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Presseau, Justin, Byrne-Davis, Lucie M T, Hotham, Sarah et al. (18 more authors) (2021) Enhancing the translation of health behaviour change research into practice: A selective conceptual review of the synergy between implementation science and health psychology. *Health psychology review*. pp. 22-49. ISSN: 1743-7202

<https://doi.org/10.1080/17437199.2020.1866638>

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To cite this article: Justin Presseau , Lucie M.T. Byrne-Davis , Sarah Hotham , Fabiana Lorencatto , Sebastian Potthoff , Lou Atkinson , Eleanor Bull , Alexandra L. Dima , Anne van Dongen , David French , Nelli Hankonen , Jo Hart , Gill ten Hoor , Kristian Hudson , Dominika Kwasnicka , Sanne van Lieshout , Jennifer McSharry , Ellinor K. Olander , Rachael Powell , Elaine Toomey & Molly Byrne (2021): Enhancing the translation of health behaviour change research into practice: A selective conceptual review of the synergy between implementation science and health psychology, Health Psychology Review, DOI: [10.1080/17437199.2020.1866638](https://doi.org/10.1080/17437199.2020.1866638)

To link to this article: <https://doi.org/10.1080/17437199.2020.1866638>



Accepted author version posted online: 15 Jan 2021.



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Publisher: Taylor & Francis & Informa UK Limited, trading as Taylor & Francis Group

Journal: *Health Psychology Review*

DOI: 10.1080/17437199.2020.1866638



Enhancing the translation of health behaviour change research into practice: A selective conceptual review of the synergy between implementation science and health psychology

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Abstract

Health psychology is at the forefront of developing and disseminating evidence, theories, and methods that have improved the understanding of health behaviour change. However, existing evidence dissemination approaches may be insufficient for promoting the broader application and impact of findings to benefit the health of patients and the public. Health psychology is contributing to the science of implementing research into practice. Behaviour change theory and methods typically directed towards health behaviours are now being used to understand and change the behaviour of individuals at different levels of the health system whose own behaviour impacts the delivery of evidence-based health behaviour change interventions. Despite this contribution *to* the science of implementation, health psychology is perhaps doing less to draw *from* implementation science. We propose that a redoubled focus on implementation science in health psychology could provide novel prospects for enhancing the impact of health behaviour change evidence. In this article, we report a journal-specific review of reviews of trials of health behaviour change interventions published in *Health Psychology Review* from inception to April 2020. We identified 34 reviews and assessed whether implementation readiness of health behaviour change intervention was discussed. We then narratively review ways in which implementation science has integrated theory and methods from health psychology and related disciplines to inform the science of how to improve health care. Finally, we demonstrate how greater synergy between implementation science and health psychology could help promote greater follow-through on advances made in the science of health behaviour change.

Keywords: Implementation Science; Intervention Development; Intervention Mapping; Behaviour Change Wheel; Theoretical Domains Framework; Behaviour Change

Introduction

In the multidisciplinary landscape of contributions to the science of health behaviour change, health psychology provides unique and novel advances through the development and application of over a century of theory, evidence and measurement. Evidence generated within health psychology, applied social psychology, behavioural medicine and psychology-informed health promotion literatures on *what works* and *why* for changing health behaviour has the potential to address key societal health issues (e.g., Bélanger-Gravel et al., 2013; Caperon et al., 2018; Knittle et al., 2018; Kok et al., 2018). However, it is not clear to what extent these behaviour change advances are implemented and evaluated beyond research settings in which they are tested.

Health psychology journals and conferences showcase well-developed methods, compelling theories, and rigorously developed, evaluated and synthesised interventions. While fundamental for sharing and promoting advancement within the field, such dissemination approaches are unlikely to be sufficient for ensuring the implementation of findings more broadly and may amount to ‘preaching to the converted’. There is a risk of producing an imbalance between the evidence of what works (innovations), and what is actually delivered to patients and the public in practice (implementation and impact). Assuming that health behaviour change research evidence will be implemented by others may not be sufficiently capitalizing on the potential of the evidence being generated. Greater focus on implementation alongside innovation in health psychology may promote wider-scale impact.

Gaps between research evidence and actual practice were recognized in the evidence-based practice movement in medicine, which highlighted that patients do not receive healthcare according to best evidence: 30-40% do not receive healthcare according to clinical evidence and up to 25% of care provided is unnecessary or even harmful (Grol, 2001; McGlynn et al., 2003). In health psychology, it is not yet clear what evidence is being implemented into routine practice, or even where the evidence-practice gaps lie for practicing health psychologists and other health professionals (e.g., physicians, nurses, public health practitioners) who routinely deliver health behaviour change interventions to patients and the public. While health psychology has much to contribute to the health and well-being of patients and populations, the question remains whether health psychology is fully realizing the potential of the evidence being generated. Is health psychology following-through on its breakthroughs (cf Woolf, 2006)?

Systematic reviews of experimental and trial evidence demonstrating the benefit of specific interventions, strategies and techniques for changing behaviour form the empirical foundation to justify advances that might be ready for delivery in routine healthcare settings. For example, implementation intentions emerged from social psychology (Gollwitzer, 1999), is embedded in contemporary health behaviour change theories (Hagger & Chatzisarantis, 2014; Schwarzer, 2008) and arguably has the evidence-base favouring use in routine health settings when supporting health behaviour change: evidence supports its use for promoting physical activity (Bélanger-Gravel et al., 2013) and healthy/unhealthy eating (Adriaanse et al., 2011) and possibly across a range of other health behaviours (Squires et al., 2013). The extent to which implementation intentions are used by various healthcare providers in various jurisdictions, for various behaviours remains an empirical implementation question (e.g., Gonzalez Salas Duhne et al., in press). This intention-behaviour gap-bridging breakthrough in health behaviour change

may currently be largely confined to disciplinary bounds and to the trials in which it has been tested rather than truly impacting on patients and population in routine healthcare settings. Implementation intentions are but one example. It is clear from the multiple systematic reviews of trials of health behaviour change interventions published in *Health Psychology Review* to date that much is known about health behaviour change. However, their readiness for implementation, evaluation and use in routine practice by health psychology practitioners and other health professionals supporting people to change their behaviour remains unclear. Clarifying the maturity of the evidence to inform readiness for implementation and accompanying implementation research and evaluation would be key towards following-through on advances in the science of health behaviour change.

While some evidenced health behaviour change interventions may be ready for implementation and implementation research, publishing a review of evidence that favours a given health behaviour change intervention is only the first step in ensuring the move from evidence to routine practice. The past two decades has seen the emergence of implementation science, which focuses squarely on this issue: studying how to move research evidence into routine healthcare to change the care provided in the real world. Implementation science is “the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence to improve the quality and effectiveness of health services (p.1)” (Eccles & Mittman, 2006). Paradoxically, a potential issue is that though health psychology and related disciplines have contributed much *to* implementation science, health psychologists may not yet be aware of this contribution. Perhaps as a result, health psychology has seemingly done less so far to draw *from* implementation science to inform the wider impact of evidence-based health behaviour change interventions.

This may partly be due to a lack of awareness of the synergy between the disciplines, of what health psychology has already contributed to implementation science, and of new opportunities afforded by applying implementation science principles in health psychology.

