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A systematic review to identify anxiety measures for use in populations undergoing abdominal aortic aneurysm screening

ABSTRACT

Objective
To identify the most appropriate patient reported outcome measure (PROM) to quantify anxiety of participants in the United Kingdom (UK) National Abdominal Aortic Aneurysm Screening Programme (NAAASP)

Methods
Comprehensive electronic searches were undertaken to identify studies reporting development or validation of PROMs used in the measurement of anxiety in screened populations. Study selection, data extraction and analysis were conducted independently by two reviewers; the "COnsensus-based Standards for the selection of health Measurement INstruments" (COSMIN) classification of measurement properties was used in the evaluation of included PROMs enabling a recommendation to be made for the most appropriate PROM for use in the NAAASP.

Results
The systematic review identified three PROMS that met the specified quality criteria and of these the Psychological Consequences of Screening questionnaire (PCQ) was judged to be the most appropriate PROM for use in populations undergoing screening for abdominal aortic aneurysm (AAA). Though the PCQ was developed for use in breast screening the individual items are appropriate to a population undergoing screening for AAA with minimal modification.

Discussion
The review was undertaken as part of a wider research initiative aiming to introduce routine measurement of anxiety alongside the UK NAAASP. A significant number of individuals participating in this screening programme will have an AAA that will never progress to a stage where it will directly cause ill health or require treatment. For these individuals the knowledge that they have an AAA could create anxiety that has a significant impact on quality of life, there is a potential for this to outweigh the benefits of screening and surveillance.

Conclusion
In the absence of a PROM with proven validity and reliability in populations undergoing AAA screening the PCQ is a pragmatic choice as a measure of anxiety in this population and appropriate for the purposes of the NAAASP.

1. INTRODUCTION

Abdominal Aortic Aneurysm (AAA) is a condition that occurs when the wall of the aorta weakens and dilates over time, if untreated AAA can result in death. AAA most commonly occurs in men aged over 65 years, although it can also be present in women and younger men. The majority of AAAs are symptomless and are discovered by chance, during an investigation for some other condition.

The National Abdominal Aortic Aneurysm Screening Programme (NAAASP) is a Public Health England programme, designed to screen for asymptomatic aneurysms with a view to early detection and treatment in order to prevent rupture and death (1). Men over 65 years of age are offered routine screening to detect the presence of an (AAA). The men are sent a leaflet explaining the condition and possible treatment options and are left to decide whether or not to take up the offer of screening.

Once detected, by chance or by screening, AAAs can be monitored and successfully treated by invasive treatment (surgery or endovascular repair). Treatment is usually only considered if the aneurysm is symptomatic, is enlarging quickly or is over 5.5cm (2). However, the treatment itself carries some element of risk and it is also possible that the AAA may never rupture during the patient's lifetime. The NAAASP are interested in monitoring levels of anxiety of participants in the screening programme, as there is a risk that anxiety, induced by the screening programme, could offset the benefits of screening. Vascular nurses are ideally placed to counsel eligible participants about participation in screening and also to support individuals with a diagnosis of AAA, whether that diagnosis has been made following screening or as an incidental finding as a result of tests and investigation for another condition.

Measuring anxiety requires an objective, valid and reliable tool. Informal scoping searches and discussions with experts in screening and vascular surgery failed to identify any high quality, valid and reliable Patient Reported Outcome Measures (PROMs) for use with this population. The authors were commissioned to undertake a systematic review and evaluation of existing PROMS used to measure anxiety levels in adults undergoing screening. The aim was to ascertain whether an existing tool was suitable for use to routinely measure anxiety in adults undergoing screening for AAA.

2. METHODS

2.1 Protocol and registration

A systematic review protocol based on COSMIN methodology(2-4) was pre-registered and is available at:
http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018091621

2.2 Eligibility

We included full text papers published in English language peer-reviewed journals that reported on the development, or assessed the validity and/or reliability, of PROMs used to assess anxiety in populations undergoing screening. PROMs that assessed broader concepts such as quality of life or emotional wellbeing were eligible for inclusion only if a subscale clearly assessed anxiety as a discrete construct and assessment of that subscale was possible using the "COnsensus-based Standards for the selection of health Measurement Instruments" (COSMIN) criteria.(3-6) Research studies that used PROMs to measure anxiety as an outcome but did not evaluate any aspect of validity or reliability were excluded.

