

Chapter title

Advances in Motivation in Exercise and Physical Activity

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Abstract and Keywords

Given the considerable epidemiological evidence linking regular physical activity with good health and reduced risk of chronic disease, exercise psychologists have adopted theories and models of motivation to understand the antecedents and processes that give rise to health-related physical activity. These theories are important as they provide the basis for the development and evaluation of interventions aimed at promoting increased physical activity in a largely sedentary population. This chapter reviews three of the leading theories that have been applied in physical activity contexts: the theory of planned behavior, self-determination theory, and achievement goal theory. Advances in research that have aimed to promote better understanding of the factors that underpin motivation in physical activity and the relevant processes are also reviewed including implementation intentions, the increasing importance of psychological needs, and theoretical integration. In addition, the role of methodological improvements such as the measurement of implicit motivational processes and the need for 'gold standard' designs when evaluating physical activity interventions based on these theories are highlighted. It is concluded that future research needs to develop hybrid interventions adopting both motivational and implemental strategies to change physical activity behavior, research should extend knowledge of the relative contribution

of implicit and explicit motivational processes on physical activity behavior, and investigations to evaluate physical activity interventions should pay careful attention to design and evaluation.

Keywords: exercise, planned behavior, intention, autonomous motivation, achievement goals, implicit processes, intervention design

Introduction

There is strong epidemiological evidence linking low levels of physical activity with chronic health conditions such as cardiovascular disease (P. T. Williams, 2001), obesity (Ross, Freeman, & Janssen, 2000), diabetes (Jeon, Lokken, Hu, & van Dam, 2007), and cancer (Byers et al., 2002). International reports have highlighted the importance of regular physical activity an important preventive behavior in managing these health risks (U.S. Department of Health and Human Services, 1996; World Health Organization, 2004). However, it is clear that people in industrialized nations do not engage in sufficient physical activity to minimize risks from these chronic conditions (Bauman et al., 2009; Martinez-Gonzalez et al., 2001). Such reports have catalyzed considerable investigation into the motivational variables that are associated with individual leisure-time physical activity in order to develop population-based interventions to change behavior (Marteau, Dieppe, Foy, Kinmonth, & Schneiderman, 2006).

Many behavioral approaches adopted to understand people's motivation to engage in physical activity have been based on social psychological theories and models. The purpose of these theories is three-fold: (1) to identify the motivational correlates and antecedents of physical activity behavior; (2) to identify the mechanisms and processes by which these correlates affect physical activity (e.g., mediation and moderation effects); and (3) use knowledge of the antecedents and mechanisms to inform and design interventions aimed at changing behavior to promote desirable health outcomes (Baum & Posluszny, 1999; Hagger, 2009; Taylor, 2008). In this chapter I will review three dominant social psychological approaches to understanding

motivation in physical activity and review recent advances in the field that have aimed to enhance understanding and advance knowledge of how to increase motivation and behavior in physical activity. I will first review the research on the motivational theories and the contribution such research has made in identifying the key constructs that influence physical activity behavior and which have been most effective in explaining variance in physical activity behavior. The theories are Ajzen's (1985, 1991) theory of planned behavior, Deci and Ryan's (1985b, 2000) self-determination theory, and Nichols' (1989) achievement goal theory. I will very briefly review the research adopting these approaches and evaluate their importance and level of contribution to the literature on motivation and physical activity. Most importantly, I will identify the advances, theoretically, that researchers in the physical activity domain have made to each these theories such as the use of implementation intention strategies, the adoption of new perspectives on psychological needs (e.g., 'need thwarting'), and the introduction of a 2 x 2 achievement goal framework. I will also outline how theoretical integration may benefit theoretical research in physical activity contexts. Finally, I will review recent methodological advances in the psychology of physical activity such as the use of implicit measures of motivation and the importance of randomized controlled trials, intervention mapping, and intervention fidelity to ensure that the effective components of motivational interventions to change physical activity can be identified and replicated precisely.

