Do we need motivation to sit less? Thoughts on a psychology of sedentary lifestyles

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There has been plenty written about physical activity from a number of perspectives, including biology, social dimensions, economic perspectives, and of course psychology. Most of the research on the psychology of 'physical activity' has focussed on moderate-to-vigorous intensity physical activity (MVPA). This usually includes periods of structured exercise, playing some sports, or being active through transport (walking, cycling). But even enthusiastic exercisers are likely to spend less than 5% of their waking day in MVPA, so what are they doing for the other 95%? This requires an investigation into all movement behaviours, ranging from very little movement (e.g., sitting) through to highly vigorous exercise. If sleep is included, we can document the 'movement behaviours' across a full 24-hour day.

In this chapter, I will explain how 'movement behaviours' can be conceptualised along a continuum and how important it is to recognise the context in which such behaviours may take place. I will outline long-standing research on the determinants of active and sedentary behaviours, with a focus on psychological and self-related concepts. Theories will be considered in the context of current thinking on behaviour change and I will attempt the answer the question 'do we need motivation to sit?'. Readers will probably detect that the answer will be 'not really' as such habitual behaviours may rely more strongly on contextual cues and less conscious processes. More on that later.

Understanding the Behaviour

A Movement Continuum

Before we can properly apply psychological theories and principles to a behaviour, we need to understand the behaviour itself. As suggested in the introduction, 'physical activity' is, typically, thought to be movement at higher levels of intensity, or at least moderate-to-vigorous. Rarely do we think of lower levels of movement, such as strolling looking in shop windows, standing to chat at the coffee shop, as behaviours worthy of study.

But over a 24-hour day we participate in a range of movement behaviours, and the balance of these behaviours may be important for health. As shown in Figure 1, behaviours range from sleep and low levels of movement up to more vigorous forms of exercise. We are always in one of these conditions, and therefore transition between them throughout 24-hours. For example, if you are sitting (sedentary) you cannot be standing and moving. If you are exercising (e.g., MVPA), you cannot be sleeping. This has led to wider acceptance of a 24-hour model of movement with some countries (e.g., Australia, Canada) adopting 24-hour movement guidelines, especially for children, where guidance if offered concerning sleep, sitting time (usually in the form of recreational screen time), and physical activity.

Movement in a Context

In addition to understanding that movement is multidimensional, we also need to know where these behaviours are taking place. Typically, we can conceptualise the main contexts as the home, work (for adults, school for children), travel, and community. Examples where physical activity are encouraged or restricted might include:

- Home: sedentary screen-based entertainment systems
- Work: sedentary office work
- Travel: active commuting (walking, cycling)
- Community: access to open green space or facilities.

Table 1 shows where certain types of contexts might be particularly important for some behaviours. For example, while structured exercise could be performed in the home or local community, it is the home that will influence leisure-time TV viewing, a common sedentary pursuit. Changes to TV viewing time will necessitate modifications to the home environment, such as household rules or physical restructuring of screen availability.

It is noteworthy that some of these behaviours are closely interdependent. For example, Figure 1 supports the idea that light-intensity physical activity is likely when you

get out of the chair and start moving around. Hence, the substitution between sitting and light physical activity is a clear one and so the more you can reduce your sitting, the more likely it is that you will engage in at least light activity. Of course, health gains will be greater if sitting is replaced with MVPA, but this is less likely to occur for any length of time. Figure 2 shows a hypothetical distribution of a 24-hour day for a typical adult who manages to undertake a 30-minute session of exercise. If they sleep for 8 hours and exercise for half an hour, the rest of their day will be split between sedentary time and light activity. In the example provided, sedentary (sitting time) comprises 9.5 hours (40%) of the day, with 6 hours (25%) being in light activity, such as general ambulation and day-to-day tasks not involving sitting. With such a small percentage of the day in MVPA, it is logical to plan for increases in this. However, the challenge will be for people to engage in MVPA for more than 1 hour per day. This means that reductions in sitting are likely to replaced with increases in light physical activity. This has implications for the psychology of behaviour change. Overall in this section, therefore, the key point is that to change behaviours we first must understand what the behaviours are and then understand the contexts within which they operate.

