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Behaviour change in diabetes: behavioural science advancements to support the use of theory

J. McSharry[1], M. Byrne[1], B. Casey[1,2], S. F. Dinneen[2,3], M. Fredrix[1,4], L. Hynes[1,2], A. J. Lake[5,6] and E. Morrissey[1,2]

[1]Health Behaviour Change Research Group, School of Psychology, [2]School of Medicine, National University of Ireland, [3]Centre for Diabetes, Endocrinology and Metabolism, Galway University Hospitals, Galway, Ireland, [4]Radboud University Medical Center, Radboud Institute for Health Sciences, IQ Healthcare, Nijmegen, Netherlands, [5]School of Psychology, Deakin University, Geelong and [6]The Australian Centre for Behavioural Research in Diabetes, Diabetes Victoria, Melbourne, Victoria, Australia

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Abstract

Behaviour is central to the management of diabetes, both for people living with diabetes and for healthcare professionals delivering evidence-based care. This review outlines the evolution of behavioural science and the application of theoretical models in diabetes care over the past 25 years. There has been a particular advancement in the development of tools and techniques to support researchers, healthcare professionals and policymakers in taking a theory-based approach, and to enhance the development, reporting and replication of successful interventions. Systematic guidance, theoretical frameworks and lists of behavioural techniques provide the tools to specify target behaviours, identify why ideal behaviours are not implemented, systematically develop theory-based interventions, describe intervention content using shared terminology, and evaluate their effects. Several examples from a range of diabetes-related behaviours (clinic attendance, self-monitoring of blood glucose, retinal screening, setting collaborative goals in diabetes) and populations (people with type 1 and type 2 diabetes, healthcare professionals) illustrate the potential for these approaches to be widely translated into diabetes care. The behavioural science approaches outlined in this review give healthcare professionals, researchers and policymakers the tools to deliver care and design interventions with an evidence-based understanding of behaviour. The challenge for the next 25 years is to refine the tools to increase their use and advocate for the role of theoretical models and behavioural science in the commissioning, funding and delivery of diabetes care.

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Introduction

> *The evidence that behaviour is the dominant element in successful management of diabetes is so overwhelming that we tend to ignore it*

Although medication and technological advances are often considered both necessary and sufficient to improve outcomes, in the quote above, Professor Edwin Gale [1] highlights the importance of behaviour in the management of diabetes. At its core, diabetes is a behavioural challenge, as diabetes management is dependent on the initiation and maintenance of a complex series of behaviours of both the person with diabetes and their healthcare professionals. Although technological and pharmacological advancements are vital, a new medication or device can only influence outcomes if appropriately prescribed by a healthcare professional and used as prescribed by the person with diabetes.

Correspondence to: Jennifer McSharry. E-mail: jenny.mcsharry@nuigalway.ie

Health behaviours, defined as 'behaviour patterns, actions and habits that relate to health maintenance, to health restoration and to health improvement' [2], have huge capacity to impact an individual's health positively or negatively. Behaviours relevant to diabetes include self-monitoring of blood glucose levels, eating healthily, engaging in regular physical activity, taking medications as prescribed, and the use of healthcare services, such as healthcare professional visits, and eye and foot examinations.

Although there are examples of the use of theory to understand behaviours in diabetes in past decades, recent years have seen the development of approaches to make theory more accessible and useful to both clinicians and researchers.

Aim

Through a narrative review of the literature, we aim to outline the evolution of behavioural science and theoretical models applied to diabetes care over the past 25 years. A particular focus is on the tools and techniques that have been

What's new?

- Behaviour is central to the management of diabetes.
- This narrative review outlines the evolution of behavioural science and theoretical models as applied to diabetes care over the past 25 years.
- The use of theory for behaviour change has been recommended but the large number of theories and limited guidance are barriers to theory use.
- The review describes tools and techniques developed to support researchers, healthcare professionals and policymakers in taking a theory-based approach to behaviour change.
- The review provides examples from a range of diabetes-related behaviours and populations as a guide to their use to improve care in diabetes.

developed to increase the ease of application and clinical relevance of theoretical models for diabetes healthcare professionals, researchers and policymakers.

What we knew in 1995

In 1986 in *Diabetic Medicine*, Robert Anderson reported that 'most diabetes educators (physicians, nurses, nutritionists) lack the time and expertise to become familiar with theories of human behaviour even though they may be relevant to the education of their patients. As a result, the current practice of diabetes patient education reflects, in many instances, an extension of the information transfer approach found in most schools' [3]. This approach, in assuming that self-management behaviours are driven by knowledge and skills alone, failed to address the true complexity of behaviour change.