We convened a meeting consisting of health psychology and implementation science researchers and practitioners spanning Australia, Canada, Finland, France, Ireland, Poland, the Netherlands, the UK and the US to discuss links and opportunities between health psychology and implementation science. The meeting highlighted the lack of clarity in the literature on conceptual links between the two disciplines, particularly regarding four issues that the present review seeks to address: a) the lack of clarity on the extent to which the behaviour change evidence generated within health psychology is being implemented beyond the trials being synthesised in systematic reviews, b) the lack of awareness of the degree to which implementation science has drawn from methods and theories used in health psychology, and therefore c) the potential opportunity for health psychology to further enhance its traditional remit to emphasise implementation and d) to contribute further to implementation science while drawing from it to evaluate and enhance the impact of evidence-based behaviour change interventions for the health and well-being of patients and populations. Co-authors self-selected into each of these four issues and worked together to identify key literature to address each point with the aim of highlighting synergies between health psychology and implementation science and the potential for advancing impact of health behaviour change intervention outside of disciplinary bounds. The result formed the basis for the present review, which sought to address these issues by narratively synthesising non-exhaustive internationally representative exemplars of literature to draw links between implementation science and health psychology, seeking to highlight opportunity for further synergy.

With this narrative conceptual review, our goal was to highlight whether existing evidence of health behaviour change interventions is described in terms of its readiness for implementation research and evaluation; to highlight how much implementation science has drawn from a broad and international range of behaviour change theories and methods, and to highlight a range of contemporary approaches in implementation science that health psychologists could further adopt. Our first aim was therefore to identify reviews of randomized trials of health behaviour change interventions published in one journal (*Health Psychology Review*) and chart the current extent of discussion of readiness of the interventions for implementation and evaluation beyond the trials. We then aimed to describe existing synergies between health psychology and implementation science that may help to promote a greater focus on the opportunities for rigorous design and evaluation of the implementation of effective health behaviour change interventions by a) taking stock of key contributions that health psychology and related disciplines (applied social psychology, health promotion) have made to implementation science, b) discussing the potential of implementation science for enhancing the impact of health behaviour change evidence, and c) recommending how health psychologists can supplement current evidence dissemination activities with efforts towards implementing evidence to enhance the impact of their research while also contributing to implementation science itself.

Identifying discussion about readiness for implementation in systematic reviews of trials of health behaviour change interventions published in *Health Psychology Review*

Methods

We were interested in whether the reviews of health behaviour change interventions reviewed and published in *Health Psychology Review* make mention of the extent to which the evidence synthesised is ready for implementation research, delivery and evaluation beyond the trials in which they were tested. We identified and screened all articles published and in press in *Health Psychology Review* from inception to 27 April 2020 using PsycINFO (journal title used for search strategy) to identify empirical systematic reviews of trials of health behaviour change interventions. An initial screening was conducted in December 2019 and updated in April 2020.

Inclusion criteria: We included systematic reviews (and reviews of reviews) of randomized controlled trials of health behaviour change interventions that reported a pooled effect size of a health behaviour change intervention (broadly defined as testing a strategy, program, or one or more behaviour change techniques/methods or modes of delivery) on a health behaviour.

Exclusion criteria: We excluded reviews that did not include any randomized controlled trials, did not report a pooled quantitative analysis on a health behaviour change outcome, or that focused only on theory-based process measures (e.g., intention, risk perceptions) or only on psychological or physical health outcomes (e.g., well-being, weight).

Screening: Two authors (GtH, ET) used Covidence to independently screen titles and abstracts, then full-text, resolving conflicts with a third reviewer (JP) when needed.

Data extraction: Two authors (LBD and AD) extracted the author, year, target population, behaviour(s), setting, and description of behaviour change interventions from included articles.

They then independently double-coded whether each included review had any mention of the readiness of the intervention being synthesised for moving to implementation research and practice (coding: yes, no, unclear) and whether the review specifically extracted data on implementation readiness (yes, no, n/a, unclear). Of reviews that did, they coded whether the intervention was deemed by reviews to be ready for implementation research or practice (yes, no, n/a, unclear). Discrepancies were resolved through discussion, involving a third author (JP).

Results and Discussion

Of the 323 articles published in *Health Psychology Review* from inception to April 2020, we identified 34 reviews of randomized controlled trials of health behaviour change interventions with health behaviour outcomes (see PRISMA diagram in online appendix). As seen in Table 1, the majority focused on physical activity (n=12) or multiple health behaviours (n=12), while others focused on eating (n=3), medication adherence/prescribing (n=3), breastfeeding (n=2), alcohol (n=1) and smoking (n=1). Most reviews did not focus on a particular intervention setting or target population. Interventions tested were varied, ranging from specific behaviour change techniques/methods tested experimentally (e.g., implementation intentions, goal setting) or via meta-regression and sub-group meta-analysis, to interventions based on particular behaviour change theory (e.g., self-determination theory), to interventions defined by their mode of delivery (e.g., text messages) or setting (e.g., workplace). Only four included reviews had a mention of the potential of the intervention and its evidence-base for moving to implementation research or practice and no reviews extracted implementation-related data.

Given the health behaviour change evidence being generated and reviewed, there is clear impetus to focus greater attention on whether the strength of the evidence for a given health behaviour change intervention justifies (or not) moving to an implementation phase yet, and if not, what would be needed to get there. Such indication could benefit those who are already delivering health behaviour change interventions in practice. This would also provide the evidentiary foundation for drawing upon implementation science to rigorously move interventions into practice. The groundwork has been laid for such synergies between health psychology and implementation science, but the implications and opportunities of these synergies may not yet have fully permeated into health psychology. The following conceptual overview aims to redress this to enhance capacity to rigorously follow-through on advances in the science of health behaviour change.

Taking Stock: What has Health Psychology Contributed to Implementation Science?

Traditionally, disciplines such as health psychology, applied social psychology and health promotion have focused on the health behaviours of patients and the public. However, pioneering health and social psychologists recognized that the behaviour of healthcare providers could also be a focus of inquiry, allowing for the application of methods and theories from health psychology to the behaviours of those involved in providing health care (Bartholomew Eldredge et al., 2016; Michie & Johnston, 2004). This conceptual shift recognises behaviour change as important in individuals at multiple levels. Instead of contrasting ‘individualistic’ against ‘organizational/system’ approaches, this false dichotomy is rectified by considering the actors at various levels whose behaviour needs to change (Bartholomew et al., 2001; Sniehotta et al., 2017): patients, health professionals, service providers, teachers, family members, managers,

commissioners, policy makers, and politicians. Any intervention is ultimately mediated through *someone doing something differently somewhere, at some level*. Herein, we focus largely on health care professionals as one such group of actors, recognizing that the same principles apply across a range of actors at different levels. This shift in paradigm moves away from relegating change in the behaviour of those who deliver interventions to the purview of ‘education and training’ that might be the responsibility of another discipline. Instead, there are opportunities within health psychology to focus on understanding specific theory-based determinants of, and strategies for changing, the behaviour of healthcare professionals and other actors at all levels of a healthcare system.

Do theories, methods and measures typically applied to health behaviours in patients and the public also apply to health professionals? This is an empirical question and the answer to date is, in short, yes. Implementation scientists are applying theories and methods from health psychology and related disciplines that health psychology draws from to improve healthcare. Key contributions to implementation science – described below – include the centrality of behaviour, the role of behaviour change theory, methods for behaviour change intervention development and evaluation, and methods for theory-informed evidence synthesis.

Contribution 1: The centrality of behaviour

While behaviour is a fundamental outcome of interest in health psychology, behaviour is not necessarily measured or even considered in other health disciplines. Initially within social psychology, Fishbein (1967) proposed that behaviour be defined by the *target* of the action, the *action* itself, and the *context* and *time* of its performance; i.e., the ‘TACT’ principle. However, the target of the action may be someone other than the self and as a result, adding the *actor* has

been a recent extension driven by applications of the TACT principle in implementation science (Francis & Presseau, 2019; Presseau et al., 2019). Implementation science has taken up this call for behavioural specificity, recognizing the importance of identifying, defining and measuring behaviour (Michie et al., 2009; Michie & Johnston, 2004).