(h1) Three key motivational theories in physical activity

The psychology of physical activity is a theory-rich discipline with many motivational theories and models proposed to provide comprehensive and definitive explanations of health behavior (Hagger, 2010a, in press). It is, however, important to note that many of these theories have similar components and hypotheses, such that there is considerable overlap in the definitions of constructs and the proposed mechanisms by which these constructs affect physical activity

behavior (Hagger, 2009). For example, self-efficacy, a very important construct in the field of social psychology and derived from Bandura's (1977, 1995) influential social cognitive theory, is a key component in numerous theories of motivated social behavior such as protection motivation theory (Rogers, 1975) and the theory of planned behavior (Ajzen, 1985) and both have been applied to physical activity (Hagger, Chatzisarantis, & Biddle, 2002b; Rhodes, Plotnikoff, & Courneya, 2008). Similarly, the construct of intention, which is a motivational construct reflecting the degree of effort and planning an individual is prepared to invest in pursuing a behavior, is also a key component of numerous theories such as the theory of planned behavior, protection motivation theory, the theories of self-regulation and trying (Bagozzi & Kimmel, 1995), and the theory of goal-directed behavior (Perugini & Conner, 2000). Again these theories have been adopted to explain behavior in a physical activity context (Bagozzi & Kimmel, 1995; Perugini & Conner, 2000). Similarly, these theories have different assumptions and perspectives. For example, attitudinal theories like the theory of planned behavior are belief based, and focus on behavioral predictions based on estimates of the future outcomes of a given behavior and individuals' evaluation of those outcomes. In contrast, theories such as self-determination theory (Deci & Ryan, 1985b, 2000) adopt an organismic approach, steeped in the humanist tradition, focusing on the contextual influences on motivated behavior and motivational orientations derived from the satisfaction of innate psychological needs. In this chapter I will focus on three dominant motivational theories applied in physical activity contexts: the theory of planned behavior, self-determination theory, and achievement goal theory. I will outline how the adoption of these theories has contributed to the understanding of physical activity behavior. I will also review how these theories might help move the field forward in terms of developing a more comprehensive theory of the antecedents and mechanisms of physical activity behavior and informing

interventions and practical solutions to increase motivation to participate in physical activity and promote engagement in physical activity behavior.

(h2) The theory of planned behavior

The theory of planned behavior (Ajzen, 1985, 1991; Fishbein & Ajzen, 2009) is a widely-adopted social cognitive theory aimed at explaining intentional behavior. It has been applied to many health-related behaviors, including physical activity (Hagger et al., 2002b; Symons Downs & Hausenblas, 2005). In the theory, intention is considered a motivational construct and represents the degree of planning and effort people are willing to invest in performing any future planned action or behavior. Intention is conceptualized within the theory as the most proximal influence on behavior and is a function of a set of personal, normative, and control-related belief-based social-cognitive constructs regarding the performance of the future behavior, termed *attitudes*, *subjective norms*, and *perceived behavioral control*, respectively.

Attitudes refer to an individual's overall evaluation of the behavior and are usually tapped using *direct* measures and psychometric scales (Ajzen, 2003). However, the sets of personal beliefs that that the target behavior will result in outcomes (behavioral beliefs) and whether such outcomes are salient (outcome expectations) are hypothesized to underpin the direct attitude measure (Ajzen, 2003). These can also be measured individually for each belief and outcome and are considered *indirect* measures of attitude. Similarly, subjective norms are typically measured directly as a person's overall evaluation that significant others would want them to engage in the target behavior. As with attitudes, subjective norms are sourced indirectly from sets of beliefs that reflect expectations that significant others will exert pressure or cajole the individual to engage in the behavior (normative beliefs) and the individual's propensity to comply with those significant others (motivation to comply). The construct of perceived behavioral control encompasses control-related perceptions with respect to the target behavior including actual barriers and personal

evaluations of limitation or capacity with respect to the behavior. This led Ajzen to indicate that perceived behavioral control contained elements of Bandura's (1977) self efficacy construct in that it captures judgments of how well one can execute required actions to produce important outcomes. The construct is also underpinned by a set of beliefs (Ajzen, 1985). *Control beliefs* refer to the perceived presence of factors that may facilitate or impede performance of behavior and *perceived power* refers to perceived impact facilitative or inhibiting factors may have on performance of behavior (Ajzen & Driver, 1991). An indirect measure of perceived behavioral control is formed from the composite of the control beliefs multiplied by its perceived power (Ajzen & Driver, 1991).

