experiments. Speech restructuring – modified One-Day Prolonged Speech Instatement Program. Consisted of individual prolonged speech teaching sessions, a 7-hr group day, in which participants instated stutter-free speech and four further individual sessions, in which participants practiced their new speech pattern. **Number of hours:** Intervention arm – 10 week (15 hours) CBT followed by 14 sessions (14 hours) speech restructuring**.** 3 months of maintenance sessions offered. **Delivered by who?** CBT delivered by one of the authors a Clinical Psychologist, speech restructuring by SLP **Control:** Speech restructuring only. Received no intervention for first 10 weeks then same speech restructuring sessions as intervention group **Length of follow up:** 12 months **Response and/or attrition rate:** 32 recruited, 2 lost to follow up. 5 from control group withdrew from intervention. Data at 1 year follow up available for 19 (speech) and 14 (psychological measures)	**Outcome measures:** %SS Multiaxial psychiatric interview Diagnostic and Statistical Manual of Mental Disorders GAF scale Clinical assessment of social anxiety. Social Phobia Anxiety Inventory Fear of Negative Evaluation Scale Social Avoidance and Distress Scale Beck Anxiety Inventory Beck Depression Inventory–II Unhelpful Thoughts and Beliefs About Stuttering (UTBAS) measure	**Main results:** Participants in the experimental group had superior, sustained, and often continuously improving measures of psychological functioning in relation to the control group. Participants in the experimental group who had received the CBT package scored, on average, 21.3 points higher on the GAF scale than those in the control group (p < .005 95% CI: 12.6–32.7). The experimental group displayed significantly less avoidance at final follow-up than the control group (95% CI: 17–48). No participant in the experimental group retained a diagnosis of social phobia at FU, despite two-thirds being diagnosed with the condition at baseline. The control group intervention did little to eliminate the high rate of social phobia. No difference in %SS between the two groups at FU. The additional CBT treatment given to the experimental group had no further impact on the stuttering reduction resulting from their speech restructuring treatment. Post-treatment stuttering frequency (%SS) at FU was around half that at baseline. Group mean for intervention at recruitment 7%SS at FU 3-4% (taken from figure), for controls 8-9% baseline 3-4% FU.	**Limitations/comments**

Millard et al. 2008 **Country:** UK **Study design:** Before and after **Data collection method:** Video-recorded speech samples **Aim:** To evaluate parent-child interaction therapy **Detail of participants (number, any reported demographics):** N= 6 aged 3;3–4;10. 4 M & 2 F.	**Methods:** Parent-child Interaction Therapy. Initial consultation followed by introduction of "Special Time" during which parents practice interaction targets during play with the child. Programme includes parent management strategies based on behavioural methods together with parent-identified interaction targets. Home based consolidation period following clinic sessions. **Number of hours:** 6 sessions of clinic-based therapy and 6 weeks of home consolidation. **Delivered by who?** Specialist SLTs **Control:** None **Length of follow up:** 12 months **Response and/or attrition rate:** 2 completed follow up to 7/8 months only	**Outcome measures:** %SS Stuttering severity score (0-7) based on duration of three longest stutters, degree of tension and secondary behaviours.	**Main results:** 4 of the 6 children studied significantly reduced the frequency of their stuttering with both parents by the end of the therapy phase. 3 children reduced stuttering severity level to zero (from 5,3,2) and were discharged. One reduced from 2 to 1 and was also discharged. Two children had severity scores of 2 at follow up (reduced from 4 and 5) and required further intervention.	**Limitations/comments** Data reported by each individual child
Millard et al. 2009 **Country:** UK **Study design:** Before and after **Data collection method:** Video recording, parent questionnaire **Aim:** To evaluate Palin PCI therapy **Detail of participants (number, any reported demographics):** N=10 (6 intervention 4 control). 9 M & 1 F. Age range 3:7 to 4:11.	**Methods:** Palin Parent-Child Interaction therapy. Initial assessment, followed by six sessions of clinic-based therapy (incorporating interaction strategies, family strategies and direct fluency strategies) 6 weeks of home-based therapy and regular review sessions for up to 1 year post therapy. **Number of hours:** 6-week package of weekly 1-hour clinic sessions. 6 weeks home practice. Progress reviewed at 3-weeks, 3-months, 6-months and 1-year **Delivered by who?**	**Outcome measures:** % stuttered words Parent rating	**Main results:** All six children who received therapy and one child in the no treatment condition significantly reduced stuttering frequency over the period of the study. This was associated with therapy in four cases. Families who participated in therapy reported reduced impact and increased knowledge and confidence in managing stuttering at the end of the study	**Limitations/comments** Data reported by each individual child

	Specialist SLTs **Control:** No intervention, families completed video recordings **Length of follow up:** 1 year **Response and/or attrition rate:** None			
Miller & Guitar 2009 **Country:** USA **Study design: Before and after** **Data collection method:** Video recording in clinic and home **Aim:** To evaluate long term outcomes of the Lidcombe Program **Detail of participants (number, any reported demographics):** N=15. 11 M & 4 F. mean age 3;9 (SD 0.81; range 2;5–5;9).	**Methods:** Standard Lidcombe treatment **Number of hours:** Average number of clinic visits for the participants to reach the end of Stage 1 (essentially stutter-free in all situations) was 19.8 (SD 10.7, range 6–44). The median number of sessions was 17. **Delivered by who?** SLPs who had not used the programme previously but received two days training, assisted by students. **Control:** None **Length of follow up:** 12 months **Response and/or attrition rate:** 17 had been recruited, 1 withdrew 1 lost to follow up	**Outcome measures:** %SS SSI	**Main results:** Mean baseline %SS 12.6 (SD 7.38, range 5.9–24). Mean follow-up %SS 0.5 (SD 1.1, range 0–3.7). An average reduction in stuttering frequency of 96%. Significant pre-post change p < 0.001. ES 2.3. Baseline SSI–3 total overall score 24.9 (SD 5.7, range 18–37, moderate to very severe). Mean follow-up SSI–3 total overall score 3.5 (SD 5.8, range 0–16, normal fluency to mild). An 86% reduction in severity of stuttering. Eleven children evidenced no stuttering in the follow-up, and 13 were considered to be completely fluent by their parents. The difference between the baseline and follow-up SSI–scores was significant, p<0.001. ES 3.7.	**Limitations/comments**

Nilsen & Ramberg 99 **Country**: Sweden **Study design**: Before and after **Data collection method**: Tape recorded speech samples reading and retelling a story, Visual Analogue Scales. Aim: To evaluate an intensive programme for adolescents **Detail of participants (number, any reported demographics):** N=13 11 M & 2 F, aged 13-17:9 mean age 15:2. All referred to programme by SLTs all had received therapy or consultations previously. One mild, 5 moderate, 7 severe stutter.	**Methods:** Residential individual and group therapy encompassing dealing with stuttering, stuttering more fluently and development of social and communication skills. Individual therapy as well as group sessions. Each participant had own therapist. Individual sessions mostly focussed on motor speech control, attitudes, and emotional obstacles tailored for individual. Group sessions practiced techniques, role play, group exercises. **Number of hours:** 21 days divided in to 3 sections over 6 month period. Evening social activities, games and sports. **Delivered by who?** Experienced therapists, a drama pedagogue and youth leaders (who stuttered and had experienced intervention) **Control:** None **Length of follow up:** Immediate post-intervention **Response and/or attrition rate:** 15 had been recruited, one withdrew due to personal problems, one withdrew due to illness	**Outcome measures:** Rating of severity by independent listener (SLT) on 3 point criteria of mild, moderate or severe stuttering Rating of severity and communication problems by therapist on rating scale. Results measured by distance in millimetres on VAS. Social skills evaluated by youth leaders via rating scale Locus of Control of Behaviour scale Questionnaire to participants	**Main results:** Over all measures 12 had a change on at least one aspect measured. Independent rating – 6 participants positive change, 7 did not change. Post intervention rating 2 mild, 9 moderate, 2 severe. Therapist rating 5 positive change, 6 no change, 2 negative change in stuttering severity. Social skills – 9 positive change, 1 no change, 3 negative change. LCB – 5 positive change, 1 no change, 7 negative change, No significant change for the group. 9 participants satisfied or very satisfied with the programme.	**Limitations/comments**

O’Brian et al. 2003 **Country:** Australia **Study design:** Before and after **Data collection method:** Video and audio recorded speech samples **Aim:** To evaluate the Camperdown Program **Detail of participants (number, any reported demographics):** N= 30 21 M & 9 F, age range 17 to 58 years. 10 had received no previous treatment for stuttering. The other 20 had received some form of treatment 4 to 30 years previously. Average time since treatment was 12.8 years.	**Methods:** The Camperdown Program. Four stages: individual teaching sessions, a group practice day, individual problem-solving sessions, and a performance-contingent maintenance stage. Participants learn prolonged speech and self-evaluation of stuttering severity. Progression through programme dependent on achieving severity targets. **Number of hours:** Average 3.8 hours individual sessions during phase one. Mean time required to reach the final phase was 20.1 hours (range 13–29 hours). **Delivered by who?** Clinician. At group practice day groups of 3, with two clinicians for the first six cycles and with three clinicians for the remainder of the day. **Control:** None for intervention, use of matched normal speakers for naturalness outcomes **Length of follow up:** 12 months **Response and/or attrition rate:** 30 recruited, 5 lost during first phase, 4 withdrew after group practice day, 5 lost during final phase.	**Outcome measures:** %SS SPM Speech naturalness Self-report inventory	**Main results:** Complete data for 16 to one year FU. By the end of the group practice day, all participants had achieved natural sounding speech that contained minimal stuttering (NAT 1–3, SEV 1–2) while talking in a group situation in the clinic. Of those 25 participants, 21 subsequently generalized this result to situations beyond the clinic during the individual problem-solving sessions. Mean pre-treatment stuttering rate 7.9 %SS (*N* = 21). At maintenance stage group mean decreased to 0.4 %SS and remained stable at 0.5 %SS at 6 months post-PCMS (*N* = 18) and 0.4 %SS at 12 months maintenance (*N* = 16). 10 participants (56%) achieved mean naturalness score either below or within one NAT scale value of matched control speakers. The mean 4.5 (*SD* =1.9, range 1.3–7.3) and for matched control participants 3.6 (*SD* = 2.1, range 2.0–4.7). The difference between the groups was significant *p* =0 .025 however was less than one naturalness scale value. The reported group mean daily severity rating pre-treatment was 5.4 and post 2.8. Majority of participants indicated that they had control over their stammer for “half” or “more than half the time.” No participant reported control over stuttering all of the time. All but 2	**Comments** See Prins & Ingham 2005 critique of O’Brian et al. 2003 O’Brian et al. (2003) are entitled to conclude that the outcomes of two treatment programs are apparently not affected by the use of several different procedures for establishing and instating PS. But they are not entitled to conclude anything about which of those procedures may or may not be ‘‘necessary.’’ the outcome data are of debatable clinical validity since both programs had more than 40% patient attrition (respectively, 46.6% and 43.7%). See Response O’Brian et al. 2005 We acknowledge that dropouts are a problem, but they are a problem in all clinical trials. Further, the longer the follow-up period, the more everyday life events such as family relocation preclude the collection of these data. What we must do in clinical trials is attempt to explain attrition, so that

			participants scored the difficulty in learning PS on the midpoint of the scale or as easier than that. However, 7 responded with the “difficult” half of the scale when indicating how difficult it was to use PS outside the clinic, and 10 reported the use of PS as moderately to very uncomfortable in settings beyond the clinic.	we can at least estimate the proportion of non-responders—as opposed to non-compliers. We did this meticulously in the Camperdown report. We documented the apparent reason for every participant’s departure, and it is clear that in the majority of cases, attrition was the result of ordinary and extraordinary life events, rather than difficulties with the program. See Ingham et al. 2012 The design of the recent studies of the Camperdown Program confounds the effects of maintenance strategies and treatment outcome evaluation, thereby obscuring their contribution toward resolving the problem of maintenance. Response O’Brian et al. 2012 When a treatment program has a performance-contingent maintenance schedule, as the Camperdown Program has, participants vary greatly in the time taken to complete this schedule-up to 2 years or more, in some cases. We reject Dr. Ingham's position that outcomes be measured a

				year after individual participants conclude their maintenance for the very reasons he has argued many times in the literature. Conclusion: We will continue to measure the outcomes of our clinical trials after a clinically meaningful period and at the same time for all participants.
O'Brian et al. 2008 **Country:** Australia **Study design:** Before and after **Data collection method:** Telephone recorded speech sample **Aim:** To evaluate tele-health delivery of an intervention **Detail of participants (number, any reported demographics):** N=10 8 M & 2 F age 22–48 years (mean = 34 years). Six had attended speech restructuring treatment programs as adults 5–25 years previously (mean15 years previously), 1 had received a few sessions of speech-restructuring treatment as an adult, 2 had received minimal treatment as children, 1 had never received treatment. Pre-treatment stuttering severity ranged from very mild (2.4%SS to moderately severe (10.8 %SS). Mean stuttering rate pre-treatment for the group was 6.9 %SS.	**Methods:** Tele-health adaptation of the Camperdown Program. Phases of: teaching PS and self-evaluation scales; Instatement of natural-sounding stutter-free speech; generalization of stutter-free speech; maintenance of treatment gains via telephone contact **Number of hours:** "As little clinician contact as possible with telephone consultations if and when required" Average 8 contact hours. **Delivered by who?** Clinician **Control:** None **Length of follow up:** 6 months **Response and/or attrition rate:** None	**Outcome measures:** %SS SPM Self-reported stuttering severity Speech naturalness	**Main results:** Mean 82% reduction in stuttering frequency from baseline to immediate FU and 74% reduction at 6 months. Significant individual variation in response. 7 of the 10 participants achieved greater than an 80% reduction in stuttering, but some individuals had a 33% reduction in stuttering. At 6-month FU only 4 retained greater than 80% reduction in %SS, 3 of these had previously completed an intensive PS program, whereas the final one had received no prior treatment. All participants increased speech rate group mean increased from 184 SPM to 228 SPM. It remained fairly stable at the 6-month post-treatment assessment occasion (224 SPM). Before commencing treatment, 9 of the 10 participants reported situations in which their worst stuttering SR was 7–9 on the 9-point scale (1 = no stuttering, 9 = extremely severe stuttering). However, immediately after	**Limitations/comments**

			treatment, 4 of these 9 reported a worst SR of 4, 4 reported a worst SR of 3, and 1 reported a worst SR of 2. Those scores had reportedly decreased still further for 8 of the participants 6 months later.	
O'Brian et al. 2013 **Country**: Australia **Study design**: Before and after **Data collection method**: Taperecorded speech sample during clinic visit, parent rating of severity, parent collected tape recording **Aim:** To investigate efficacy of the program in a community setting and factors associated with outcomes **Detail of participants (number, any reported demographics)**: N=57 children, 50 M & 7 F age range 2:7 to 6:4 (mean 4:5).	**Methods:** Lidcombe Program **Number of hours:** Median number visits 11 over median 24 weeks **Delivered by who?** SLPs **Control:** None **Length of follow up**: 9 months **Response and/or attrition rate:** 12 had withdrawn from treatment at 9 months (although supplied data).	**Outcome measures:** %SS Parent reported severity rating	**Main results:** 37 (64.9%) of children had completed stage 1 of the program by 9 months. For all 57 children at 9 months mean %SS was 1.7 (large range 0.1-13 SD 2.1), 47% had %SS of less than 1%. Baseline mean 5.2 stuttering severity (scale 1-10). At 9 months mean 2.1. Issues with clinician adherence to recommended program – 49% more likely to schedule 30 rather than 45-60 minute sessions and mean 15.4 days between visits rather than weekly. Pre-treatment stuttering severity associated with longer time to complete stage 1 (p<0.001).	**Limitations/comments**

			SLPs who had received training in the program associated with larger number of clinic visits (76% more) to complete stage 1 (p<0.001). Training associated with 54% lower stuttering levels (p<0.0003) than untrained clinicians.	
O'Donnell et al. 2008 **Country:** Canada **Study design:** Before and after **Data collection method:** Telephone recorded speech sample **Aim:** To evaluate SpeechEasy including consistency of effect **Detail of participants (number, any reported demographics):** N=7 Five had participated in a previous study on the efficacy of the device. 5 M & 2 F age 24 to 53 years (mean 36.0 years). Two participants were enrolled in therapy and another attended a self-help group for people who stutter for a portion of the study, all had received therapy in the past.	**Methods:** Participants were each fitted with a programmable SpeechEasy in-the-canal (ITC) device **Number of hours:** Participants varied with respect to average hours of daily use, ranging from 2 h for Participant 3 to 15 h for Participant 2. Participants 6 and 7 also reported large amounts of daily wearing time at 5.2 and 11.6 h of use, respectively. The remaining participants did not record hours of use in their logbooks, although they verbally reported that they wore the device on a daily basis. **Delivered by who?** Device **Control: None** **Length of follow up:** 16 weeks **Response and/or attrition rate:** All but one participant experienced interruptions during the intervention, 2 terminated early.	**Outcome measures:** PSI Self rated severity Erickson scale of communication attitudes Views of the device and frequency of use	**Main results:** All participants exhibited less stuttering with the device than without at the beginning of the study, with a group mean reduction in stuttering of 87%. However at the end of the study four experienced a reduction in stuttering when wearing the device, however three exhibited more stuttering with the device than without in the laboratory. In a home setting five exhibited some instances of reduced stuttering when wearing the device and three of these exhibited relatively stable amounts of stuttering reduction during long-term use. Five participants reported a reduction in stuttering frequency while using SpeechEasy, and found SpeechEasy easy to use, and that SpeechEasy did not interfere with their ability to speak. Two participants reported that SpeechEasy was not beneficial. All but one participant reported that the physical sensation of wearing	**Limitations/comments** Most data reported by individual participant, much of paper evaluates in-laboratory assessment

			the device did not interfere with their ability to speak. The majority of participants in the current study indicated that using the device was easy and effortless. Five reported that they felt that the benefits of the device outweighed its costs and would be interested in acquiring a device of their own.	
Onslow et al, 1994 **Country:** Australia **Study design:** Controlled before and after. Drawn from waiting list at two clinics, allocated to intervention or control arms at clinic level. **Data collection method:** Conversation during clinic visits, parental severity rating, tape recorded speech sample **Aim:** To evaluate an intervention **Detail of participants (number, any reported demographics):** N=11 controls mean age 3:7 years 4 M & 7 F. N=12 intervention group mean age 3:7, 8 M & 4 F.	**Methods:** The operant program – parental verbal contingencies, positive input and prompting for target responses. In clinic sessions and home practice. Maintenance programme over 92 weeks based on needing to continually meet speech performance targets. **Number of hours:** Median 10.5 one hour clinic sessions, median 84.5 days from start of intervention to maintenance programme, 10-15 min sessions at home carried out regularly. **Delivered by who?** Clinician (1st author) **Control:** Children on a comparator clinic's waiting list (majority withdrew and asked for treatment to begin) **Length of follow up:** 12 months **Response and/or attrition rate:** 22 controls recruited, 7 did not comply with assessment requirements, one relocated, 3 withdrew consent. 18 recruited intervention group, 5 treatment not completed.	**Outcome measures:** %SS SPM Parent views	**Main results:** Parent survey returned by only 5 and sent to only 3 controls therefore data not extracted. Poor reliability for rating of SPM, data only for 4 reported and therefore not extracted. All children in intervention group showed decrease in %SS to less than or equal to 1% and an average severity rating of 2.0 and therefore progressed to the maintenance phase. Eight moved through this programme without any failures, two were lost to follow up during maintenance, one failed to meet criteria at third assessment and one at fifth assessment. Data reported by individual as figures only.	**Limitations/comments** Erratum – some figures in one table amended