It can be challenging to identify whose and which behaviour(s) to target and it may not be feasible to address all behaviours. Guiding principles can help to prioritise a focal behaviour: a) perceived importance and changeability of the determinants of behaviour, b) impact if the behaviour were to be changed; c) anticipated ease of changing the behaviour; d) importance of the behaviour relative to other behaviours; and e) ease with which the behaviour can be measured (Bartholomew Eldredge et al., 2016; Michie et al., 2011). Such behaviour analysis is often aided by seeking input from healthcare stakeholders to clarify who should be involved (Kok et al., 2015; Wolk et al., 2017). Behaviour change approaches can also be used by health professionals themselves to understand their own behaviour(s) and develop and test their own interventions, in action research or organisational participatory research (Bull et al., 2019).

TACT specification and behaviour analysis have been useful for defining healthcare professional behaviours that need to be increased (e.g., hand washing in hospitals) and those that need to stop (e.g., reducing unnecessary blood transfusions (Hartley et al., 2017) or reduced antibiotic prescription (Duncan et al., 2020)). De-implementation, i.e. stopping practices that are not in line with clinical research evidence, has become a major focus in implementation science (Prasad & Ioannidis, 2014) to which health psychology continues to have much to contribute such as in habit theory, operant learning theory and the use of specific behaviour change techniques to promote de-implementation (Gardner et al., 2010; Patey et al., 2018; Voorn et al., 2017).

Contribution 2: The role of behaviour change theory in implementation science

Improving patient care is not easy and when successful can result in small changes that are hard to maintain and replicate (Dixon-Woods et al., 2013). Shojania and Grimshaw (2005) recognized that there are no magic bullets for improving healthcare, with implementation sometimes described as a “slow and haphazard process” (Grimshaw et al., 2007). To address and accelerate this, implementation research has applied theory to synthesize existing evidence, to identify barriers and enablers and correlates of behaviour, to develop and evaluate implementation interventions, and to provide testable explanations for change (Davies et al., 2010; Eccles et al., 2005). The application of theories of behaviour in implementation science contributes to building a cumulative science, designing and evaluating interventions, and helping to identify the conditions necessary for their success (Davidoff et al., 2015).

At the turn of the twenty-first century, health psychology was in the throes of social cognition model testing, with the Theory of Planned Behaviour (TPB) as a central theory being used to predict health behaviours (Ajzen, 1991; McEachan et al., 2011). It remained an open question whether the same social cognition models could be used to predict healthcare professional behaviour. Adapting good practice methods for constructing TPB questionnaires (Francis et al., 2004), a literature emerged showing that indeed, core theories of social cognition of the time could also be applied to predict a range of healthcare professional behaviours with effect sizes equivalent to those observed when predicting health behaviours in patients and the public (for a review, see Godin et al., 2008). Contemporary theories from health psychology have since further been used to predict healthcare professional behaviours (de Bruin et al., 2018; Potthoff et al., 2019)

While implementation scientists recognized the value of theory, a key challenge is in selecting a theory among the dozens available. Broad frameworks have been developed by teams that include health psychologists to synthesize key constructs from behaviour and behaviour change theories. The Theoretical Domains Framework (TDF) is an example of such a framework and has been particularly well-adopted in implementation science. The TDF summarizes constructs from over 30 theories of behaviour and behaviour change into 14 broad domains (Atkins et al., 2017; Cane et al., 2012; Michie et al., 2005). The TDF has been used as a basis for conducting theory-based qualitative studies to identify potentially relevant behavioural factors in health professionals to target in intervention development (Patey et al., 2012), informing questionnaire studies that operationalize the TDF (Huijg et al., 2014; Taylor et al., 2013) and to identify theory-based correlates of health professional behaviour (Beenstock et al., 2012).

Contribution 3: Methods for developing and evaluating implementation interventions informed by behaviour change theory

Implementation interventions aim to embed and scale up programs, treatments, and services that have been shown to be effective, and to de-implement those that are not. Implementation science is not short of frameworks for guiding the process of developing implementation interventions (Nilsen, 2015). A unique feature of approaches originating from (or influenced by) health psychology and related psychology-informed disciplines is their direct link to behaviour change theory, ensuring that interventions draw upon and contribute to a cumulative evidence base, rooted in a consistently applied scientific language. Two key approaches to intervention development within (or informed by) health psychology and related disciplines have informed implementation interventions: applications of specific behaviour change theories to specify

intervention content and mechanisms (e.g., social cognition models, dual process models, control theory or operant learning) and use of broader frameworks to guide the intervention development process itself. Amongst others, three international contemporary approaches to intervention development with roots in health psychology and related disciplines have contributed to implementation science: Intervention Mapping (Bartholomew Eldredge et al., 2016; Fernandez et al., 2019), the Behaviour Change Wheel (BCW; including the TDF and Behaviour Change Techniques taxonomy (Michie et al., 2013)), and the French model (French et al., 2012)]. As described in Table 2, each of these intervention development process frameworks broadly involves three linked steps: 1) *Behaviour diagnostics* to define behaviours to be changed and their theory-based determinants; 2) *Developing theory-based interventions* by linking theory-informed barriers/enablers or determinants to intervention strategies, and 3) *Evaluating* processes of change in the interventions in terms of mechanisms of action (mediation and moderation) and intervention fidelity (Araújo-Soares et al., 2019).

Step 1) Behaviour diagnostics: defining behaviours and their theory-based determinants. This first step involves defining who needs to do what differently and what barriers, enablers and determinants affect their behaviour (French et al., 2012), informed by TACT. In implementation science, this involves specifying health care professional (or other environmental agent) behaviour(s) that must change for implementation to be successful and using behaviour change theory to identify these barriers and enablers. While the BCW synthesises constructs across theories into broader domains, Intervention Mapping proposes the consideration of multiple different theories in their own right, and the French model suggests using an overarching synthesising theoretical framework (e.g., TDF) as a basis for identifying

barriers and enablers. Each framework proposes the use of multiple methods for identifying theory-based determinants: primary data collection using interviews, focus groups, questionnaires, observation of practice, and/or systematic reviews of such evidence.

Step 2a) Developing new theory-based implementation interventions by drawing on health psychology and related disciplines. Once determinants of clinical practice are identified, Intervention Mapping, BCW and the French model suggest using theory and evidence-based methods to select intervention components and develop interventions. Intervention Mapping emphasises identifying theory-based methods most likely to influence changes in the selected determinants and then translating these into practical strategies taking in account the parameters for effectiveness (Kok et al., 2016). The BCW proposes linking barriers to intervention functions (broad categories of *means* by which an *intervention* can change behaviour e.g., education or modelling), and policy categories to support these interventions (e.g., guidelines or communication and marketing). The French model focuses on linking TDF domains to specific behaviour change techniques (BCTs) (Centre for Behaviour Change, 2019; Michie et al., 2008).

Step 2b) Optimizing existing implementation interventions by drawing on health psychology and related disciplines. There are already many implementation interventions to improve healthcare professional behaviours. Given the infrastructure, personnel, and relationships required for some implementation interventions, another way in which health psychology has contributed is in optimising existing implementation interventions with behaviour change approaches (Pearson et al., 2020). Explicitly describing an implementation intervention's components, theoretical underpinning and causal assumptions facilitates external

scrutiny and more effective evaluation (Moore et al., 2015). For instance, an intervention to implement sepsis care was initially evaluated within three pilot wards of a UK hospital (Steinmo et al., 2015). Despite initial success in increasing implementation of the bundle from 20% to 80% of septic patients, improvements plateaued and fell short of the 95% implementation target. Steinmo et al. (2015) applied the BCW, TDF and BCT taxonomy to specify existing intervention content, conduct observations of intervention delivery and conduct interviews with intervention designers and providers to identify barriers and enablers to implementation. Triangulating findings helped to identify behaviour change theory-informed refinements to the intervention prior to rolling it out.