We also restricted inclusion to papers that reported on population screening of asymptomatic individuals for conditions that could be identified at an early stage, prior to the need for treatment, but with the potential of disease progression such that individuals could require repeat screening over a period of years with a degree of on-going uncertainty about prognosis and future treatment options. We excluded PROMS that had been developed and validated in languages other than English and those that had not been evaluated for validity or reliability in the English language.

A pragmatic decision was made to focus on PROMs for which an evaluation of content validity could be performed. Content validity is defined as, *'the degree to which the content of a PROM is an adequate reflection of the construct to be measured'.(5)* In practice this means that qualitative studies should be conducted with the population that the PROM will be used with, either as part of the development of the PROM, or in post-development evaluation. It was therefore decided that PROMs that otherwise met inclusion/exclusion criteria but had no associated evidence detailing content validity would not be included in this review.

2.3 Search strategy

Comprehensive electronic searches of CINAHL (via EBSCOHOST), EMBASE (via OVID sp), MEDLINE (via OVID sp), PsycINFO (via OVID sp) and the COSMIN database of Systematic Reviews were searched from database inception to May 2018. Database inception is the date that the database was established. A mixture of free text and MESH terms were used based on; existing screening programmes (e.g. NAAASP, SAAAVE), general descriptors for screening (e.g. surveillance etc.), specific diseases (e.g. AAA, neoplasm), descriptors of anxiety (e.g. anxiety, emotional impact) and existing anxiety PROMs (e.g. HADS, STAI), these terms were combined with appropriate Boolean operators (e.g. AND/ OR) and appropriate mechanisms for each database. A specimen search strategy is included as appendix one in accordance with PRISMA guidelines (7). Hand searches of relevant journals and reference lists of included papers were also conducted, and experts were contacted for assistance in identifying relevant papers.

2.4 Study selection

Two of the three researchers (PP, GR and EW) independently screened titles, abstracts and full texts of identified studies with differences resolved by discussion.

2.5 Data extraction

Two authors independently conducted data extraction using standardised forms. The measurement properties were mapped against the COSMIN classification of measurement properties to ensure consistency. Measurement properties defined by COSMIN are 1/ content validity 2/ structural validity 3/ internal consistency 4/ cross cultural validity 5/ reliability 6/ measurement error 7/ criterion validity 8/ hypotheses testing for construct validity and 9/ responsiveness. Full definitions are available in the COSMIN manual for conducting systematic reviews of PROMs.(6)

2.6 Quality assessment

Focussed quality assessment was performed using COSMIN methodology (3-6).

- The 1st steps focussed on assessing the methodological quality of the studies that reported on the measurement properties
    - Papers were grouped according to the PROM(s) reported; an initial assessment was conducted that identified which measurement properties were reported for each PROM.
    - Where there was no assessment of content validity for an individual PROM, either through a development or content validity study, that PROM was not considered further in this review on the basis of COSMIN and FDA advice that content validity is critical to ensure that the PROM is fit for purpose (5,8).
    - The methodological quality of studies reporting on PROM development or content validity was assessed, using the COSMIN standards (5).
- The next step involved assessment of the quality of PROMs using the COSMIN criteria for good measurement properties (3), taking into account the quality of the studies reporting on the measurement properties, and also the reviewers (PP, GR and EW) interpretations of the relevance, comprehensiveness and comprehensibility of the PROMs.
- Finally, a Grading of Recommendations, Assessment, Development and Evaluations (GRADE) rating (9) was given rating the quality of the evidence, which indicates how confident the reviewers were in their overall rating of the PROM.
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2.7 Data Synthesis

A narrative synthesis was conducted.

