The use of behavioural evidence in physical activity policy.
Is Physical Activity Policy Evidence based?

Physical activity is vital for the health and well-being of people of all ages. It has been shown to reduce the risks of developing chronic disease and reverse some disease processes (Lee et al., 2012), to contribute to the maintenance of a healthy body weight (Swift et al., 2014), and to promote positive health and wellbeing (Penedo and Dahn, 2005, Biddle and Asare, 2011). Despite these potential benefits, around 30% of the world's adults are physically inactive, rising to over 40% in many high-income nations (Hallal et al., 2012). Over 80% of children fail to achieve the recommended 60 minutes of moderate to vigorous physical activity per day (Hallal et al., 2012). Global and regional strategies have been in place for some years to provide guidance to governments in establishing policies to promote physical activity (World Health Organization [WHO], 2013, 2015), however no country has yet succeeded in achieving a trajectory of increasing participation. Should we conclude that the policy approaches we have tried so far are ineffective, and that we need to look for alternatives? Or is it possible that the intended approaches are sound, but require improvement in their design and/or implementation in order to reach their full potential? This chapter aims to explore these two questions by examining examples of existing physical activity policies in the light of 'best practice' within behavioural theory and behavioural science research.

The examples of policy that we will review are drawn from the WHO European Physical Activity Strategy, which incorporates a range of policy approaches operating at the individual, community, cultural, political and environmental levels (WHO, 2015, Heath et al., 2012). It is widely agreed that to bring about community-wide and lasting effects on health behaviours we need to incorporate policies of different types, operating at different levels, and which simultaneously target the different determinants of the behaviour that we aim to promote (Jebb et al., 2013, Butland et al., 2007). Findings from other behavioural domains where policy action is more advanced, such as tobacco control, can provide a useful worked example of what a comprehensive set of policies should include (West, 2007, WHO, 2008). For example, the MPOWER framework for tobacco control identifies the contribution of six distinct policy approaches: 1) routine monitoring and surveillance of behaviour, 2) health protection, 3) offering support, 4) health messaging, 5) legislative approaches and 6) financial or economic approaches (WHO, 2008). The examples of policy that we will focus on in this chapter address the four MPOWER categories that are most applicable to behavioural theory and a physical activity setting; *monitoring and surveillance*, through the UK National Child Measurement Programme (NCMP), *offering support,* through the provision of brief advice in primary care and exercise referral services, *health messaging* through social marketing and workplace campaigns to promote active transport, and *financial or economic approaches* through the provision of incentives. We acknowledge that physical activity policies may not fit neatly into the MPOWER categories, but it nonetheless provides a guide to the breadth of initiatives likely to be required to promote population-level behaviour change.

The aim of this chapter is to consider the use of behavioural evidence within physical activity policy. However, to do this comprehensively we also need to consider the use of behavioural theory. Evidence and theory are necessarily intertwined; well-established theories are derived from evidence, they provide a means of integrating different sources of evidence in a systematic way, and can be tested against evidence to assess their utility. Theory is also important in helping us to understand why people act in the ways that they do (i.e., mechanisms of effect), which may provide insight into public

responses to policy (i.e., why some policies or initiatives gain support and momentum, and why others fail). This understanding is also useful when attempting to translate successful approaches from one domain or setting to another, which is often conducted to meet requirements for evidence-based policies in settings where bespoke evidence is lacking. Using theory can help by providing a model of the psychological (and other) processes that underpin the success of a policy or intervention, and thus which also need to be targeted in any adapted versions, albeit usually through different techniques. That is, theory can help to identify what the core elements of a policy are that we need to retain in order to claim that our adaptation is still 'evidence-based'. Within this chapter we will therefore outline some key theories relevant to promoting physical activity within behavioural science research, and discuss how and where these theories could be, and have been, applied within physical activity policies. This analysis is a complex process; theory may be implicit in the content of a policy, but also in who it targets, when and how. Thus, the five illustrative examples incorporated within the chapter are included to provide a more in-depth analyses of the different ways in which we can assess a policy's alignment with theory and evidence.

1. Behavioural theory applied to physical activity

Theories of behaviour change provide structure for exploring and understanding the mechanisms through which people change and maintain their health behaviours (Michie et al., 2008). They help to identify what needs to change in the way a person thinks, feels or experiences the world around them in order to engage in health behaviours, and thus can suggest where interventions and policies are best targeted. While a poorly designed or implemented intervention will be poor quality whether based on theory or not, the use of behavioural theory is argued to produce research evidence of higher quality and usability (Craig et al., 2008, Michie et al., 2008), achieving this by:

- encouraging researchers to set out explicit, testable models of the processes underpinning behaviour change (i.e., causal pathways), extending our focus from establishing *whether* or not things work, to *how* they work (Schaalma and Kok, 2009),
- the use of standardised definitions of constructs and terms to facilitate direct comparisons between studies, and thus the more meaningful aggregation of data from multiple studies for meta-analysis (Michie, 2008, Gardner et al., 2010), and
- the identification of behaviour change techniques that can be systematically mapped to theoretical pathways of action in the translation of research into practice (Kok et al., 2004).