Correlates and Determinants of Physical Activity and Sedentary Behaviour

The field of physical activity correlates stems from the seminal review by Dishman and colleagues (1985). This narrative review is an important paper because it highlighted the centrality of understanding correlates of physical activity at a time when little attention was paid to this. They said that "the public health potential of physical activity and exercise cannot be defined or fulfilled until the behavioural determinants of participation are identified" (p. 159). Dishman et al. made distinctions between 'personal characteristics' and 'environmental characteristics' in both spontaneous physical activity and supervised exercise programs.

Sallis and Owen (1999) reviewed over 40 studies on correlates of physical activity for adults, and Trost et al. (2002) updated this evidence. This, too, was updated in the form of a review of reviews by Bauman et al. (2012). Typically, psychological correlates of physical activity sit along correlates reflecting socio-demographic, biological, behavioural, social, and environmental correlates. For psychological correlates, the early review by Trost et al. (2002) reported that there was evidence for a consistent positive association with physical activity for enjoyment, expected benefits, intention, perceived health, self-motivation, self-efficacy, stage of behaviour change, and self-schemata for exercise. The strongest evidence appears to be for self-efficacy (Bauman et al., 2012), with some evidence supportive of the role of intentions, outcome expectations, perceived behavioural control, and perceived fitness (Choi, Lee, Lee, Kang, & Choi, 2017). Arguably, self-efficacy is likely to be even more important for behaviours that require effort, such as structured fitness programmes. Nevertheless, self-efficacy is associated with most types of physical activity. The summary of evidence provided by Bauman et al. suggests that there is great inconsistency as to the extent of association between psychological variables and adult physical activity, except for self-efficacy.

Self-schemata for exercise has not received as much attention as a correlate for physical activity as some other psychological variables and fails to appear in Bauman et al's (2012) review. Yet some form of physical activity and exercise 'identity' may be important. For example, self-perceptions, while typically studied in the physical activity literature as an outcome of participation (e.g., enhancement of self-esteem or physical self-worth), may also act as a driver of behaviour. This motivational approach is where self-esteem, and related constructs, act as a motivational determinant of participation. This could be in one of two ways. One is where those with high physical self-worth seek out situations where this can be reinforced, and another is where those with low physical self-worth avoid physical activity to

not expose their perceived inadequacies. Of course, it is also possible that some will seek out physical activity to improve their low self-perceptions, although this may require greater support and motivation.

In a review of self-identity constructs in physical activity, Rhodes et al. (2016) found that studies supported an association between identity/schema constructs with physical activity intentions and behaviour. However, they concluded that the evidence is in need of development as many studies were cross-sectional, of low quality, and used self-reported measures of physical activity.

The identification of the correlates of sedentary behaviours in adults is quite limited and relies largely on self-reported estimates of only a few sedentary behaviours, such as TV viewing. Rhodes et al (2012) published a systematic review and showed that most of the studies used TV viewing as a measure of sedentary behaviour, were of a cross-sectional design and focused on socio-demographic and behavioural correlates. Results showed that those who watch more TV tend to be less educated, older, unemployed or retired, and have higher body mass index (BMI), a marker of adiposity. In contrast, computer use was higher among younger, more educated adults, with computer game users more likely to be male. An association was also observed between higher TV viewing and lower leisure time physical activity. Although psychological correlates have not been widely studied, a sedentary attitude construct (e.g., preference, utility, and enjoyment) emerged as a strong positive correlate of all sedentary behaviours. Higher depressive symptoms and lower life satisfaction also emerged as potential correlates.