Similarly, an early critical review of diabetes self-management published in 1991 concluded that attempts to improve self-management had relied excessively on provision of information [4]. The review highlighted that although trait variables (such as personality and demographics) were presumed to be important in determining self-management, the evidence to support this supposition was weak. The review suggested that the important factors in determining self-management are transient situational factors, such as psychological stress and social pressure (e.g. to eat). Although the authors presented some evidence that self-management interventions could improve blood glucose levels, they stated that the evidence was limited and, in particular, long-term effects of such interventions were lacking. The review concluded that self-management was poorly assessed and that a greater understanding of the determinants of self-management behaviours, over and above lack of knowledge, was needed to enable the development of more effective interventions.

What has the past 25 years of research told us?

The past 25 years have provided the focus on behaviour and theory required to explore behaviour change in diabetes. Techniques, tools and frameworks have also been developed to support diabetes healthcare professionals, researchers and policymakers in considering the complexity of behaviour change.

Increased understanding of the centrality of behaviour in diabetes

A number of landmark studies published in the late 1990s and early 2000s highlighted the central role of behaviour in the prevention and management of diabetes. The Diabetes Prevention Programme demonstrated that a lifestyle intervention consisting of modest weight loss combined with physical activity could reduce the incidence of type 2 diabetes [5]. The importance of behaviour change in preventing diabetes has been replicated across countries, leading to an International Diabetes Federation consensus statement that diet and physical activity behaviour change is key to diabetes prevention [6]. In terms of people with diabetes, a systematic review and meta-analysis of 31 behaviourally focused self-management interventions reported a 0.76% difference in HbA_{1c} between intervention and control conditions [7].

The findings of these and similar studies have led experts to advocate for the use of behavioural science in diabetes. In 1999, Russell Glasgow and colleagues reviewed the current status of behavioural research and practice in diabetes, and concluded that integrating behavioural science advances in diabetes could improve care and quality of life for persons with diabetes [8]. Similarly in 2002, Edwin Fisher and colleagues reviewed the role of behavioural science in diabetes prevention and concluded that prevention research may be enhanced by utilizing behavioural science at the individual, group or community level [9].

Consequently, by the early 2000s, behaviour change theories were increasingly being used to predict the health behaviours of people with diabetes. In particular, the Stages of Change model [10] which proposes that motivation to change behaviour involves progression through five stages (pre-contemplation, contemplation, preparation, action and maintenance) gained popularity with healthcare professionals as a means to understand and change the behaviour of people with diabetes or at risk of type 2 diabetes [11].

Given the range of healthcare professional behaviours involved in diabetes care (e.g. appropriate prescribing, providing advice on self-management, foot examination) and in the delivery of evidence-based care more broadly, behaviour change theories also began to be applied to the prediction of healthcare professional behaviours [12].

Increased focus on the role of theory

A greater understanding of the centrality of behaviour in diabetes, and in healthcare more broadly, led to an increased focus on explaining and predicting behaviours through the use of theory. Theory has been defined as a 'systematic way of understanding events or situations. It is a set of concepts, definitions, and propositions that explain or predict these events or situations by illustrating the relationships between variables' [13]. In simple terms, theory is our understanding of why we expect particular actions to have particular outcomes.

There are a number of benefits to applying theory in behaviour change. Theory can inform care delivery and the content of interventions by providing a framework to identify factors causally related to behaviour that should be targeted for change. Theory can also help in evaluating why attempts to change behaviour are effective or ineffective, and provide the basis for refining future attempts. Finally, use of theory facilitates the accumulation of evidence over time to develop a body of knowledge of what works, for whom and in what context.

The 2009 Medical Research Council (MRC) guidance for the complex type of interventions typically used in healthcare settings highlights the importance of using appropriate theory and includes 'Identifying and developing theory' as an explicit stage in developing interventions [14]. Specific to diabetes, Harvey and Lawson [15] concluded that interventions based on psychological theory offer professionals the best chance of supporting people to manage diabetes and achieve improved outcomes.