3. RESULTS

Search strategies identified 13,573 potentially relevant papers, after removal of duplicates 8,939 papers had titles and abstracts screened and 61 full text papers were retrieved (See PRISMA flow chart (7) (Figure 1.) Eight full text papers (10-17) were identified reporting on three PROMS that met the inclusion criteria:

- Psychological Consequences Questionnaire (PCQ)
- Cervical Dysplasia Distress Questionnaire (CDDQ)
- Psychosocial Effects of Abnormal Pap Smears Questionnaire (PEAPS-Q)

Measurement properties of the PCQ are reported in six papers (10-15), whilst two papers (16,17) report measurement properties for the CDDQ/PEAPS-Q, these two are related PROMs and are considered together.

Initial evaluation of the development/content validity studies for all three PROMs found that the quality of the studies was doubtful (Table 1). Whilst this finding is concerning it needs to be considered in the context of the strict standards by which the PROMs are judged according to the COSMIN criteria (5), which uses the lowest score counts principle. Thirty-five separate standards are assessed and an inadequate or doubtful score on any one of these results in the study being assigned that designation for that measurement property. For instance, there is a lack of clarity about analysis and coding of interview data which led to classification of the PCQ as of doubtful quality for content validity, but there are aspects of development that are rated as very good; for instance appropriate qualitative data collection methods were used to identify relevant items for the PCQ and pilot testing was conducted in an appropriate sample. So this doubtful classification was not considered a critical flaw in the quality of these 3 PROMs

The next step was assessment of the PROM itself; a key stage in this process involved the reviewers (PP, GR, EW) assessing the PROM for relevance, comprehensiveness and comprehensibility (3).

CDDQ and PEAPS-Q were developed for use with, and by, women undergoing screening for cervical cancer. Such screening is by its nature invasive and sensitive. The PROMS focus on the medical procedure (Pap screening), sexual health, fertility and the specific disease (cancer). In these PROMs it is clear that the majority of items are not relevant to populations undergoing AAA screening. A pragmatic decision was made that no further assessment of criteria of these two PROMs was necessary, as they were unsuitable for use in a population undergoing screening for AAA.

The most comprehensively evaluated questionnaire in screened populations is the Psychological Consequences of Screening questionnaire (PCQ) and although this was developed for use in breast screening mammography the individual items would all appear to be appropriate to a population undergoing screening for AAA with minimal modification.

The PCQ is divided into positive and negative consequences sections and is described (10) as having emotional, physical and social subscales across both sections. The negative consequences questionnaire is presented as a series of statements about issues such as sleep, appetite, worries about the future, meeting commitments and feeling scared, and respondents are asked to state how often they have experienced the issues over the past week because of thoughts and feelings about breast cancer. Possible responses are not at all, rarely, some of the time, all of the time. The positive consequences section asks participants to consider their experiences at the breast examination and whether they agree that the experience caused, for example, improvement in relationships, a sense of reassurance and feeling hopeful about the future. As described earlier an explicit part of the

process of evaluation using the COSMIN criteria involves the reviewers assessing PROMs for relevance, comprehensiveness and comprehensibility and

In addition to the PROM development and evaluation of content validity (10) five papers (11-15) were identified in the review process that assessed other measurement properties of the PCQ (Table 2). Cooper et al assessed structural validity using a confirmatory factor analysis (11); structural validity was also assessed though less rigorously by both Molina et al (15) and Ong et al 1997(12). Additionally, assessment of internal consistency, construct validity and responsiveness (hypothesis testing) were conducted across these six papers, though our assessment concluded that the papers by Swanson(14) and Shermann(13) did not report any usable data.

Post development evaluation of PCQ measurement properties contrast with the original description of the PCQ (10) as a two section PROM (positive and negative consequences), with three subscales (physical, emotional and social). Cooper et al,(11) Ong et al (12) and Molina et al (15) all focus on the negative consequences section of the PCQ and do not evaluate the positive consequences section at all. Cooper's factor analysis (11) supports both a three factor and a one-factor model but the author's express a preference for the one factor model due to the high co-variance in the three-factor model.

4. DISCUSSION

This review was undertaken as part of a wider research initiative aiming to introduce routine measurement of anxiety and quality of life alongside the National AAA screening programme. AAA screening is similar in many respects to breast screening programmes, but differs from some other screening programmes in that the majority of those identified by the screening programme will have sub-clinical disease that does not require immediate treatment, but may involve long-term surveillance to check for enlargement of the aneurysm, sometimes over several years. If there is significant impact on quality of life from the anxiety associated with screening and surveillance, then there is potential for this to outweigh the benefits of the programme.