Onslow et al. 1990 **Country:** Australia **Study design: Before and after** **Data collection method:** Audio recording in clinic and at home **Aim:** **Detail of participants (number, any reported demographics):** N=4 age 3 years 2 months to 5 years 3 months.	**Method:** Parent-administered verbal stimulation. Parent and child seated together and engaged in conversational speaking task, with stutter-free utterances rewarded with praise. Stuttered utterances noted by parents and request for repetition. During clinic sessions clinician trained parents in techniques. At conclusion of treatment placed on maintenance program based on maintaining performance criteria. **Hours:** Sessions conducted at home regularly for 10 minute periods. Clinic sessions 5-7 ranging from 30-80 minutes **Delivered by:** Clinician/parent **Control:** None **Length of follow up:** Up to 9 months **Response and/or attrition rate:** None	**Outcome measures:** %SS SPM Stuttering per minute of speaking time Syllables spoken 10 point scale of severity 10 most severe, 1 least severe Speech naturalness	**Main results:** Data reported for each participant individually and in graph form only. %SS in general data show reduced stuttering with improvement maintained over 9 month period. All showed an increase in syllable output during the post-treatment period. All parents reported no stuttering post-treatment (although clinician ratings were of a small number of stutterings). Clinician ratings of naturalness varied however there was no increase in perceived unnaturalness.	**Limitations/comments**

Onslow et al. 1992 **Country:** Australia **Study design:** 2 studies before and after (controls not stutters) **Data collection method:** Recorded speech samples during conversation and monologue **Aim:** To compare speech naturalness of treated stutterers vs nonstutters **Detail of participants (number, any reported demographics):** Study 1 N=14, all male, 7 stutterers and 7 who did not stutter. Age range 13-36 years. Study 2 N=36 in same treatment programme age range 9-50 years, mean age 21, 33 M & 3 F.	**Methods:** Clients in prolonged speech residential program. Consisted of establishment phase shaping prolonged speech into normal sounding speech followed by self-evaluation 1 and transfer program with second self evaluation phase and finally maintenance. **Number of hours:** 2 weeks residential phase, weekly visits transfer phase, 126 week maintenance program. **Delivered by who?** Clincian **Control:** 7 Non stutterers matched for age **Length of follow up:** 2 weeks after residential phase **Response and/or attrition rate:** None	**Outcome measures:** Speech naturalness scale %SS SPM	**Main results:** Mean naturalness score for treated stutterers was 5.49 (SD 1.01) and non stutterers 3.25 (SD 0.77). The scores significantly differentiated the two groups ($p<0.001$). Two weeks after residential naturalness scores were little changed. Pre-treatment %SS and SPM scores showed low but significant correlations with post treatment naturalness scores (0.38 %SS and -0.44 SPM). More severe stuttering pre-intervention = worse speech naturalness post.	**Limitations/comments** See erratum
Onslow et al. 1996 **Country:** Australia **Study design:** Before and after **Data collection method:** Audio taped speech sample, covert telephone sample (posing as hospital PR staff) **Aim:** To evaluate a prolonged speech programme	**Methods:** Residential and non residential components. Residential phase client learns prolonged speech at increasing rates of SPM with criteria of speech naturalness required in order to progress to increased rate. Followed by transfer phase	**Outcome measures:** %SS SPM Speech naturalness	**Main results:** Those who withdrew after residential did not differ in terms of %SS one week post-treatment from those who completed second self-evaluation phase.	 **Limitations/comments**

Detail of participants (number, any reported demographics): N=18, of these 12 completed the entire programme (7 to 3 year FU). All had history of previous treatment with short term partial benefit followed by complete relapse. Mean age 21 years (SD 8.4 range 10.7-41.6) 15 M & 3 F.	using techniques outside setting and self-evaluation I phase. After approx 2 weeks of residential second phase of self-evaluation with weekly clinic visits. Final maintenance phase 126 weeks of speaking tasks, recording and clinic visits. None attended a self-help group during study period. None attended booster or refresher courses during period of study. **Number of hours:** During residential clients live in treatment setting 24 hours 7 days a week usually 2 weeks. Self evaluation phase II usually weekly for 12 weeks. Maintenance 126 weeks. **Delivered by who?** Clinicians **Control: None** **Length of follow up:** Up to 3 years **Response and/or attrition rate:** 32 recruited, 6 failed to learn the technique satisfactorily, 8 declined to regularly attend and make recordings. 18 completed intensive phase. Data collected for 7 up to 3 years.		%SS scores generally at or near zero for 9 of the 12 clients, the other 3 scored above 1%. No reduction in SPM, indeed participants increased SPM during post treatment phase. All achieved post treatment naturalness scores in the range of 2-4 (non-stuttering speakers) Majority (8) did not show a regression in %SS or naturalness during post-treatment period	
Onslow et al. 2002 **Country:** Australia **Study design:** Cross sectional **Data collection method:** Audio recorded speech samples, conversation in clinic and at home **Aim:** To examine any acoustic changes associated with completing the programme **Detail of participants (number, any reported demographics):** N=8 males who completed a Lidcombe program	**Methods:** Lidcombe program **Number of hours:** Not reported in this paper **Delivered by who?** Not reported in this paper **Control:** None **Length of follow up:** Immediate **Response and/or attrition rate:** None	**Outcome measures:** %SS Mean length of utterance Articulation rate Spectogram acoustic	**Main results:** No significant changes in any measures were detected after treatment. The reduction in stuttering achieved following the programme are not due to change in speech timing.	**Limitations/comments**

		analysis of speech timing measures (including inter-vocalic interval, vowel duration, voice onset time)		
Pape-Neumann 2004 **Country:** Germany **Study design:** Before and after **Data collection method:** Questionnaires and speech samples directly before treatment, 4 to 6 weeks after end of treatment, 1 year and 2 years after treatment **Aim:** To evaluate stammering intervention on a longitudinal basis **Detail of participants (number, any reported demographics):** 100 participants were first selected. No inclusion or exclusion criteria was chosen, just a stammer needed to be obvious (and participant in therapy with any speech and language therapist)	**Methods:** No specific methods: different external speech and language therapist took part with their patients, the study focused on evaluation of any therapy approach (included were single, group and intensive intervention programmes) **Number of hours:** Variable, depended on the therapy program the individual speech and language therapist chose **Delivered by who?** Speech and language therapists **Control: None** **Length of follow up:** 1 year and 2 years **Response and/or attrition rate:** From 100 participants results from 82 were analysed, as the other participants did not finish their intervention up to the second measurement point	**Outcome measures:** Avoidance of communication Attitude towards communication Self-judgement of stammering in social situations Impact on all day life Speech samples for quantitative data about stammer symptomatic (including stammer frequency, naturalness of speech, speech rate)	**Main results:** Children: Effect sizes for speech samples for quantitative data about stammer symptomatic were calculated: stammer frequency = 0.63, naturalness of speech = 0.60, speech rate = 0.37. Additionally, effect sizes for avoidance of communication, attitude towards communication, self-judgement of stammering in social situations, and impact on all day life were 1.70 (one value for all effect sizes!) Adolescents and adults: Effect sizes for speech samples for quantitative data about stammer symptomatic were calculated: stammer frequency = 0.77, naturalness of speech = 0.44, speech rate = 0.35. Additionally, effect sizes for avoidance of communication (1.84), attitude towards communication (2.26), self-judgement of stammering in social situations (2.15), and impact on all day (2.46). In general, improvement could be observed in all measured	**Limitations/comments**

			outcomes. A t-test result showed for every outcome a significant positive improvement from p<0.1 or smaller.	
Pollard et al. 2009 **Country**: US **Study design**: Before and after **Data collection method**: Video and audio recorded speech samples, questionnaire, diary **Aim**: To evaluate SpeechEasy in a natural setting **Detail of participants** (number, any reported demographics): N=11, 6 M& 6 F age 18 to 62 years (mean = 34.2). All had received treatment in the past, one attended a stuttering support group during the study period.	**Methods**: SpeechEasy In-the-Canal units. Includes instructing the wearer to attend to the second speech signal and teaching several active techniques to alter one's speech pattern, such as easy vocal onsets, prolongations, continuous phonation. DAF delay settings around 50–60 ms were suggested however final settings were participant preference. **Number of hours:** Suggested 5 hours per day. Average wear time 5 hours. Range from none (one participant) to 10.4 hours per day. 9 week treatment phase with bi-weekly visits for recording speech. **Delivered by?** Device **Control**: None **Length of follow up**: 4 months **Response and/or attrition rate**: None	Outcome measures: SSI %SS OASES PSI Logs of usage Participant views	Main results: Data for 9 included in analysis. A statistically significant effect of SpeechEasy immediately post-fitting compared to baseline (PSI scores t(16) = 3.13, p = 0.014). Effect not maintained at FU. No other pre-post assessments reached significance (p >0 .05 for SSI & OASES). Large individual variation in response. Most commonly reported "likes" were increased confidence in speaking (n = 6) and improvement in fluency (n = 6). Most commonly reported "dislikes" of were irritating background noise (n = 8) and being unable to hear/understand one's self and/or others (n = 5). Most common situations in which the device was reported to be helpful were using the telephone (n = 9) and speaking with strangers (n = 5). At end of study 4 purchased the device, 6 reported they would use it if provided free of charge but would not purchase, one could not be	**Limitations/comments** See Saltuklaroglu et al. 2010 Critique of Pollard et al. 2009 The study is criticised on the grounds that the study failed to maintain participant adherence to the treatment protocol of device usage; they utilized an inadequate question-asking task; and their conclusion of no significant treatment effect that is drawn from their inferential statistical analyses of group data only, and positive subjective findings. **Pollard et al. 2010** Responds to criticism of Pollard et al. 2009 by Saltuklaroglu et al. 2010 Reiterates that all results failed to reach significance for any speech task p>0.05. Highlights the discrepancy between

			contacted for response.	fluency counts and subjective impressions with 60% mentioning increased confidence as a benefit of using the device. Evidence of some immediate group effect of SpeakEasy in 2 studies conducted by the manufacturer but not in extra-clinical settings.
Ratynska et al. 2012 **Country:** Poland **Study design:** Cross sectional **Data collection method:** Assessment during reading and monologue/dialogue **Aim**: To evaluate the Digital Speech Aid **Detail of participants (number, any reported demographics):** N=335 aged 6-64 average age 17.9 years, 268 M & 67 F. All had received intervention however found them to be ineffective or insufficiently effective.	**Methods:** Digital Speech Aid incorporating DAF and FAF. **Number of hours:** Aid fitted by a clinician with trial at different settings over a 3 day period of hospitalisation **Delivered by who?** Device **Control:** None **Length of follow up:** Immediate **Response and/or attrition rate:** None	**Outcome measures:** Speech fluency with and without the aid Kurkowski Syllabic Test (number of disfluent syllables in 100)	**Main results:** Fluency in all speaking situations improved with the DSA ($p<0.005$). The odds ratio of disfluency during reading without versus with was 3.39. Immediate fluency in 82.1% of participants. In dialogue the odds ratio of disfluency without versus with was 3.19. Immediate fluency improvement in 84.5%. In monologue the odds ratio of disfluency without versus with was 2.69. Immediate improvement in 81.2%. 17.9% of the group exhibited no change or deterioration in fluency during reading.	**Limitations/comments**
Reddy et al. 2010 **Country:** India **Study design:** Before and after **Data collection method:** Assessment scales **Aim:** To evaluate CBT intervention **Detail of participants (number, any reported demographics):** N=5 All male aged 16-30.	**Methods:** Phase 1 8 sesions CBT training in relaxation techniques (mindfulness meditation, deep breathing) and speech techniques such as humming and prolongation. Phase 2 techniques including cognitive restructuring, problem solving and assertiveness. Sessions flexible according to client need. **Number of hours:** 22/23 sessions	**Outcome measures:** SSI PSI Becks Anxiety Inventory Dysfunctional	**Main results:** Clinically significant change (50% and above). Improvement on SSI between pre and post assessment for 3 patients, no change at mid intervention point. Clinically significant reduction of struggle avoidance, expectancy in 1 case. Clinically significant reduction	**Limitations/comments** Little data provided, general description of findings only

	over 4-6 weeks, 16-18 of these were intervention and the rest used for assessment. Each session 60 minutes. **Delivered by who?** Not reported **Control:** None **Length of follow up:** Immediate post intervention only **Response and/or attrition rate:** None	Attitude Scale Fear of Negative Evaluation Assertiveness Scale Rosenberg's Self-Esteem Scale WHO Quality of Life Scale	in anxiety seen in all cases. Self esteem 2 clients showed clinically significant improvement.	
Riley & Ingham 2000 **Country**: US **Study design**: Before and after **Data collection method**: Oral motor assessment scale recording of repeated syllable sets **Aim**: To examine speech motor changes following intervention **Detail of participants** (number, any reported demographics): N=12 intervention + 9 in reference group. Aged 3:8 to 8:4 years (mean 6:2 in SMT group, 5:9 in ELU group) 14 M & 7 F.	**Methods:** Speech Motor Training, and Extended Length of Utterance treatment **Number of hours**: 24 sessions of SMT , 24 sessions of ELU **Delivered by who?** Clinician **Control**: Two treatment arms, 9 children with no stutter formed "reference group" but baseline data only. **Length of follow up**: 8 weeks **Response and/or attrition rate**: None	Outcome measures: Measures of speech motor performance – vowel duration, stop gap duration, voice onset time, stop gap/vowel duration ratio, total token duration %SS	Main results: Following SMT increase in vowel duration (by 44ms) and some reduction in stop gap duration (but not significant). Significantly reduced vowel duration/stop gap ratios (by 50%). Median decrease in %SS following SMT intervention was 3.19 (a 36.5% reduction $p<0.05$). One child increased. ELU treatment had no effect on acoustic measures pre-post . Median decrease in %SS following ELU intervention was 2.36 (a 63.5% reduction $p<0.04$). Difference between SMT and ELU intervention significant ($p=0.04$). At baseline children who stutter not different from normal matched controls on acoustic measures.	**Limitations/comments**

Rosenberger 2007 **Country:** Germany **Study design:** Before and after **Data collection method:** 4 assessment points: pre-treatment (T1); post-treatment (T2); 2 months follow-up (T3); 9 months follow-up (T4) **Aim:** To analyse the effectiveness of a intensive stammering therapy program for children and adolescents who stammer **Detail of participants (number, any reported demographics):** 2 groups: Group A: 19 participants (14 male, 5 female, mean age 14,5 years); Group B: 15 participants (10 male, 5 female, mean age 13 years)	**Methods:** Stuttering modification therapy method (van Riper) amending awareness tasks in larger and smaller therapy groups; social interaction and activities **Number of hours:** 3 weeks intensive stammer therapy, 1 weekend of follow-up treatment after 2 months; 1 weekend of follow-up treatment after 9 months **Delivered by who?** 3 experienced stammering therapists, some internship candidates from speech and language therapy and to carer (for social activities) **Control:** None **Length of follow up:** 2 months and 9 months **Response and/or attrition rate:** Drop outs in group B: for T3 and T4 data from just 10 participants could be taken	**Outcome measures:** Stammering severity including stammer rate and stammer symptoms Assessment of child`s experience of stammering	**Main results:** Significantly reduced stammer rate and reduced anxiety of children when they stammer following intervention. Group A: 10 of 19 participants showed distinct reduction of stammering between T1 and T2 and 9 of 19 between T1 and T4. 18 of 19 participants show reduced anxiety considering experience with stammering Group B: 8 0f 11 participants show a reduced stammer rate between T1 and T2, 1 participants showed reduced stammer rate between T1 and T3 Comparison for group A and group B: significant improvement of scores considering reduction of stammer rate (p<0,001) for T1, T2, and T3 Additionally, significant reduction of anxiety measured via the child`s experience test (p<0,001) for group A for T1, T2, T3, and T4 and (p<0,025) for group B	**Limitations/comments**

Rousseau et al. 2007 **Country**: Australia **Study design**: Before and after **Data collection method**: Language assessments, recorded speech samples **Aim**: To examine factors associated with response to treatment **Detail of participants** (number, any reported demographics): N=29 completed programme, 21 M & 8 F. 3 had received previous therapy	**Methods**: Lidcombe Program **Number of hours**: Once weekly session. Stage 1 completed in a median of 16 clinic visits (mean 18), and in a median of 27 weeks (mean 24). 90% completed Stage 1 within 31 visits. **Delivered by who**? SLP (1st author) and parents **Control**: None **Length of follow up**: 24 months **Response and/or attrition rate**: 34 enrolled	**Outcome measures**: Time taken to complete stage 1 of the program. CELF Peabody Picture Vocabulary Test Assessment of Phonological Processes MLU %SS	**Main results:** Phonological development does not predict treatment time. Stuttering severity, MLU and CELF Receptive Score predict 35–45% of the variance for time taken to complete stage 1 of the program. For each 10 unit increase in CELF Receptive Score, the number of clinic visits to complete Stage 1 is estimated to increase by 27% (95% CI: 7–49%) and for each 1 unit increase in MLU, the number of clinic visits to complete stage 1 is estimated to decrease by 18% (95% CI: 2–32%). Higher CELF Receptive Scores only a significant factor though when added to stuttering severity Mean baseline 3.0%SS, and mean immediate post-intervention was, with few exceptions, below 1.0%SS. Difference between pre- and post-treatment %SS scores was significant ($p < 0.0001$). At 6 months mean in 3 conditions (home, away from home, clinic) was 1.1, 1.0, 0.8. At 12 months 1.0. 0.8, 0.6, and at 24 months 0.3, 0.3, 0.1. Mean number of syllables spoken 581 at baseline and 715 FU indicating that treatment outcome was not associated with reduced speech output.	**Limitations/comments**
Ryan & Ryan 1995 **Country:** US **Study design:** Before and after **Data collection method:** Recorded speech samples in clinic home and school **Aim:** To compare outcomes from DAF versus	**Methods:** DAF with prolongation program – taught slow prolonged speech aided by DAF equipment built up gradually in terms of reducing auditory feedback. No emphasis on increasing speaking	**Outcome measures:** Stuttered words per minute SW/M	**Main results:** 20 (11 DAF and 9 GILCU) achieved less than 0.5 stuttered words per minute at end of first intervention phase and stared transfer.	**Limitations/comments**

GILCU establishment programs **Detail of participants (number, any reported demographics):** N=24. 20 M & 4 F, age 7-17 (mean 11.8).	rate. GILCU – Gradual increase from one word utterances to 5 minutes of fluent speaking at normal rates. Participants received same transfer and maintenance program after this – increasing audience size, different settings. Maintenance consisted of 3 minutes each of reading, monologue and conversation fluently. **Number of hours:** DAF - minimal time 110 minutes to complete program GILCU – minimal time 105 minutes. Transfer program minimum 115 minutes. Maintenance minimal 36 minutes over 15 week period. Total 7.9 hours establishment and 10.4 hours transfer and maintenance. 11 of the 20 who completed phase 1 successfully achieved it within 9 months. **Delivered by who?** 12 clinicians in 4 sites supervised by authors. **Control**: 2 intervention arms **Length of follow up:** 7 months for 18 and 14 months for 11 **Response and/or attrition rate:** 20 completed the first phase and started transfer program, 11 finished maintenance	Words spoken per minute WS/M These assessed during "Criterion test" and Stuttering interview Views of parents, teachers and clinicians.	11 of 20 finished the transfer and maintenance program. Both programs reduced stuttering rate. DAF from 7.5 SW/M to 0.3 and GILCU 6.0 to 0.4 SW/M. Significant effect pre-post mean of both interventions SW/M (6.6 versus 3.1 p<0.01). Difference (p<0.01) between pre means (7.0 and 6.4) and post GILCU mean (1.5) indicating GILCU had better generalisation. Higher speaking rate for both groups pre versus post. Significant difference in %SS pre-post (p<0.01) for both interventions, with GILCU reducing %SS more than DAF (p<0.05) At mean 7 month follow up those who participated in the maintenance program did better than those who did not (0.3 SW/M versus 2.8). No statistically significant difference between the intervention groups. At 14 month FU 11 children who completed had reduced stuttering from 7.7 SW/M to 0.8. Interview data found 7 of 19 children who completed maintenance program no longer viewed themselves as having a stutter, and reduction in avoidance reported by children (from 74% to 47%) and by parents. All 12 clinicians reported that they planned to use the programmes again.	