Despite the potential benefits, there is limited clear evidence that theory use is associated with larger changes in health behaviour. A recent review of reviews concluded that theory-based interventions as currently operationalized are not more effective than interventions without a theoretical basis [16]. The lack of systematic review evidence to support guidelines advocating theory may reflect the poor application of theory, with a distinction drawn between interventions that are truly theory-based and those described as theory-inspired [17]. Theory-inspired interventions may mention behavioural theory, but fail to link intervention components with relevant theoretical constructs. To more accurately test if interventions based on theory are more effective, there is a need for a clearer match between intervention content and the theoretical constructs hypothesized to lead to behaviour change, and for greater transparency in the reporting of intervention content.

Using theory to change behaviour is challenging and requires an understanding of behaviour in context, the identification of appropriate theories to explain behaviour, and the selection of theory-informed techniques. Even for clinicians with an interest in applying theory, the sheer number of theories and lack of practical guidance have been barriers to theory use. The following section outlines recent developments that aim to address these barriers and allow theories to become more accessible and practical, not just to the research community, but also to healthcare professionals and policymakers.

Techniques, tools and frameworks to support the use of theory

The past decade has seen advancements in behavioural science leading to the development of step-by-step guidance on behaviour change including the Behaviour Change Wheel (BCW) [18] and Intervention Mapping (IM) [19], frameworks that summarize theories of behaviour change and theoretical constructs including the Capability, Opportunity Motivation Behaviour (COM-B) model [18] and the Theoretical Domains Framework (TDF) [20], and a standardized vocabulary to describe behaviour change, Behaviour Change Techniques (BCT) Taxonomy [21]. The following sections provide a brief description of these developments followed by case-examples of their practical use in diabetes.

Behaviour Change Wheel and the Capability Opportunity Motivation-Behaviour model

The BCW (see Fig. S1), a systematic approach to intervention design, was developed through the synthesis of existing behaviour change frameworks [18]. At the hub of the BCW is the COM-B model, the overarching model of behaviour that forms the basis for an intervention.

The increased interest in theory over the past 25 years, has led to an explosion in theory development, with more than 80 theories identified in behaviour change alone [18]. This number of potential theories can be both daunting and off-putting when considering behaviour change. The COM-B model was designed to describe the minimum number of factors needed to account for behaviour change. The benefit of the COM-B model over other more established theories is that it provides a simple approach to understanding behaviour in context, of particular importance to encourage busy clinicians to engage with behaviour change theory in their work.

The COM-B model comprises three factors, each broken down into two components, which interact to influence behaviour: capability (physical and psychological), opportunity (physical and social) and motivation (reflective and automatic). Once a target behaviour has been identified, the COM-B model provides a guide to determine what needs to shift to bring about change. The BCW system then offers a matrix for matching the COM-B components to intervention functions, defined as the broad categories of means by which an intervention can change behaviour, such as education, environmental restructuring and incentives. A case example of application of the BCW and the COM-B model in the diabetes context is given later in this review.

Intervention Mapping

IM is an alternative approach to the BCW and aims to bridge intervention development theory and pragmatic, real-world

practice by providing guidance to support researchers and clinicians in developing theory-based health behaviour change interventions [19]. Initially developed in 1998, the approach outlines an iterative, six-step framework that is consistent with the UK MRC guidance on development of complex interventions [14]. The six steps of IM are shown in Fig. 1.

Key activities across steps include: engagement with multidisciplinary planning group, conduct of needs assessment studies, and development of a logic model that depicts linear pathways of cause and effect, in order to define the problem (step 1); statement of behavioural determinants, expected outcomes and development of logic model of change, providing a foundation for the intervention (step 2); pragmatic selection of theory-based methods and design strategies (step 3); programme production including pilot and review with leading stakeholders (step 4); contextually appropriate programme delivery and specification of outcome measures (step 5); and programme evaluation including assessment of programme fidelity, outcome, process and economic evaluation (step 6).

Since its development, IM has been used to guide the development of more than 200 health interventions at the person/population, provider and healthcare system levels, and to improve adoption, implementation and maintenance of programmes within healthcare [23]. A case example of the application of IM in the diabetes context is given later in this review.

Theoretical Domains Framework

The TDF was developed in response to low uptake of evidence-based guidelines and standards of care. Similar to the COM-B model described above, the TDF is not a theory, rather it is in integrative framework of influences on health behaviour that consolidates 33 behaviour change theories into 14 theoretical constructs [20] (Table S1).