This systematic review has identified that Psychological Consequences of Screening Questionnaire (PCQ) Negative Consequences, appears to the most appropriate validated PROM for use in the population undergoing AAA screening as part of the National AAA screening programme. Assessment of content validity has been conducted in a population undergoing screening by ultrasound examination, albeit for a different disease which affects women only and which has a different natural history. The individual items all appear to be of relevance to the AAA population. Whilst there are question marks over some aspects of the methodological quality of the studies reporting on the measurement properties of the PCQ and the absence of any assessment of some of these properties, the PROM demonstrates relatively rigorous development and psychometric evaluation. Other potential PROMs identified through the review were not deemed to be suitable to use in AAA screening. This was because they were either too generic (e.g. HADS questionnaire and STAI questionnaire), with limited evidence of psychometric evaluation in screened populations, or they were very specifically related to the condition being screened for and/or the test of examination used in screening.

Strengths:
This systematic review is the first of its kind to examine validated PROM tools to determine which tool may be most suitable for use within the AAA screened population.

Limitations:
A number of papers were excluded that conduct evaluation of PROMs in screened populations because they use translation of the PROM; the majority of these studies were conducted in Dutch and Scandinavian populations.

The target population for the review was defined as a population undergoing screening, which includes PROMs developed for use in populations such as breast screening, and subsequently a subjective decision was made about the relevance of the PROM to our population (AAA). The research team made this an explicit part of the assessment of content validity, where the three reviewers rated the content of the PROMs themselves.

Recommendations for future research:
There are now plans to introduce the use of the PCQ alongside generic measures of quality of life as part of the UK National AAA Screening Programme. This should provide a large sample of data for further evaluation of the psychometric properties of the PCQ and the relationship between this condition-specific PROM and generic measures. The results of this further evaluation will then provide a quantitative assessment of the psychological impact of screening and surveillance for AAA.

5. CONCLUSION

This systematic review aimed to identify a validated PROM that can be used to assess anxiety in the AAA screening population. The conclusion drawn is that the PCQ negative consequences questionnaire can be used in this population, with the proviso that there is a single sub scale as defined by Cooper (11) and this appears to be the most appropriate PROM for use in a population undergoing screening for AAA.

FIGURE 1 PRISMA Flow Diagram(6)