Rollo and colleagues (2016) reviewed cognitive and motivational variables associated with sedentary behaviour. They concluded that risk factors for greater sedentary time included:

- “having a more positive attitude towards sedentary behaviour

- perceiving greater social support/norms for sedentary behaviour
- reporting greater sedentary behaviour habits
- having greater intentions to be sedentary
- having higher intrinsic, introjected, and external motivation towards sedentary behaviour" (Rollo et al., 2016, p. 980).

Given what has been said about different behaviours occurring across different contexts, it should also be expected that some correlates will operate more strongly in some situations – and for some behaviours – than others. This makes the field complex but cannot be ignored when planning behaviour change interventions.

Psychological Theory Used to Study Physical Activity

For the study of the psychology of physical activity and exercise ('exercise psychology'), many early studies were atheoretical. However, this changed as theories, mainly from social psychology, were adopted and tested. An early chapter on psychological models and theories in exercise was that by Sonstroem (1988). He claimed that the first model developed specifically to predict participation in exercise was his 'psychological model of participation in physical activity' (Sonstroem, 1978), but such frameworks have been superseded by more established theories borrowed from cognate sub-disciplines in psychology. Some of these were alluded to by Sonstroem, such as the Health Belief Model (HBM; Rosenstock, 1974) and Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975).

Sonstroem also proposed his 'Exercise and Self-Esteem Model' (see Sonstroem, 1997). This purports that physical self-efficacy will influence physical competence and acceptance, each affecting self-esteem. While the model has received little empirical testing, it laid the foundations for other self-related models and measurement processes in physical activity and is therefore an important historical milestone in our field (Fox & Corbin, 1989; Marsh, Richards, Johnson, Roche, & Tremayne, 1994).

Dishman's (1994) edited text on exercise adherence including chapters on social-cognitive models (Godin, 1994) and the Transtheoretical Model (TTM; J.O. Prochaska & Marcus, 1994). In Godin's chapter, theories and models covered included the HBM, Protection Motivation Theory, Self-Efficacy, the TRA and Theory of Planned Behaviour (TPB), and the Theory of Interpersonal Behaviour (Triandis, 1977).

The field of exercise psychology was dominated initially by what could be called 'the big 3' theories:

- Social Cognitive Theory (SCT, including self-efficacy) (Bandura, 1986)
- Theory of Reasoned Action/Planned Behaviour (see Ajzen, 1988)
- Transtheoretical Model (J O Prochaska & DiClemente, 1982)

Table 2 suggests some conceptual overlap between these theories. Subsequently, Self-Determination Theory (SDT; Ryan & Deci, 2000) has gained in popularity, including research on exercise (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Two main approaches from this theoretical framework have been adopted. First, the continuum of behavioural regulations, ranging from intrinsic to extrinsic, including identified and introjection motivational regulations as intermediary constructs on this continuum, have been used to describe individual's stated reasons for participation (Ryan & Deci, 2000), with an early study applying this to school physical education classes (Goudas, Biddle, & Fox, 1994).

The second focus of SDT research in physical activity has concerned the three psychological needs of autonomy, competence, and relatedness. For example, Standage et al. (2019) concluded that autonomy, and supports for autonomy, such as providing choice and empathy, are associated with positive affect, vitality, enjoyment, satisfaction, and exercise intentions. "Autonomy-supportive interventions have also been successful in enhancing … adults' autonomous exercise motivation, positive affect towards exercise and exercise

attendance, and the frequency of leisure-time physical activities and stronger intentions of school children" (Standage et al., 2019, p. 297).