Because the TDF synthesizes multiple theories, it encourages a broader consideration of the potential determinants of behaviour than may be possible using a more narrowly focused theory. The TDF was initially used to explore influences on healthcare professional behaviours and elicited previously unidentified factors impacting well-researched behaviours; for example, determinants of hand hygiene practices among healthcare practitioners [24]. More recently, the TDF has been used to explore barriers and enablers to uptake of healthy behaviours in the general population, including in the context of diabetes prevention [25]. A case example of application of the TDF in the diabetes context is given later in this review.

Behaviour Change Techniques

Lack of a common vocabulary to define the components of intervention content has impeded scientific progress in the development of behaviour change interventions and the potential replication of interventions across settings [26]. To address the issue, Abraham and Michie [26], published a

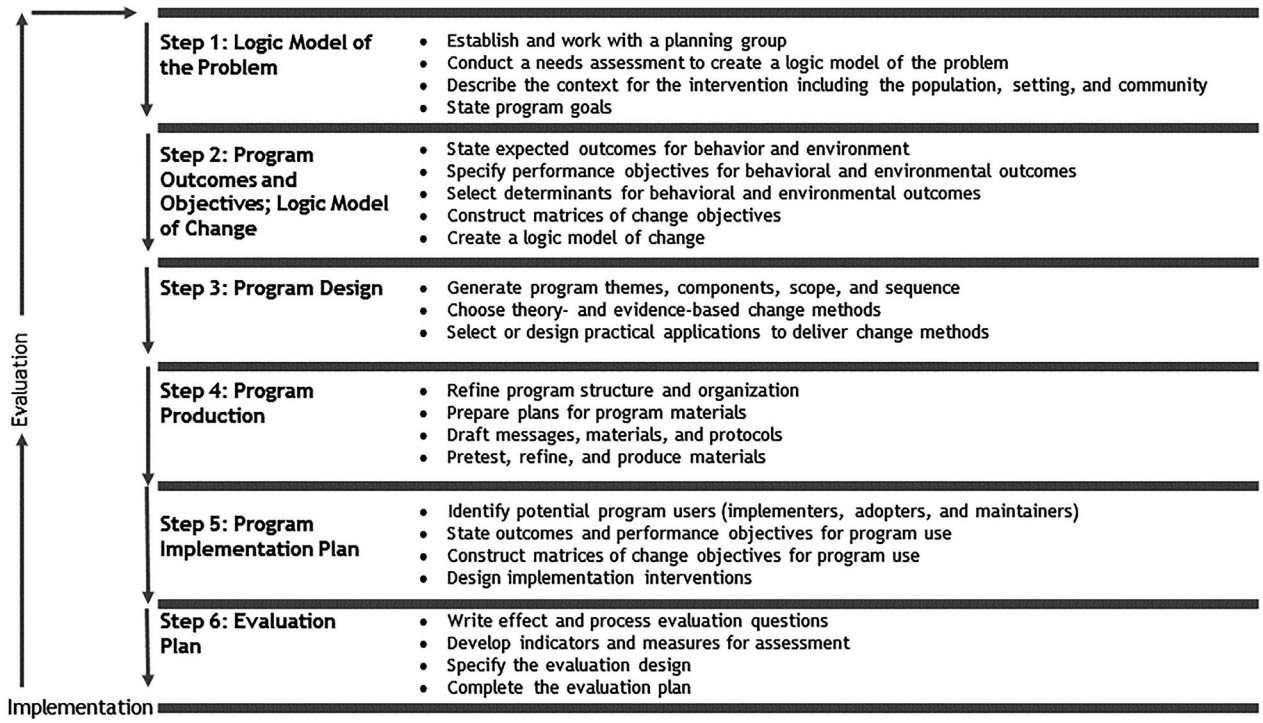

FIGURE 1 Six steps of Intervention Mapping (adapted from Bartholomew *et al.* [22]).

taxonomy of BCT, the observable, replicable components of an intervention used in health behaviour change interventions. An updated list, the BCT taxonomy version 1 (BCTTV1), was subsequently developed through a Delphi exercise with experts and provided labels, definitions and examples of 93 BCTs clustered into 16 groups [21]. A case example of application of BCT in the diabetes context is given in the section below.

Case examples

Using the BCW and COM-B model to understand barriers and facilitators to type 1 diabetes self-management among young adults (the D1 Now study)

Living with type 1 diabetes is challenging, and young adulthood can be a particularly difficult time for self-management leading to suboptimal glycaemic control [27]. A systematic review demonstrated a lack of effective interventions to support young adults with type 1 diabetes [28]. The D1 Now study aims to improve outcomes for young adults with type 1 diabetes by enhancing self-management and increasing clinic engagement. Based on the MRC Framework for developing and evaluating complex interventions [14] and the BCW, development work was undertaken to provide a basis for an effective intervention [29].