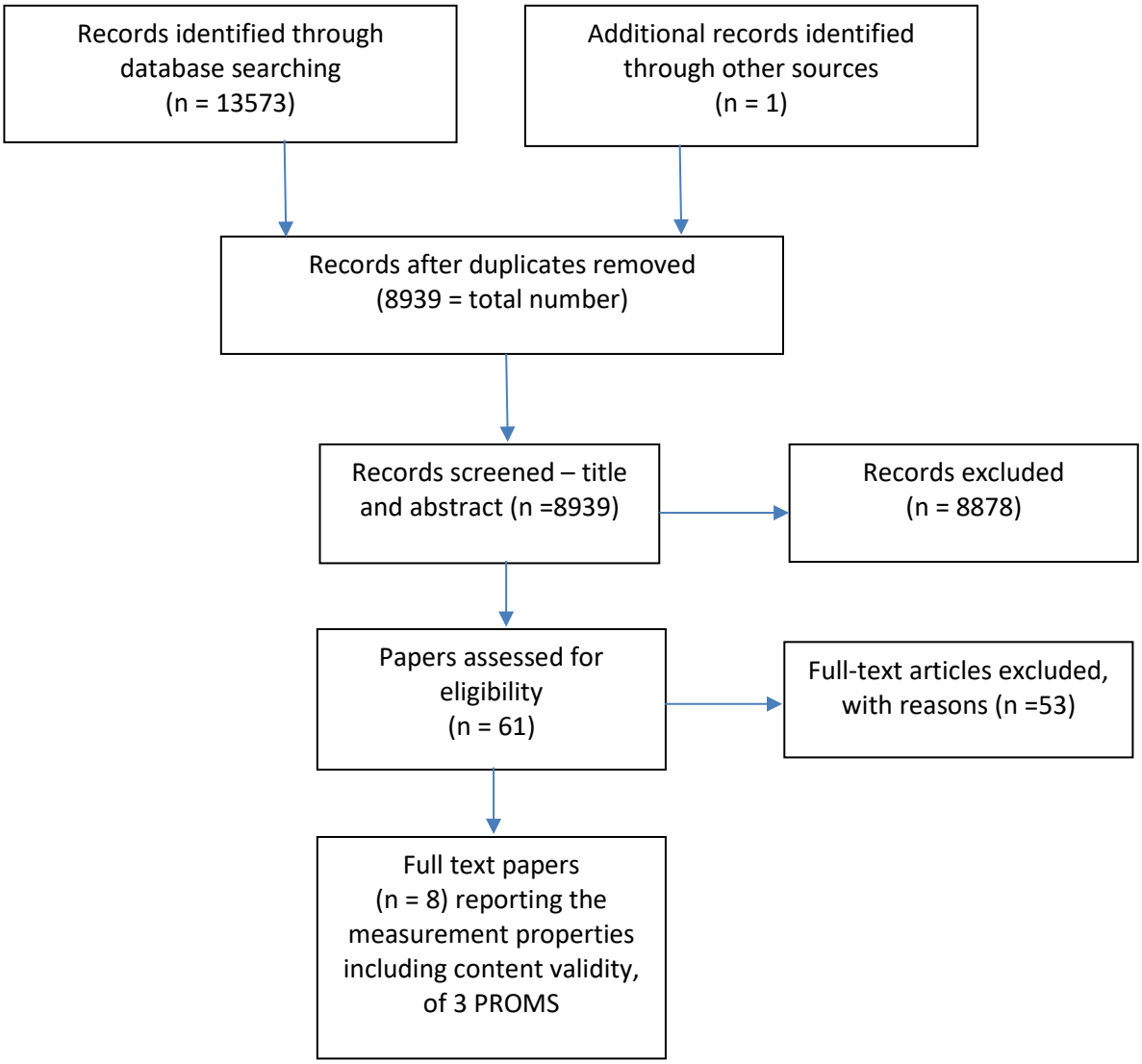

TABLE 1 Results of COSMIN standards and criteria assessment for PROMs that report content validity

	Overall Study Quality (content validity)		Assessment of PROM quality (COSMIN criteria)	Reviewer rating
PROM	**PROM development Study**	**Assessment of content validity**		
PCQ (positive consequences)	Doubtful (Cockburn 1992)(7)	Insufficient data (Cockburn 1992)(7)	Indeterminate	Sufficient
PCQ (negative consequences)	Doubtful (Cockburn 1992)(7)	Insufficient data (Cockburn 1992)(7)	Indeterminate	Sufficient
PCQ (emotional)	Doubtful (Cockburn 1992)(7)	Insufficient data (Cockburn 1992)(7)	Indeterminate	Sufficient
PCQ (physical)	Doubtful (Cockburn 1992)(7)	Insufficient data (Cockburn 1992)(7)	Indeterminate	Sufficient
PCQ (social)	Doubtful (Cockburn 1992)(7)	Insufficient data (Cockburn 1992)(7)	Indeterminate	Sufficient
CDDQ (medical procedure items - embarrassment)	Doubtful (Shinn 2004)(13)	Insufficient data (Shinn 2004)(13)	Not assessed	Insufficient
CDDQ (medical procedure items – discomfort tension)	Doubtful (Shinn 2004)(13)	Insufficient data (Shinn 2004)(13)	Not assessed	Insufficient
CDDQ (distress items – concern about sexual and reproductive issues)	Doubtful (Shinn 2004)(13)	Insufficient data (Shinn 2004)(13)	Not assessed	Insufficient
CDDQ (distress items – concern about health consequences)	Doubtful (Shinn 2004)(13)	Insufficient data (Shinn 2004)(13)	Not assessed	Insufficient
PEAPS - Q (Experience of medical procedures)	Doubtful (Bennetts 1995)(14)	Insufficient data (Bennetts 1995)(14)	Not assessed	Insufficient
PEAPS-Q (beliefs/ feelings about cervical abnormality and changes in perception of	Doubtful (Bennetts 1995)(14)	Insufficient data (Bennetts 1995)(14)	Not assessed	Insufficient