Evidence from systematic reviews supports the contention that behaviour change interventions based on theory are more effective than those that are not (Gardner et al., 2010, Webb et al., 2010, Prestwich et al., 2014, Horodyska et al., 2015). However, there are a large number of behavioural theories to choose from, each of which may be more or less effective depending on the setting, population or type of behaviour we wish to influence. While choosing a theory may thus appear a daunting task, there is considerable overlap between the constructs that are identified across theories, and indeed most, if not all comprehensive theories of behaviour change converge to support the importance of three psychosocial determinants in driving health behaviours and behaviour change; self-efficacy, social support and motivation (Schwarzer and Luszczynska, 2008, Michie et al., 2011, Greaves et al., 2011, Olander et al., 2013, Amireault et al., 2013). Thus, we will focus on these three elements in exploring the theoretical content of physical activity policies.

1.1 Self-efficacy

Self-efficacy is a core construct of Social Cognitive Theory, the most commonly applied theory within physical activity research (Bandura, 1998). It is also an important component of other well-known frameworks such as the Transtheoretical Model (often referred to as the Stages of Change model by health practitioners; Prochaska and Velicer, 1997). Self-efficacy can be defined as a person's belief in their ability to carry out a particular task or challenge (Bandura, 1998), and is a very specific belief, relating to the particular type of behaviour on the specific occasion under consideration rather than a general sense of confidence. As such, the detail of how physical activity is described and marketed within policies can make a big difference to the level of self-efficacy people feel towards it. Self-efficacy is important on the basis that people are unlikely to initiate an action if they have little belief that they will be able to achieve it (Schwarzer and Luszczynska, 2008; Michie et al., 2011). The results of systematic reviews suggest that self-efficacy towards physical activity can be enhanced by: facilitating vicarious experiences (i.e., providing opportunities to observe people similar to oneself successfully carrying-out an activity); the provision of personal feedback (e.g., through self-monitoring techniques; Ashford et al., 2010); the provision of instruction, facilitating action planning, and providing reinforcement for being active (Williams and French, 2011). Policies may operate at a population or individual level, but in either case can be scrutinised for the degree to which they are supportive of people's self-efficacy for physical activity; for example policy may directly aim to boost self-efficacy as in the case of providing behavioural support services, or indirectly by reducing perceived barriers to an active lifestyle, such as through creating more supportive physical environments.

1.2 Social support

Social support is a broad set of factors ranging from interpersonal influences such as emotional support and encouragement, instrumental support (e.g., providing transport to sports activities for children; van Sluijs et al., 2007) and having people to exercise with, to community and societal level factors such as social norms and social cohesion (i.e., coming together with others in communities that promote the adoption of physical activity) (McNeill et al., 2006). Social norms are challenging to create through policy, as they rely on both actual change (e.g., prevalence) in addition to perceptions of change (e.g., visibility), but may nonetheless be an important target. For example, in the smoking domain, social norms for *not* smoking (rather than smoking) in many countries shifted very slowly after decades-long comprehensive policy approaches towards tobacco control. Not only did the shift in norms help to increase public acceptance of policy intervention (e.g., even among smokers there was very little opposition to smoke free legislation; Borland et al., 2006), but individual smoking behaviours were also influenced. Contrary to critics' fears for the unanticipated effects of smoke-free legislation, smoking in the home (particularly in the presence of children) actually decreased following the ban of smoking in public places, suggesting the legislation had strengthened smokers' recognition and endorsement of the rationale for reducing exposure of non-smokers to second hand smoke (Phillips et al., 2007, Akhtar et al., 2009). Similar positive effects of social norms have also been observed in the physical activity domain, such that when physical activity becomes highly visible within a community (i.e., people report seeing others walking and cycling frequently), this perceived norm for activity is predictive of increased physical activity over and above the effects of direct social support from friends and family (Ball et al., 2010). However, even with the addition of considerable infrastructure, increases in the critical mass of active walkers and cyclers are difficult to achieve (Goodman et al., 2013) and people report their attempts to be active are often undermined by those around them who are inactive (Whale et al., 2013).