Health policy articles are a means of disseminating recommendations supporting the implementation of health behaviour change interventions. Yet, the assumed mechanisms of action in such documents are rarely detailed explicitly. Seppala et al. (2018) used the TDF, BCT Taxonomy version 1 (BCTTv1) and the BCW to identify and categorise the targets, mediators, and change strategies for physical activity and nutrition behaviour change in workplace health promotion policy articles. Together, these examples highlight how theory and methods used in health psychology are and can be used in implementation science to develop new, and improve existing, implementation interventions.

Step 3) Process evaluation. A gold standard for evaluating implementation interventions is the randomized (or cluster randomized) trial to establish causal evidence of whether or not an implementation intervention is effective, and implementation science is not short of such trials (cf. Cochrane Effective Practice and Organization of Care reviews). However, effect estimates on a health professional behaviour change outcome alone are not necessarily sufficient to

understand how the intervention works and says little about why it was not effective if there is no effect. This ‘black box’ undermines replication of effective interventions and adjustments to ineffective interventions. Decision makers tasked with improving healthcare systems cannot rely solely on trial evidence to inform implementation of interventions in new settings (Ivers & Grimshaw, 2016; Moore et al., 2015). Implementation science has recognized the importance of clarifying factors influencing the effectiveness of interventions to understand ‘what works and why’ (Bellg et al., 2004; Hardeman et al., 2008) and draws upon theories and methods from health psychology and related disciplines to further evaluate interventions using process evaluations.

The term ‘process evaluation’ holds different meanings and takes different forms (Steckler & Linnan, 2014). While the term is not necessarily commonplace in health psychology, health psychologists have been conducting process evaluations for decades. Manipulation checks, theory-based mediation/moderation analyses, and post-intervention qualitative inquiry are often inherent to evaluations of health psychology interventions to assess whether intervention effects are consistent with theory-based hypotheses. Findings from process evaluations enable further interpretation of trial outcomes and inform replication and scalability. Health psychology has contributed unique theory and methods for process evaluation to implementation science: methods for assessing intervention mechanisms of action and fidelity.

Mechanisms of action (mediation and moderation analyses). Investigating mechanisms of action within a process evaluation (particularly using an experimental design) helps to clarify, test, and refine the mechanisms through which interventions operate to achieve behaviour change (Moore et al., 2015). There have been many calls from the literature for the need for more

experimental tests of mechanisms of behaviour change, greater rigour in the design of such evaluations, rooted in theory and pre-specified logic models (Hagger et al., 2020; Rothman et al., 2020; Sheeran et al., 2017). These are echoed by syntheses of such studies that highlight the relative dearth of high quality reviews of mechanisms of action and process evaluations (Hennessy et al., 2020).

The utility of theory in mechanistic process evaluations in implementation science is recognized (Grimshaw et al., 2007). However, a systematic review investigating theory use in 123 process evaluations conducted alongside interventions to change healthcare professional behaviour identified that only 20% of studies cited a classic social/health psychology or implementation theory, and only seven reported actually testing a theory (McIntyre et al., 2020). Drawing on classic health psychology methods, studies that did test theory typically hypothesized and subsequently tested theory-informed mechanisms of action by either assessing whether theoretical constructs (e.g. change in intention) mediate intervention effects (e.g. in this case, healthcare professional behaviour change), or comparing differences in theoretical construct scores between trial arms (Bosch et al., 2014; Desveaux et al., 2015; Grimshaw et al., 2014; Zwerver et al., 2013). For instance, in an intervention testing different forms of printed educational material to increase general practitioners' referrals of patients for retinal screening, a TPB-based process evaluation was conducted alongside a factorial randomized trial (Grimshaw et al., 2014). The trial process evaluation was also factorial and involved administering questionnaires to physicians assessing each TPB construct pre- and post-intervention. Findings showed that pre-intervention intention scores were already high, with no significant differences post-intervention between intervention and control group scores on intention, attitude, subjective norm, and perceived behavioural control across factors. An intervention targeting motivation was

thus unlikely to be effective and the theorised pathway of change was not supported; thereby explaining in part the lack of observed intervention effects in the trial itself. There is much opportunity for embedding such theory-based mechanism of change process evaluations alongside trials of implementation interventions.

Intervention fidelity. Interventions may achieve limited effects due to not being properly delivered or received (Borrelli, 2011) or may achieve intended outcomes despite inconsistent or poor fidelity. An intervention not delivered or received as intended may have untrustworthy findings that need to be interpreted with caution and may be difficult to replicate. Interventions to change professional practice are complex, involving multiple components, targeting multiple levels in the health system, groups of healthcare or other professionals, across multiple organisations; thereby increasing their susceptibility to variable delivery and receipt (Steckler & Linnan, 2014). Assessing fidelity of delivery is vital to increasing confidence in interpretation of outcomes (Borrelli, 2011). Psychologists have proposed many intervention fidelity conceptual frameworks, providing methodological recommendations for strategies to enhance systematic and replicable assessment of delivery fidelity that have since been taken up in implementation science (Bellg et al., 2004; Borrelli, 2011; Carroll et al., 2007). For instance, Intervention Mapping has been used to assess the fidelity of delivery and receipt, and dose of a sex education program delivered by teachers (Rijsdijk et al., 2014). The BCT taxonomy has been used to assess fidelity of delivery of an intervention to improve general practitioners' management of back pain (French et al., 2015) of HCPs' delivery of evidence based smoking cessation advice (McIntyre et al., 2020) and in audit and feedback interventions to reduce unnecessary blood transfusions (Lorencatto et al., 2016).

Contribution 4: Methods for theory-informed evidence synthesis

A frequent finding from systematic reviews of implementation interventions is the heterogeneity in outcomes across interventions, with limited clarity around what makes one intervention more effective than another in changing professional practice. For example, Audit and Feedback (A&F) is a very common strategy used to promote change in healthcare professional behaviour, involving providing a summary of clinical performance to healthcare provider(s) (Ivers et al., 2012). A Cochrane review of 140 randomised trials showed that A&F led to a median 4.3% absolute improvement in improved clinical practice (Ivers et al., 2012). However, effects were variable, with a quarter of trials showing a large effect on clinical practice (>16% absolute improvement), while another quarter had negative or null effects. Effectiveness has not improved over time (Ivers, et al., 2014). Reasons underpinning this variability and lack of progress are unclear, in part due to poor description of the A&F interventions, and because A&F has been designed and delivered in various ways, often lacking explicit rationale or theory (Colquhoun et al., 2017). The application of theory and frameworks developed in psychology and applied in health psychology in evidence syntheses has enabled implementation researchers to identify active ingredients of interventions associated with increased effectiveness. Control Theory (Carver & Scheier, 1982) is a mechanism through which A&F might operate and Gardner et al. (2010) re-analysed data from an earlier Cochrane review of A&F interventions to change professional practice, coding for the presence of these theory-consistent techniques. They identified that most A&F interventions were not consistent with Control Theory, suggesting future possibilities for theory-informed optimization.

Describing the active ingredients of implementation interventions in concrete behaviour change terms using a shared language fosters the ability to synthesize evidence from across a

variety of implementation settings. Intervention Mapping proposes a taxonomy of behaviour change methods and their parameters for effectiveness, that are directly linked to specific theory-based determinants (Kok et al., 2016). The BCTTv1 (Michie et al., 2013) provides a list of potential active ingredients of interventions specified at a granular level and differentiated from each other. The BCTTv1 has been used to identify the active behaviour change content within systematic reviews of trials of healthcare professional behaviour change interventions (Lawrenson et al., 2018; McHugh et al., 2018; Pesseau et al., 2015), as has the BCW (Michie et al., 2011) to identify and categorise the functions of existing interventions (Gardner et al., 2016). So too could the Intervention Mapping coding taxonomy be used (Durks et al., 2017; Fernandez et al., 2019; Kok et al., 2016). Such specification provides a more detailed description of intervention content in existing interventions, and a basis for meta-regressions to explore relationships between observed effects and constituent behaviour change technique, methods and/or intervention functions.