One aspect of SDT that seems to have been under-played in physical activity is the notion of 'true' vs. 'contingent' self-esteem (Deci & Ryan, 1995). For example, it is common to judge our feelings of esteem and self-worth relative to other people ('contingent' self), yet to have self-esteem based solely on performance and behaviours, and what we have achieved, is limiting and may not always be psychological healthy. Deci and Ryan (1995) propose that 'true' self-esteem develops as one acts in accordance with one's own volition (meeting the need for autonomy), experiences a sense of efficacy (meeting need for competence), and is loved or regarded based on who they are not what they have achieved (need for relatedness). A true self-esteem is "more stable, more securely based in a solid sense of self" (Deci & Ryan, 1995, p. 32). In contrast, a 'contingent' self-esteem is "feelings about oneself that … are dependent on matching some external standard of excellence or living up to some interpersonal or intrapsychic expectations" (p. 32). This means that it is more reliant on social comparison, which can be a fragile basis for self-perceptions. The notions of true or contingent self have not been discussed a great deal in the literature concerning physical activity and self-esteem yet may hold promise for understanding how physical activity can influence psychological well-being.

Trends in publications concerning physical activity psychology across a 20-year period have been documented by Rhodes and Nasuti (2011). They analysed 10 established journals for behavioural medicine and sport and exercise science/psychology. For theory, they showed that while the volume of research increased over time, the use of SCT remained a popular theoretical framework. Moreover, SDT gained in popularity since from around 2000. The TTM has been a well-used approach in behaviour change studies.

Gourlan et al. (2016) published a systematic review and meta-analysis of interventions to increase physical activity in adults. Specifically, they were interested in the role of theory-based interventions. From 31 interventions using the TTM, a significant moderate effect was found but with quite high variability between studies. This led to a recent meta-analysis concerning just the TTM and physical activity (Romain et al., 2018). These researchers examined whether the effects of TTM interventions for physical activity varied according to whether interventions were stage-matched or not and if participants were selected according to their stage of change. The moderator effects of the theoretical constructs that underpin the TMM were also examined. These included decisional balance (pros and cons of change), self-efficacy, and processes (strategies) of change.

From 22 studies, Romain et al. (2018) reported significant overall intervention effects for studies based on the TTM, as well as for those where participants were stage-matched. However, although a lower effect was seen for those not stage-matched, the difference between the two was not significant. The effects for interventions where participants were selected by their stage showed no difference to those not selected in this way. In addition, the meta-analysis showed that interventions were more effective when self-efficacy was used as a behaviour change strategy, and when processes of change were emphasised. However, this was not the case for decisional balance.

Rhodes and Nasuti (2011) also showed that environmental frameworks became dominant over time in the literature. For example, in 2008, papers using these frameworks outnumbered those using the four main psychological theories combined. This trend reflects the widespread use and acceptance of an ecological approach to the study of physical activity behaviour, in which recognition is given to social, environmental and policy influences, as well as inter-personal psychology (Sallis & Owen, 2015). However, wider use of social and organisational theories underpinning physical activity is less obvious to see in the literature.

Rhodes and Nascuti's (2011) analysis also showed that many papers had no explicit theory at all. Michie et al. (2014) analysed theories of health behaviour change, including those used in physical activity. They identified 83 'theories' or frameworks of behaviour change and found that the TTM, TPB, and SCT were highly frequent. However, there are many other perspectives that could, and should, be tested, such as those suggested by Bartholomew et al. (2001) and illustrated in Figure 2. An emphasis on individual-level theory may be too narrow. For example, some approaches to health behaviour change may require a focus on individual behaviour tailoring and hence the TTM may be an appropriate framework. But if a focus on changing social norms is required, mass media interventions using, for example, a diffusion of innovations approach could be adopted.

It is still a little unclear if theories discussed here are suitable for the study of sedentary behaviour (see Biddle, Mutrie, & Gorely, 2015). I have already argued that we need to be more nuanced in our approach – there are different types of movement behaviours and they occur in different settings. This suggests we should not use a narrow range of theories.

Behaviour Change: From Theory to Frameworks to Techniques

Psychological theory, it might be argued, only gets you so far. To bring about behaviour change, more is needed, such as wider frameworks with greater heuristic appeal and application for health professionals. Bringing psychological, social, environmental, community, and policy issues together in one framework, Michie et al. proposed the 'Behaviour Change Wheel' (BCW) (Michie, Atkins, & West, 2014; Michie, van Stralen, & West, 2011). The BCW is a framework that can be used at various levels, including individuals, groups, and communities. There are three key elements of this framework: the sources of behaviour, intervention functions, and policy categories. In addition, it is important to consider the use of specific behaviour change techniques (BCTs).