1.3 Motivation

Many theories of motivation are available providing different emphases on the determining characteristics of our motivation to improve our health behaviours. Common examples include; protection motivation theory (PMT; Rogers, 1975) which models the motivating mechanisms of threat and coping appraisals (i.e., responding to 'fear appeals'); the health belief model (HBM; Conner & Normal, 1996) that is grounded in assumptions of people choosing to act or not to act as a result of their attitudes and beliefs (e.g., perceptions of susceptibility, severity, potential benefits and barriers); and the trans-theoretical model, which draws on theories of psychotherapy to describe a model of progressive stages of readiness to change and the processes driving people's progression through these stages (Prochaska & Velicer, 1997). While providing useful frameworks for studying phenomena, theories such as these have been criticised for being of limited use in helping to understand and influence motivation in relation to physical activity in particular, where the link between the behaviour and health outcomes are typically not well defined or understood: For example, many people who are inactive do not feel an imminent health threat or believe their behaviour is risky (i.e., limited relevance for fear appeal within PMT and perceived severity within the HBM), and they may perceive more barriers or threats (e.g., discomfort, lack of time or enjoyment, injury risk) than advantages to becoming active (i.e., limiting the perceived benefits within the HBM). Further, such theories are criticised as providing a simplistic view based on the assumption that people make rational and planned decisions based on coherent attitudes, leading to relatively stable and predictable states of motivation.

No theory is perfect in helping to understand any behaviour, but one that perhaps provides a more comprehensive view of people's multiple and changing motives for physical activity is self-determination theory (SDT) (Ryan and Deci, 2000a). SDT is a macro-theory of human motivation that incorporates many theoretical perspectives, conceptualising motivation as something that is dynamic, influenced by both internal and external factors, and reflective of people's ability to hold multiple competing motives at any one time. SDT has been shown to be useful in the design of physical activity interventions (e.g., Teixeira et al., 2012, Fortier et al., 2012), and importantly for the focus of this chapter, also provides insight into how policy effects could influence individual behaviour (Moller et al., 2006). Within SDT, motivation is framed as a continuum, ranging from more controlled types of regulation (i.e., with low self-determination) at one end, to high quality, autonomous motivation at the other (Ryan and Deci, 2000a). Autonomous motivation is associated with positive behavioural and affective outcomes, such as long-term behavioural engagement, greater effort and enjoyment, whereas controlled motivation is associated with only the temporary or short-term behavioural engagement, and poorer well-being, effort and enjoyment (Teixeira et al., 2012, Ryan et al., 2008). Controlled types of motivation include occasions when we act purely in response to overt controls, such as to gain rewards or avoid punishment (e.g., payment, legal requirements), or when we act in response to internalised controls, such as to avoid feeling guilt or shame, or to impress and please others. Conversely, autonomous motivation reflects a greater sense of volition, when our behaviour is more aligned with our personal values. For example, and in increasing order of self-determination, people may take exercise autonomously because they personally endorse and value the outcomes of an activity (e.g., health or fitness benefits), because it reflects their identity and sense of self (i.e., "being fit and active is part of who I am"), or for the sheer pleasure and enjoyment of doing so (intrinsic motivation) (see Standage and Ryan, 2012 for a comprehensive review of the application of SDT in the physical activity setting).

So how can we design policies and interventions that promote autonomous motivation? A key component of any autonomy supportive approach is acknowledging (and respecting) the views of the people we are trying to influence, and ensuring that they perceive a meaningful rationale for changing

their behaviour (Deci et al., 1994). Research suggests that there is at least some public recognition of the need for policies to promote physical activity (Emm et al., 2013, Brownson et al., 2001, Oliver and Lee, 2005), and thus that there is already acceptance of a meaningful 'rationale' for some level of government intervention. However, we all too often assume that people are motivated to change for the same reasons that are pertinent to health professionals and policy makers (e.g., future health and financial benefits), but this may not be the case. For example, retired adults report a range of motives for being active from seeking a daily sense of challenge and purpose, to enjoyment and seeking social affiliation, whereas health outcomes may appear only as a welcome but secondary by-product; for some older adults improved fitness can even be a disincentive if it distances them from their less able peers (Beck et al., 2010). Similarly, people adopting active forms of commuting may do so for cost and convenience and be unmoved by the rationale to do so for health benefits (Hansen and Nielsen, 2014). However, it is upholding people's sense of their own volition and freedom to choose that is of greatest importance in promoting autonomous motivation. Even if the public largely agree with the values driving policy initiatives, feeling that an activity is no longer one's own choice but as a result of 'complying' with instructions can undermine existing autonomous motivation and lead to psychological reactance (i.e., perceiving the message as a threat to personal freedom, and responding with anger and/or commitment to take the opposite course of action; Quick and Considine, 2008). Behaviour may be reduced to below the level observed prior to intervention if a new policy initiative generates a sense of reactance (Paul-Ebhohimhen and Avenell, 2008).

Two policy examples, financial incentives and the National Child Measurement Programme (NCMP), provide an illustration of how an understanding of SDT could help to improve policy design. The case of incentives also highlights some of the challenges and limitations of attempting to translate policies supported by evidence form one context to another, and shows how theory could help to identify alternative techniques to achieve the same ends:

Policy Example 1: Financial policies to support physical activity: The use of incentives.