In a Cochrane review of interventions to improve antimicrobial prescribing practices in secondary care (Davey et al., 2017), the main comparison was between any intervention to improve antibiotic prescribing for hospital inpatients versus standard practice. To explore heterogeneity, the BCW and BCT Taxonomy were used to identify and classify the intervention functions and component BCTs. Sub-group analyses showed that the intervention functions ‘restriction’ and ‘enablement’ were associated with greater improvement in outcomes and interventions including ‘feedback on behaviour’ had additional effects. Findings point to the specific types of intervention strategies and components that contribute to intervention outcomes.

Taxonomies that typically focus on the behaviour of patients and citizens can thus also be used to describe the active ingredients of implementation interventions to change healthcare

provider behaviour. This provides a basis for drawing from and contributing to a cumulative evidence linking determinants of behaviour to behaviour change techniques in the behaviour of healthcare professionals (McSharry et al., 2016).

Frameworks such as the TDF have also been applied in systematic reviews to synthesise barriers and enablers to healthcare practitioner behaviour change across clinical settings to infer which barriers and enablers the interventions in the review appeared to be targeting (Heslehurst et al., 2014; Little et al., 2015). Applying a behaviour change theory-informed framework such as the TDF to synthesise barriers across studies in a review provides a theory-informed basis for systematically selecting BCTs to propose candidate interventions components to address identified barriers/enablers to healthcare professional change.

There remains room for in health psychology to further contribute to evidence synthesis in implementation science. Complex interventions often include multiple BCTs yet to date, meta-regressions have typically examined the effects of single BCTs in isolation, rather than proposing and testing theory-linked combinations of BCTs. Recent advances in analytical methods are available to enable such investigations including Meta-CART (Dusseldorp et al., 2014) and Bayesian hierarchical meta-regression (Ivers et al., 2014). Such tools developed to review existing literatures have taken root within implementation science to further understand the inner workings of interventions to change healthcare professional behaviours.

A challenge of meta regression-based approaches is the complex nature of interventions included in such reviews. Often, multiple behaviour change techniques, methods and functions are combined such that the effect of any given technique is challenging to unpack in relation to co-occurring techniques (Peters et al., 2015). Design solutions are needed to tease apart the individual and interacting techniques experimentally, such as between- and within-person

factorial and fractional factorial (Collins, 2018), and could inform evidence syntheses focused on these specific mechanisms. Greater international coordination would help in understanding and synthesising which behaviour change techniques – individually and in combination – are effective under which conditions (Armitage et al., in press).

Using Implementation Science to Enhance the Real-World Impact of Health Behaviour

Change Interventions

Health psychology and related disciplines have contributed much to implementation science in terms of theory and methods for developing, evaluating and synthesising interventions to change healthcare professional behaviours. Further interchange between the disciplines has the potential to advance implementation science and expand health psychology's traditional remit of research activities to a greater focus on the behaviour of those who are in a position to *deliver* the health behaviour change interventions are being designed and tested in routine health settings. Health psychology has untapped potential for more widespread impact. Opportunities abound for those interested in focusing on healthcare professional behaviour change. A number of advances in implementation science could readily inform health psychology, and for some, may have already: clarifying behaviour change evidence-practice gaps, theories/models/frameworks from implementation science to inform health psychology theory, the role of context, stakeholder engagement, and implementation laboratories.

Clarifying behaviour change evidence-practice gaps

Often, a starting point for implementation research is a systematic review demonstrating the effectiveness of an intervention across settings, combined with an indication of gaps between this research evidence and current practice in the health care system (Graham et al., 2006). This

approach could be applied to evidence of health behaviour change interventions. For instance, French and colleagues (2014) showed that across 24 studies of interventions targeting self-efficacy to increase physical activity in older adults, interventions led to a small but potentially clinically important effect on physical activity. They also identified particular BCTs were associated with greater or lesser physical activity in this population. Disseminating these findings is only one side of the equation and likely does not ensure findings will be used in practice. The other side involves clarifying whether and to what extent health care professionals currently deliver such interventions in practice. A concerted effort to identify and demonstrate health behaviour change evidence-practice gaps (see findings in Table 1 for a potential starting point) could form a robust basis for prioritizing the development of implementation interventions.

Theories, models and frameworks from implementation science to inform health psychology

While health psychology has provided tools and resources to implementation science, the latter also draws on other disciplines beyond those informed by psychology as well as the field itself for other complementary frameworks, theories and models (Nilsen, 2015). As health psychologists shift to designing and evaluating the implementation of effective behaviour change interventions in routine care, it may be worthwhile to collaborate with implementation scientists to leverage complementary theories. The breadth of theories and frameworks used in implementation science is succinctly summarised by Nilsen (2015), who classified five key categories of theories, models, and frameworks from a range of fields and disciplines. These are identified and organised according to overarching aims and primary function: process models where focus is on translating research in to practice (e.g. the Knowledge to Action Framework;

Graham et al., 2006); determinant frameworks to capture organisational and individual factors that act as barriers and enablers and influence implementation (e.g. Greenhalgh's model of diffusion of innovations in organisations (Greenhalgh et al., 2004); Consolidated Framework for Implementation Research [CFIR]; Damschroder et al., 2009) and Ferlie and Shortell's Framework (2001); classic theories (e.g. social cognition models) and implementation theories (e.g., Normalization Process Theory (May et al., 2009), theory of organizational readiness for change (Weiner, 2009)) and evaluation frameworks to assess reach, efficacy/effectiveness, adoption, implementation and maintenance (e.g. RE-AIM; Glasgow, Vogt, & Boles, 1999) and Precede-Proceed (Green & Kreuter, 2005)) that enable researchers to form conclusions on how the broader context influences the delivery of the intervention. The challenge remains in identifying which criteria justify the selection of a given theoretical model and framework (Sniehotta et al., 2015) and tools are emerging to aid in defining such criteria to help theory selection (Birken et al., 2018).

The Role of Context

A common thread running through many implementation science frameworks, theories and models is the emphasis placed on the role of context in influencing behaviour change. Context can be defined as anything external to an intervention, including the physical, social, political, economic environments, that may hinder or facilitate delivery and receipt, or influence intervention effects (Squires et al., 2015). Contexts vary and boundaries are often blurred between external context and interventions delivered in applied settings (Pfadenhauer et al., 2017). Implementation science's use of the TDF explicitly recognises contextual determinants of behaviour in two of its 14 theoretical domains: 'social influences' (e.g., social norms,

organisational culture/climate, inter-group conflict) and 'environmental context and resources' (e.g. person x environment interactions, environmental stressors), representing social and physical setting context factors. Such frameworks have been applied in qualitative process evaluations of implementation interventions to understand how context may impact on observed trial outcomes (Lorenцatto et al., 2016). Curran et al. (2013) conducted a retrospective TDF-based qualitative process evaluation of a trial evaluating an intervention aiming to change clinician behaviour in terms of their use of computer tomography (CT) in adult patients with minor head injury. Contextual barriers were identified, including how the physical and organizational context of emergency practice (e.g., patient flow, overcrowded/busy department) influenced their CT use (e.g., during a busy shift, use of the rule was seen to either slow down or improve momentum).