Sources of Behaviour

The three main sources of behaviour (B) are proposed to be capability (C), opportunity (O) and motivation (M), hence the so-called 'COM-B' approach, as shown in Figure 3. Understanding the specific behaviour in question is critical and this is consistent with the earlier text on needing to know more about behaviours and contexts. Physical activity, for example, does not only take many different forms (e.g., light activity, moderate-to-vigorous physical activity, high intensity training; see Figure 1), but could also differ by type (e.g., muscle strengthening exercise, walking, dance). The COM-B framework allows for an analysis of the physical and psychological capabilities to undertake the behaviour, the social and physical opportunities, and reflective and automatic forms of motivation (see Figure 3). An example from research into sedentary behaviour illustrates the importance of opportunity (Atkin, Gorely, Biddle, Marshall, & Cameron, 2008). Using time-use diaries, we found that a 'critical window' of opportunity to be physically active for teenagers appeared to be the immediate after-school period. This was when activity was in competition with sedentary pursuits of TV viewing and computer games. Later in the evening, activity was less likely and not necessarily expected, hence sedentary screen time is less likely to compete with physical activity. We surmised that if the opportunity to be active was missed during the critical window, it was likely to be missed altogether. This suggested that targeting increases in physical activity needed to look at after-school opportunities.

The BCW recognises a dual-process approach to motivation through both reflective and automatic processing (see more detail later). Reflective approaches are common in psychology, as illustrated by the 'big 3' theories discussed earlier in this paper. Reflective approaches are where people process information, think and reflect, and then, possibly, act out the behaviour. This is commonly assumed in expectancy-value approaches in psychology where people think about what might happen with a course of action, and what the benefits

and costs might be. Weiner (1992) refers to this as the 'God-like metaphor' in human motivation whereby humans are 'all-knowing' and fully informed about behavioural options. Of course, the reality is a little different. Many behaviours are driven more strongly by less conscious, or more 'automatic', processes.

Automatic processing is at a lower level of conscious processing, and it is where behaviours might occur through either environmental 'nudging' or 'gut reaction' acts driven by affective ('like-dislike') responses. These will involve little fore-thought or planning. For example, climbing the stairs might be undertaken because they are easily accessible and attractive. Little thought may have gone into this action. By making the stairs accessible or attractive is a strategy that reduces the need for reflective motivation and is likely to trigger more automatic processing. Sadly, the opposite is usually the case – stairs are tucked away in many public buildings, they are unattractive, and the lifts/elevators are more accessible, hence the automatic processing in favour of less active behaviour.

Intervention Functions

The intervention functions in the BCW are the types of interventions that might be delivered. These could include coercion, training, modelling, environmental restructuring, education, persuasion, incentivisation, and others. Interventions are likely to have more than one intervention function operating. For example, in implementing sit-to-stand desks in the workplace to reduce sitting, education will be needed alongside the environmental restructuring of the office itself (i.e., provision of the desks) (see Edwardson et al., 2018). While intervention functions represent broad categories or domains by which an intervention might change behaviour, actual behaviour change techniques (BCTs) represent the more tangible components, or 'active ingredients', that help change behaviour (see section on BCTs below).

Policy Categories

The third element of the BCW comprises policy categories. These can be used to deliver the intervention functions and might include, among others:

- guidelines
- environmental planning
- communication/marketing
- legislation
- regulation
- fiscal measures.

A matching of policy with the intervention functions is one step in planning an intervention to change behaviour. For example, to incentivise more physical activity in the workplace, policies might include communication with employees, production of guidelines, and fiscal measures, such as subsidies for bicycle purchase (Michie, Atkins, et al., 2014).