In other health domains (such as smoking cessation), the most effective policy in shaping behaviour is taxation (West, 2007). However, this type of punitive economic approach is primarily appropriate for reducing the behaviours that we wish people to do less of, whereas behaviours that require active engagement are better shaped by incentives (Petry, 2000). Incentives can be an attractive approach as they unarguably show positive short-term outcomes (Finkelstein et al., 2008), however in practice, financial incentives in particular are rarely associated with long-term positive outcomes such as sustained physical activity (Strohacker et al., 2014). For example, in a trial to promote physical activity to children in Singapore, participants were rewarded with a ~£15 toy store voucher for reaching agreed step-count goals (8000 steps on 15 days/month, assessed by pedometers), and entry into a prize draw for continued attendance (Ngo et al., 2014). The impact on step count was initially positive, with steps increasing from 8763 at baseline to 9394 at their peak five months later. However, attendance at physical activity sessions was low (43% in the first month, 25% at five months and 6% at nine months) and any initial benefit facilitated by incentives was not sustained; steps dropped back to baseline levels within 9 months. Similar findings have been found with payment schedules to college students; incentives increased gym attendance over a three month period, but attendance dropped to below baseline levels within a couple of months of the withdrawal of the incentive (Pope and Harvey, 2015). From an SDT perspective, such findings are consistent with the undermining effect of rewards on autonomous motivation, as we come to feel our behaviour as directed by the values of someone else (the incentiviser) and no longer our own (Moller et al., 2013). So while financial incentives may be enough to get us through the door of a leisure centre a couple of times and

to support behaviours that do not require persistence (e.g., attending screening), the controlled motivation that results is insufficient to sustain long-term behaviour changes such as the adoption of regular physical activity (Haskell et al., 2007).

Despite the evidence against using monetary-incentives, not all forms of incentive are perceived to be controlling (Cerasoli et al., 2014). It is worth exploring alternative types of incentive, as if we can identify incentives that are not perceived to be coercive, people may benefit from their strong initial 'stimulus' effect, prompting the first steps towards long-term behaviour change. The provision of informational feedback shows promise as one such type of incentive, as it is effectively a form of praise grounded in objective information about a person's level of achievement rather than someone else's values, and thus has been found to be supportive of autonomous motivation, (Ryan and Deci, 2000b, Patrick and Canevello, 2011). From the perspective of population-level approach, an advantage of this form of incentive is that it is easily facilitated by mobile technology through providing real-time feedback of personalised information such as step counts, and the automated delivery of rewards/praise in response to goal achievement (Zuckerman and Gal-Oz, 2014, Turner-McGrievy et al., 2013). The commercial expertise in designing engaging interfaces on which most computerised systems draw also means that using an app or website for feedback purposes can be fun in itself, and thus appealing to more autonomous (intrinsic) motives for their use (Zuckerman and Gal-Oz, 2014). Apps and internet based resources endorsing 'self-help' approaches to physical activity promotion are already widely endorsed by UK policy makers (e.g., NHS apps library; NHS, 2015, myPace, Barnett et al., 2015). While the motivation to continue to use such apps and web-based programmes to support behaviour change may not always be long-lived, if these tools can serve the purpose of prompting the initial uptake of behaviour for sufficiently long to become part of a person's routine, then they are clearly a useful component of a comprehensive policy approach.

Little research has been conducted in identifying other types of incentives that could be perceived as endorsements of a person's choices, rather than coercive means of directing their behaviour. Given how strongly evidence supports taxation to reduce unhealthy behaviours at a policy level, research is warranted to explore the motivational effects of the related approach of providing subsidies (already evident in practices such as policies to provide free swimming for children, or workplace gym/cycle subsidy schemes), investigating whether subsidies in this setting are perceived by recipients to be controlling or autonomously supportive prompts towards physical activity.

Policy Example 2: Monitoring and surveillance policy related to physical activity: The UK National Measurement Programme (NCMP).

The use of monitoring and surveillance policies are also interesting from an SDT perspective, as they provide inherent challenges to perceptions of autonomy and control; the act of monitoring is one that is done to a person rather than with or for them. While not exclusively relating to physical activity, the NCMP was initially introduced as a surveillance programme to monitor obesity rates among primary school children, and the data it generates has been used to provide justification for national investment in, and prioritisation of, the promotion of physical activity for children. Most public health teams have chosen to feed back their NCMP measurements to parents of overweight children (Mooney et al., 2010) as a means of improving parental awareness of childhood overweight (Jeffery et al., 2005). However, the receipt of this feedback has created strong reactance from some parents (Grimmett et al., 2008, Statham et al., 2011, Gillison et al., 2014), and anecdotal evidence from school nurses and public health teams indicates that the uptake of child weight management programmes and other forms of support offered to parents within NCMP letters has been minimal. Research conducted with parents indicates that such negative reactions result from a combination of factors including; the lack