Implementation frameworks acknowledge the importance of context and provide specific constructs to address different aspects of context. For instance, originating from the organisational and policy literature (Damschroder et al., 2009), CFIR recognises the multiple, interacting levels at which context can influence behaviour change, including: outer context (e.g. patient and resources), inner context (i.e. organisational culture and leadership), and individual context (i.e. reflection, readiness for change). These frameworks differ in what they argue constitutes context, and no one framework alone may be sufficiently inclusive or comprehensive. It is perhaps unsurprising that a number of studies in implementation science are combining frameworks, such as the TDF+CFIR, to more comprehensively investigate contextual determinants of behaviour change (Birken et al., 2017). While some elements of context are described in the BCW and Intervention Mapping as well, further multidisciplinary, integrated approaches to investigating context are needed.

Stakeholder engagement

As health psychology research increasingly utilises patient and public involvement (PPI) strategies, there is potential to learn from examples of how to further embed the input of key stakeholders in addition to patients and members of the public at all stages of the research process (Byrne, 2019). Research focusing on the role of PPI in implementation research and health services research more generally has helpfully highlighted key factors that predict productive and authentic contributions to the research process (Gray-Burrows et al., 2018). An example of how PPI approaches can be woven into health psychology is demonstrated in the diabetes prioritisation work reported by McSharry and colleagues (2016). Researchers engaged with a wide range of stakeholders – people with diabetes, healthcare professionals and policy makers – to collate opinions on what they thought were the most important target behaviours for research, with findings used to frame future research. Such approaches can inform both early and latter phases of research. For instance, involving health care professionals and health system stakeholders (managers, policymakers) as early as possible and throughout all phases of the research is a staple of implementation research that could further be adopted within health psychology to ensure greater likelihood of impact (as advocated within the BCW and Intervention Mapping approaches).

Implementation laboratories

Securing resources to conduct research at scale, and difficulty in recruiting and retaining participants to ensure studies are sufficiently powered, is a common problem in health psychology. One solution proposed by the implementation science literature is to embed research within health-care systems through “implementation laboratories” (Grimshaw et al., 2019; Ivers

& Grimshaw, 2016; Wolfenden et al., 2017). Implementation laboratories involve close relationships between research teams and health systems that are already delivering interventions at scale to allow research to be conducted within existing large-scale initiatives and infrastructures. The ‘laboratory’ component can allow for randomisation of interventions at large scale and rapid embedding of effective interventions as new standard of care. As a vehicle for promoting impact, implementation laboratories provide an opportunity to rigorously test behaviour change approaches from health psychology with larger and generalizable samples than possible or feasible by research teams working in isolation.

Implementation laboratories present an opportunity for methodological innovations, such as novel trials designs, and to reduce the cost of research by utilizing existing structures. The AFFINITIE programme is an example of embedding and testing behavioural interventions informed by health psychology theory and frameworks at scale through a collaboration between UK National Health Service and health psychology researchers (Gould et al., 2014; Hartley et al., 2017), as is the international Audit and Feedback Meta-Lab (Grimshaw et al., 2019).

The capacity of an intervention to be scaled-up and implemented in different organisations and locations/jurisdictions is another key research question in implementation science. A review synthesizing evidence on scaling up public health interventions into population-wide policy and practice identified eight existing frameworks with an explicit focus on scaling up interventions. Across frameworks, Milat and colleagues (2015) identified a number of key success factors for scaling up including establishing monitoring and evaluation systems, costing and economic modelling of intervention approaches, active engagement of a range of implementers and the target community, tailoring the scaled-up approach to the local context, use of participatory approaches, systematic use of evidence, infrastructure to support

implementation, strong leadership and champions, political will, well defined scale-up strategy and strong advocacy. The importance of these factors to scalability and impact is recognised from the start and routinely considered in implementation science when designing and evaluating interventions.

Future Directions

Health psychology has contributed much to the development of implementation science, but the degree of synergy between fields remains unclear. To enhance the opportunities afforded by greater linkage, we propose a set of practical recommendations for how implementation science can further inform health psychology (see Table 3) and how health psychology could further inform implementation science (see Table 4).

Health psychology is replete with examples of rigorous studies of health behaviour change interventions synthesized in systematic reviews that hold the promise of making a true impact on the health and well-being of patients and populations (see Table 1). However, health psychologists may not yet be following-through to ensure this impact. It is not clear how many and which health behaviour change interventions are being implemented into routine care or are ready to be the focus of concerted implementation research. Future research could focus on identifying these behaviour change evidence-practice gaps.

Studying healthcare professional behaviour change presents at least two new opportunities for health psychologists: a) to promote greater impact of evidence-based health behaviour change interventions by using approaches from health psychology to support the adoption, implementation and sustained use of that intervention *beyond* the study it was tested in, and b) to test behaviour change theories and methods in an under-researched set of health-related behaviours. The settings of interest to implementation science offer an opportunity to test and

apply existing theories of behaviour and the potential to advance theory. For instance, traditionally, theories of behaviour applied in implementation science conceptualized healthcare professionals' behaviour as a product of a reflective decision-making process (Godin et al., 2008). Dual process models propose that healthcare professional behaviour is driven by two parallel processes: a reflective process that is slow and effortful, and an impulsive process that operates fast and efficiently outside conscious awareness (Strack & Deutsch, 2004). Studies have applied and tested dual-process models in healthcare professionals (Potthoff et al., 2019) demonstrating the potential role the impulsive process in health professional behaviour.

Implementation intentions (Gollwitzer, 1999) are a mainstay of health psychology (Hagger et al., 2016; Hagger & Luszczynska, 2014) and a recognized means for accessing the impulsive process to promote behaviour change. This technique could be used to change healthcare professional behaviour, e.g., to improve hand-hygiene adherence in nurses. A systematic review of all implementation intentions studies aiming to change health behaviours also sought to identify interventions targeting healthcare professional behaviours (Squires et al., 2013). There remains much untapped potential here.

Another emerging area of theorizing in health psychology involves developing theory to account for multiple behaviours (Albarracín et al., 2018; Conner et al., 2016; Fleig et al., 2015; Nudelman et al., 2018). These developments readily generalize to implementation science, where healthcare professionals perform multiple behaviours competing for limited time (Jaén et al., 1994; Pesseau et al., 2009). Most theories of behaviour change focus on explaining a single behaviour, however, healthcare professionals (and patients and members of the public) pursue multiple goals, some of which are compatible and others, less so. Moving from a single- to a

multiple-behaviour paradigm could improve the description of clinical behaviours and design of interventions.

Strengths and Limitations

While endeavouring to represent multiple international traditions, the breadth of topics covered in the present conceptual review necessarily meant narrowing to specific contemporary examples rather than seeking to comprehensively represent all approaches. Nevertheless, we juxtaposed a number of research approaches for the first time. However, not all approaches are represented and we hope instead that the present review serves to catalyse broader discussion and synergy spanning other approaches, and more in-depth reviews within each of the broad topics covered herein. Furthermore, while we highlighted contemporary theories and approaches, we recognise that the approaches covered do not necessarily stem from health psychology and implementation themselves, and that the boundaries between disciplines often become less important when moving to more multi- and interdisciplinary approaches.

Conclusions

There is much promise in expanding the remit of health psychology to consider changing not only the behaviours of patients and the public but also the behaviours of those who routinely deliver interventions targeting patients/public and other actors in the broader health system. Doing so provides an array of theories and methods used within health psychology that can be applied, challenged and enhanced through application to healthcare provider behaviour change. Implementation can thus be studied as a behaviour change intervention itself. There is much literature to support health psychologists in doing this already, and implementation science has much to offer to the systematic implementation of health psychology interventions for impact. The potential is clear; it is time to follow-through.

Author contributions

All authors contributed to conceptualising the original idea and goals and aims. JP, AD, LBD, GtH, and ET contributed to the methodology, screening and analysis of the systematic review. JP, MB, SP, AvD, ALD, RP, SH, JH, DF, JMcS, KH, FL, NH, ET, LBD, EB, and GtH led the original draft. JP, MB, SP, AvD, ALD, EKO, RP, SH, JH, DF, JMcS, FL, NH, ET, LBD, SvL, LA, EB, GtH, and DK contributed to reviewing and editing. JP, MB, SP, SH, FL, and LBD provided overall supervision and oversight. All authors reviewed and approved the final manuscript.