Theoretical Domains Framework

There is clearly an overlap at the level of individual constructs within theories and frameworks (see Table 2 for examples from common theories). This led to the development of the 'Theoretical Domains Framework' (TDF; Cane, O'Connor, & Michie, 2012; Michie, Atkins, et al., 2014). The TDF specifies 14 domains, including knowledge, skills, behavioural regulation, beliefs about consequences, intentions, goals, and emotion. The TDF was developed as an integrated framework and as "a response to the difficulty of selecting between many overlapping theories … and aimed to make theory more accessible to intervention designers" (Michie, West, et al., 2014, p. 31).

Behaviour Change Techniques

Behaviour change techniques are the 'active ingredients' designed to change the target behaviour. There are many BCTs that have been used to facilitate behaviour change and this has created a lack of clarity and consistency in terminology. For example, reports of

interventions often do not adequately describe the BCTs employed, making replication of studies difficult and limiting what can be learnt from research syntheses. There is a need for a common language and definition of BCTs to aid both researchers and practitioners in the identification of effective techniques, and Michie and colleagues have addressed this.

Using the original behaviour change taxonomy (Abraham & Michie, 2008) as a starting point, Michie et al (2011) conducted systematic reviews to see which BCTs could be used to identify core components of physical activity and healthy eating behaviour change interventions. The resulting 'CALO-RE taxonomy' contains 40 techniques and provides a definition of each and the construct it is hypothesised to change. Examples include providing information, goal-setting, identifying barriers, rewards, self-monitoring, feedback, modelling, environmental restructuring, prompting, fear arousal, relapse prevention, and time management.

The use of standardised BCTs facilitates identification of the BCTs that actually contribute to intervention effectiveness as well as providing a common language to accurately describe an intervention. This standardisation should improve the mapping of BCTs to constructs identified in behavioural theory and thus aid the development and refinement of such theory.

We conducted a systematic review of BCTs used in interventions designed to reduce sedentary behaviour (sitting time) in adults (Gardner, Smith, Lorencatto, Hamer, & Biddle, 2016). First, we assessed the 'promising' nature of the interventions located. 'Very promising' where those interventions with significant reductions in at least one sedentary behaviour in the intervention group and a reduction compared to a control group or other intervention arm in the study. Interventions were 'quite promising' where there were either significant declines in at least one sedentary behaviour indicator within the intervention group or a reduction relative to controls. Interventions were 'non-promising' with neither a change

in sedentary behaviour nor differences in sedentary behaviour change relative to controls. In this review, we analysed both intervention functions and BCTs. These were deemed 'promising' when used in at least twice as many promising as non-promising interventions. The most promising intervention functions and BCTs are shown in Figure 5. What these results suggest from the point of view of motivation is that both reflective and automatic forms of motivation are likely to be in operation, thus being consistent with a 'dual-process' model of processing. The promising BCTs identified included what might be considered more reflective approaches (e.g., problem solving) and those that are more automatic (e.g., environmental restructuring). The latter is illustrated by students walking into a lecture. Given the social and physical environment (lecture; seats, desks), it is not surprising that virtually no one will stop to think, on entry to the lecture theatre, 'shall I sit or stand?'. It's a relatively automatic deflection to sitting. On the other hand, if standing desks were provided at the back of the room and near the door (possibly with behavioural prompts displayed), the default option of sitting may now be challenged. While cognitive processing will still be at work, the change to the environment will have 'nudged' the students to a less sedentary option for part of the lecture.

From Reflective to Automatic Motivation

As stated, much of the theoretical work in health psychology, and certainly that concerning physical activity, involves a cognitive (reflective) approach (Brand & Cheval, 2019). But as the BCW states, we need to recognise a 'dual-processing' approach. Automatic processing is associated with notions of 'habit' and affect.