of perceived legitimacy of school nurses to measure and report this information (i.e., an infringement of a family's perceived autonomy), a lack of self-efficacy to effect change (what to do if children refuse to be more active, or are already perceived to be as active as possible within the family's limitations?), and as parents' primary concerns for their child's health relate more to their psychological well-being than their weight alone (Gillison et al., 2014, Syrad et al., 2014). The issue of childhood obesity may represent a particularly sensitive area, but nonetheless this example provides insight into how surveillance programmes are often perceived, and suggests that if we are to use them as a springboard to try to encourage individual action then further steps first need to be taken to minimise perceptions of unwarranted intrusion into family autonomy that can lead to reactance. Theories of health communication may be helpful in designing more acceptable implementation plans, for example, reactance can be reduced and support for autonomy strengthened when people feel a greater sense of self-worth, stronger self-efficacy to make the required changes, and when alternative viewpoints are acknowledged and respected (Byrne and Niederdeppe, 2011).

2. Integrating behavioural theories into policy design

So far, we have argued that theory can be useful in understanding peoples' responses to policy intervention, providing examples critiqued through the lens of SDT. But how can we identify effective strategies that promote all three highlighted psychosocial determinants of physical activity (i.e., motivation, self-efficacy and social support) to incorporate within physical activity promoting policies? Ongoing work led by UK researchers has been conducted to try to facilitate this process, by defining specific, identifiable behaviour change techniques within published interventions and linking these to the theoretical constructs that they aim to target (Craig et al., 2008, Michie and Prestwich, 2010, Michie et al., 2005). The result to date is a comprehensive taxonomy of behaviour change techniques, providing standard descriptions of frequently use strategies (BCT taxonomy; Michie et al., 2013).[1] For example, the techniques of '*self-monitoring'* (Nietfeld et al., 2006), '*goal setting'* and '*modelling'* are linked to promoting self-efficacy (Bandura, 2004), and the technique *'provide information about the health-behaviour link*' is linked to motivation through strengthening one's rationale to change (Deci et al., 1994). Use of the taxonomy enables researchers to engage in a more transparent design process and build interventions, services and policies that can be clearly described as a set of hypothesised 'active ingredients'. While it is acknowledged that in reality strategies are likely to interact and operate in concert with others rather than to confer independent effects (Peters et al., 2015), the standardisation of terms allows us to identify what a given intervention (which could be a policy) includes. Describing interventions in this way allows us to compare the outcomes of studies containing specific techniques to assess their performance across studies. In this way, a meta-regression exploring the effect of specific behaviour change techniques in healthy eating and physical activity interventions found particular support for self-monitoring in promoting change (Michie et al., 2009), and as a result this technique has experienced a renaissance in its popularity and is included in most new services and interventions (NICE, 2014). Such a swift and comprehensive response is perhaps testament to the appetite for direct evidence as to what works in physical activity promotion from policy makers. The following two examples demonstrate how taxonomies of theoretically informed behaviour change techniques can help us to more objectively assess the degree to which policies to provide individual support are informed by behavioural theory and evidence in both their content, and the determinants of behaviour change that they target.

[1] Valuable evidence syntheses have also been conducted that contribute to our knowledge base without adhering to the categories set out in the taxonomy of behaviour change on which we draw in this chapter, but we stick to this method for simplicity.

Policy Example 3: Offering support through Exercise Referral Schemes

A common element of physical activity policy across the UK is the provision of exercise referral services for people at high cardio-vascular risk. The National Institute for Care Excellence (NICE) has raised concerns over the efficacy of such schemes (NICE, 2006), reflecting findings from the research literature that the overall effect of services on physical activity is minimal (Pavey et al., 2011). However, in recognition that some schemes *do* work, deconstructing the active behaviour change content of effective schemes may help to identify what strategies underpin their efficacy and could thus be rolled out to improve less successful services. A starting point for this process lies in identifying the constituent behaviour change techniques within service protocols, in the same way that has been done in research trials, allowing them to be scrutinised in relation to the broader behaviour change literature (Beck et al., 2016, Murphy et al., 2012). By scrutinising behaviour change techniques within services and their outcomes (i.e., evaluating the efficacy of processes of change) rather than simply their impact on behaviour, we are better able to target adaptations and service improvements. That is, if a process evaluation identifies that a service successfully enhances self-efficacy but fails to enhance motivation, improvements may be more productively made through additional or alternative motivational strategies rather than adding further techniques to bolster self-efficacy.