Acknowledgements

This article was developed during the SYNERGY expert meeting as part of the 2017 Synergy Expert Meeting (www.ehps.net/synergy/expert-meetings/). The meeting brought together health psychologists with experience and expertise in implementation science to consider how health psychology has contributed to implementation science to date, and how it might draw from it to move towards greater impact. We are grateful to Andrea Patey for discussions on an earlier version of the manuscript. We are grateful to the EHPS for providing the space for advancing the discussion on the links between health psychology and implementation science.

Funding details

Molly Byrne is funded through a Health Research Board (Ireland) Research Leadership Award.

Disclosure

The authors do not have any competing interests to declare.

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Appendix. PRISMA flow diagram

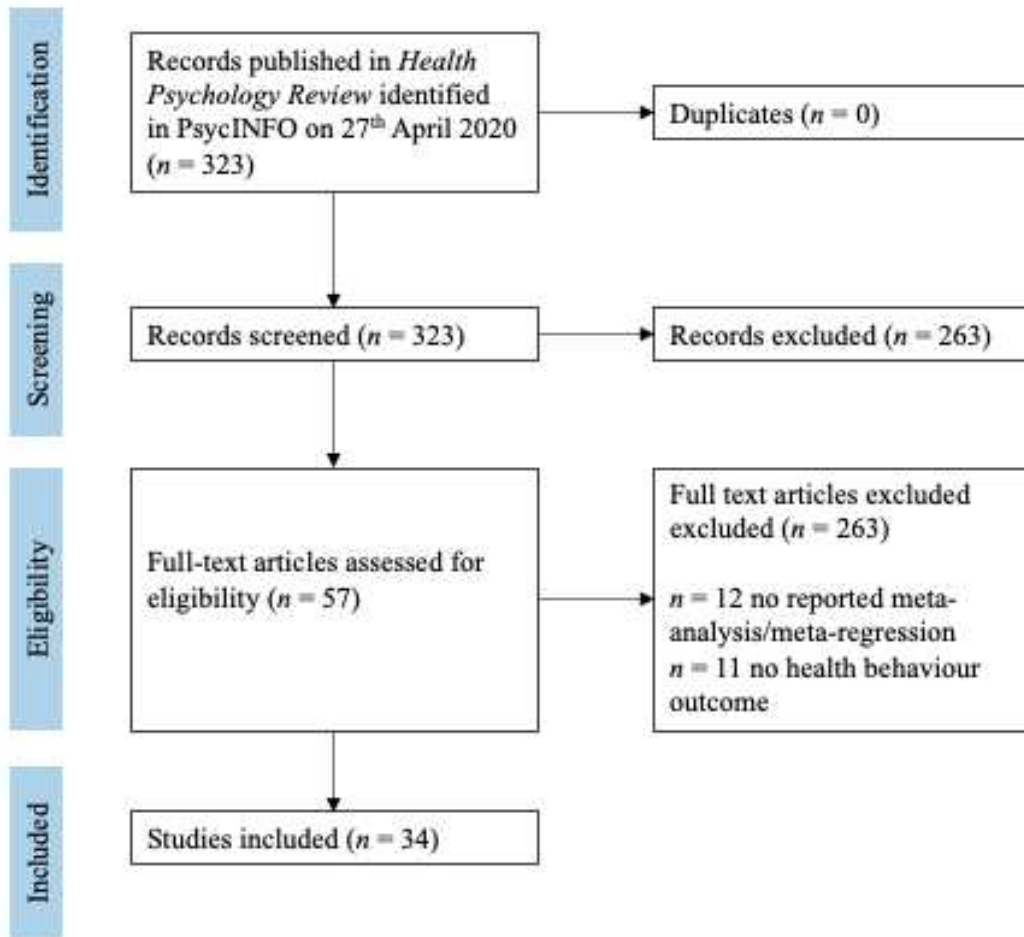


Table 1. Systematic reviews with meta-analyses of trials of health behaviour change and health promotion interventions published in *Health Psychology Review* (2007-2020)

Authors, Year	Population	Intervention Setting	Targeted Health Behaviour	Behaviour Change Intervention Synthesised	Review discusses implementation-readiness of intervention	If discussed, does the review suggest evidence supports intervention implementation-ready?
Abraham & Graham-Rowe, 2009	Employees	Workplace	Physical activity	Workplace-based	no	n/a

Albarracín et al., 2018	Adults	Any	Smoking; Diet; Physical Activity	Various strategies focused on changing multiple health behaviours	no	n/a
Allom et al., 2016	Any	Any	Eating, Alcohol consumption	Inhibitory control training (suppression of actions that interfere with goal-directed behaviour)	no	n/a
Aulbach et al., 2019	Any	Any	Eating	Implicit bias interventions	no	n/a
Bélanger-Gravel et al., 2013	Adults 18-64	Any	Physical activity	Implementation intentions	no	no
Benn et al., 2016	Any non-clinical	Any	Eating	Self-weighing	no	n/a
Black et al., 2016	Any non-clinical	Digital	Alcohol consumption	Computer-delivered	no	n/a
Cameron et al., 2015	Any	Any	Multiple	Positive affect induction	no	n/a
Caperon et al., 2018	Any	Low- or Middle- Income Country	Eating	Various behaviour change techniques	yes	yes
Carr et al., 2019	Any	Any	Physical activity	Diadic interventions	no	n/a
Cross & Sheffield, 2019	Adults	Any	Eating; Physical activity; Smoking, Diabetes self-care	Mental contrasting	yes	yes
Davie et al., 2019	Adult women delivering single	Multiple	Breast feeding	Social-psychological interventions	yes	no

	baby at $\geq 37+0$ weeks' gestation					
Dombrowski et al., 2012	Adults aged ≥ 40 years and BMI ≥ 30 with additional risk factors	Any	Eating; Physical activity	Various behaviour change techniques	no	n/a
Gilinsky et al., 2015	Postnatal women	Any	Physical activity	Various behaviour change techniques	no	n/a
Gourlan et al., 2016	Adults	Any	Physical activity	Theory-based	no	n/a
Griffiths et al., 2018	Pregnant women	Digital	Smoking cessation	Digital interventions	no	n/a
Hennessey et al., 2020	Any	Any	Any	Self-regulation interventions	no	n/a
Kassavou & Sutton, 2018	Adults prescribed oral medication to treat/prevent cardio-metabolic conditions	Primary care, secondary care and pharmacy	Medication adherence	Automated telecommunication	no	n/a
Kassianos et al., 2019	Women in the postpartum period	Any	Breastfeeding	Various behaviour change techniques	unclear	unclear
Lock et al., 2020	Employees	Any	Physical activity	Theory-based	unclear	unclear

McEwan et al., 2016	Any	Any	Physical activity	Goal setting	no	n/a
McEwan et al., 2019	Any	Any	Physical activity	Theory-based	no	n/a
Ntoumanis et al., 2020	Any	Any	Any	Self-determination theory-informed	no	n/a
O'Brien et al., 2015	Adults 55-70 years, healthy or at risk of chronic disease	Any	Physical activity	Various behaviour change techniques	no	n/a
Orr & King, 2015	Any	Any	Any	Mobile SMS messages	yes	yes
Peters et al., 2013	Any	Any	Any	Fear appeals	no	n/a
Protogerou et al., 2020	Any	Any	Unhealthy risk-taking	Self-regulation interventions	no	n/a
Rhodes et al., 2019	Adults	Any	Physical activity	Affective judgment manipulation	no	n/a
Rhodes et al., 2020	Adults	Any	Physical activity	Theory-based	no	n/a
Spring et al., 2020)	Any	Any	Eating; Physical activity	Self-regulation interventions	no	n/a
Suls et al., 2020	General public	Any	Multiple	Self-regulation interventions	no	n/a
Taylor et al., 2012	Employees	Workplace	Physical activity	Various behaviour change techniques	no	n/a
Thoolen et al., 2012	Patients or members of the public	General public; General practice ; outpatient clinic	Antibiotic prescribing	Patient-oriented	no	n/a