Sicotte et al. 2003 **Country:** Canada **Study design:** Before and after **Data collection method:** Recorded speech sample, questionnaires, interviews, observation **Aim:** To evaluate the use of a telemedicine delivered intervention **Detail of participants (number, any reported demographics):** N=6 Age 4-19 at least 5%SS. No further details.	**Methods:** The type of therapy given "consisted of currently accepted and well used procedures documented by various authors" **Number of hours:** 12 x 1hour weekly sessions. Four received an additional eight sessions, to give a total of 20 h of therapy. Maintenance phase, =five x1 hour sessions in week two, four and eight and then at the third and sixth month. **Delivered by who?** SLP via videoconferencing **Control:** None **Length of follow up:** 6 months **Response and/or attrition rate:** None	**Outcome measures:** Attendance Quality of session Patient/carer views %SS	**Main results:** Overall, the telemedicine unit was judged as adequate by the SLP to deliver a satisfactory intervention. Five patients/parents highly satisfied with therapeutic contact, none concerned about treatment at a distance. Stuttering ranged from 13% to 36% across participants before treatment and from 2% to 26% after treatment (mean 52% decrease in the frequency of stuttering). All participants maintained at least part of their improved fluency at the end of follow-up, when stuttering ranged from 4% to 32%. Data reported by individual only.	**Limitations/comments**
Smits-Bandstra & Yovetitch, 2003 **Country**: Canada **Study design**: Before and after **Data collection method**: Video speech sample retelling a story **Aim**: To evaluate an intervention **Detail of participants (number, any reported demographics):** N=3 intervention (all male aged 8/9, 2 severe and 1 mild stutter) and N=2 control (both male aged 11/12 severe and moderate stutter).	**Methods**: Cognitive behavioural therapy focused on the remediation of negative attitudes, thought processes, and avoidance tendencies. Included cognitive techniques (employing self-monitoring, facilitating positive attitudes, desensitization) and Behavioural stuttering therapeutic techniques (blending, easy onsets, cancellations, pull-outs, and preparatory sets). All parents participated in a three-hour group counselling session. Homework assignments were included in the program (e.g., practising and delivering a speech) **Number of hours:** Semi-intensive 3 weeks Monday to Friday from 9:00 a.m. to 12:00 p.m. **Delivered by who?**	**Outcome measures:** % dysfluent speech time Dysfluent words per minute % words stuttered per minute. Culture-Free Self-Esteem Inventory Communication Attitudes Test Revised Parent views	**Main results:** The program was partially effective in the alleviation of both behavioural and attitudinal stuttering symptoms. 90% of the participants however went back into therapy after two months. %improvement in dysfluent time for participants was 79.4, 59.6, 67.5 (intervention children) and 17.6 and -18% (controls). %word stuttered per minute pre-2 month post intervention children - 22.8 to 23.5, 2.8 to 2.3 and 9.5 to 7.4, Control child - 30.5-35.8. Experimental participants displayed improvement or normalized CAT –R scores after treatment. Control	**Limitations/comments**

	Clinician **Control:** Children of families willing to receive intervention but who had transport issues and unable to attend **Length of follow up:** 2 months **Response and/or attrition rate:** One participant lost at one month FU		participants' scores worsened or remained highly negative. Both experimental participants and control participants self-esteem scores fell well within the expected range for children of their age.	
Stewart 96 **Country:** UK **Study design:** Before and after **Data collection method:** Recorded speech sample **Aim:** To explore factors underpinning the long term maintenance of fluent speech **Detail of participants (number, any reported demographics):** N=12 11 M & 1 F age 18-38 mean 26.1 years (SD 7.5). All but one had received previous intervention (6 immediately prior) none had received group intervention.	**Method:** Group intervention including phases of attitude change sessions which aimed to develop self-awareness, positive aspects of self, identification of aspects of fluency important for individuals, exploration of issues relating to generalisation and maintenance. Also, technique sessions which taught prolongation, rate control, pausing, regular breathing, flow, light contacts and easy onset. Final phase of transfer and maintenance to establish techniques at acceptable speaking rate and in spontaneous utterances, transfer into non clinical situations, and further examination of issues relating to relapse/non-use. **Hours:** Weekly sessions of 2 hours for six months then fortnightly for up to 12 months. After 12 months option of maintenance sessions (50% attended regularly) **Delivered by:** 2 therapists one the author, second specialist SLT **Control:** None **Length of follow up:** 2 years **Response and/or attrition rate:** 12 of 15 approached recruited. 2	**Outcome measures:** Words spoken per minute (WSM) %words stammered Stammered words per minute (SWM) SSI S24 assessment of communication attitudes Attitude and intention assessment	**Main results:** Assessed following attitude change sessions, and again following the technique phase, third assessment one year post initial assessment and final assessment 2 years after initial assessment. Monologue Baseline WSM group mean 83.6 (SD 69.09) . After attitude change sessions WSW group mean 91.1 (SD 51.68). After 1 year WSW group mean 92.75 (SD 30.86). After 2 year group mean 103.5 (SD 33.67). Baseline SWM group mean 15.2 (SD 8.76). After attitude change sessions SWM group mean12.8 (SD 6.18). After 1 year group mean 5.7 (SD 5.28). After 2 year group mean 3.7 (SD 3.86). Baseline %words stammered 30.6 (SD 28.28). After attitude change sessions % words stammered group mean 30.7 (SD 34.5). After 1 year group mean 12.6 (SD 25.78). After 2 year group mean 19.7 (SD 18.9). Conversation	**Limitations/comments**

	lost to follow up at 2 year reassessment		Baseline WSM mean 100.8 (SD 55.91) After attitude change sessions WSW group mean 91.3 (SD 46.38). After 1 year group mean 105.8 (SD 39.89). After 2 year group mean 107.2 (SD 40.2). Baseline SWM group mean 16.6 (SD 8.6). After attitude change sessions SWM group mean 14.1 (SD 10.41). After 1 year group mean 7.0 (SD 6.85). After 2 year group mean 10.5 (SD 8.37). Baseline %words stammered 23.4 (SD 16.78). After attitude change sessions %words stammered group mean 25.6 (SD 27.02). After 1 year group mean 12.2 (SD 20.43). After 2 year group mean 19.7 (SD 18.9) SSI baseline range mild to very severe, after phase one range very mild to very severe, after technique phase all but 3 in very mild to mild/moderate, after 1 year all but 3 scored in very mild to mild-moderate, after 2 years severity ranged very mild to very severe six scored in very mild to mild range. S24 baseline mean 18.5 (SD 5.2), after phase one mean 17 (SD 4.6 ns diff baseline), after technique phase mean 16.8 (SD 5.9) significant change from baseline $p<0.02$, after 1 year group mean 14.2 (SD 6.6 significant change from baseline $p<0.05$), after 2 years group mean 13.2 (SD 7.5 significant change from baseline $p<0.05$). Attitude to own speech baseline	

			mean 1.67 (SD 0.85), after phase one mean 1.6 (SD 0.9), after technique phase mean 1.7 (SD 0.78 ns), after 1 year mean 1.8 9 (SD 1.32 ns), after 2 years mean 1.6 (SD 0.94 ns) Attitude to technique speech baseline mean 1.98 (SD 0.91), mean 2.6 (SD 0.9), after phase one mean 1.7 (SD 0.9), after technique phase mean 3.4 (SD 1.51 significant change from baseline p<0.02), at 1 year mean 3.7 (SD 1.32 significant change from baseline p<0.01), at 2 years mean 3.2 (SD 1.3 significant change from baseline p<0.05). Intention to use technique speech baseline mean 2.18 (1.12), after phase one mean 2.1 (SD 1.04), after technique phase mean 3.44 (SD 1.36 significant change from baseline p<0.05), at 1 year mean 3.48 (SD 0.9 significant change from baseline p<0.01), at 2 years mean 2.98 (SD 1.2 significant change from baseline p<0.05). Intention to use own speech baseline mean 2.83 (SD 1.09), after phase one mean 2.6 (SD 0.9), after technique phase mean 1.8 (SD 0.88 significant change from baseline p<0.05), after 1 year mean 1.95 (SD 1.04 significant difference from baselinep<0.05), after 2 years mean 2.16 (SD 1.3 ns). Attitude change sessions did not seem to result in significant changes, the technique sessions in	

			contrast resulted in significant changes. During transfer and maintenance group maintained speech gains however small number of participants had poor maintenance. Change apparent in most of the attitude measures following technique sessions.	
Stidham 2006 **Country:** USA **Study design:** Before and after **Data collection method:** Recorded speech sample **Aim:** evaluate the effects of a prototype device using a modification of a currently used bone conduction hearing device with delayed auditory feedback on adult patients with significant stuttering problems. **Detail of participants (number, any reported demographics):** N=10 8 M & 2 F. Average age 38 years, range 18-58 years.	**Method:** Bone conduction device on a headband with temporal feedback delayed according to patient preference between 5 and 130 msec. Patients were allowed to choose their own DAF setting based on the naturalness of their speech and comfort at the initial fitting. **Hours:** Patients were asked to wear the device at least 4 hours per day for 4 weeks. **Delivered by**? Device **Control:** None **Length of follow up:** Stuttering Severity Index-3 (SSI-3) tests were completed at prefit, immediate postfit, and at 2-week, 4-week, and 6-week intervals. **Response and/or attrition rate:** Nine patients completed the study.	**Outcome measures:** SSI	**Main results:** A statistically significant decline in SSI-3 scores was documented from pre-fit compared with immediate post-fit and 4 weeks follow up (P < 0.001) using the Tukey test method. Before fitting, 78% (seven) of patients scored as very severe/severe and 22% (two) were moderate with 0% of patients scoring mild/very mild. At the immediate post-fitting scoring, 22% (two) were very severe/severe, 11% (one) was moderate, and now 67% (six) scored as mild/very mild. Statistical significance was approached but not reached at 2 weeks. At 2 weeks, 33% (three) were very severe/severe, 44% (four) were moderate, and 33% (three) were mild/very mild. At 4 weeks, 33% (three) scored very severe/severe, 11% (one) scored moderate, and 56% (five) scored mild/very mild. There was no significant difference between prefit and the 6-week follow up when patients had returned the device. At the 6-week scoring, 33% (three) of patients tested as very severe/severe, 56%	**Limitations/comments**

			(five) were moderate, and 11% tested (one) mild/very mild. Patients subjectively noted improvement in their speech and confidence using the device.	
Stuart 2004 **Country:** US **Study design:** Before and after **Data collection method:** Video-recorded speech samples. **Aim:** To examine the first therapeutic application of self-contained ear-level devices on the proportion of stuttered syllables and speech naturalness. **Detail of participants (number, any reported demographics):** *Experiment 1:* N=7 6 M & 1 F 5 adults; 2 adolescents Mean age = 21.9 (SD 7.3). All presented with stuttering at ≥ 5% SS in either reading or monologue. All reported a history of therapy though none currently. *Experiment 2:* N=8 4 adults (Mean age 38.0 years SD 15.9) & 4 youths (Mean age 12.5 years SD 2.6). None had been enrolled in experiment 1. *Experiment 3:* N=15 Undergraduate students Mean age =23.1 years, (SD 4.0) 11 females 4 males	**Method:** A self-contained in-the-ear AAF prosthetic fluency device was used. FAF was set at 500 Hz up and combined with a DAF setting of 60 ms. *Experiment 1*: Each participant read different 300-syllable passages. Participants also produced 300 syllables of monologue speech. Both speech tasks were produced with and without a device. Reading and monologue conditions were counter balanced. *Experiment 2:* Apparatus were the same as that in Experiment 1 with one exception: personal ear-level devices were constructed in either ITC or CIC custom-made shell designs. *Experiment 3:* Twelve speech samples were extracted from the video recordings of each participant in Experiment 2. The listeners rated each track for naturalness in which ‘1’ was ‘highly natural’ and ‘9’ was ‘highly unnatural’. A 5-min rest was provided at the end of 48	**Outcome measures:** Number of stuttered syllables Rating of speech naturalness	**Main results:** *Experiment 1:* A statistically significant main effect of device was found [F (1,6)~13.2, Huynh–Felt p~0.011, g2~0.69]. The proportion of stuttered syllables was reduced by approximately 90% during reading and 67% during monologue. *Experiment 2:* A significant main effect of device was found (p=0.0028). All other main effects and interactions were not significant (p<0.05). The proportion of stuttering events was significantly reduced with the device in place regardless of speech task or group and remained so after 4 months of time. Collapsed across speech task, time, and group an approximately 81% reduction in the proportion of stuttered syllables occurred with the device in place compared with not in place. Although participants in experiments 1 and 2 displayed significant reductions in stuttering	**Limitations/comments**

	tracks. Hours: Every participant returned to the clinic, either once or twice for a follow-up session. These sessions typically lasted for approximately 30 to 45 min. At 4 months post-fitting (±1 week), participants returned to the clinic for follow-up testing as before. **Control:** None **Length of follow up:** 4 months **Response and/or attrition rate:** None		not all individuals responded favourably or at all to AAF. *Experiment 3:* Mean naturalness ratings of speech samples generated with the device were judged to be more natural sounding than those without the device (p<0.0001). There was no significant difference between the mean naturalness ratings of speech samples generated during the initial fitting with the device relative to that at 4 months with the device (p<0.05) in all cases except with the youths while engaged in monologue. For that condition, raters judged the speech produced at the initial fitting as more natural. Mean naturalness - Youth monologue Device versus no device p= 0<.0001 Initial visit with device versus 4 months with device p =0.012 Adult monologue Device versus no device p <0.0001 Initial visit with device versus 4 months with device p= 0.072 ns	

Stuart 2006 **Country:** USA **Study design:** Before and after **Data collection method:** Recorded speech samples **Aim:** To measure the effect of a self-contained ear-level device delivering altered auditory feedback (AAF) at 12 months FU **Detail of participants (number, any reported demographics):** Nine individuals with developmental stuttering participated. N=9 Five participants were adults (mean age 41.4 years, SD 14.7) and four were youths (mean age 13.5 years, SD 2.6).	**Method:** In Experiment 1, the proportion of stuttering was examined during reading and monologue. A self-report inventory inquiring about behaviour related to struggle, avoidance and expectancy associated with stuttering was examined in Experiment 2. In Experiment 3, native listeners rated the speech naturalness of speech produced by the participants during reading and monologue. **Control:** None **Length of follow up:** 12 months **Response and/or attrition rate**: None	**Outcome measures:** Proportion of stuttering events. Self-reported perceptions of stutter Speech naturalness	**Main results:** The proportions of stuttering events were significantly (p<0.05) reduced at initial fitting and remained so 12 months post follow-up. After using the device for 12 months, self-reported perception of struggle, avoidance and expectancy were significantly (p<0.05) reduced relative to pre-fitting. Native listeners rated the speech samples produced by those who stutter while wearing the device significantly more natural sounding than those produced without the device for both reading and monologue (p<0.0001).	**Limitations/comments**
Trajkovski 2011 **Country:** Australia **Study design:** Phase II Clinical trial **Data collection method:** Audio-taped speech samples. **Aim:** To extend evidence on treatment using syllable-timed speech (STS). To determine the percentage of children who would achieve clinically significant reductions of stuttering by using non-programmed STS. **Detail of participants (number, any reported demographics):** N=17 11 M & 6 F..Age range 3 years-5years 9 months (mean 3 years 9 months). No previous stuttering treatment.	**Method:** Westmead programme. STS involves speaking with minimal differentiation of stress between syllables. Each syllable is spoken in time with a rhythmic beat. During STS practise sessions, parents are instructed to occasionally praise the child for using STS. Initially, STS is taught with imitation and closed picture description tasks. Once the child can maintain the STS pattern, open and natural conversation using STS occurs in and around the home. Progression to Stage 1b occurs once the parents and	**Outcome measures:** %SS Treatment time, Speech quality, Parent severity ratings.	**Main results:** For the eight children who progressed to Stage 2, the mean pre-treatment %SS was 6.0 and the mean %SS at Stage 2 entry was 1.3, resulting in a 78.3% reduction in stuttering. At 12-month follow-up, the mean %SS had further reduced to 0.2, which represented a mean stuttering reduction of 96% in beyond-clinic conversations. The effect size was large, at 1.8 for log-transformed data. For the nine children who did not progress to stage 2, the mean pre-treatment %SS was 6.7 and the	**Limitations/comments**

	child are implementing the STS practice correctly and consistently each day. The aim of Stage 2 is to maintain low levels of stuttering while the child and parent attend the clinic less frequently for 1 year. During Stage 2 parents are instructed to gradually withdraw the STS practise sessions, over a period of months. Each day the parent assigns a SR score for average stuttering severity for that day. **Hours:** During Stage 1a, the child and parent attend the clinic once a week for between 30–60 minutes to master the STS technique and to establish a treatment routine Parent and child are instructed to practice STS four-to-six times per day for 5–10 minute intervals in everyday situations. Stage 1b frequency of clinic visits decreases to fortnightly and last 30–45 minutes. **Control:** None **Length of follow up:** 12 months**.** **Response and/or attrition rate:** Nine children (52.9%) withdrew before completing Stage 1. Author's impression is that families tended to withdraw from treatment at the point when low-level stuttering severity had been attained but not stabilised.		mean within-clinic %SS at the last clinic session was 2.6. As a group, for these children stuttering had reduced by a mean of 58.7% at the time of withdrawal. This effect size was large at 0.9 for log transformed data. The eight children who completed the treatment did so with a mean of 12.4 (range=4–17) clinic visits to complete Stage 1, over a mean period of 27 weeks (range=6–40). The mean number of clinical hours taken to complete Stage 1 was 8.0 (range=2.6– 12.8). For the nine children who did not complete the treatment, the mean number of hours in treatment before withdrawal was 8.6 (range=4.0–16.1) over a mean period of 18.7 weeks (range=6–36) and 11.3 clinic visits (range=4–20). Of the 17 participants recruited, 47% achieved and maintained a mean stuttering reduction of 96% for up to 12- months post-entry to Stage 2, with a decrease of stuttering to 0.2 %SS.	