In terms of process and the operationalization of the model, intentions are hypothesized to lead directly to behavior and mediate the effects of attitudes, subjective norms, and perceived behavioral control on behavior. This means that intentions *explain* the effects of attitudes, subjective norms, and perceived behavioral control on behavior. Intentions are therefore necessary to convert these constructs into behavior. Ajzen (1985) also predicted direct and indirect effects for the perceived behavioral control construct on behavior. The effects of perceived behavioral control that are mediated by intention reflect the level of perceived volitional control an individual has over the performance of the behavior in future, similar to self-efficacy. However, if perceived behavioral control closely reflected the degree to which participation in the behavior was impaired by real environmental barriers or impedances, the construct would serve as a 'proxy' measure of actual control and directly affect behavior unmediated by intention.

The most-frequently cited or 'modal' beliefs that underpin the attitude, subjective norms, and perceived behavioral control constructs in physical activity contexts have been identified. The beliefs are typically elicited from pilot research using open-ended measures that are content-analyzed to provide sufficient information to develop the salient outcomes for the behavioral belief

and outcome evaluation measures, the salient referents for the normative belief and motivation to comply measures, and the salient barriers and control-related issues for the control beliefs and perceived power measures (Ajzen & Fishbein, 1980). Research in physical activity has typically identified the following most frequently-cited (modal) outcomes: “good companionship”, “weight control”, “benefit my overall health”, “take too much time”, “fun”, “get fit”, “stay in shape”, “improve skills”, “get an injury”, and “makes you hot and sweaty” (Hagger, Chatzisarantis, & Biddle, 2001). Similarly, important referents identified include friends, colleagues and family members like parents, grandparents, and siblings (Hagger et al., 2001). The modal control beliefs identified include barriers and facilitators that underpin the direct measure of perceived behavioral control: “bad weather”, “age”, “heart pain”, “costs”, “fatigue”, and “no time” (Godin, Valois, Jobin, & Ross, 1991). As with behavioral and normative beliefs, research shows that control beliefs demonstrate considerable variance across different populations and behaviors. For example, studies in the physical activity domain have identified “age” and “fear of having a heart attack” among the control beliefs for older and clinical populations (Godin et al., 1991), but these beliefs do not feature among the control beliefs of younger populations who focus more on inclement weather and lack of time (Hagger et al., 2001). Interestingly, the comparatively limited research examining relations between the indirect belief-based measures and the direct measures suggests that multiplicative composites of the belief and value systems do not account for a high degree of variance in the direct measures of attitudes, subjective norms, and perceived behavioral control (Hagger et al., 2001). Few definitive solutions have been put forward for this problem, and the role of beliefs and expectancy-value models within the theory of planned behavior is an area of surprisingly sparse attention in the literature (Ajzen & Fishbein, 2008; Bagozzi, 1984; French & Hankins, 2003).

Formative research adopting the theory of planned behavior in physical activity contexts has demonstrated that attitudes and perceived behavioral control consistently and significantly predict intentions and explain approximately equal proportions of the variance in physical activity behavior with a substantially lesser role for subjective norms (Hagger & Chatzisarantis, 2005; Hagger et al., 2002b). In addition to individual empirical studies, a meta-analysis of 72 studies applying the theory of planned behavior in physical activity contexts supported the trends in the physical activity data across the literature (Hagger et al., 2002b). Using a meta-analytic path analysis, intention was found to be the sole proximal predictor of physical activity and that the effects of attitudes and perceived behavioral control on intentions were medium in magnitude and stronger than the effects of subjective norms. In addition, studies that separated measures of self-efficacy (reflecting personal capacity and confidence estimates) and perceived controllability (reflecting perceived barriers) indicated that self-efficacy explained additional variance in the prediction of both intentions and behavior. Past behavior also predicted all of the theory constructs and attenuated their effects on intention and behavior. Nevertheless, the influences of the social cognitive constructs on intentions and behavior remained significant even after controlling for previous experience. This indicated that previous decision-making processes were accounted for by the variables in the model, but the most recent decision-making variables remained salient as explanations of variance in physical activity intentions and behavior. It was concluded that “...while past behavior had a significant and direct influence on intention, attitude, perceived behavioral control, and self-efficacy, these cognitions are also necessary for translating past decisions about behavioral involvement into action. This is consistent with the notion that involvement in volitional behaviors such as regular physical activity involves both conscious and automatic influences” (p. 23).