This development work included a qualitative study with young adults and parents exploring self-management barriers and facilitators and an expert consensus meeting to discuss potential intervention components [29]. In the qualitative study, barriers and facilitators to self-management were categorized according to the COM-B components. For example, young adults identified a lack of carbohydrate-counting skills as a barrier to self-management, which was categorized as 'Physical capability' using the COM-B model. Similarly, technology was identified as a facilitator to self-management and was categorized as 'Physical opportunity'. These findings were brought to an expert consensus meeting and mapped to appropriate intervention components (Table S2). For example, the barrier identified 'Lack of skill' was categorized as 'Physical capability' and mapped to skills attainment, leading to the intervention component of a support worker who can refer young adults to appropriate education services to attain the necessary skills.

The finalized intervention includes three components that aim to enhance young adults' capability, opportunity and motivation: the interactive Florence messaging system, an agenda-setting tool, and the addition of a support worker to the existing diabetes team with responsibility for coordinating Florence and use of the agenda-setting tool, and to act as a liaison between the young adult and the clinic. The intervention will now be piloted to assess effectiveness, feasibility and acceptability.

Use of the COM-B model and BCW approach allowed the full range of barriers to self-management and potential intervention options to be considered through a systematic evaluation of evidence. The simplicity and coherence of the COM-B model also facilitated discussion within the multidisciplinary team.

Using IM, the TDF and BCT to promote uptake of retinal screening

Young-onset type 2 diabetes (diagnosed before age 40 years) is increasing in prevalence worldwide and predisposes the individuals affected to early development and rapid progression of diabetes-related complications, including diabetic retinopathy [30]. Retinal screening is the proven clinical pathway for the early detection of retinopathy, and timely treatment thereafter can significantly reduce the risk of vision loss [31]. Despite this, young adults with type 2 diabetes (aged 18–39 years) are the least likely to initiate retinal screening in accordance with international guidelines. In response to a lack of age-appropriate interventions, a programme of research was conducted, with two key objectives: (1) identify modifiable factors impacting retinal screening behaviour among young adults with type 2 diabetes, and (2) develop a psycho-educational retinal screening promotion intervention.

The six steps of IM [19] were used to guide a systematic process, including the formation of a multidisciplinary planning group, comprising representatives from a range of diabetes and eye health sector groups [32]. In step 1, interviews were used to identify factors impacting retinal screening. The TDF was used to analyse interviews, and as the TDF had previously been used to explore barriers to retinal screening in older adults with type 2 diabetes, use of the same domains enabled the authors to identify factors of greater salience to the younger age group [33]. These included that young adults with type 2 diabetes were less likely to disclose their diabetes diagnosis and did not know similar-aged others with diabetes ('Social influences'); had lower perceived personal risk ('Beliefs about consequences') and experienced additional life-stage barriers to uptake of retinal screening ('Environmental context and resources').

In step 1, findings from all needs assessment activities (in-depth interviews, literature review and survey) were integrated into a logic model of the problem (Fig. S2), which provided a graphical depiction of the cause–effect pathways related to a health behaviour. Five individual-level, modifiable determinants were selected ('knowledge', 'attitudes', 'normative beliefs', 'intentions' and 'behavioural skills') leading to the identification of specific objectives to be met by the intervention.

In step 2, a logic model of change (Fig. S3) was developed, which depicted the hypothetical pathway from intervention to the targeted psychosocial determinants, programme outcomes and finally, broader health and quality of life outcomes. Four performance objectives were developed, each with multiple sub-objectives.

In step 3, evidence-based messaging was developed for each sub-objective and described in terms of relevant BCT

[21]. In step 4, the messages were embedded in a print-based leaflet with age-appropriate imagery, and subjected to pilot testing and review with sector stakeholders and members of the priority population. The *Who is looking after your eyes?* leaflet (Fig. S4) has been implemented widely by stakeholders in the diabetes and eye health sectors (step 5), and in step 6 was evaluated via a randomized controlled trial [32].