	Overall Study Quality (content validity)		Assessment of PROM quality (COSMIN criteria)	Reviewer rating
PROM	**PROM development Study**	**Assessment of content validity**		
oneself				
PEAPS-Q (worry about infectivity)	Doubtful (Bennetts 1995)(14)	Insufficient data (Bennetts 1995)(14)	Not assessed	Insufficient
PEAPS-Q (effect on sexual relations)	Doubtful (Bennetts 1995)(14)	Insufficient data (Bennetts 1995)	Not assessed	Insufficient

Abbreviations: PCQ - Psychological Consequences Questionnaire; CDDQ- Cervical Dysplasia Distress Questionnaire; PEAPS- Q - Psychosocial Effects of Abnormal Pap Smears Questionnaire.

TABLE 2 Table of measurement properties of PCQ (positive and negative consequences) assessed using COSMIN guidelines

PCQ (negative consequences)	**Standards**	**Criteria**	**Grade**
Content validity	Doubtful	?	?
Structural validity	Very good	+	Moderate
Internal consistency	Very good	+	Moderate
Construct validity (convergent validity)	Inadequate	_	Low
Responsiveness (hypothesis testing before and after intervention)	Very good	+	Moderate
PCQ (positive consequences)	**Standards**	**Criteria**	**Grade**
Content validity	Doubtful	?	?
Structural validity	Not assessed	n/a	n/a
Internal consistency	Very good	+	Moderate
Construct validity (convergent validity)	Inadequate	-	Low
Responsiveness (hypothesis testing before and after intervention)	Very good	+	Moderate

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APPENDIX 1: Search Strategy

MEDLINE and PsycINFO search strategy via OVIDSP:

1. exp Mass Screening/
2. "screen*".kw,tw.
3. screening.kw.
4. NAAASP.kw,tw.
5. SAAAVE.kw,tw.
6. Aortic Aneurysm, Abdominal/pc [Prevention & Control]
7. Aortic Rupture/pc [Prevention & Control]
8. (sub-aneurysm$ or subaneurysm$).ab,ti.
9. surveillance.ab,ti,kw,tw.
10. Watchful Waiting/
11. watchful waiting.kw,tw.
12. Neoplasms/pc [Prevention & Control]
13. mammogra$.mp. or Mammography/
14. Prostate-Specific Antigen/
15. (cervi$ adj2 smear$).ab,kw,ti.
16. ((smear or pap) and test).ab,kw,ti.
17. (f$ecal adj2 occult adj blood).ab,kw,ti.
18. Cardiovascular Diseases/pc [Prevention & Control]
19. (distress adj2 thermometer).kw,tw.
20. (anxi$ adj2 index).kw,tw.
21. (anxi$ adj2 tool).kw,tw.
22. (anxi$ adj2 PRO).kw,tw.
23. (anxi$ adj2 instrument).kw,tw.
24. ((anxi$ adj4 patient) and report and outcome).kw,tw.
25. (penn state worry questionnaire or pswq).kw,tw.
26. (anxi$ adj2 questionnaire).kw,tw.
27. (GADQ?4 or GADQ?IV or GAD?7).kw,tw.
28. (HAD score or HAD scale).kw,tw.
29. (anxi$ adj2 score).kw,tw.
30. (HARS or HAR score or HAR scale).kw,tw.
31. PHQ?4.kw,tw.
32. (anxi$ adj2 inventory).kw,tw.
33. (beck adj2 inventory).kw,tw.
34. STAI.kw,tw.
35. (anxi$ adj3 scale).kw,tw.
36. (PCQ or psychological consequences questionnaire).ab,kw,ti,tw.
37. (psycholog$ adj4 consequences adj4 screening).ab,kw,ti,tw.
38. (psycholog$ adj2 harm).ab,ti,kw,tw.
39. (benefit* and harm*).m_titl.
40. (emotional adj2 impact).kw,tw.
41. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18
42. 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 39 or 40
43. 41 and 42