This evidence indicates the general recognition of theory of planned behavior as an important theoretical approach to the understanding of the motivational influences on physical activity behavior. The considerable attention paid to the theory in the literature is attributable to its effectiveness in accounting for variance in physical activity intention and behavior as well as its relative parsimony and role as a flexible framework for the study of psychosocial influences and processes that underpin physical activity behavior. For example, its role as a ‘flexible framework’ has been supported by research that has shown the attitude, subjective norm, and perceived behavioral control constructs mediate the effect of other distal constructs on intentions and behavior such as personality (Bozionelos & Bennett, 1999; Chatzisarantis & Hagger, 2008; Conner & Abraham, 2001; Conner, Rodgers, & Murray, 2007; Hoyt, Rhodes, Hausenblas, & Giacobbi, 2009; Rhodes & Courneya, 2003; Rhodes, Courneya, & Jones, 2002, 2003) and other individual difference variables (Chatzisarantis & Hagger, 2007; Fitch & Ravlin, 2005; Hagger, Anderson, Kyriakaki, & Darkings, 2007). However, researchers have also indicated that the theory does not account for all of the variance in intention and behavior, nor does it mediate the effects of certain ‘external variables’ on intentions and behavior (e.g., Bagozzi & Kimmel, 1995; Conner & Abraham, 2001; Conner & Armitage, 1998; Rhodes & Courneya, 2003; Rhodes et al., 2002). Paradoxically, this ‘weakness’ has become the theory’s greatest strength. Ajzen (1991) states that the theory should be viewed as a *flexible framework* into which other variables can be incorporated provided they make a meaningful and unique contribution to the prediction of intentions and there is a theoretical precedence for the inclusion of such variables.

As a consequence, the theory has been adopted by researchers in physical activity as a general framework to investigate the effect of a number of additional social cognitive constructs on intention and behavior (Conner & Armitage, 1998). To the extent that such constructs have a unique effect on intention or behavior and are not mediated by the core theory variables of

attitude, subjective norm, and perceived behavioral control, the researcher has evidence to support the inclusion of that construct within the theory. A number of constructs have been found to have a unique effect on intentions and/or behavior including anticipated affect and attitude ambivalence (Armitage & Conner, 2000), anticipated regret (Sheeran & Orbell, 1999a), cultural norms and ethnicity (Blanchard et al., 2008; Blanchard et al., 2009; Blanchard et al., 2003; Van Hooft & De Jong, 2009; Walker, Courneya, & Deng, 2006), descriptive norms (Sheeran & Orbell, 1999a), group norms and membership (Terry, Hogg, & White, 2000; White, Hogg, & Terry, 2002), health locus of control (Armitage, 2003; Hagger & Armitage, 2004), moral norms (Godin, Conner, & Sheeran, 2005; Lam, 1999), past behavior (Aarts, Verplanken, & van Knippenberg, 1998; Albarracín & Wyer, 2000; Conner, Warren, Close, & Sparks, 1999; Hagger et al., 2001), prototypes (Norman, Armitage, & Quigley, 2007), self-identity (Hagger & Chatzisarantis, 2006), and self-schemas (Sheeran & Orbell, 2000a).