Two independent studies have used taxonomies of behaviour change techniques to try to identify what type of behavioural support is routinely delivered through exercise referral services (Beck et al., 2016, Murphy et al., 2012). In each case, the research teams conducted structured observations of standard services to identify what behaviour change strategies were present during consultations as opposed to those written within a protocol. The process was conducted with a view to identifying potential gaps in the behavioural support provided, and suggesting additional or alternative strategies to bridge these. Both studies reported unexpectedly large inconsistencies in the behaviour change techniques delivered; whether as a result of limited time, skills or other factors, clients attending the same service often received very different behavioural support from each other, and often different support from that set out in the intended service protocol. Such insight is informative in directing service improvements, for example if exercise referral advisors are failing to deliver a complete protocol through lack of time, structural changes to the service may be a priority (more staff, longer appointments), whereas if deviation from the protocol results from a lack of skills, resources may be better invested in training (Beck et al., 2016). While it has yet to be formally tested whether the recommendations generated by such an approach would result in more effective exercise referral services, it does provide greater insight into how we can align evidence to practice to make sure that future evaluations of the implementation of a given policy on service provision represent a fair assessment of that service operating to its full potential. If other services are equally mixed in the support they provide, this suggests that a single policy such as the provision of exercise referral services does not in reality relate to the provision of a homogenous type of intervention or support, and undermines the conclusions of meta-analyses that work on the assumption of the comparability of trials reported under the same name.

Policy example 4: Offering support through Brief Advice within Primary Care

The provision of brief advice within primary care provides a second example of the importance of evaluating the implementation of policies before concluding on their potential for efficacy. The provision of brief advice in primary care is a core physical activity policy within the UK (NICE, 2006), US (Moyer and Force, 2012) and across Europe (Oja et al., 2010). In this setting, brief advice

is defined as the provision of information (e.g., on the risks of inactivity), encouragement to change, and direction of where to seek further help, following an 'ask, advise, assist' structure. Brief advice is not designed or intended to provide a full programme of behavioural support to help people to make long term changes, but to prompt people to consider change who may not otherwise consider it (or who are not eligible for more intensive behavioural support services), and signpost them to sources of further support. Thus, it represents the first step in supporting the development of a person's motivation, through the provision of personally referenced information and communication of personal risks and benefits.

Relating this to theory, such an approach is certainly a useful part of a wider supportive environment for physical activity; we know that people are more likely to act on health risk information when this is communicated by a person in a respected position (e.g., O'Malley et al., 2004, Becker and Roblin, 2008), and when that information is personalised (Broekhuizen et al., 2012). One of the key limitations of health messaging is that many people within the community ignore health messages as they do not believe they apply to them. We could therefore hypothesise that if brief advice increases a person's awareness of their personal health risk, it could act as a 'prime' making them more receptive to the existing generic information, support and advice available elsewhere in their environment, and thus heighten the effect of these complimentary campaigns. However, this hypothesis of a priming effect needs investigation. Evaluations of the efficacy of opportunistic brief advice show a small but significant positive effect on physical activity (Lawlor and Hanratty, 2001, Anokye et al., 2014, Campbell et al., 2012), suggesting that it does appear to encourage people to move towards taking action. Given its low costs and potentially wide reach, the impact of even this small size of effect on national physical activity levels could be considerable.

3. Organisational and community level approaches to physical activity promotion

Policies to facilitate the provision of interpersonal support for behaviour change provided through brief advice and exercise referral schemes is an important part of a comprehensive policy approach, particularly when targeted at people with heightened health risk. However, broader approaches reaching whole communities are necessary to bring about the population-level shift in activity levels necessary to make an impact on any nation's health. Given that physical activity has been largely 'designed out' of daily life for most people in high-income nations (e.g., through motorised transport, and the mechanisation of manual occupations and domestic chores), we need to include policies that establish long-lasting support for physical activity to ensure that those who are active are supported in their efforts to remain so. Health messaging and social marketing can help to form part of this positive environment: In the UK for example, the NHS launched a Change 4 Life campaign in 2009, comprising social marketing delivered at a national level, with encouragement for further implementation at a local level, both supported by a comprehensive interactive website that could be used to develop personal physical activity (and other health behaviour) plans (Department of Health [DOH], 2009). The initiative incorporates numerous behaviour change techniques and has a strong emphasis on appropriate tailoring to different audiences (DOH, 2009). However, efficacy cannot be assumed on this basis alone; an early RCT evaluation of one module within the campaign ('How are the kids?') found that while a 6-month intervention to provide materials to parents was successful in raising awareness of the initiative, it did not improve parental attitudes towards promoting more physical activity to their children (Croker et al., 2012). Further, the campaign had an unintended negative outcome by reducing the perceived importance of perceived physical activity among parents in higher socio-economic groups (Croker et al., 2012). The authors of the study evaluating the efficacy of the programme cited the lack of parental interest and engagement with the materials as a

reason for failure, potentially as the materials were perceived to have little personal relevance. In effect, this example demonstrates that just as physical changes to the environment are necessary but not sufficient to encourage communities to use them (Giles-Corti, 2006), neither is the provision of information and tailorable online resources sufficient to support individual behaviour change.