The goal of physical activity behaviour change is to make activity a 'habit'. Habits involve behavioural patterns learned through context-dependent repetition. A mental association is made between the situation and behaviour. Sedentary behaviour (sitting time) is a clear example where the behaviour is strongly driven by habit, as illustrated by our example

of the student entering the lecture theatre. When a particular context is encountered, such as arriving home after work, it is often sufficient to automatically cue the habitual response of, say, sitting on the sofa and turning on the TV. Some physical activity behaviours can become habits through repetition, such as leaving the house for work on foot or by bike, rather than by car.

In novel contexts, behaviour is more likely to be regulated by conscious decisions through intentions (reflective processing), but in familiar contexts behaviour will be much more affected by habit (automatic processing). Given the high frequency of many sedentary behaviours, such as sitting in front of the TV, it is easy to see how habitual such behaviours become. Similarly, car use becomes habitual for many through high frequency usage. By making environments highly conducive to physical activity, such as making them attractive and accessible, should help make the behaviour more habitual and will lessen the need for reflective decision making. Unfortunately, environments often encourage less physical activity, such as car-dependent neighbourhood designs.

Self-monitoring can be used to identify behaviours. This way people can be more aware of situations in which they perform unwanted habitual behaviours. Self-monitoring underpins the successful use of wearable technology, such as a pedometer or smart watch (Brickwood, Watson, O'Brien, & Williams, 2019). On the other hand, we have found that self-monitoring devices can sometimes be seen as difficult or disruptive and require too much effort to process feedback (Biddle et al., 2017). These issues need considering in intervention designs.

Based on behavioural economics, the concept of ‘nudging’ has been proposed (Marteau, Ogilvie, Roland, Suhrcke, & Kelly, 2011). Behavioural economics refers to the “combination of microeconomic concepts, principles, and measures along with concepts, principles, and experimental methods developed by behaviour analysts” (Madden, 2000, p.

6). It is "designed to understand factors that influence choice among alternatives" (Roemmich et al., 2008, p. 1011).

Nudging is when behaviours are encouraged through little or no incentives rather than through highly directive or so-called 'nannying' approaches, such as through government policies and legislation. A review concluded that the public acceptability of government interventions to change behaviour is greatest for the least intrusive type of interventions (Diepeveen, Ling, Suhrcke, Roland, & Marteau, 2013). Nudging is also referred to as the influence of 'choice architecture' and involves altering small-scale social and physical environments to cue desired behaviours (Hollands et al., 2013). This is akin to the restructuring of environments referred to in the behaviour change wheel. In an analysis of various health behaviours, Hollands et al. (2013) found that just under 20% of studies were concerned with physical activity, the majority of which tried to nudge behaviour through changes to the ambience and design of the environment. Providing signs at the foot of stairs to encourage walking rather than standing still on a parallel escalator is a popular example (Bellicha et al., 2015).

Nudging and behavioural economics informs us that affective responses are also important. More automatic forms of motivation can be strongly influenced by simple 'likes' and 'dislikes'. This is where behaviours follow quick and less reflective processes. For example, we may choose to buy a product based on its looks and 'feel' more than its functionality. In the same way we may choose a certain physical activity, such as walking to work, based on little conscious decision making but a simple 'liking' for being outside. Of course, if the route to work is unattractive it will be less likely to occur than if the environment is highly attractive. We need to seek ways of making physical activity attractive and 'affectively pleasing', and more so than focussing on longer term health outcomes (Dishman et al., 1985; Ekkekakis & Dafermos, 2012; Ekkekakis, Vazou, Bixby, &

Georgiadis, 2016). Equally, it may be dangerous to promote physical activity simply for appearance. While self-presentation can be positively associated with participation in physical activity (Brunet & Sabiston, 2019), unhealthy behaviours, such as extreme dieting or excessive exercise, may also result. High social physique anxiety may discourage involvement in exercise in public places.

A model to reflect the dual use of reflective and automatic processing in physical activity has been proposed by Brand and Ekkekakis (2018) – The Affective Reflective Theory (ART). They distinguish between automatic ('type 1'; 'fast') processes and those that are more reflective ('type 2'; 'slow'). Automatic, affectively-based processing will lead to behavioural impulses rather than slower, more deliberate, processing.