In addition to the effects of other constructs, the influence of variations in the characteristics and nature of the core theory of planned behavior constructs on intentions, and of intention itself, on behavior have been investigated (Sheeran, 2002). Examples include the stability of intentions (Sheeran, Orbell, & Trafimow, 1999), the accessibility of attitudes (Doll & Ajzen, 1992; Verplanken, Hofstee, & Janssen, 1998), and hypothetical bias (Ajzen, Brown, & Carvahal, 2004). In addition, researchers have sought to differentiate between the independent and fundamental concepts within each of the psychosocial components that predict intentions. For example, attitudes have been differentiated into cognitive or instrumental attitudes and affective attitudes (Lowe, Eves, & Carroll, 2002; Trafimow & Sheeran, 1998), subjective norms have been differentiated into injunctive norms and descriptive norms (Rivis & Sheeran, 2003), and, as mentioned previously, perceived behavioral control has been differentiated into self-efficacy and perceived controllability (Armitage & Conner, 1999a, 1999b; Hagger et al., 2001; Povey, Conner,

Sparks, James, & Shepherd, 2000; Sniehotta, Scholz, & Schwarzer, 2005; Terry & O'Leary, 1995). Even intentions have been distinguished from desires, the latter being 'emotional' forms of intention (Perugini & Bagozzi, 2001, 2004). In the same vein, researchers have also investigated the extent to which individuals are orientated towards or base their intentions on each of the core theory constructs (Sheeran, Trafimow, Finlay, & Norman, 2002; Trafimow & Finlay, 1996). These modifications suggest that the antecedents of volitional behaviors, like physical activity, may be more complex than originally conceived by the theory (Conner & Armitage, 1998). However, it is important to note that many of these modifications make relatively modest increases in the predictions within the model and the separation of the theory components into more specific, differentiated constructs does not appear to affect the prediction of intentions and behavior at the global level (Hagger & Chatzisarantis, 2005). Notwithstanding these modifications, the theory still performs relatively well in terms of explaining physical activity behavior and in its most parsimonious form can inform successful interventions to promote physical activity (e.g., Chatzisarantis & Hagger, 2005; Darker, French, Eves, & Sniehotta, 2010).

Although the theory of planned behavior has demonstrated considerable success in terms of predicting physical activity in numerous contexts and groups, the theory and the research that has adopted it does have considerable documented limitations. First, the relationship between intentions and behavior is far from perfect. In fact, it frequently falls considerably short of a large effect size and meta-analytic studies have typically indicated that the relationship between intentions and behavior is relatively modest (Hagger et al., 2002b), perhaps medium in size, according to Cohen's (1987) taxonomy of effect sizes. Numerous reasons have been cited for this problem such as a lack of correspondence between the measures of intention and behavior, the relative instability of intentions, and the moderating effect of numerous individual difference factors such as self-schema. These have been frequently investigated and research has shown that

the intention-behavior ‘gap’ is strengthened under conditions of high intention stability and among self-schematics (Sheeran & Orbell, 2000a). However, the relationship remains relatively modest in effect size, which means that people frequently do not convert their ‘good’ intentions to engage in physical activity into actual behavior. Researchers have therefore sought to develop strategies which might assist in moderating the intention-behavior relationship, particularly strategies that enable individuals convert their ‘good’ intentions to engage in physical activity behavior into actual action. These strategies and advances will be reviewed in the ‘theoretical advances’ section of this chapter.

(h2) Self-determination theory

Self-determination theory (Deci & Ryan, 1985b, 2000) is a prominent motivational theory adopted to identify the contextual and interpersonal influences on human behavior and has received much attention in the physical activity literature (Hagger & Chatzisarantis, 2007a, 2008, 2007d; Ryan & Deci, 2007). Self-determination theory is actually a meta-theory comprising a number of sub-theories that seek to explain human motivation and behavior on the basis of individual differences in motivational orientations, contextual influences on motivation, and interpersonal perceptions. Central to self-determination theory is the distinction between self-determined or *autonomous* forms of motivation relative to non-self-determined or *controlling* forms of motivation. The extent to which people experience motivation to engage in activities and behaviors as autonomous or controlling will determine their persistence with the behavior in future and whether they gain certain adaptive outcomes such as satisfaction, enjoyment, and psychological well-being. Organismic integration theory (OIT), a sub-theory of self-determination, theory seeks to provide an explanation for the processes by which people assimilate behaviors that are externally regulated and incorporate them into their repertoire of behaviors that are self-determined and integrated into their personal system. Central to OIT is the perceived locus of