Wilson et al., 2020)	People with chronic conditions	Any	Medication adherence	Self-regulation interventions	no	n/a
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Table 2. Key phases, use of theory and examples of three health psychology-informed implementation frameworks

	Intervention Mapping	Behaviour Change Wheel	The French et al. model
Key phases	Step 1: Logic Model of the Problem Step 2: Program Outcomes and Objectives – Logic Model of Change Step 3 – Program Design Step 4 – Program production Step 5: Program Implementation Plan Step 6: Evaluation Plan	Stage 1: Understanding the behaviour <ul style="list-style-type: none"> Step 1: Define the problem in behavioural terms Step 2: Select target behaviour Step 3: Specify the target behaviour Step 4: Identify what needs to change Stage 2: Identifying intervention options <ul style="list-style-type: none"> Step 5: Identify intervention functions Step 6: Identify policy categories Stage 3: Identifying content and implementation options <ul style="list-style-type: none"> Step 7: Identify behaviour change techniques Step 8: Identify modes of delivery 	Step 1: Identify who needs to do what differently Step 2: Identify barriers and enablers using a theoretical framework Step 3: Identify behaviour change techniques and modes of delivery best suited to address identified barriers and enablers Step 4: Select measures of behaviour and mediators/moderators of change
Use of theory	Whole theories used and combined by applying ‘Core Processes’	Summarized groups of constructs used e.g. Capability, Opportunity, Motivation, and TDF domains	Theories or groups of constructs, TDF example provided

Table 3. Guidance for how implementation science has and can further inform health psychology

<p><i>Recommendation 1</i> Enhance systematic review conduct and reporting of health behaviour change interventions by including a discussion on implementation readiness</p>	<p>1a. Systematic reviews of randomized trials and experiments of health behaviour change interventions should discuss the implementation-readiness of the synthesized evidence (e.g. adding an ‘implications for implementation’ section).</p>
	<p>1b. Systematic reviews of randomized trials and experiments of health behaviour change interventions should distinguish between efficacy (i.e. under ideal conditions) and effectiveness (i.e. under real-world conditions) trials to inform the readiness for implementation.</p>
<p><i>Recommendation 2</i> Consider implementation (outside the setting of the experiment itself, delivered by someone outside the research team) as early as possible</p>	<p>2a. Assess potential barriers and enablers to implementation as early as possible (ideally concurrently with behaviour change intervention development) to identify feasibility of delivery and indicate implementation support needs</p>
	<p>2b. Consider the implications of infrastructure, resources and competing demands of those who would be tasked with implementing a health behaviour change intervention</p>
<p><i>Recommendation 3</i> Extend and develop the science of health behaviour change to understanding and changing the behaviour of actors at multiple levels that enable and deliver health behaviour change interventions in practice</p>	<p>3a. Consider the behaviours involved in the delivery of the health behaviour change intervention into routine care as target behaviours to understand and change in themselves within health psychology</p>
	<p>3b. Apply behaviour and behaviour change theories, models and frameworks for understanding and developing interventions to change the behaviour of the organisational actors delivering health behaviour change interventions in practice</p>
	<p>3c. Test the utility boundaries of theories and methods developed within health psychology and behavioural science on the behaviour/behaviour change of organisational actors</p>
	<p>3d. Test theories head to head to prioritise which may be most useful under which circumstances</p>
	<p>3e. Draw from implementation science theories and evidence to enhance existing and/or develop novel theories of behaviour change that could be applied to health behaviours of patients and the public, including aspects of scale and spread of interventions and the role of complexity and context</p>
	<p>3f. Given the multitude of theories, models and frameworks from which to select, consider applying tools for selecting and justifying the selection of and (if relevant) further development of existing theories to avoid theory fragmentation and proliferation</p>
<p><i>Recommendation 4</i> Develop implementation science capacity</p>	<p>4a. Incorporate implementation science into health psychology training to develop capacity</p>
	<p>4b. Involve implementation science expertise in health psychology and behavioural medicine societies, including special interest groups</p>

within health psychology	4c. Partner with implementation researchers, scientists and practitioners who can lead on implementation while being aware of health behaviour change being developed.
	4d. Develop educational opportunities and paid positions for health psychologists to be embedded in health service settings
	4e. Demonstrate rigorous implementation research of health behaviour change interventions in health psychology journals, including use of special issues
	4f. Enhance editorial boards of health psychology and behavioural medicine journals with health psychologists with implementation science expertise
	4g. Develop national and cross-national funding streams for promoting collaboration (e.g. research visits, studentships, fellowships, targeted operating grants)

Table 4. Guidance for how health psychology has and can further inform implementation science

<i>Recommendation 1</i> Identify whose behaviour(s) and which behaviour(s), at which organisational level need to change to implement an evidence-based intervention into practice	1a. Consider organisational actors (health providers, middle managers, leadership) and wider actors in the outer setting (government, other organisations) as involving people needing to change their behaviour to implement an evidence-based intervention in practice
	1b. Specify the behaviour(s) of organisational actor(s) implementing an evidence-based intervention into routine care as well as the behaviour of other organisational actors that enable intervention delivery
	1c. Use existing tools to enhance the specificity and priority of whose behaviour and which behaviour should be targeted to inform identification and development of process and outcome measures for qualitative and quantitative implementation evaluation
	1d. Rather than being synonymous with an individual-level approach, broaden the scope of behaviour change approaches in implementation to involve change in multiple people's behaviour at multiple levels
	1e. Explore the role of context as a function of the behaviours that have been shaped by, and could be further shaped by, the behaviour of people operating at different organisational and societal levels over time
<i>Recommendation 2</i> When considering de-implementation of low value care, draw upon behaviour change theories and methods that describe reducing, replacing and/or stopping a behaviour to develop cumulative	2a. Apply behaviour change techniques and theory specific to reducing and stopping a behaviour
	2b. Consider the implications that replacement and substitution behaviours have for the existing behaviour(s) being replaced (de-implemented) and new behaviour being implemented in its place
	2c. Consider the role of the physical and social setting in maintaining low-value care through automatic and habitual processes triggered by the setting and people within it

theory and evidence for de-implementation	
<i>Recommendation 3</i> Draw upon theories and methods of behaviour change that describe how change is maintained and sustained over time	3a. Apply behaviour change techniques and theory specific to ensuring that change is maintained over-time and factors associated with sustained change that may differ from factors associated with generating change
	3b. Consider the role of both reflective decision processes as well as automatic habitual and affective processes in developing implementation interventions designed to be sustained and maintained over time
<i>Recommendation 4</i> Draw upon theory and methods from health psychology to empirically investigate the fidelity and mechanisms of change of implementation interventions	4a. Draw upon methods for using theory to evaluate whether implementation interventions show change in process measures and whether such changes are associated with implementation outcomes (theory-based mechanisms of change)
	4b. Draw upon methods for using theory and consistent terminology for clarifying the content (techniques and strategies) of implementation interventions to investigate fidelity of delivery and receipt
<i>Recommendation 5</i> Develop health psychology capacity within implementation science	5a. Involve and fund behaviour change expertise in implementation research and practice
	5b. Incorporate principles of health psychology and behavioural science as part of emerging multidisciplinary implementation science training worldwide
	5c. Develop national and cross-national funding streams for promoting collaboration (e.g. research visits, studentships, fellowships, targeted operating grants)