A further example of the promotion of physical activity to communities that can be targeted at a local, organisational or national level, and through approaches ranging from social marketing, traditional health messaging, to multi-faceted work-place interventions, is the promotion of active transport.

Policy Example 5: Health messaging policy related to physical activity: Promoting active transport. Active transport represents a potentially important focus for health messaging campaigns, as it is relevant to both school children and most ambulant adults (whether in relation to travel to work or for leisure) and has been shown to increase overall physical activity to a meaningful degree (Heath et al., 2012). The promotion of active transport is endorsed within UK physical activity policy (NICE, 2006). The type of physical activity (i.e., cycling or walking) and the level of energy expenditure required is familiar to most people, so it is easier to form positive predictions of one's self-efficacy to achieve it than for some other more intensive exercise options. There are also a broad range of potential motives for, and benefits from, active transport that could contribute to a meaningful rationale for taking part for a wide range of people (e.g., health and fitness, journey time and predictability, environmental impact, enjoyment, cost savings). However, active transport presents a further advantage; when an activity is regularly enacted in response to a similar prompt or cue within the environment (i.e., preparing to go to work or school), there is potential for that behaviour to become a habit (Verplanken and Melkevik, 2008). Habits are defined as "learned sequences of acts that have become automatic responses to specific cues, and are functional in obtaining certain goals or end states" (Verplanken and Aarts, 1999), that is, behaviours that we perform with little conscious awareness or self-regulatory effort (Verplanken and Orbell, 2003). Habits are an efficient means of driving frequent behaviours as they bypass conscious decision making by operating as a cue-response behavioural pattern. As such, when a behaviour (or in the case of physical activity, the decision to act; Phillips and Gardner, 2015) becomes a habit rather than an activity requiring deliberation, it is less likely to be disrupted by the challenges encountered in our day to day environment, such as if the weather is bad, if we're feeling tired, or have a more attractive offer. Furthermore, observational research shows that active transport is associated with habitual processes both in adults (Gardner et al., 2011) and children (Murtagh et al., 2012).

Habit theory thus suggests that in principle, policies to promote physical activity through active transport would have the potential to promote long term change through promoting habit formation, and that this will be true to the degree to which they support the consolidation of a cue-response relationship between preparation for work or school and physically active travel choices. The behaviour change technique termed implementation intentions (or if-then plans, setting out specific actions to be undertaken in response to very specific cues) has been shown through experimental research to help people to create new habits. However, habit formation first requires the repetition of the behaviour to enable the physical activity pattern to be established, and thus support for the same psychosocial determinants of behaviour that are important for other forms of physical activity are equally important in this setting (i.e., self-efficacy, motivation and social support). Work-place schemes are well placed to do this, through providing proximal and locally-relevant forms of both environmental and social support (e.g., Audrey et al., 2015, Wen et al., 2005). For example, positive effects have been reported to using posters depicting actual employees within a company using modes of active transport to get to work, alongside testimonials of why they choose to travel in this way (e.g., for environmental reasons, better predictability, mood enhancement etc) (Wen et al., 2005). The

posters thus incorporated the techniques of *modelling* to promote self-efficacy for change, creating *social norms* among work colleagues, and (across a series of posters) the provision of alternative rationales for active travel in order to promote autonomous motivation. Thus, active transport policies reflect behavioural theory through the way in which they link physical activity to daily routines with the potential to foster habits, and can enhance their potential for effect through harnessing the potential from within existing social groups to provide the social support that theory and evidence suggests to be crucial in promoting the uptake and continuation of health behaviours.

4. Critical reflections on the application of behavioural theory to physical activity policy

A number of limitations are useful to consider in setting realistic expectations of what behavioural theory can contribute to the enhancement of physical activity policy. First, the use of theory is not a guaranteed route to policy success; theoretical approaches commonly improve the transparency and quality of design, but poor understanding of the needs of the target group(s), poor specification and poor implementation of behaviour change techniques will still lead to poor quality policies regardless of reference to theory. Conversely, policies designed by well-informed experts without reference to theory could be successful; our argument is simply that referring to theory enhances our ability to build meaningfully on past work to incorporate evidence and increase the chances of positive outcomes. There is growing awareness among policy makers of the evidence base surrounding behaviour change techniques, in recognition of the advantages of behaviour change theory. For example, NICE has published generic guidelines on individual approaches to behaviour change across a range of health behaviours that draws specifically on this literature (NICE, 2014), providing a resource for all commissioners and personnel involved in initiatives to promote health behaviour change. However, while this represents a clear and encouraging example of how behavioural theory can become embedded as standard practice within policy design, the quality of behavioural support will still depend on sound implementation. Implementation is influenced both by available resources and infrastructure, including the articulation of different policies within communities that maximise people's perceptions of a clear and consistent message (e.g., 'move more'). The skills of the staff charged with providing face-to-face behavioural support are also important in the translation of theoretically informed behavioural science to practice. This has perhaps not received sufficient attention to date; we are expecting people with limited training in behaviour change to deliver complex combinations of behaviour change techniques in short amounts of time. While evidence suggests that we can teach people from health professional and allied-health backgrounds to adopt more autonomy supportive styles (e.g., in the provision of autonomy support; Williams and Deci, 2001, Rouse et al., 2011), to do so with little basic understanding of theory, techniques and the rationale for changing their own practice is a lot to ask.