Unger 2012 **Country:** Germany **Study design:** Cross sectional **Data collection method:** Recorded speech samples **Aim:** To examine the immediate effect of DAF and FAF on people who stutter. **Detail of participants (number, any reported demographics):** N=30 adults (18 years and over) All diagnosed with stuttering All had therapy in the past but not AAF. 23 M & 7 F Age range 18-68 years (mean 36.5; SD 15.2).	**Method:** 2. Four experimental conditions: a) No device (no AAF) b) Inactive (DAF/FAF set to 0) Participants under the impression that setting was active. c) Device A (active settings) DAF 50ms delay; FAF upward shift of 250mHz d) Device B (active settings) DAF 50ms delay; downward shift 0.4 octaves **Control:** No device **Length of follow up:** Immediate **Response and/or attrition rate:** None	**Outcome measures:** %SS SPM Frequency of repetitions, prolongations, blocks. SSI	**Main results:** Results show a statistically significant main effect in the occurrence of stuttered syllables between the control (No Device) and active DAF/FAF conditions F(1.76, 51.08) = 4.89, p = .014, η^2_p = .145. Pairwise comparisons between the control and the two With Device conditions show, that stuttering was reduced significantly while using both Device A (p = .000) and Device B (p = .000). *Duration*: There was no significant difference in the average length of moments of stuttering F(2, 58) = .27, p = .762, η^2_p =.009 when speaking while using a device. These results suggest that even though moments of stuttering appeared less often during the With Device conditions, the average lengths of the still occurring disfluencies remained essentially unaltered. *Speech rate*: Results revealed that there was no significant effect in speech rate F(2.08, 60.18) = 1.18, p = .323, η^2_p= .038. This result indicates that the evaluated participant group did not experience a notably slower speech rate while exposed to AAF. This conclusion is strengthened	**Limitations/comments**

			when considering the descriptive statistics, which proof that there was minimal variability in speech rate figures between the control (M = 174.61, SD = 51.93) and With Device conditions (Device A: M = 177.28, SD = 45.03. Device B: M = 176.77, SD = 43.45). Articulatory rate. Results revealed that there was no significant effect in articulatory rate F(2.09, 60.54) = 1.98, p = .145, η^2_p =.064. There were no statistically significant changes in articulatory rate when comparing the control (M = 197.99, SD = 52.13) to the With Device (Device A: M = 191.41, SD = 51.63; Device B: M = 192.88, SD = 47.50) experimental conditions. This indicates that while using an AAF device set to display minimally invasive alterations, fluent speech output is produced at an unaltered speed. *Total repetitions*: There was no significant effect in the frequency of total repetitions among the two With Device conditions F(1.52, 44.11) = .861, p = .402, η^2_p = .029, indicating that the use of a device does not impact the occurrence of repetitions. *Prolongations*: There was also no significant effect in the occurrence of prolongations throughout the No Device, Device A and Device B conditions F(1.75, 50.62) = .645, p = .508, η^2_p = .022. *Total blocks*: There was a significant effect in the occurrence of total blocks among the two With Device conditions F(1.73,	

			50.06) = 9.35, p = .001, η^2_p = .244. Results show that blocks were reduced significantly during both With Device conditions (Device A: p = .017; Device B: p = .049). Based on these results, the AAF devices appeared to decrease the occurrence of blocks during the administered speech samples. However, the frequency of the core behaviors prolongations and repetitions were not affected significantly by the use of a device. *Reading*: Findings suggest that there was a significant effect in the frequency of stuttering during the reading task F(1.86,54.17) = 7.29, p = .002, η^2_p = .201. The participant group experienced a significant reduction in stuttering while using both devices during the scripted speech task (Device A: p = .002; Device B: p = .007). *Monologue:* There was also a significant decrease in disfluencies during the monolog F(2, 58) = 9.64, p = .000, η^2_p= .249. A decline in stuttering was evident during both device conditions (Device A: p = .009; Device B: p = .001). *Dialogue:* The evaluated participant group further appeared to benefit from the device use during the conversational speech task F(2, 58) = 7.63, p = .001, η^2_p = .208. Stuttering was reduced significantly when using both devices (Device A: p = .048; Device B: p = .005).	

			The use of a device significantly lowered disfluencies during all administered speech samples. However, reductions in %SS varied between speech tasks; reading: M = 2.33, SD = 3.75; monolog: M = 2.26, SD = 3.32; dialog: M = 1.49, SD = 2.71. Although, participants appeared to benefit from the use of a device during scripted and spontaneous speech, the mean reduction in disfluencies did not result in stutter-free speech within any sample. Descriptive statistics show that stuttering remained most evident during the spontaneous speech tasks (monolog: M = 3.97, SD = 4.10; dialog: M = 4.32, SD = 4.25), indicating that an AAF device had a dominant impact on stuttering during scripted speech tasks (reading: M = 2.99, SD = 4.82). SSI Results revealed a significant group effect in the SSI severity ratings when comparing the No Device to the Device A rating Z = 3.75, p = .000, r = −0.48 and the No Device to Device B severity rating Z = 3.63, p = .000, r = −0.47. More specifically, for Device A 17 participants showed a decline in their stuttering severity rating while the use of this device did not result in a lowered SSI score for 13 participants. Throughout the Device B experimental condition, the SSI-4 rating decreased for 16 participants, remained unaltered for 14.	

			Results showed that the mild severity group experienced statistically significant reductions in stuttering exclusively during the spontaneous speech tasks. Those clients within the moderate–severe category presented with significant decreases in stuttering during all recorded speech samples.	
Van Borsel 2003 **Country:** Belgium **Study design:** Before and after **Data collection method:** Video-taped speech samples **Aim:** To investigate the effects of delayed auditory feedback (DAF) outside a clinical environment **Detail of participants (number, any reported demographics):** N=9 Age range 18-45 years (mean 26.5) 4 M & 5 F.. Recruited from a self-help group All had a history of therapy but with no durable results. Stuttering severity: Very severe = 7, Severe = 1, Mild = 1	**Method:** Repeated exposure to DAF consisted of daily and weekly speech tasks. An examiner called participants randomly four times a month to ask about compliance. Delay times range = 13 to 187 minutes. Delay time used most frequently = 93, then 120, then 133 then 147 minutes. **Hours:** Each day participants used DAF during a 5 minute monologue, a 15 minute conversation and during 5 minutes reading aloud. Once a week they made a telephone call using DAF. Participants spent an average of 260 minutes per week using DAF. (mean individual duration 131 to 408 minutes; overall range 30-480 minutes). **Delivered by:** DAF device, minimal instruction and clinical guidance in a non-clinical environment **Control:** None **Length of follow up:** 3 months **Response and/or attrition rate:** None	**Outcome measures:** % stuttered words Diaries were kept of compliance and time spent carrying out tasks. A summary evaluation sheet was completed at the end of each week.	**Main results:** Speaking during DAF resulted in a reduction of the number of dysfluencies in people who stutter. The percentage of stuttered words during NAF was significantly lower than before repeated exposure to DAF in all speech tasks. Pair-wise comparisons (Wilcoxon test) to test before and after effects: Automatic speech: z= -2.371, p=0.018 Reading aloud: z = -2.666, p=0.008 Repeating words and sentences: z = -2.521, p=0.012 Picture description: z = -2.521, p=0.012 Conversation with an examiner : z= -2.310, p=0.021 After 3 months before and after dropped to non-significant apart from reading aloud: Automatic speech: z= -1.473, p=0.141 Reading aloud: z = -2.552, p=0.011 Repeating words and sentences: z = -0.676, p=0.499 Picture description: z = -1.859, p=0.063	**Limitations/comments**

			Conversation with an examiner : z= -1.363, p=0.173 Comparison (Wilcoxon test) of stuttered words before (NAF) and after DAF: Automatic speech: z= -2.117, p=0.034 Reading aloud: z = -2.668, p=0.008 Repeating words and sentences: z = -2.313, p=0.021 Picture description: z = -1.960, p=0.050 Conversation with an examiner : z= -1.836, p=0.066 After 3 months, comparison (Wilcoxon test) of stuttered words before (NAF) and after DAF: Automatic speech: z= -0365, p=0.715 Reading aloud: z = -0.178, p=0.859 Repeating words and sentences: z = -0.843, p=0.399 Picture description: z = -0.560, p=0.575 Conversation with an examiner : z= -1.051, p=0.293 A Spearman rank order correlation showed a modest correlation (rho=0.667, p=0.05) between the amount of reduction and the time spent practising. *Participant's Perceptions*: Almost all participants experienced fluency under DAF as better than speech fluency before the experiment. However, at least some participants at some point during the experiment found that their fluency or emotional state was	

			worse (score 2) than before. Participants were generally positive about the device. Also, some reported a positive effect when speaking without DAF. S2, for instance, wrote that already after 3 weeks her speech was remarkably better ‘even without the apparatus’. However variation in perceptions. S8 wrote ‘Personally I experienced little improvement’ and ‘I certainly did not start speaking more fluently’. Some participants (S2, S7, S8, S9) also mentioned that at some point they faced a decline of the speech fluency they had initially experienced and several participants pointed out the importance of regular practise to obtain a good result. Some participants commented on the positive influence on their affective or cognitive status. For several participants, using the apparatus had reduced their fear to speak on the telephone, leading to its more frequent use. Some of the comments were less positive. While S7 mentioned that the apparatus gave her the feeling of being helped, she also added that this feeling was ‘not so familiar’ and that the small stutters now sounded in her ears as big stutters. S8 commented that the apparatus did not give him the feeling that his stuttering had now completely disappeared. A longer exposure to DAF does not reduce stuttering frequency further	

			during DAF. It is possible that there is a limit after which longer exposure to DAF does not further reduce stuttering frequency during NAF.	
Von Gudenberg 2006 **Country:** Germany **Study design:** Before and after **Data collection method:** Measurement before therapy, after therapy, after 3 years and after 5 years **Aim:** To evaluate the therapy approach of Kassel (fluency shaping) and show long term effectiveness **Detail of participants (number, any reported demographics):** unclear	**Methods:** Fluency shaping therapy with focus on how to speak fluently and awareness tasks **Number of hours:** 3 weeks intensive program with 1 year after care therapy **Delivered by who?** Speech and language therapists **Control: None** **Length of follow up:** Unclear (definitely 1 year) **Response and/or attrition rate:** Unclear, no defined participant group. Collected data over several years was compared for different outcomes	**Outcome measures:** Dysfluency in speech Self-judgement of treatment Natural speech Speech rate	**Main results:** Dysfluency in speech: Over a time period of 3 years a reduction of dysfluent speech was observable in 50 participants Self-judgement of treatment: 46 of 77 participants reported that they speak horribly before they started the treatment; after 2 years just 6 of 62 participants spoke about their own speech like this Natural speech: Directly after therapy the naturalness of the speech did not change, but after 1 year the speech becomes more natural (measured in 29 participants) Speech rate: All clients of the program showed either the same speech rate after the treatment as before or even improved speech rate	**Limitations/comments**
Von Gudenberg 2006 **Country:** Germany **Study design:** Before and after **Data collection method:** before treatment, after treatment and for some after 1 year **Aim:** To evaluate if the computer based intensive therapy approach is effective for children between the age of 9 and 13 **Detail of participants (number, any reported**	**Methods:** Fluency shaping techniques, including computer-based training, and awareness training. **Number of hours:** 2 weeks intensive therapy program (100 hours), 1 after care weekend after 1 month, and 2 refreshment weekends after 5 and	**Outcome measures:** Interview about therapy Reading Speaking on the phone	**Main results:** In general, an improvement can be observed in all described measured outcomes 4 of 23 participants suffer from a backslide into severe stammering after 1 year; on the other hand, 5 of this 23 children do not show any stammering after 1 year	**Limitations/comments**

demographics): 32 children between 9 and 13 years Additionally, longitudinal comparisons between this group and older groups (14 to 18 and over 18)	10 months **Delivered by who?** Speech and language therapists **Control: None** **Length of follow up:** unclear up to one year **Response and/or attrition rate:** Unclear	Interview of random people on the street Objective and subjective data about stammering	Speaking on the phone improved distinctly Comparing data from 9-13 years old and 14-19 years old shows that 9-13 years old children stammer more after the therapy program than 14-19 years old participants, effect sizes were calculated between stammer rate before the treatment and after 1 year: 9-13 years old show an effect of d=0.96, and 14-19 years old of d=0.88. All effect sizes show a large effect	
Wagaman 1993 **Country:** US **Study design:** Before and after **Data collection method:** Audio-taped speech samples **Aim:** To investigate the effectiveness of a treatment programme based on awareness training, response training and social support. **Detail of participants (number, any reported demographics):** N=8 Age 6-10 years 6 m & 2 F. Mean duration of stuttering = 3.9 years (range 1-7 years, mean 2.2 years).	**Method:** Three elements, awareness training, response training, social support. Awareness training: Participant and parent identify stuttering events from audio-recorded speech samples by verbal response or hand raising. Response training: Discussion and modelling of diaphragmatic breathing. Social support: At least one parent attended sessions and learned the techniques being taught. They were advised to practice at home with the participants and remind them to use techniques when stuttering was heard. Praise was used for good progress and daily records were kept. **Hours**: Initial training session 2hours. Following sessions 45-60 minutes. 3 treatment sessions per week until <3% SS had been achieved. **Delivered by?** Speech pathologist **Control:** N/A **Length of follow up:** 10-13	**Outcome measures:** %SS Rate of speech. Treatment Evaluation Inventory Short Form.	**Main results:** Criterion of <3% was used as a measure of treatment success. Baseline: all participants showed varied but relatively stable levels of stuttering. Posttreatment all participants achieved <3%SS which were maintained for 10-13 months. The results show 89% reduction in stuttering across the sample. Speech rates were mainly equivalent from baseline to post-treatment, showing that the success was not associated with changed rates. The intervention was acceptable to parents, particularly post-treatment and speech pathologists assessed that speech was improved post-treatment. Parents found the treatment acceptable: Score 27 on description of the study, rising to 33.9 (range 32 to	**Limitations/comments**

	months **Response and/or attrition rate:** None		37) before treatment and 39.5 (range 36 to 45) post-treatment. T(7) = 4.11, *p*<0.01 Parents and speech pathologists rated the children high on the five social validity questions post-treatment, suggesting that their speech was unimpaired and natural, their dysfluencies were not noticeable, and that they were not in need of further intervention for stuttering. For speech pathologists, the post-treatment mean score of 34 (range, 32 to 35) was almost per-fect and was significantly higher than the pretreatment mean score of 16.3 (range, 10.3 to 22.6), t(7) = 11.07, p < .00 1. For parents, the post-treatment mean of 25.7 (range, 15.5 to 33) was lower than for the speech pathologists, but was significantly higher than the pretreatment mean of 14.2 (range, 7.3 to 25), t(7) = 3.90, p <0.01.	
Wagaman 1995 **Country:** US **Study design:** Before and after **Data collection method:** Audio-taped speech samples **Aim:** 3-5 year follow up of investigation into the effectiveness of a treatment programme based on awareness training, response training and social support. **Detail of participants (number, any reported demographics):** N=7 Age 9-14 years All had participated in a previous research study. Two participants had received <6 months of speech therapy since the original follow up.	**Method:** Three core elements of the program. Firstly, awareness training: Participant and parent identify stuttering events from audio-recorded speech samples by verbal response or hand raising. Secondly, response training: Discussion and modelling of diaphragmatic breathing. Thirdly, social support: At least one parent attended sessions and learned the techniques being taught. They were advised to practice at home with the participants and remind them to use techniques when stuttering was heard. Praise was	**Outcome measures:** %SS Speech rate	**Main results:** All participants had increased their rate of speech since 1 year post-treatment. For 5/7 participants the follow up mean %SS was lower than at one year. For one participant the follow up increased score was well below their original baseline score. For the other participant the increased score was still close to 3%. %SS Results from baseline to follow up (speech rate in brackets) for individual participants.	**Limitations/comments**

	used for good progress and daily records were kept. **Hours of intervention:** Each participant received an average of 10 treatment sessions. **Delivered by:** **Control:** N/A **Length of follow up:** 3-5 years **Response and/or attrition rate:** 1/8 from original study		Nicky: Baseline =11.84 (017) Treatment = 1.90 (115) One Year = 0.50 (123) 3-5 years = 0.34 (164) Pat: Baseline = 7.06 (132) Treatment = 2.63 (137) One Year = 2.17 (129) 3-5 years = 3.30 (179) Kay: Baseline = 5.73 (109) Treatment = 2.17 (98) One Year = 1.32 (108) 3-5 years = 1.40 (129) Eric: Baseline = 10.74 (91) Treatment = 2.43 (90) One Year = 0.93 (112) 3-5 years = 0.94 (176) Josh: Baseline = 16.72 (90) Treatment = 2.21 (93) One Year = 1.69 (89) 3-5 years = 0.77 (147) Jake: Baseline = 10.73 (93) Treatment = 2.56 (97) One Year = 1.28 (107) 3-5 years = 0.32 (110) Steve: Baseline = 8.32 (79) Treatment = 2.91 (74) One Year = 1.25 (96) 3-5 years = 4.75 (117)	