> "It suggests that the automatic valuation of exercise and physical inactivity … is the basis from which subsequent, more complex affective and cognitive operations (e.g., weighing beliefs and values, action planning) can arise. In this way, the ART complements and attempts to incorporate findings from the numerous studies on exercise motivation that were inspired by cognitivist theorizing (e.g., theory of planned behavior, social-cognitive theory, self-determination theory) and emphasize the role of rational thinking in behavioral choices" (Brand & Ekkekakis, 2018, p. 56).

The authors of the ART suggest that the framework goes beyond other theories in offering an explanation for why many people remain inactive. The ART proposes that the "core affective valence associated with the current state of physical inactivity is more positive than the affective valence associated with exercise." (p. 56). But rather than rely solely on automatic processing, they combine this with reflective approaches. Our research on children's views to reduce their own screen time showed strong affective reactions to the idea of behaviour change (Sebire, Jago, Gorely, Hoyos Cillero, & Biddle, 2011). For example, one

child said that "I love spending time (on screens) … so it would be horrible (to reduce it)". Such strong affect is likely to be associated with less reflective thinking about their screen time. Some may have adopted screen-based self-identities such that they label themselves as screen gamers more than physically active participants in, say, sports.

Conclusions

My thoughts in this chapter reflect around 40-years of working in the field of physical activity teaching and research. This includes a focus on physical education in schools, youth sport and physical activity participation, adult and older physical activity, and sedentary behaviour across the lifespan. I make a case for understanding the psychology of physical activity by reflecting on different types of activities across a spectrum from sitting to highly vigorous activity. And these behaviours can take place across different contexts. As such, influences on these behaviours will vary greatly, depending on both behaviour and context.

The use of reflective, cognitive, approaches has been clear. But have these served us well? The additional consideration of affective and automatic processes is seen as positive and is progress for our field. With the greatest public health gains accruing from helping the least active becoming active, we need to emphasise behaviours that have good population reach and this may require an approach that focusses less on individualistic psychological approaches and more on a broader range of psychological, social, cultural, and environmental approaches. Although we do need some motivation to change our behaviours, let us emphasise making the behaviours easier to do (by also being more attractive) than requiring high levels of personal motivation or will power.

To return to my somewhat provocative question 'do we need motivation to sit less?', I will stay true to my psychological roots and say "it depends"! But equally, I do believe that changing such a normative and habitual behaviour like prolonged sitting will require us to go much beyond typical social-cognitive theories. We need to pay greater attention to

environmental and social normative change, alongside behaviour change techniques, that will enable an amplification of environmental effects, such as through self-monitoring and goal-setting.

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Table 1. Example links between movement behaviours and contexts.

	Home	**Community**
TV viewing	✓	
Computer use	✓	
Walking		✓
Sports		✓
Exercise	✓	✓

Table 2. Common psychological constructs across the 'big 3' social cognitive theories.

Theory	Intention	Outcome expectancy	Social norm	Self-efficacy	Perceived behavioural control
Social Cognitive Theory		✓	✓	✓	✓
Theory of Planned Behaviour	✓	✓	✓		✓
Transtheoretical Model	✓			✓	

Figure captions

Figure 1. A 24-hour movement continuum [Key: PA: physical activity; MVPA: moderate-to-vigorous intensity physical activity].

Figure 2. Hypothetical distribution of movement behaviours across a day for adults [Key: PA: physical activity; MVPA: moderate-to-vigorous intensity physical activity].

Figure 3. Different levels and approaches to health behaviour theories (see Bartholomew et al., 2001).

Figure 4. The Behaviour Change Wheel's COM-B model and components [Key: C: capability; O: opportunity; M: motivation; B: behaviour]

Figure 5. Promising intervention functions and behaviour change techniques for reducing sitting in adults (Gardner et al., 2016).