The project demonstrated many benefits of IM; the systematic process ensured a strong theory and evidence base to intervention content, and enhanced potential for replication and extraction of specific messaging for use in other formats. For example, the *Who is looking after your eyes?* leaflet has potential to be adapted to other priority populations such as young adults with type 1 diabetes, or the development process used as a template for the development of other diabetes-complication resources.

Using BCT to explore healthcare professional behaviour change and goal-setting in structured diabetes education (DAFNE)

Behavioural science tools and techniques can also be applied to healthcare professional behaviour change. A research prioritization exercise conducted with adults with diabetes, healthcare professionals and policymakers in Ireland identified 'Engaging in collaborative goal-setting with people with diabetes' as the most important target healthcare professional behaviour for research in diabetes [34]. This led to a programme of research exploring the implementation of goal-setting techniques in a diabetes context.

A systematic review and meta-analysis was conducted to identify an evidence base related to goal-setting interventions targeting diabetes outcomes [35]. By using a BCT Taxonomy [21] to code intervention content, the authors were able to identify the BCTs frequently used within existing goal-setting interventions. The findings highlighted that although setting a behavioural goal with people with diabetes was commonly included across interventions, only two of the 12 studies incorporated 'Feedback and monitoring' techniques within the intervention. Goal-setting theory suggests that feedback loops can have a significant impact on the potential for goal-setting to impact on behaviour change [36]. Making use of a standardized list of BCTs allowed for current gaps in how goal-setting is currently delivered to be identified and practical recommendations for healthcare professionals to be generated; to support progress monitoring and provide feedback on goal attainment for all goals set with people with diabetes.

In subsequent work, the implementation of goal-setting was explored in the context of the Dose Adjustment for Normal Eating (DAFNE) programme, a prominent type 1 diabetes structured education programme. Diabetes self-management education programmes can have inconsistent effects on health outcomes [37]. Issues with implementation fidelity, the extent to which an intervention is implemented as originally intended [38], may contribute to these inconsistencies. BCTs were used to explore the implementation fidelity of the delivery of goal-setting techniques in practice, using the example of the DAFNE programme [39]. The goal-setting component of the DAFNE programme manual was double-coded using a standardized list of behaviour change techniques [21]. Fidelity was assessed according to session, educator and BCT by observing and audio-recording 20 DAFNE goal-setting sessions and comparing number of manual-specified BCTs with techniques delivered in practice. On average, only half of the manual-specified BCTs were delivered in practice with large variation across educators, session-type and specific technique.

Use of the BCT Taxonomy to code the DAFNE programme delivery highlighted inconsistent delivery and variations between goal-setting sessions and educators suggesting a need for enhanced methods for monitoring delivery of educational programmes and continuous support for educators.

Translation and implementation

Application of techniques, tools and frameworks

Alongside these case examples, these approaches have been applied across a range of diabetes-related behaviours and populations. The COM-B model and the BCW have been used in interventions targeting both the person with diabetes and healthcare professional behaviour change, and been used to develop culturally sensitive self-management support for people with type 2 diabetes in UK from African and Caribbean communities [40], and to improve general practitioners' prescribing and medication practices [41].

Use of IM within diabetes has focused primarily on the person/population level, for both diabetes prevention [42] and the promotion of specific aspects of diabetes self-management; for example, peer support in rural communities [43]. The TDF has also been used in diabetes prevention [25] and for specific self-management behaviours, including insulin self-titration for people with type 2 diabetes [44].

In little over a decade, BCTs have come to be considered a crucial element of best practice in the design and reporting of health behaviour change interventions, enabling standardized description of intervention content, identification of the mechanisms of change of an intervention, and enhancing cross-context replication. In diabetes, BCTs have been used in systematic reviews to identify techniques associated with changes in physical activity and diet [45] and active ingredients within trials of implementation interventions for diabetes care [46].

Critique of techniques, tools and frameworks

Despite their growing popularity, these approaches are not without criticism. The BCW approach has been described as over-systematized and oversimplified, and critics question

whether the COM-B model can explain all aspects of a behavioural problem in sufficient depth [47,48]. IM has faced the opposite criticism and been described as 'complex, elaborate, tiresome, expensive, and time consuming' [23] given the multiple steps and elements.

The COM-B model, TDF and BCW may also be criticized on philosophical grounds as a move away from empowerment and self-determination by attempting to make people with diabetes change their behaviours in line with the views of healthcare professionals or intervention developers. In our view, these approaches, like most approaches, models or frameworks, can be used in a person-centred manner or in a more didactic manner, and can assist in understanding behaviour and developing interventions to support people to change their behaviour, acknowledging that the person may not wish to change.