			Mean acceptability of treatment rating = 36.1 (range 32 to 41). Maximum score 45 Mean acceptability of outcome rating = 24.4 (range 10 to 35) Maximum score 35 Mean parental satisfaction score = 9.47 out of 10	
Ward 1992 **Country:** UK **Study design:** Before and after **Data collection method:** Audio and video taped speech samples **Aim:** Preliminary evaluation of SIFT intervention (semi-intensive fluency therapy) **Detail of participants (number, any reported demographics):** N=4 No other information reported	**Method**: SIFT has three phases: Identification, Prolongation, Transfer. The purpose of the identification phase is to more fully acquaint participants with an understanding of normal phonatory processes to help stutterers become more aware of what is happening in motor-speech and perceptual terms when dysfluencies occur. Prolongation phase: Participants produce carefully monitored timed blocks of slowed speech while maintaining the required fluency skills. Transfer: Client and clinician decide together on the appropriate rate ranges to be finally adopted for each individual. There is a group discussion on day 12 about clients' perceptions and fears about transferring the new speech style to the "real" world. **Hours of intervention:** Participants attend clinic for two hours each day (4:30- 6:30 pm.) Monday to Friday for three-weeks. **Delivered by who?** Clinician **Control:** None	**Outcome measures:** SPM %SS S24	**Main results:** **Oral reading** baseline to post intervention SH: SPM 170; %SS 8.2, post SPM 187; %SS 2.0 WN: SPM 175; %SS10.8, post SPM 183; %SS 3.8 BW: SPM 216; %SS 7.2, post SPM 182; %SS 0.8 BR: SPM 191; %SS11.6, post SPM 225; %SS1.1 Group pre oral reading: SPM 188; %SS 9.4 Post-intervention oral reading group: SPM 194; %SS 1.9 **Monologue:** SH: SPM 222; %SS 9.0, post SPM 223; %SS 4.7 WN: SPM 166; SS13.8, post SPM 184; %SS 4.4 BW: SPM 210; %SS 9.7, post SPM 221; %SS 1.6 BR: SPM 146; %SS23.3, post SPM 196; %SS 1.3 Group pre monologue: SPM 186; %SS 13.9 Post intervention monologue: Group: SPM 206; %SS 3.0 **Conversation**	**Limitations/comments**

	Length of follow up: 3 months Assessment at 2 weeks, 4 weeks and two months post clinic then at two months, then monthly for first year **Response and/or attrition rate**: None		SH: SPM 210; %SS 6.4, post SPM 222; %SS 5.8 WN: SPM 191; SS10.5, post SPM 183; %SS 4.1 BW: SPM 200; %SS 5.7, post SPM 207; %SS 1.9 BR: SPM 157; %SS18.3, post SPM 183; %SS1.6 Group pre intervention conversation: SPM 189; %SS 10.2 Post intervention conversation: Group: SPM 196; %SS 3.3 **Telephone conversation:** SH: SPM 166; %SS10.8, post SPM 228; %SS 3.7 WN: SPM 104; SS16.5, post SPM 220; %SS 3.9 BW: SPM 198; %SS12.4, post SPM 229; %SS 2.8 BR: SPM 92; %SS 29.1, post SPM 238; %SS 7.4 Group baseline telephone conversation: SPM 140; %SS 17.2 Post-intervention telephone Conversation: Group: SPM 228; %SS 4.4 **S24** Score baseline: SH: 7; WN 17; BW: 23; BR: 23; Group mean: 17.5 S24 Score follow up: SH: 7; WN 9; BW: 11; BR: 8; Group mean: 8.7 All clients achieved normal speaking rates though not consistently for all participants.	
Wille 1999 **Country:** Germany **Study design:** Before and after **Data collection method:** Videotaped sample of spontaneous speech,	**Methods:** The 14 participants were randomly allocated into two groups. One group first had bio-resonance therapy, whereas the other group	**Outcome measures:** Spontaneous speech	**Main results:** Parental report suggested improvements in the behaviour of young children regarding social	**Limitations/comments**

reading and interviews with parents of participants **Aim:** To evaluate whether bio-resonance therapy is more successful than standard therapy care **Detail of participants (number, any reported demographics):** 14 participants: aged 9 – 18	had standard speech therapy intervention. After a phase of 4 months the groups switched intervention types for another 4 months. Evaluation of stammering severity was assessed before the first intervention, between the interventions, and after the second intervention by interviewing parents, teachers, and speech therapists. **Number of hours:** 10 hours bio-resonance therapy, and 4 months of speech therapy (hours unclear) **Delivered by who?** By speech and language therapists using bioresonance therapy instrument **Control: None** **Length of follow up:** no follow up **Response and/or attrition rate:** Unclear	Reading Controlled speech	contacts. Improvement of fluency during the first 4 month of therapy, but no further improvement in the second therapy phase where intervention programmes changed. Considerable variation in individual response to the intervention. Not possible to conclude whether or not bio-resonance therapy was more effective.	
Wilson 2004 **Country:** Australia **Study design:** Before and after **Data collection method:** Speech samples. Use of audio-recorders or video recorders (depending on equipment available at home) to assess speech. 10 minute recordings. **Aim:** To evaluate a tele-health version of the Lidcombe Program **Detail of participants (number, any reported demographics):** N=5 aged 3-7 years	**Method:** Lidcombe program Replacement of clinic visits with tele-health consultations. Videos provided for use by parents. **Number of hours:** Number of weeks from beginning to end Stage 1 range 11-30. Number of consultations required to reach stage 2: range 3-26. Duration of consultations (minutes): range 22.3-40.5 . Total clinician time for each consultation (minutes): range	**Outcome measures:** % Syllables Stuttered (%SS) Syllables per Minute (SPM) Parent Questionnaires	**Main results:** Mean 12-13 months post-treatment were below or slightly above the Lidcombe Programme criterion of 1.0%. Data reported by individual participant. Pretreatment and posttreatment SPM means: J.L. = 144, 191 A.C. = 101, 185	**Limitations/comments**

	32.6-67.9 Frequency of consultations (days): range 9.1-38 **Delivered by:** Clinician/parent **Control:** None **Length of follow up:** 12 months Measured at : 2 months, 1 month, 1 week pre treatment; 1 week, 1 month, 2 months, 4 months, 6 months, 8 months, and 12 months post treatment. **Response and/or attrition rate:** Eighteen families originally; attrition of thirteen families. Reasons: Childs stuttering reduced pre-treatment to non-significant levels (n=2) Serious illness or death in the family (n=4) Objection to protocol of no treatment during pre-treatment phase (n=1) Relocation (n=1) Unwilling to comply with beyond-clinic recording (n=4) Child not motivated (n=1)		T.L. = 150, 175 G.H. = 186, 194 J.W. = 136, 167. Pre-treatment %SS: J.L. = 3.2 – 15.1 A.C. = 12.1 – 23.3 T.L. = 3.0 – 12.5 G.H. = 0.7 - 3.0 J.W. = 2.0 – 9.7 Range of %SS over 12 month follow up: J.L. = 0.0 – 0.9 A.C. = 0.2 – 3.8 T.L. = Not reported G.H. = 0.0 – 0.6 J.W. = One week data only, near zero JL experienced slight increase in stuttering at 3 months post-treatment. This was associated with stress at school. However, near zero rate was then achieved and maintained. AC experienced some short-lived increases in stuttering at 1 week, 1 month, 8 months and 12 months post-treatment. TL experienced increases in stuttering at 1 week, 2 months and 8 months post-treatment. This was associated with her mother’s lack of compliance, ceasing Lidcombe procedures once stage 2 was reached. Advice was not taken on board. JW may have recovered naturally, since near zero stuttering was obtained at one week. The	

			remaining data is unavailable due to lack of attendance and compliance. FOC values for three of the five participants were close to the values attained for standard delivery of the Lidcombe Program, in which the child and parent attend the clinic once each week, with occasional failures to attend. *Parental Questionnaires* 3/5 end of stage 1, 4/5 month 6 and 5/6 month 12 returned. Positive responses to satisfaction overall. Most parents were still praising stutter free speech at 6 and 12 months follow up. Satisfaction with child's speech showed mainly satisfaction at 6 and 12 months, with one dissatisfied at 12 months.	
Woods 2002 **Country:** Australia **Study design:** Before and after **Data collection method:** Scores on questionnaire assessment tools **Aim:** To identify psychological effects of participating in the Lidcombe Program **Detail of participants (number, any reported demographics):** N=8 (child and parent) 7 M & 1 F. Age range 35-63 months (mean 54.4 months). Middle SES area.	**Method:** Evaluation of the Lidcombe Program. Assessment at 1 week pre-treatment, during treatment and 1 month post-treatment. **Number of hours**: All children had received the Lidcombe Program for a mean 12.3 months from stuttering onset to starting the programme. **Delivered by who?** Clinician/parent **Control:** N/A **Length of follow up:** One month **Response and/or attrition rate:** None	**Outcome measures:** Attachment Q-Set Screening tools completed by parents .	**Main results:** *Total problems score* Pre-treatment mean 44.8 (SD 5.6) During treatment mean 42.0 (SD 5.9) Post-treatment mean 40.8 (SD 7.5) *Internalising behaviours* Pre-treatment mean 43.5 (SD 5.4) During treatment mean 41.8 (SD 5.0) Post-treatment mean 37.0 (SD 8.9) *Externalising behaviours* Pre-treatment mean 45.5 (SD 6.8) During treatment mean 41.8 (SD 8.1) Post-treatment mean 40.3 (SD 9.6) Mean changes from pre-treatment	**Limitations/comments** May have been some contamination in completing the checklist from parental positive attitude to decreased stuttering. However, the AQS scores are not consistent with bias.

			to post treatment were positive in all but one participant and change from baseline was statistically significant . *AQS* Pre-treatment mean 0.53 (SD 0.15) Post-treatment mean 0.51 (SD 0.15) Non-significant according to Wilcoxon signed-rank test (*Z*5 Õ 0.42, *p*< 0.67) No evidence from this study of deleterious psychological effects of the Lidcombe Program. with some signs of improvement.	
Yairi & Ambrose 1992 **Country:** US **Study design:** Before and after **Data collection method:** Recorded speech sample taken at clinic visits **Aim:** To provide long term data on children who stutter **Detail of participants (number, any reported demographics):** N=27, 19 M & 8 F, age range 23-52 months (mean 36.96 SD 6.73). Number of stuttering-like dysfluencies per 100 syllables 3.64-32.32, 3 mild, 3 mild-moderate, 11 moderate and 9 severe. No more than one year post-onset.	**Methods:** Treatment offered to all, 18 received a short program of 5-12 sessions within first 4 months. Consisted of modelling slowed speech. **Number of hours:** Not specified **Delivered by who?** Not specified **Control:** Untreated – not interested, preferred waiting, lived distant **Length of follow up:** 2 years for all, up to 12 years **Response and/or attrition rate:** None	**Outcome measures:** Stuttering-like dysfluency Other dysfluency Total dysfluency	**Main results:** No significant difference between groups over time, both had downward trend in SLD (p=0.4). Considerable variation between individuals but all followed the overall pattern. Much of the reduction took place near end of 1st year post-onset with group differences suggested by 20 months post-onset.	**Limitations/comments** Yairi & Ambrose 1996 Reports an error in the original article by Yairi and Ambrose 1992. Several corrections are made to the original values appearing in Table 3 on page 759.
Yaruss et al. 2006 **Country:** US **Study design:** Before and after **Data collection method:** speech sample, parent questionnaire **Aim:** To evaluate the Camperdown Program **Detail of participants (number, any reported demographics):**	**Methods**: Camperdown – **a** family focused treatment approach consisting of parent-child training programme and child-focused treatment. Sessions once per week or bi-weekly. Consists of education and counselling, communication modification training (parents learn to	**Outcome measures:** %stuttered words Parent views of programme Parent rating of	**Main results:** Baseline mean stuttering frequency 16.4% (SD 6.6%), after treatment 3.2% (SD 2.0%). Significant reduction (Z=j3.517 p<0.001). Parent questionnaire – most parents (10/91%) were very satisfied with the program, parent education about stuttering was	**Limitations/comments**

N=17, 12 M & 5 F age range 31-62 months (mean 40.8 SD 9.1). 3 mild, 1 mild/moderate, 6 moderate, 6 moderate/severe, 1 severe stuttering.	implement strategies to facilitate child fluent speech including easy talking, reduced time pressure, reduced demands, providing positive communication model), review and reassessment (parents evaluate strategies). **Number of hours:** 9 children received 6-8 sessions of 45 minutes parent sessions, 2 received parent sessions and treatment for other communication problems. 6 received parent programme and child programme, of these 1 received 5 sessions, two received four and three received "considerably more" or 6 months intervention. **Delivered by who?** Speech and Language Pathologist (2nd author) **Control: None** **Length of follow up:** 1 to 3 years (mean 2.3 years SD 0.8). **Response and/or attrition rate:** 11 completed questionnaires, before and after data available for 16 children.	fluency	judged to be the most helpful component (10 rated as helpful to a high degree). Videotaping of sessions rated as least helpful. Children judged by parents to speak significantly more fluently at home following treatment (Z=j2.64 p=0.008) and more fluently in new speaking situations (Z=j2.64 p=0.008). Speaking more fluently at school was not significant. For 11 children (64.7%) the parent training sessions were sufficient for them to achieve child fluency within normal limits. These children continued to exhibit normal fluency at follow ups. For the 6 who also received the child programme by follow up all but one had been discharged from formal treatment (one received occasional refresher sessions).	
Zimmerman 1997 **Country:** US **Study design:** Cross sectional **Data collection method:** Video-recordings of telephone conversations under three conditions **Aim:** To investigate the effects of two types of Altered Auditory Feedback on stuttering during scripted telephone interactions. **Detail of participants (number, any reported demographics):** N=9 6 M & 3 F. Mean age 35 years (SD 9.2)	**Method**: AAF delivered by a digital signal processor. Binaural headset used with boom microphone so that participants could hear binaural sidetone amplification. Two intervention arms DAF (50 ms delay) FAF (frequency shift half octave down). **Number of hours**: Not clear **Delivered by who**?: AAF device **Control:** No auditory feedback **Length of follow up:** Immediate **Response and/or attrition rate:** None	**Outcome measures:** Stuttering episodes (divided by total number of syllables)	**Main results:** Mean proportion of stuttering events across nine participants: NAF = 0.22 (SD 0.038) DAF =0.87 (SD 0.032) FAF = 0.10 (SD 0.034) ANOVA showed a significant main effect of the AAF condition F(2,8) = 13.56, p=0.0004 $\hat{w}^2$ = 0.48. Significant reduction in stuttering frequency for AAF (weighted means of DAF and FAF) versus NAF F(1,16) = 26.97, p=0.0001 $\hat{w}^2$ =	**Limitations/comments**

			0.59 There were no significant stuttering events observed under DAF versus FAF F(1,16) = 0.14 *p*=0.71 $\hat{w}^2$ = 0.00. Not all participants showed the same level of fluency enhancement under AAF; one demonstrated only limited enhancement and only with DAF. AAF (DAF and FAF) significantly reduce the frequency of stuttering events in adults who stutter during scripted telephone conversations.	

Appendix 6 Extraction tables qualitative studies

Anderson 2003	**Method:**	**Outcome measures:**	**Main results:**	**Limitations/comments**
Country: US **Study design:** Qualitative **Data collection method:** Audio-recorded interviews. **Aim:** To gain a better understanding of individuals who reported recovering from stuttering after the age of 10. **Detail of participants (number, any reported demographics):** N=6 (formerly n=7). Adults (18-55 years). Recovered from stuttering and not participating in treatment. Mean age 21 years; range 17-30 years. Mean % of dysfluent behaviours ranged from 0.6 to 2.0, overall mean 1.4.	Recruitment: Letters sent to participants of a stuttering intervention at a clinic. Flyers distributed at a local meeting of the NSA as well as in several public areas. 60-90 minute interviews. Analysis: Interviews transcribed verbatim. Familiarisation with the data and quotations that were salient to the research question identified. Thematically related material sorted together into categories. Modification of preliminary categories. Inter-rater reliability determined by second researcher categorising 20% of quotes. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate:** One participant excluded following interview due to not fitting inclusion criteria.	Recollections of past stuttering Representations of recovery Perceptions of the recovery process Perceptions of current speaking performance	Relating to the review question: Five participants had received some form of treatment for stuttering at some point in their lives. Perceptions of the treatment (which varied in type and duration) varied across the group. Description of treatment: "*Reading a lot of words"* KL *"Saying words and making telephone calls"* AG *"Reading, making telephone calls and pretending to stutter*" KP Of the 5, reporting formal treatment in the past, three attributed recovery to the treatment process. ME reported that being involved in a fluency shaping programme gave him the tools to become more fluent: "*when I got through the programme – that's when I knew that I had the mechanics*" KP attributed being in speech treatment as directly responsible for increasing her fluency: "*I think there were people that helped me all of those years*". PC described how speech treatment as a child and public speaking courses in graduate school had assisted his recovery. At the age of 30, ME started a treatment programme at the suggestion of his girlfriend at the time. This was his first encounter with formal speech treatment and he reported feeling almost immediate positive changes in his speech as a result: "*I began to see benefits of learning how*	Perceptions of the recovery process may or may not reflect the factors that were in reality responsible for their improvement. The study therefore identifies factors that participants *believed* were important in their recovery. Difficult to establish whether the participants were truly 'recovered' or whether they had learned to manage their condition effectively. There was an inability to fully verify past and present speaking behaviour as past speech was described through self-report.

			to…not to force out sounds" The treatment became "*a power within not to stutter*" that allowed him to recognise that he "*wasn't helpless*". ME reported that he practised the techniques regularly at home for about a year after treatment ended using a voice monitor to signal the occurrence and smooth voice onsets and to monitor speaking rate. He reports that although now fluent most of the time, he still practices occasionally to keep his speech "*on track*".	
Beilby 2013 **Country:** Australia **Study design:** Mixed methods; interviews, OASES and SF-36 **Data collection method:** Audio-recordings of interviews. **Aim:** To investigate what personal experiences and themes exist for both members of a couple dyad when one member of the couple stutters. To examine whether the partners have different experiences with respect to the impact of stuttering on their lives. **Detail of participants (number, any reported demographics):** Ten couple dyads (n=20) in a >one year relationship. Adults ≥ 21 years. Relationship duration range 2-42 years Participants who stuttered:	**Method:** Interviews carried out with both partners present (at the choice of the PWS). Duration 1-2 hours. Analysis: Open, axial and selective coding to develop a set of themes. Interview transcripts were read and segmented into sections of text containing one main meaning. Each of the meaning units was then assigned a theme that identified discrete ideas and phenomena. After initial themes were stipulated, a subset of text was selected for analysis of inter-rater reliability. The three researchers agreed on the coding of themes and subthemes in 94 percent of the passages. Reiterative comparison within and across groups were made. Emergent themes and subthemes were examined and agreed upon by all three authors. **Control: N/A**	**Outcome measures:** Questions relating to this review: Fluent partner: What have you done to help your partner with their speech? What role did you play in them obtaining any help for their speech? How did/does the therapy affect your relationship? What advice would you offer to someone contemplating marrying a person who stutters? PWS: What have you done to work on improving your speech? Have you received therapy since	**Main results:** Themes relating to this review question: A number of participants indicated their preference for treatment including what they perceived was important in the therapeutic process: "*We're both involved. The individual who stutters and their partner, or whoever's supporting them, should be involved in some pre-treatment workshops and discussions. And the discussions should be completely honest. Honest in that the therapy is not going to cure you. There is no cure. You're starting on a journey that's going to be life-long*". PWS were asked to describe previous and relevant intervention programmes that had been undertaken and there was a wide range of treatments and strategies that were detailed. "*We had all those old wives tales, peas under the tongue. . .*" "*I went to speech therapy, came out, thought I was cured . .But then I crashed, it was so much harder. . . I was still hiding my stutter behind my newfound fluency*". One adult who stuttered flew to America to	**Limitations/comments** This study attempted to obtain a randomly selected, representative sample of participants, but the recruited sample reflected only 10 couple dyads. A larger cohort may provide different insights regarding diverse life experiences, though analyses revealed that saturation of themes was reached with these 10 dyads. The treatment histories of the adults who stuttered in the study were not explored. Such background information about the types of treatments attempted, and details regarding the amount of time, money and resources expended in the past may have provided additional contexts for the responses and