Finally, it remains the case that despite strong observational evidence confirming the association between the theoretical psychosocial determinants of behaviour and health behaviours themselves (Amireault et al., 2013), most physical activity interventions are relatively short term (i.e., ≤ one year). As such, the evidence that these initial interventions bring about long-term maintenance of physical activity is less convincing. At present, while behavioural science can recommend an 'end-point' towards which policy can be directed, the research base for behavioural maintenance is relatively young and these recommendations are likely to change. Furthermore, we have yet to provide the proven tools with which to reach all of these end points.

5. Implications for future physical activity policy and practice

In drawing the discussions within this chapter together, we come back to the questions posed at the outset; are current policy approaches well informed by behavioural science but ineffective, or are the approaches sound but in need of better implementation? Through exploring the examples of five physical activity-related policies, we have attempted to highlight the importance of considering both the target of a policy and its content in addressing these points. In terms of the targets of physical activity policies, we reflected on the degree to which policies are oriented to facilitate the provision of social support, and support for people's self-efficacy and motivation to be active. A number of the policy examples discussed were consistent with support for these determinants; for example the availability of behavioural support through exercise referral services (Policy Example 3) may enhance self-efficacy through helping people to perceive they have access to the specialist assistance they need to get active, and the promotion of active transport (Policy example 5) could be argued to support self-efficacy by endorsing a simple, cheap type of physical activity of achievable (low-to-moderate) intensity that can be regularly accommodated into daily life, in addition to facilitating opportunities for social support from colleagues/friends. We also identified where policies appear to work in opposition to theory, for example through the potential for financial incentives (Policy Example 1) and the use of monitoring programmes to identify people at risk (Policy Example 2) to undermine people's autonomous motivation for change, and cause them to react against perceptions of external control. Assessing the degree to which the content of physical activity policies are consistent with behavioural evidence was more challenging, as what is intended by a policy may not relate to what is delivered in practice, and there may be wide variations in what aspects of support which should be available is implemented or accessed. This was most clearly demonstrated by the evaluations of exercise referral services (Policy Example 3). This research highlighted that variations in the practice of exercise referral staff meant that the support given to clients within the same service (and in theory according to the same protocol) included very different sets of behaviour change techniques, and thus levels or types of behavioural support that were not directly comparable. Such findings emphasise how the task of ensuring that policies are informed by behavioural evidence does not stop at the design phase, but needs to extend to implementation.

So what should a well-designed and implemented policy look like? Physical activity is an effortful and often functionally unnecessary part of daily life, requiring motivation and the self-efficacy to direct and sustain one's behaviour in the face of attractive sedentary alternatives. Exerting the self-control required to adopt behaviours over a prolonged period is not usually sustainable (Vohs et al., 2014), so policies need to ensure that once people have made the effort to incorporate physical activity into their lives the social and physical environment around them supports these to continue. In order to foster long-term participation, policies need to provide support for autonomy through emphasising choice rather than imposing requirements or using coercion, to acknowledge and strengthen the rationale people perceive for being active, and ensure that policies are informed by consultations with the communities they aim to influence, taking on board their priorities, preferences and attitudes towards physical activity (Moller et al., 2006). Without acceptance from target communities, policies risk unintended negative consequences through people reacting against them, and without acceptance from those who will be asked to deliver policies, they risk failing through poor implementation. Similarly, policies need to increase perceptions of self-efficacy for change. Different strategies may be more or less appropriate in different settings, but providing vicarious examples of the successful adoption of physical activity (i.e., modelling) and the resources to obtain personalised feedback and self-monitor progress present a good starting point. Self-efficacy can also be enhanced by the simple knowledge that achievable levels of physical activity will be of benefit and

that support is available, so raising awareness of what services are already provided in a given community could also help to move people towards action. Finally, given the importance of social support in promoting physical activity (Greaves et al., 2011), policies to encourage proximal social support (e.g., co-participation with friends and family, and positive social environments within exercise settings), and more distal supports (e.g., normalising physical activity and encouraging community-level social cohesion) could play an important role in both promoting the uptake, and longer-term maintenance of active lifestyles.

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