Finally, because the approaches described are all relatively recent, there is no evidence that interventions developed using these approaches are more effective. Our focus on the COM-B model and TDF over traditional theories was not based on an assumption that these are more effective, but because they provide an overarching understanding of behaviour change. The COM-B model and TDF are not intended to replace existing theories but offer an accessible entry point to the consideration of theory in behaviour change.

Where are the current gaps?

The past 25 years has seen an increased recognition of the importance of theory for health behaviour change. However, the uptake of theory remains suboptimal with a 2015 review indicating that up to 89% of health interventions are not theory-based [49]. Similarly, although BCTs have come to be considered best practice in the design and reporting of behaviour change interventions, BCTs are underutilized in diabetes interventions, with only a small proportion of available BCTs included in most programmes [46].

Although these approaches represent an advancement in making theory more accessible, these tools, techniques and frameworks are still not commonly used outside the research context. The multiple tools available can cause confusion as to whether the approaches work in isolation, in sequence or in parallel, if different approaches can be used without the others and how these can be selected. A common feature across the approaches is an emphasis on the need to understand behaviour before attempting behaviour change. Both the COM-B model and the TDF are suitable frameworks to identify determinants of behaviour. The TDF can be thought of as a variant of the COM-B model which subdivides the components in a specific way that has been most widely applied to the understanding of clinical practice behaviours [18].

A second common feature is the design of interventions based on a theory-based understanding of behaviour. Theory is emphasized to a higher degree in IM and for people with no previous behaviour change experience, the BCW is arguably more accessible as it draws from one single unifying model (the COM-B model). The BCT taxonomy offers a comprehensive list of techniques used to change behaviour and is useful in choosing and documenting intervention content. There is also scope for BCTs to be used in clinical settings with the potential for application of techniques such as 'Provide information on consequences' (describe health consequences of performing a behaviour) and 'Prompt self-monitoring of behaviour' (ask the person to keep a record of a specified behaviour) into practice [21]. However, more work may be needed to support healthcare providers to embed these approaches into practice.

Another significant barrier is a lack of parity of esteem placed on the use of theory and behavioural science in diabetes care. In 2016, a review of international funding awarded in the preceding 5 years found less than 3% of funded studies had a behavioural focus [50]. Similarly, a recent paper described behaviourally focused education programmes as the 'Cinderella of diabetes care' due to relative lack of investment and recognition when compared to medications and devices [51].

Increasing the use of theory-based behaviour change approaches in diabetes care is in itself a behaviour change intervention, and requires an understanding of the capability, opportunity and motivational barriers from the perspectives of professionals and people with diabetes. The UK National Institute for health and Clinical Excellence (NICE) guidance on behaviour change recommends that healthcare professionals receive training on theories, methods and skills of behaviour change. Future research should explore how best to deliver such training to address barriers identified.

Finally, advocating for the inclusion of theory-based behaviour change within professional guidelines, e.g. the American Diabetes Association's 'Standards of Medical Care in Diabetes' or as a European Association for the Study of Diabetes Statement, could also be an effective means to prioritize behaviour change in diabetes.

Conclusion

Changing behaviour is central to improving outcomes in diabetes care – whether that be the behaviour of people living with diabetes or that of diabetes health professionals. Yet, many attempts to change behaviour are unsuccessful, or at best, partially successful, due to lack of time, resources or understanding of behaviour change. Many of us attempt to change behaviour by simply following the "It Seemed Like A Good Idea At The Time" (ISLAGIATT) principle.

The behavioural science approaches outlined in this review give healthcare professionals, researchers and policymakers the tools to move beyond intuition to deliver care and design research based on a theory-based understanding of behaviour. The challenge for the next 25 years is to increase the

use of these approaches and advocate for the role of theory and behavioural science in the commissioning, funding and delivery of diabetes care to ensure maximum impact on the health and well-being of people with diabetes.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Figure S1. Behaviour change wheel.
Figure S2. Logic model of the problem with individual level determinants circled.
Figure S3. Logic model of change.
Figure S4. "Who is looking after your eyes?" Leaflet.
Table S1. Theoretical Domain Framework domains, definitions and component constructs.
Table S2. Mapping of results from qualitative study on barriers/facilitators to self-management to the Capability Opportunity Motivation-Behaviour Model and D1 Now intervention.