Males =9 Females =1 Mean age = 39.7 years Partner participants: Males =1 Females=9 Mean age = 38.3 years	**Length of follow up: N/A** **Response and/or attrition rate:** Not reported	beginning this relationship? How did/does the therapy affect your relationship? What advice would you offer to someone who stuttered if they were contemplating (a) beginning a relationship (b) Wanting to get married?	participate in an intensive, residential workshop. Financial and emotional consequences were outlined in his attempts to find a 'cure' for his stutter. "*I went to the states and had therapy there. I did an intensive course for 14 days straight because I really wanted to improve my speech. That was big bucks as well. I heard about it from the internet. I saw their website and they claimed to have pretty good results from their clients. It worked for me for only a short time*". Discussion: The fluent partners reflected on the perceived impact of the stutter upon communication with their spouse and explained the support that they felt they provided on a regular basis. This type of support varied from explicit provision of a target word, to broader concepts of patience in allowing the PWS to express themselves without pressure. They encouraged their spouse to seek therapy, and described the support they provided regarding the range of decisions their partner made in the pursuit of fluency. The fluent partners described strong and unfailing acceptance of their spouse and their stutter. Throughout the interviews there evolved a profile of individually tailored and personal approaches to successfully building a secure and supportive partnership.	reactions described. It is possible that the results were biased by the fact that all dyads of participants and their partners opted to conduct their interviews together, rather than separately. This could be addressed through the use of independent interviews for speakers and their partners.
Boberg 1990 **Country:** US **Study design:** Qualitative interviews **Data collection method:** Audio-recorded interviews face to face (n=12) and telephone (n=3). **Aim:** To determine how wives of people who stutter were affected	**Method:** Semi-structured interviews app. 40 minutes in duration, face to face or by telephone. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate:** Not reported	**Outcome measures:** Questions related to how the couple met, did he stutter at the time, what was the wife's first impression, how speech affected various stages of the relationship, whether there are children and	**Main results:** Eight wives said that at their first meeting with their future spouses, they noticed no stuttering. In some cases this was because the couple was alone: Only in the presence of a third person would stuttering occur. In other cases, it was because the stutterer generally succeeded in hiding his problem from his future wife, and in one case the stutterer had been successful in therapy and	**Limitations/comments** Not reported

by their spouses' stuttering, how they coped, and what advice they could offer to clinicians and wives of other stutterers. **Detail of participants (number, any reported demographics):** N=15 Wives of people who stutter. Age range mid 20s – early 60s. Married for 6 months to 5 years. Educational status varied from diploma to PhD. 7 of the husbands who stuttered had completed a 3-week intensive Comprehensive stuttering Program. Three had completed an intensive 3.5 week modified Precision Fluency Shaping Program. Three had participated in various types of avoidance-reduction programs. Two had never received therapy.		if so how have they reacted to their father's stuttering. *Relevant to the review:* What role did you play in his obtaining therapy? How did the therapy affect your relationship?	was fluent, only to break down some months later in a devastating relapse. One very severe stutterer, unable to utter a word to anyone except his fiancée, went to a psychiatrist to be hypnotized for his wedding day. The psychiatrist did not believe hypnosis would help and prescribed instead a series of sedative pills, one to be taken each day leading up to the wedding and an extra powerful super pill for the day itself. The minister was also consulted and assured the stutterer that he would speak the vows in chorus with him. As a result, the bridegroom's vows were the first fluent words his bride's parents heard him speak. One wife described how a friend who was a speech pathologist had drilled her husband for several hours before the ceremony, going over and over the words he would have to say and "brainwashing" him into believing he could be fluent. The most surprising discovery from the interviews was that many of the couples did not discuss stuttering until the husband announced his decision to take an intensive therapy course or, in two cases, until he became active in a self-help group for stutterers. In some cases, it was the prospect of having children that drove the stutterers to therapy. They did not want to be unable to read a bedtime story or communicate freely with their children, nor did they want to be a stuttering role model. Two spouses reported that they had delayed having children until the husband gained control over his speech. Once their father had been through effective therapy, some children took part in the	

			maintenance program by reminding him to use his fluency skills. Keeping track of speech rate or stutters, and even in a couple of cases fining him 2% for every uncorrected dysfluency. An endearing 3- year-old, in her eagerness to help him speak, would hold her stepfather's face when he struggled with a block. Such unaffected concern led to active participation in the post-therapy maintenance stage by both her and her siblings, which was reported to be very helpful to the stutterer. Only one wife reported obtaining professional advice to help relieve the impact of stuttering on her relationship. Before her marriage, she had sought out a speech pathologist in the school where she taught. From her she had learned helpful techniques for responding to her husband's blocks and struggle behaviour. She also benefited for many years from confiding in a close friend who was a speech pathologist. Two wives said that they were amazed when their spouses expressed interest in attending a 3-week intensive clinic for stutterers because they had never realized that the slight dysfluency they saw was a matter of any concern to their husbands. They said their husbands seemed so outgoing and competent that they could not understand how they would benefit from therapy. The pre-treatment videotapes showing their husbands stuttering in a stressful situation were a revelation to them, as were the discussions they had with their husbands as a result of therapy. The striking fact running through all the interviews is that the wives took the lead from the husbands: "He didn't seem embarrassed so I wasn't": "He didn't seem to	

			want to talk about it”: “1 was afraid it might upset him if I mentioned it.” With one exception, only if the husband introduced the topic was it discussed. Another wife, unusually perceptive, tried to encourage her husband to tell people when he met them that he was a stutterer and might have difficulty speaking, instead of exerting great effort to hide the fact. She felt that it would be less embarrassing for the listeners if they were prepared for possible dysfluencies in advance, and her husband would be under less stress if he had nothing to hide. Unwittingly she had hit on one of the key points in many therapy programs, but it was not until her husband had experienced therapy and received the same advice from a clinician that he was able to heed it. Several said they had believed there was nothing that could be done to help a stutterer until they read newspaper articles about the success of intensive therapy programs. The spouses’ comments demonstrated the difficulty of obtaining accurate and up-to-date information about the problem and the availability of therapy. In addition to advising therapy, three wives advised that the wife become involved in the therapy procedures so that she can actively help her husband by slowing her speech to match his and reinforcing his appropriate use of fluency skills. See also piece about one wife who became involved in the therapy early on (p.72).	

Bricker-Katz 2010 **Country:** Australia **Study design:** Qualitative **Data collection method:** Focus Groups (2) **Aim:** To investigate perceptions of limitations to activity and participation in a group of older people who stuttered into adulthood. **Detail of participants (number, any reported demographics):** N=11 Males = 8 Females = 3 All over 55 years of age Mean age = 70.7 (± 9.13) years Retired = 6 Semi-retired = 2 Employed = 3 Past therapy: None = 5 Speech pathology only = 2 Elocution = 1 Speech pathology, psychotherapy, hypnotherapy, medication = 3 Marital status: Married = 7 Divorced = 2 Single = 1 Widowed = 1	**Method:** Recruited from general population via press releases to local and community newspapers and seniors' newspapers inviting to contact researcher by telephone. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate:** 16 suitable participants; eleven available for the focus groups.	**Outcome measures:** Perspectives of older people who stutter about their experience of stuttering as an older person, how stuttering impacts on their communication, what barriers they foresee as they grow older with a stutter and what, if any, their treatment needs are.	**Main results:** Participants spoke of impact of stuttering in the past as well as currently. Some felt that their experiences had improved since retiring because they did not have to talk to strangers and felt less self-conscious and fearful. Acceptance was linked with stuttering having less impact for them than in the past. They were less judgemental of themselves and more patient than in the past even when stuttering. Resignation to the fact that a solution in old age is less probable. Participants described spending time thinking about their speech; they are never sure when it will occur or how severe it will be. Therefore they need to be constantly vigilant and this has not changed. Coping was described in two ways; coping with speech and coping with feelings. Fear can become a habit; some described facing that fear so that fear itself doesn't cause more dysfluency. Coping included strategies To manage speech and feelings. Some were taught on programmes, but increased age meant that a repertoire had been built up. There were several techniques for speech management reported such as slow or smooth speech; consideration about how to maintain this is needed in old age. Fear of speaking continued, particularly on the telephone, with other communication methods such as e-mail being used more. There was also fear that others perceived them as mentally ill or intellectually disabled, though this was less prominent in those who had accepted themselves or were resigned to their stutter.	**Limitations/comments** None reported

			Fear has consequences for social interaction following retirement when new relationships are likely to be made. Suggestions for improving their situation included ‘removing fear’ – through medication or reducing anxiety. Building confidence was linked to this. Self-disclosure as a strategy was valued as PWS felt more at ease. Support from others was helpful, particularly where the condition was understood. Growing older, others may attribute the speech problem to old age or a stroke. There is constant concern about what others are thinking, though with older age there may be less reactivity to problems. There was regret that opportunities to improve speech were missed when they were children. This was compared to more pro-active treatment that can be accessed currently for children. Treatment needs and preferences were individual, with an experienced and knowledgeable clinician. Working in a group could be considered later in the treatment. Feeling understood was an important aspect of the therapeutic relationship. Motivation was linked to the perception that treatment would be effective. There was a n expressed desire for a solution that is not complicated or time consuming. Feelings of being misunderstood by speech pathologists led to disappointment with the treatment. Lack of understanding had also been experienced from teachers, relatives and work colleagues. Some felt let down by therapy, perhaps because of the need for ongoing work. Support at the emotional level was also cited as a need from therapy if	

			maintenance was to succeed. This supports findings from studies with younger PWS.	
Butler 2013 **Country:** UK **Study design:** Qualitative **Data collection method:** Focus Groups and interviews **Aim:** To explore how individuals who experience speech dysfluency manage personal discrediting in their identity work in the intermittent emergence of a stigmatised characteristic (stuttering). **Detail of participants (number, any reported demographics):** N=38 Age range 19-90 years Males = 82%	**Method:** Recruitment was through 'open microphone' sessions at stammering awareness events and by contacting members of stammering self-help groups. Data were collected during stammering self-help groups (led as FGs) lasting average of 75 minutes and through 17 interviews, either face-to-face or via telephone. Interview duration was 30-75 minutes (mean 60 minutes). For interviews, questions were provided in advance for two participants so that they could prepare. Analysis was through a grounded approach that included familiarisation, coding to construct abstract categories. Broader themes were identified in the final stage. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate:** Not reported.	**Outcome measures:** Ways in which PWS manage identity work given that stammering can be stigmatised yet it is intermittent.	**Main results:** **Identity cloaking** A randomised identity conflict was identified based on PWS evaluation of societal and personal forces as well as consideration of locus of control. Identity work is negotiated via a range of approaches the author describes as 'identity cloaking', taken from participant data. The cloak represents a veil which occupies the space between society and self or within the self. Each form of cloaking enables the use of space in a different way depending on PWS use of personal and social space. 1. <u>Hiding space – forestallers</u>: theme of exclusion through being controlled by others and through self-exclusion from social situations. Felt stigma was reported as being experienced more often by those around the PWS than the PWS. Avoidance by others could be due to fear of 'courtesy stigma' or stigma by association and controls the PWS ability to be social. PWS are aware that in their deviant role in interactions, they disrupt the dual responsibility and take the blame for this, accepting the subsequent social exclusion. Yet PWS desire to be seen as an individual. Distinctiveness was afforded though was sub-optimal "*you just stand out like a sore thumb….what I want most is an invisibility*	**Limitations/comments** None reported

			cloak like Harry Potter’”’. Mental space to exchange words – converters: Theme of concealing dysfluency by converting or avoiding words. Concealment can result in near fluency, presenting as ‘normal’ to observers (see Goffman on stigma). A range of methods were described to achieve this such as paving the way with easy sounds or words or switching words around. These PWS did not want to discuss these behaviours, seeing them as covert or ‘underhand’. They described the behaviour as reciprocal form of social-personal-social control and represented it as a struggle between their self-identity as a PWS and a perceived need to conceal to display an acceptable identity. Social space as a prop cupboard – heeders A fifth of PWS identified themselves as a ‘person who sometimes stammers’, reporting being ready to call upon approaches in social situations, but sometimes not needing them. They accepted this identity and were proud of their ability to heed and react to societal cues (‘special powers’). More than half talked of having advanced in other ways (“*I’m a far nicer person*…”) They saw themselves as increasingly responsive to the personal and social contexts, as part of a wider group that have to face challenges. Bodily space – exorcisers – Range of experiences includes shame, embarrassment and guilt, with strong reference to the views of others. Stammering afforded low status in personal and working lives, with the reputational self being impacted by the stammer. Some demonstrated anger toward the self and hatred toward the stammer. Rather than conceal, they would try ‘anything that was	

			out there’ which typically involved bodily techniques. This group represent in-group identity created by agreeing what the in-group is or is not (not identifying with concealment for example). They were controlled by or controlled the personal space rather than the social (as in concealers). <u>Space for it – segregators</u>: Separation between self (and social stigmatised identity) and stammer through identity work. The onset was described as the arrival of ‘it’ (“*when it came back I was about twelve*…”) dis-identification (‘them’ and ‘us‘ for example) is evidenced in a focus on being embodied in an external entity. References to being ‘odd’ or a ‘freak’ suggested a detrimental influence on identity work from social stigmatisation. <u>Space as a place to perform – narrators</u>: Behaviour is impacted by context and also the perception of role in that context. Leading roles in sport or as expert for example impacted positively on fluency and vice versa. However with family and friends there were divided reports as being more relaxed could impact either positively or negatively on fluency. In role playing, social identity was different to self-identity yet integrated (“*it’s just another me*”).	
Crichton-Smith, 2002 **Country:** UK **Study design:** Qualitative **Data collection method:** Interviews **Aim:** To explore the experiences of adults who stammer **Detail of participants (number,**	**Method:** Eleven recruited via newspaper advert and three via local self-help group. Semi-structured interview, framework analysis. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions	**Main results:** Data reported as two groups, those received therapy during adulthood and those not. Perceptions of stammer limiting academic potential, working lives, and exclusion from available activities. Respondents anticipated speech breakdown in social communicative situations and majority would avoid such situations if possible.	**Limitations/comments**

any reported demographics): 14 Eleven male and three female, age range 26 to 86 years, mean age 56. 13 had developmental stammer, one acquired, 2 had received no intervention, and the remainder had received a wide variety of interventions.			References to low self esteem commonplace, most perceived stammering as an adult in social situations as unacceptable even though few described overtly negative reactions. All referred to episodes during childhood of negative reactions. Adults use a variety of speech management strategies, these strategies used equally by those who had received therapy as an adult and those who had not. Strategies – no change (no prior planning), intuitive change (not taught), taught change (use of therapy technique), and highlighting (commenting on their stammer). Heavy reliance on intuitive strategies such as word and situation avoidance however participants indicated that this avoidance not desirable therefore a mismatch between what they believed and what they practised. Belief that avoidance not desirable seemed to be what they had been told by SLT. Those who felt had experienced successful SLT cited more examples of adopting intuitive changes than taught changes. Many commented on useful strategies learnt in therapy yet did not cite then as current functional management strategies. Techniques gave sense of control, providing an opportunity to talk about stammering. All those who had received therapy felt overloaded by either effort to think and control speech at same time or the responsibility of transferring fluency in to their daily routine, cited lack of dedication to practice or preference for habitual way of talking. Few dissatisfied with therapy. Need to discuss coping strategies as a therapeutic tool	

Corcoran & Stewart 1995 **Country:** Canada **Study design:** Qualitative **Data collection method:** Interview **Aim:** To investigate adult stutterers' perceptions of beneficial or adverse experiences. **Detail of participants (number, any reported demographics):** 5 M and 2 F stutterers. Age range 25 to 50. 3 high school graduates, one at university, one had a degree. Range of occupations from farmer to engineer. All had been or were currently receiving stuttering therapy (4 fluency shaping, 2 stuttering modification, one both). 2 severe, 2 moderate, 3 mild stutterers. Level of stuttering not related to type of therapy received. None had received therapy as children.	**Method:** 2 interviews with each person conducted one month apart (one person had 3). Purposive sampling of participants. **Control: N/A** **Length of follow up: N/.A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions.	**Main results:** Importance of **understanding** and establishing a **relationship** in therapy. One participant described a therapist using "tricks" rather than having an understanding of stuttering. Another described failure of a therapist to establish a relationship with them – described as not wanting to get involved. Beneficial relationships were characterised by a therapist or fellow stutterer sharing their knowledge of stuttering. This led to feelings of **hope**, a sense of **being supported**, and an awareness of **not being alone**. Interaction with fellow stutterers broke down the feeling of isolation. Those who had overcome stuttering gave beacons of hope. Support and understanding of another stuttering person added feeling of being truly understood. Positive aspects of therapy: having experience of stuttering **understood by others**, new **understanding of the dynamics of their stuttering and ways to modify**. Importance of clients understanding the rationale underpinning techniques. Other important aspect: a **decrease in fears**. Progress in therapy could change participant's view of themselves which could lead to changed relationship with others, or highlight the need for psychological therapy.	**Limitations/comments**

Corcoran et al. **1998** **Country:** Canada **Study design:** Qualitative **Data collection method:** Interview **Aim:** To investigate the experiences of adults who stutter. **Detail of participants (number, any reported demographics):** Same 7 participants as in Corcoran 95 study + one additional person who was not receiving therapy. 5 M and 3 F stutterers. Age range 25 to 50. 3 high school graduates, one at university, two had a degree. Range of occupations from farmer to engineer. All but one were currently receiving stuttering therapy (4 fluency shaping, 2 stuttering modification, one both). 2 severe, 2 moderate, 3 mild stutterers. Level of stuttering not related to type of therapy received. None had received therapy as children.	**Method:** 2 interviews with each person conducted one month apart (1 person had 3). Purposive sampling of participants. **Control: N/A** **Length of follow up: N/.A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions	**Main results:** Ongoing experience of stuttering had resulted in a profound sense of helplessness. Effect of stuttering were so powerful they no longer felt in control of the direction of their lives. Powerful emotional components resulting from feelings of uncertainty and helplessness. Deep sense of shame reported. Positive aspects of themselves obscured or discounted as presence of stuttering became the primary focus. Insensitivity of listeners led to pain resulting from shame. Having a lack of explanation for stuttering led to guilt and self-blame for their stuttering. Participants spoke of fear and tension physically upsetting them.	**Limitations/comments** All but one participant same as 1990 study. Different section of same data?

Cream et al. 2003 **Country:** Australia **Study design:** Qualitative **Data collection method:** Interviews **Aim:** To investigate the experiences of adults who received therapy for prolonged speech **Detail of participants (number, any reported demographics):** 10 people who had received treatment with prolonged speech therapy as an adult and who had experienced zero stuttering at the end of treatment. 9 M and 1 F age 24 to 54 years. 9 had intensive PS treatment and 4 had treatment programmes on more than one occasion. Time since treatment 4-20 years. 6 had accessed support groups/networks since treatment.	**Method:** Phenomenology, open-ended conversational interview approach, purposive sample. Data collected over 2 year period. 2 people had only one interview (one moved away, contact lost with other). In total 34 interviews carried out. **Control: N/A** **Length of follow up: N/.A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions	**Main results:** All participants continued to stutter at times after intervention even those highly proficient in using the technique. Behavioural control provided by PS has to be balanced against sounding unnatural and different. Key importance of adults who stutter needing to protect themselves from the harmful consequences associated with stuttering which does not diminish following therapy with prolonged speech. Control of the speech motor system became a means of protecting themselves from harm while taking part in speaking situations. Participants continued to experience feelings of being different from people who do not stutter. Use of PS could exacerbate the feeling of being different. Participants could control stuttering by using an exaggerated version of prolonged speech but this was not considered acceptable to speaker or listener. Participants were prepared to use the technique in situations where the desire to not stutter overrides the consequence of sounding unnatural and different. In other situations sounding unnatural in order to avoid stuttering was not considered personally or socially acceptable. Use of the technique could be reserved for high risk situations rather than consistent use. Participants sought to control situations/environments which were high risk. Perception of using PS as not sounding themselves. Fear of being discredited or caught out. Controlling stuttering using PS boosted self-	**Limitations/comments**

			confidence and self esteem however stutterers still felt different from non stutterers. PS rewarded speakers with control over stuttering but also distinguished them from people who do not stutter. The effort required to maintain proficiency with PS could not be maintained constantly or in the long term.	
Cream et al. 2004 **Country:** Australia **Study design:** Qualitative **Data collection method:** 34 **i**nterviews. 2 focus groups. **Aim:** 10 adults who stutter were interviewed to investigate their experience of treatment. **Detail of participants (number, any reported demographics):** 10 people who had received treatment with prolonged speech therapy as an adult and who had experienced zero stuttering at the end of treatment. 9 M and 1 F age 24 to 54 years. 9 had intensive PS treatment and 4 had treatment programmes on more than one occasion. Time since treatment 4-20 years. 6 had accessed support groups/networks since treatment.	**Method:** Phenomenology, open-ended conversational interview approach, purposive sample. Data collected over 2 year period. 2 people had only one interview (one moved away, contact lost with other). In total 34 interviews carried out. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: NR**	**Outcome measures:** Views and perceptions	**Main results:** People who stutter focus on doing what they can to protect themselves from the harmful consequences of stuttering. Prolonged speech is only one of a variety of skills and strategies that they use in order to protect themselves. The essence of experiences after treatment was an active process of seeking balance between being different and being in control. The control people achieve with prolonged speech is subject to fluctuation because of the range and extent of demands in communication at the same time. Metaphor of a four way rocker used to describe differing demands on communication in different speaking situations and need for prolonged speech to be one of a number of tools. May choose to use prolonged speech and not stutter or to participate naturally in a conversation and stutter.	**Limitations/comments** Same participants as 2003 study, findings also overlap with this study

Daniels et al. **2012** **Country:** US **Study design:** Qualitative **Data collection method:** Interviews and focus groups. **Aim:** To explore the school experiences of adults who stutter. **Detail of participants (number, any reported demographics):** N=21, 11 interviewed 8 M and 3 F, age 29-69 mean 47, 8 mild, 2 moderate, one severe stutterer, one receiving therapy currently and prior, 8 had received prior, 2 had never had therapy . 10 focus group. 1 group 6 participants - 2 M & 6 F age 30-58 mean 37 years, 5 mild, one moderate, 5 received prior therapy, one never had therapy. 2nd group 4 participants - 3 M & 1 female age range 21-34 mean 27 years, 3 moderate and one mild severity, all had received therapy in the past.	**Method:** Participants purposively selected for diversity by advertising via stuttering association and personal contact. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions	**Main results:** Physical (behaviours such as tapping and speech modification techniques), linguistic (word avoidance or substitution) and social-interactional (saying I don't know, developing signals to teacher, writing, talking in character) coping strategies reported .	**Limitations/comments**
Daniels 2006 **Country:** US **Study design:** Qualitative interviews **Data collection method:** Video-tapes of interviews **Aim:** To explore how African American men who stutter view communication, identity and life choices.	**Method:** Semi-structured interviews app. 1 hour each. *Analysis*: Transcription of video-tapes. Reading and coding each line. Abstraction of major and minor themes from codes. Credibility through two researchers carrying out review of transcripts. **Control: N/A**	**Outcome measures:** *Qs*: How has stuttering affected the way you live your life? How has stuttering affected the important relationships in your life. Prompts: Did you ever have speech therapy? How	**Main results:** *Effects of race and communication on identity.* *Effects of race and communication on life choices.* *Communicative coping strategies of African American men who stutter.* *Identity construction: major and minor themes of African American men who stutter.* Data relating to the review question (i.e.	**Limitations/comments** Not reported

Detail of participants (number, any reported demographics): N=6 Adult African American males who stutter. Age range 24-58 years. Living in Texas, US Varied educational status from ‘some college’ to graduate degree (Masters). Recruitment through verbal announcements and flyers in Universities, colleges and community buildings (libraries, churches, bookshops, barber shops etc.).	**Length of follow up: N/A** **Response and/or attrition rate:** Not reported	did that impact on your life at the time?	interventions). “One might suggest that African American men may positively view having a Black racial identity because of the many organizations, resources, support systems, and counter-hegemonic images designed to counter-balance negative images and stereotypes”. The authors state that whilst people who stutter form a cultural group and therefore share many experiences and beliefs, there are other cultural groups within this larger group for whom stuttering may have particular meanings that relate to both stuttering and being, for example, a black male. “The participants in this study all spoke of how communicative, cultural, and race ethnic factors affected their identity and lifestyle. Some participants contended that race-ethnic factors coupled with stuttering shaped their life experiences, while others only spoke of stuttering”. “Thus, speech-language pathologists, educators and other professionals must adopt multidimensional approaches that address not only affective, behavioural and cognitive components, but sociocultural components as well” p. 212	
Goodhue et al. **2010** **Country:** New Zealand **Study design:** Qualitative **Data collection method:** Interviews **Aim:** To explore the experiences of mothers during the Lidcombe programme. **Detail of participants (number,**	**Method:** Interviews pre-treatment and then at regular intervals during the programme. Each interviewed 9 times. Work based on phenomenology. Interviews face to face and via telephone. Treatment provided by 2 SLTs independent of the interviewer. Thematic analysis process. **Control: N/A**	**Outcome measures:** Views and perceptions	**Main results:** 5 obstacles to impede participants’ ability to implement the programme – finding time to fit in therapy, forgetting to implement, presence of siblings. Other two obstacles not identified in the paper. Regular clinic sessions and/or phone calls helped as reminders to do the treatment, using a previously established routine such a story time to carry it out was reported as	**Limitations/comments**

any reported demographics): N=16 mothers, children between 3-6 years, stuttering severity more than 2% at assessment, no previous stuttering treatment, mother and child proficient in English, no intellectual impairment of other SLT disorder.	**Length of follow up: N/A** **Response and/or attrition rate: N/A**		helpful, another family member taking sibling in to another room or including them or carrying session out when sibling asleep reported as potentially helpful. Beneficial outcomes reported following programme – increase in quality time, increase in knowledge and management of stuttering, improved parenting skills. Report of increased child confidence. Adverse outcomes - Several children did not like hearing feedback on their speech, did not like the word "smooth", two children reportedly felt they had done something wrong by stuttering. Although many reported being empowered some parents troubled by the responsibility leading to anxiety/pressure and guilt over not doing the therapy. Distress reported by 8 mothers linked to severity of stutter and seeing child struggle, some distressed by relapse or process of conducting programme. Confidence improved if child's speech improved however deteriorated if speech got worse. Parental expectations for all but one were that improvements would be quicker than they experienced, also surprise at their role in delivering the therapy. Perception that the programme was effective by all but one mother. Programme described as requiring commitment, dedication and consistent focus. Programme not difficult to carry out however implementation was a struggle. Perception that parent needed knowledge regarding the next steps in the programme, some wanted more written material, a few suggested a support group. Report of children enjoying the intervention, often reminded parent to carry out the	

			sessions or give praise/reward for smooth speech.	
Hayhow 2009 **Country:** UK **Study design:** Qualitative **Data collection method:** Interviews **Aim:** To explore parental experiences of the Lidcombe programme. **Detail of participants (number, any reported demographics):** Parents of 14 children receiving the programme. Participant numbers not reported –? mothers, two fathers, one nanny, one partner	**Method:** 21 interviews carried out, 6 participants interviewed twice **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions	**Main results:** Some surprised by parental role in therapy. Most felt a sense of responsibility which for some was a positive feeling. Treatment times referred to by many as special times. Some children however tired of talk times after a while so they did not always retain this special quality. Positive aspects – stuttering reduced quite quickly and consistently, parents found own ways of implementing procedures in to everyday lives, parents and children overall enjoyed the treatment, in some cases gradual shift from parent taking responsibility to child taking more responsibility, problems that arose were resolved by consultation with SLT or by experimentation. Issues identified – difficult to keep momentum of treatment going, setbacks, feelings of guilt, support needed in implementing treatment at home, weekly visits to clinic became a burden over a longer timescale, as children older school began to have an impact, children became less responsive over time and could become irritated by requests for self-correction. Those children who were less responsive to correction appeared to retain a greater	**Limitations/comments** Limited data presented, findings reported as lists of points with small number of quotes to illustrate.

			vulnerability to persistent stuttering. Description of guilt/concern for parent when child progress halts. When progress not straightforward parents faced with long-term implications of stuttering and need help in adapting treatment. 2 parents ambivalent about the programme and experienced difficulty in implementing procedures. These experienced difficulty in taking a firm lead, doubted their ability to help their child, had a more problem-orientated orientation, talked more about anxiety/guilt, and had beliefs about stuttering at odds with the programme.	
Hearne et al. 2008 **Country:** Australia **Study design:** Qualitative **Data collection method:** Focus group and interviews **Aim:** To examine the impact of stuttering during adolescence **Detail of participants (number, any reported demographics):** 13 Young adults/adolescents aged 13 to 26 years. 12 M & 1 F. All stuttered during adolescence. Varying experiences of therapy, 7 in maintenance having completed 1 week intensive Smooth Speech treatment, 2 in treatment (PS), 1 in maintenance PS, 1 completed Camperdown, 2 completed 1 day PS.	**Method:** Purposive sampling across Australia. Two focus groups and 7 interviews completed. **Control: NA** **Length of follow up: NA** **Response and/or attrition rate: NA**	**Outcome measures:** Views and perceptions	**Main results:** Lack of awareness and knowledge regarding stuttering amongst significant others. Lack of own awareness of what stuttering is, who else stutters. Therapy had increased knowledge, variety of misconceptions and not sure whether what they did was stuttering. Many reported never having met anyone else that stuttered and thought they were the only person. Parental/teacher lack of knowledge, not talked about in the home, never spoke to friends about it. View that it should be spoken about, teachers should have more knowledge. Participants began attending therapy at a variety of ages however it was a decision that they made on their own. The participants all reached a point where they decided they needed to do something about it. Some had reached this point sooner than others. For some career aspirations spurred them to seek therapy.	**Limitations/comments**

			Participants reported that they preferred group therapy – an advantage to be with others of same age and interests and more representative of the real world. Felt they could learn from each other and know they were not the only one with this kind of problem. Participants found intensive therapy positive, emphasised easy to forget techniques. Struggle to keep skills once regular visits finished, leaving supportive environment, blamed lack of practice due to forgetting being busy or self-conscious. Not using when comfortable talking to friends/family, couldn't be bothered, getting lazy. Their busy lives meant speech practice slipped down their list of priorities, felt self-conscious using techniques. Family significant in helping them practice, others however viewed it as being up to them. Most useful part of therapy viewed as transfer tasks, need to experience talking to different people, therapy needs to focus on how going to use speech when leave, more follow up days perceived as useful.	
Hughes et al. 2011 **Country:** Canada **Study design:** Qualitative **Data collection method:** Interviews **Aim:** To examine family experiences of adults who stutter **Detail of participants (number, any reported demographics):** 7 adults who stutter who had received treatment at some	**Method:** Recruited via support groups and speech therapy clinics **Control:** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions	**Main results:** Participants described a wish for support concerning the emotional aspects of stuttering "deep support". Wanted to be able to discuss their feelings associated with stuttering. Voiced a desire for a role model, to know an older child or adult who had overcome their stuttering or someone more knowledgeable regarding stuttering who would help them cope more effectively. Felt a need to identify with others who stutter or individuals who stutter in order to obtain support not provided by their families.	**Limitations/comments**

point in their lives. 5M & 2 F age 22-53. Range of therapies moderate or severe stutter.			Participants reported a generally supportive home environment e.g. assistance locating speech therapists, transportation and financial assistance. However stuttering seldom discussed with family. Barriers to receiving help – pressure to be fluent around families, lack of communication regarding therapy and family over-emphasising techniques taught in speech therapy. Assistance provided by family and SLT well-meaning but unhelpful. Four felt the treatments had not been beneficial to long term recovery. Majority had received misguided assistance from family regarding their stuttering.	
Irani et al. 2012 **Country:** US **Study design**: Mixed methods **Data collection method:** Interviews, clinical data (measures on assessments). **Aim:** To understand client perceptions of an intensive programme. **Detail of participants (number, any reported demographics):** 7 participants average age 27 years (22-39). 5M & 2F. All had attended the programme, three once or twice previously. Two had not received follow up therapy. 4 were students, one a residential specialist, one a teacher and one a SLP.	**Method:** Phenomenological approach, retrospective clinical data and interviews **Control:** None **Length of follow up:** Participants had attended the programme in 2003/4/5/6/8/9. **Response and/or attrition rate:** N/A **Intervention:** 9 or 15 day intensive therapy programme conducted during the summer. Utilises both fluency shaping and stuttering modification approaches in addition to CBT. Sessions last 5 to 7 hours each day with both group and individual sessions. Provided by graduate students, overseen by fluency specialist and clinicians on a 1:1 patient/clinician ratio.	**Outcome measures:** Clinical data from case notes gathered retrospectively – Questionnaire assessing feeling and attitudes (Locus of Control of Behaviour Scale, Erickson S-24, OASES). Speech samples – conversation, phone call, reading analysed for %syllables stuttered, type of dysfluency, secondary behaviours, SSI. Current clinical data – LCB, S-24, OASES, speech sample,	**Main results:** Participant's positive regarding benefit of an intensive clinic, found residential nature of course helpful. Speech techniques learned helpful, all reported benefit from learning a variety of techniques. Preference for slow prolonged speech. Participants reported difficult to use techniques in all speaking situations but important to know how to use them and practice in a variety of settings. Reported benefits of strategies such as CBT and motivational quotes. Benefitted from exploring their own attitudes towards communication and stuttering. In many ways a foundation for the techniques. Perceived benefits of completing activities that pushed participants outside comfort zone and addressed transfer of techniques to typically feared speaking situations. Follow up perceived as beneficial. Importance of personal motivation to attend	**Limitations/comments** Not certain exactly when interviews were carried out, presumably 2011 or 2012? Follow up interview up to 7 or 8 years for some, 2 or 3 years for others. CI data across zero for many measures.

	4 phases of therapy – awareness of stuttering behaviours, process of reducing stuttering behaviours, techniques to modify and improve fluency, developing a personal maintenance programme. Follow up therapy in form of weekend intensive workshops, regular therapy or tele-practice.	attitudes questionnaire, SSI-3. Treatment outcomes measured via attitudes questionnaire and before/after speech sample. Views and perceptions.	the therapy impacting on perceived benefits. Importance of good clinician-client relationship with clinician responses and demeanour having a positive or negative impact. Clinical outcomes – SSI effect size pre to post 1.19 (Cohen's d) CI 95% minus 0.01 to 2.24. Pre to time of interview 1.25 CI 0.04 to 2.31. S-24 effect size pre to post 1.79 CI 0.46 to 2.89. Pre to time of interview 0.70 CI minus 0.42 to 1.73. LCB effect size pre to post 0.75 CI minus 0.38 to 1.78. Pre to time of interview 0.07 CI minus 0.99 to 1.11. %SS pre to post Conversation – effect size 1.12 CI minus 0.07 to 2.17. Pre to time of interview 1.97 CI 0.59 to 3.09. Reading pre to post 0.59 CI minus 0.52 to 1.62. Pre to time of interview 0.98 CI minus 0.19 to 2.02. Phone call pre to post 0.72 CI minus 0.40 to 1.75. Pre to time of interview 2.22 CI 0.78 to 3.38. Descriptive attitude data indicates improvement on measures of attitude change pre-post.	
Kathard et al. 2004 **Country:** South Africa **Study design:** Qualitative **Data collection method:** Repeated Interviews **Aim:** To explore processes shaping self-identity formation as dis-other and the actions of participants who stutter **Detail of participants (number, any reported demographics):** N=7	**Method:** Participation invited via local hospitals, private practices, the university and a local self-help group. Semi-structured, open-ended life history interviews lasting on average 2 hours. Each participant was interviewed on average three times (total 6-10 hours per participant). Interviews were audio-taped and recordings transcribed verbatim. Analysis was at two levels: 1) Representational narrative	**Outcome measures:** Biographical stories and the representation of self-identity.	**Main results:** All participants began to stutter in the pre-school years. The contexts for discovering difference were homes and school. Parents, teachers and peers drew attention to stuttering as being different to normal and as a disorder by reacting in a negative way. Though experiences at home and at school could differ, by adolescence the participants gained an understanding of themselves as different. "…*I did eventually get to therapy. She tried to help but I hated it because it intruded on*	

Males = 5 Females = 2 Age range 19-65 years Ethnicity: Black = 3 Indian = 2 White = 2	analysis, where raw data are configured by means of a plot, into a story to explain a particular end. 2) Grounding the analysis within the individual case; constant comparison across cases. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate:** None reported.		*all the joys…my sport and all that stuff…I was just fed up with it…just relax, relax, it didn't do me any good. It just emphasised my difference and that I didn't speak well*" (Gareth) "*The teachers at school noticed my speech. Everyone knew the problem.…It got so bad they arranged a speech therapist for me. I went to therapy at the Convent attached to the school. I was happy to go. She taught me to prolong the first word to make my speech fluent. The girls in class would laugh at me so I stopped doing it. They thought this new speech was funny. I stopped going to therapy after a few months*". (Nonthokozo) In three stories, schools collaborated with health professionals (nurses, speech therapists) to treat stuttering. Whilst intervention was a means of help, it also cast stuttering into the realm of a disorder and reinforced dis-otherness. Pass as Normal – strategies included remaining silent, concealing the stutter and using a range of techniques and 'blending in'. Some were angered and fought back. Formally learned strategies were used with varying degrees of success throughout life. Gareth suggested that he had difficulty using slow and controlled speech which did not suit his personality but he continued as any amount of fluency was welcome. Disavowal was described as a cultural coping mechanism in SA, where children's problems are not discussed. This could have positive (attention not drawn to the issue) and negative (feeling isolated) consequences.	

Klompas & Ross, 2004 **Country:** South Africa **Study design:** Qualitative **Data collection method:** Interviews. **Aim:** To investigate the life experiences of adults who stutter. **Detail of participants (number, any reported demographics):** 16 adults mean age 29 (20-59 years) 9M & 7F. Four attending speech therapy at time of study. 15 had previously received therapy for periods ranging 2 sessions to 10 years, one not received any therapy. 13 single, 10 employed, mix of stuttering severity from 1 recovered to 3 varies mild to severe.	**Method:** Recruited via stuttering association, university clinic and personal contacts **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions.	**Main results:** Data relating to perceived effects on education, social life, employment, family and married life. Only one participant viewed speech therapy as being helpful in terms of enhancing fluency. 14 perceived speech therapy as non-helpful. Frustration, anger lack of carry over to real life situations, lack of belief trust between therapist and client, boredom, and hatred towards therapy described. One person reported she went to speech therapy out of curiosity, 4 attended other forms of treatment such as speech and drama, which was described as a confidence booster. While holding negative opinions of therapy helping them become more fluent 8 viewed speech therapy as exerting a positive effect on their quality of life, and 3 perceiving positive and negative effects. Three reported no effect on QoL. Therapy described as boosting confidence, self esteem, having techniques to fall back on, viewing and understanding stuttering, and identification with others. 13 reported using techniques or strategies to help them cope with their stuttering. 2 of these did not use them all the time however it depended who the listener was. Varying the speech rate most common strategy used followed by changing words or phrases, advertising stuttering, taking a deep breath, word avoidance, avoiding eye contact, and avoiding situations. Body language was also used as a strategy. Strategies perceived as helpful by 9 participants were Easy Relaxed Approach, and Easy Relaxed Approach Smooth Movement, shortening sentences, changing words/phrases, using airflow, interjections/filler sounds, light contacts,	**Limitations/comments**

			advertising and deep breathing. Techniques described as difficult and non-helpful by three people were airflow, rehearsing and deep breathing. Half reported that they had tried to find a cure for their stuttering, the other half described there being no cure/learning to live with it/accepted fact they stuttered. They gave their reasons for not trying to find a cure as making use of medication, a lack of facilities and had given up hope finding a cure. Three participants had not come to terms with their stuttering, others had to a greater or lesser extent.	
Plexico et al. 2009 **Country:** US **Study design:** Qualitative **Data collection method:** Semi-structured interviews **Aim:** To develop a model of coping and a better understanding of the complexities within the coping responses of people who stutter. **Detail of participants (number, any reported demographics):** N=9 adults Age range 19-63 years 7 male 2 female All reported to be coping with stuttering. 6 Caucasian 2 African American 1 Indian 4 educated to degree level 5 some college education	**Method:** Open-ended questions that were designed to elicit the participants' personal experiences about coping with stuttering. Interviews were audio-recorded and transcribed. Grounded Theory analysis. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate:** 13 originally contacted to participate. One did not turn up for initial interview, two could not be scheduled and one was excluded post-interview due to professional involvement with fluency disorders.	**Outcome measures:** Interview transcripts were broken down into 1008 meaning units. However, because a meaning unit could be placed into more than one subcategory, there were a total of 1206 meaning units in the final hierarchy. The "core category," the highest layer, subsumed four "clusters" that comprised the second layer. The four clusters were developed from layer three that contained a total of 15 categories. Finally, the categories were derived from the fourth level that consisted of 39 "subcategories."	**Main results:** This article describes the two clusters that address methods of escape as a coping response, and focuses on the categories and subcategories therein. Cluster 1: In an attempt to assuage the listener and protect myself, I devote a large amount of time and effort strategizing ways to prevent aversive communicative experiences. *Feelings of threat and anxiety result from a fear of being penalized by my listeners, and these feelings create inconsistency in my ability to manage stuttering and a desire to escape.* *To protect myself from hurt and the listener from a stressful interaction, I try to take the perspective of the listener and assume responsibility for putting him/her at ease.* *To protect myself from hurt and feeling a loss of control, I put a lot of effort into thinking about different ways to manage stuttering and speaking situations.*	**Limitations/comments** While the sample of participants is broad and diverse in terms of demographics, education, age, gender, and therapy experience, the inclusion of participants who had never thought about seeking services would make the findings of this study more diverse. Second, the results of this study are based on the participants' beliefs about their experience in coping with stuttering, not upon formal observations of how the participants cope with stuttering. It is possible that the participants' beliefs about how they cope with stuttering do not entirely match how they actually cope with

Diverse occupations Recruited through university clinical facilities.			*I cope with the urgency and fear associated with the need to respond to listeners in a timely manner by resisting the urge to speak immediately.* Cluster 2: Using methods of escape provides relief and control but hazards the risk of isolation, frustration and emotional suffering. *I often withdraw from communicative situations because stuttering is inefficient and out of my control, and withdrawal results in a diminished quality of life.* *Methods of escape provide momentary relief and distance from stuttering, but result in frustration from miscommunication and a narrowing of options.* Core category *Coping with stuttering is a struggle to replace concerns to assuage listeners with a sense of self-acceptance that can lead to approach-oriented behaviours.* Conclusions Aside from one participant who professed that stuttering was “not a big deal,” the participants currently felt negatively towards stuttering or described how they had reacted negatively towards stuttering in the past. They stressed how they found stuttering to be extremely inefficient when attempting to communicate and how they experienced a variety of negative emotions including fear, frustration, shame, embarrassment, helplessness and anger.	the experience of stuttering.

Plexico et al. 2009b **Country:** US **Study design:** Qualitative (Grounded Theory) **Data collection method:** Semi-structured interviews **Aim:** To identify patterns of coping responses by adults responding to the stress resulting from the threat of stuttering. **Detail of participants (number, any reported demographics):** As Plexico 2009a	**Method:** As Plexico 2009a **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate:** As Plexico 2009a	**Outcome measures:** As Plexico 2009a	**Main results:** Cluster 1: To improve my self-concept, I need to broaden my perspective of stuttering to recognize my capabilities, To abandon methods of escape and to recognize alternative coping choices. *Because stuttering is all that I have experienced, it is hard to embrace alternative coping choices and possibilities.* *Putting the stuttering experience into a broader perspective provides a way to reduce the magnitude of the problem, which is necessary for self-reassurance.* *With maturity and accomplishment stuttering has become a less prominent characteristic of myself, which results in feelings of increased self-worth.* Cluster 2: When I focus on my own needs and experience of stuttering versus the listener's needs, I have more agency and self-confidence, which in turn improves my fluency and self-concept. *More likely to contemplate taking action when there is an external impetus for change and an awareness that help is available.* *Acknowledgment of stuttering is beneficial because it relieves the pressure to be fluent, reduces stigma and may create positive listener affect.* *Using behavioural techniques to cope with stuttering can be effective, but they can be difficult to use and do not always result in complete fluency.* *Formal and informal sources of support provide protection, information and emotional*	**Limitations/comments** As Plexico 2009a

			stability needed to maintain or change core beliefs about the self. *Being assertive and taking responsibility for my own change results in increased confidence and self-understanding.* *Knowledge about the nature of the stuttering experience results in increased self-confidence in my ability to take action and manage stuttering.* Core category: coping with stuttering is a struggle to replace concerns to assuage listeners with a sense of self-acceptance that can lead to approach-oriented behaviours.	

Plexico & Burrus 2012 **Country:** US **Study design:** Qualitative. Phenomenological approach. **Data collection method:** Semi-structured interviews **Aim:** To describe in detail the underlying factors that may be relevant to being a parent of a child who stutters. **Detail of participants (number, any reported demographics):** N=12 All with a child who stutters (aged 5-14 years) Males = 2 Age range = 25-49 years (Mean = 36.58 years ± 7.77) Females = 10 Caucasian = 6 African American = 6	**Method:** Participants were recruited through either personal contact of the researcher, through word of mouth, or through personal contact of regional clinics and fluency programmes. The interviews did not have a pre-established time frame and took as long as it was necessary for the interviewer to feel that she had adequately captured the phenomenon of interest. The interviewer used a series of open-ended questions and unplanned prompts to elicit the participants' personal experiences with the process of coping with having a child who stutters. Interviews were audio-recorded and transcribed. Phenomenological analysis. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** What is the essential structure of coping with being the parent of a child who stutters?	**Main results:** Uncertainty about nature and cause of stuttering: *Parent questions typicality of child's disfluencies and his or her ability to overcome stuttering.* *Parent experiences a lack of certainty over cause and cure of stuttering and whether it should be acknowledged at home.* *Coping with a child who stutters results in feelings of uncertainty because it is persistent yet variable and can get more complex with time.* Coping strategies used to manage stuttering: *Nonprofessional management strategies used by parents to address child's stuttering.* *Parents want their child to speak more fluently and therefore seek professional help as a way of coping with child's stuttering.* *Personal experience and/or support is advantageous when having a child who stutters.* Parents cope with fear that their child will have negative experiences or live a restrictive lifestyle: *Parental concern that child will live a restrictive lifestyle or experience negative emotions as a result of stuttering.* *Active parental involvement is necessary to protect the child and manage bullying.* *Parent has to manage the reactions of*	**Limitations/comments** The participant pool cannot be viewed as a representation of all parents of all children who stutter. In addition, the results of this study are based on the participants' descriptions about their experience in coping with a child who stutters, not upon formal observation. It is possible that the participants' descriptions about how they cope with having a child who stutters do not entirely match how they actually cope with the experience. The results of the study were not enhanced by participant feedback. Questionnaires were sent to each of the participants, however none were returned. The poor response rate was a result of the intensive and time-consuming analysis and the time it took to later contact the participants.

			friends and family to child's stuttering. Essential structure of being the parent of a child who stutters: *Parents seek help to manage their child's stuttering. They want to reduce the chances of their child living a restricted lifestyle as well as anxiety from bullying. They try to modify the speaking behaviour of the child. They feel they need more support.*	
Plexico et al. 2005 **Country:** US **Study design:** Qualitative **Data collection method:** Interviews **Aim:** To understand how adults manage their stuttering. **Detail of participants (number, any reported demographics):** N=7 6M & 1F all history of stuttering well in to adulthood. Wide range of treatments experienced, age 38-59. All participants rated themselves as experiencing little or no handicap from the stuttering. On SSI-3 all were in the "very mild" range. All were professionals and had at least one degree. Five of them were speech pathologists actively involved in providing services to stutterers, the other two participants were active involved in self-help organisations.	**Method:** Phenomenology approach. Interviews and assessment of stuttering using the Stuttering Severity Instrument (SSI-3). **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions	**Main results:** Analysed data according to temporal stages – past if describing events from past when stuttering was essentially unsuccessfully managed -current is describing current situation when stuttering was successfully managed - transition describing transition from unsuccessful management to successful management of stuttering. 6 consistent themes associated with transition – support from others, successful therapy, self-therapy and behavioural change, cognitive change, utilisation of personal experience, high levels of motivation/determination. Support systems provided a chance to connect with others who stuttered, disclose their stuttering and exchange information. Counselling support helped participants revise negative attitudes, feelings and thoughts related to stuttering. Some had mentors who respected them, were knowledgeable about stuttering, encouraging, supportive and understanding, Participants described helpful therapy during the transition process – provided behavioural tools and cognitive and affective elements needed to change fluency and how they felt	**Limitations/comments**

			about themselves as speakers. Self-therapy an instrumental part of transition. Described how had to take it upon themselves to work on their speech. Self-therapy could involve risk taking and self-disclosure. Importance of self-disclosure (letting participants know often by voluntary stuttering) provided a sense of freedom, diminished fear of discovery and reduced amount of avoidance behaviours. Cognitive change part of transition process – more willing to take risks, take responsibility, learn more about themselves as a speaker, adopt a positive attitude. Importance of recognising positive attributes in themselves to help compensate for negative impact stuttering having on their lives. Participants sought help for themselves and had an overwhelming desire to succeed with high levels of motivation and determination. Past experiences dominated by struggle and suffering, anxiety and negative emotions. OUTCOMES Current experience themes were optimistic and positive interpretation of life with stuttering no longer a major theme. A sense of freedom to act and speak on ones behalf.	

Plexico et al. **2010** **Country:** US **Study design:** Qualitative **Data collection method:** Written responses to four questions. **Aim:** To describe factors that contribute to successful or unsuccessful therapeutic interactions. **Detail of participants (number, any reported demographics):** N=28 19 M & 9F age range 21-77 years, Mean age 39. Had received from 6 months to 12 years of therapy for stuttering. 21 had a degree.	**Method:** Phenomenology. Recruitment via NSA conference and support groups, personal contacts. Questions asked were: describe characteristics of effective SLP, describe how you felt in that interaction, describe an interaction with a SLP you felt not effective, describe how you felt in that interaction. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** View and perceptions	**Main results:** Characteristics distinguishing effective from ineffective clinicians were: communicate a passion for **helping** and genuine **understanding**, be **client-focused** and pay attention to client goals and capabilities, foster a strong therapeutic alliance based on **acceptance understanding and trust**. Characteristics of effective clinicians – passionate, committed, have belief in the therapeutic process, have belief in the client's ability to accomplish change. Effective clinicians are perceived as flexible and client-centred in their approach to treatment. Customise treatment to meet needs of client and work closely to determine goals, needs and readiness for change. Need to provide the client with knowledge about the treatment process and are sensitive to what client needs at a particular moment in timer rather than having a pre-determined agenda for each session. Need to have a confident professional manner and possess a through and comprehensive understanding of stuttering and its treatment including understanding physical and emotional aspects. Importance of establishing a therapeutic alliance with clients through being supportive and building a trusting relationship. Seeing client as a whole person and empathetic, honest and supportive. Actively listen to clients with a patient and caring demeanour. Need to encourage participation and urge action via encouragement and exhortation. Expectations should be communicated firmly and be realistic, that clients must practice and take responsibility for their own progress. Clients should be challenged beyond their comfort zone, to feel empowered to take risks and take charge of	**Limitations/comments**

			their communication abilities. Effective clinicians managed more than the speech dysfluency and emphasised effective communication rather than ideal fluency. Clients of effective therapists were more motivated and desired to attend therapy and achieve gains. Effective clinicians perceived as leading to increase in self-understanding and confidence resulting in stuttering being less dominant, increased fluency and reduced pressure to maintain complete fluency. Not effective – judgemental, lacking interest knowledge or understanding, failed to show patience or to actively listen or focus on client's goals and needs. Seen as dogmatic in their approach to therapy and likely to focus on techniques. This could lead to clients feeling misunderstood and a decreased interest in attending therapy. Also created feelings of shame, inadequacy, hopelessness, frustration, anger, guilt, embarrassment, and discouragement.	
Stewart & Richardson, 2004 **Country:** UK **Study design:** Qualitative **Data collection method:** Interviews **Aim:** To investigate the experiences of adults who had completed therapy. **Detail of participants (number, any reported demographics):** N=8 age range 23-59 mean 41 years, range of occupations, 7M & 1F, all had received the same programme of therapy individually and group with the	**Method:** Selected from 77 clients receiving group therapy and who had been discharged from therapy 95-99, also local self-help group. 13 volunteered, 3 DNA interview, two not met criteria. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions	**Main results:** Effect of therapy – reduced isolation, a chance to meet like-minded people in group therapy and share experiences was greatly valued. Also the support received from others who stammered. Support and empathetic understanding considered essential, feeling of being at ease. Seven of the eight described significant changes experienced while attending the group sessions, group therapy more effective than individual. Seven perceived their fluency had increased however a lack of agreement on which techniques were helpful. Relaxation, rate control, desensitisation and focusing on content of utterance described as helpful. Two felt block	**Limitations/comments**

same two specialist clinicians. Therapy received was combination of speak more fluently and stammer more fluently approaches grounded in client centred and PCP therapies. None still receiving therapy one discharged 96 and the rest 98/99.			modification and voluntary stammering unhelpful. Some of group experiences did not transfer to situations outside the group. Group considered “artificial”. Not a sense that skills were built upon and situations became easier with time, application to everyday situations difficult. Half discussed usefulness of establishing a “toolbox” of strategies, one could not remember having established these another was not convinced therapy gave him the ability to continue to control his speech. Variability in speech control amongst participants however for many outcome was attitudinal - fluency less of an issue of concern. Changes apparent in what clients felt able to do, feeling less fearful and stammering less impact on being able to see themselves in positive light. Some discussed significant changes in training/employment opportunities and social activities as a result of having greater confidence. Content of therapy - Suggestion that all possible interventions available should be outlined. Difference of opinion regarding balance of counselling and skills-based work during sessions. 3 suggested generalisation/transfer work on interview, telephone and giving presentations needed. Need for support after sessions ended emphasised – booster sessions or weekends, periodic follow up appointments, advanced group sessions or day courses.	

Trichon & Tetnowski, **2011** **Country:** US **Study design:** Qualitative **Data collection method:** Interviews **Aim:** To understand the experiences of individuals who attended a self-help conference **Detail of participants (number, any reported demographics):** N=12 7M & 5F early 20s to mid 50s. Had taken part in self-help conferences for between one year and 8 years.	**Method:** Phenomenology, participants recruited from self-help conference and the self-help community. Interviews conducted 4-18 months after individual's last conference. **Control: N/A** **Length of follow up: N/A** **Response and/or attrition rate: N/A**	**Outcome measures:** Views and perceptions.	**Main results:** Socialising with others - Self-help conferences a forum for conversing and building friendships with other people who stutter. Description of belonging, being in a place where not shunned or alone. Sense of becoming part of a community of people who stutter. Being there was an opportunity to redefine oneself, to accept themselves as a stutterer to be themselves. Participants described disclosure of their stutter as being a new experience or became easier after attending a conference which could lead to being easier to talk with others after the conference about the participant's stuttering.	**Limitations/comments**