causality, which represents a graduated continuum of motivational styles or *regulations*. The continuum, known as the perceived locus of causality, is characterized by two relatively autonomous forms of motivation: *intrinsic motivation* and *identified regulation*, and two relatively controlling forms of motivation: *external regulation* and *introjected regulation* (Ryan & Connell, 1989). Important for researchers and practitioners in the field of physical activity, individuals who act for autonomous reasons are more likely to persist in the absence of discernable external rewards or contingencies. Therefore if interventions can promote autonomous motives for engaging in physical activity among individuals it is likely to lead to persistence over time and cede the health benefits of physical activity to those individuals. The major theoretical tenets of self-determination theory have been outlined in detail elsewhere in this volume (see Chapter x), so the present review will focus on the specific application of self-determination in the domain of health-related physical activity.

Research adopting the perceived locus of causality from OIT has shown that autonomous forms of regulation are positively related to adaptive behavioral and psychological outcomes in domain of physical activity. Autonomous motivation is associated with physical activity participation and adherence over time (Barbeau, Sweet, & Fortier, 2009; Chatzisarantis, Biddle, & Meek, 1997; Chatzisarantis, Hagger, Biddle, & Karageorghis, 2002; Chatzisarantis, Hagger, Biddle, Smith, & Wang, 2003; Fortier & Kowal, 2007; Pelletier, Dion, Slovinec-D'Angelo, & Reid, 2004; Vansteenkiste, Simons, Soenens, & Lens, 2004), perceived competence (Goudas, Biddle, & Fox, 1994), physical activity intentions (Hagger & Chatzisarantis, 2007b; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; Phillips, Abraham, & Bond, 2003; Standage, Duda, & Ntoumanis, 2005; Wilson & Rodgers, 2004), Csikzentmihalyi's (1990) flow state (Fortier & Kowal, 2007), and psychological well being (Wilson & Rodgers, 2007). Furthermore, environmental antecedents such as autonomy support (Edmunds, Ntoumanis, & Duda, 2007) and

people's perceptions that the motivational context is supportive of their autonomous motivation (Hagger, Chatzisarantis, Barkoukis, Wang, & Baranowski, 2005; Hagger et al., 2003; Hein & Koka, 2007; Koka & Hein, 2003; Standage et al., 2005) have also been linked with autonomous motivational regulations from OIT. Findings from previous research have been supported by a recent meta-analysis of the effects of perceived locus of causality on behavior and outcomes in physical activity settings (Chatzisarantis et al., 2003). The analysis supported the proposed effects of the motivational regulations on physical activity behavior and outcomes such as perceived competence and physical activity intentions across a set of 21 studies (Chatzisarantis et al., 2003). Interestingly, autonomous forms of motivation mediated the effect of perceived competence on physical activity intentions, suggesting that competence perceptions affect behavior because competence perceptions tend to be self-determined in nature.

Another fundamental sub-theory of self-determination theory is Basic Needs Theory. Deci and Ryan (2000) suggest that the origins of self-determined motivation stem from individuals innate propensity to satisfy three basic psychological needs: *autonomy*, *competence*, and *relatedness*. These needs are perceived to be *fundamental* to all humans and people approach behaviors in an intrinsically-motivated fashion because they perceive it as being efficacious in satisfying psychological needs. The existence of these needs have been justified empirically and research has illustrated that these needs are pervasive across different cultures (Sheldon, Elliot, Kim, & Kasser, 2001). Basic needs theory is linked with OIT because it charts the origins of autonomous or self-determined motivational regulations. The perceived locus of causality is proposed to reflect the degree to which behaviors have become internalized or 'taken in'. Behaviors that have the propensity to fulfil personally-relevant goals that are valued by individuals (e.g., participating in physical activity to gain more energy for other activities in life or to increase fitness) are perceived as efficacious in satisfying psychological needs. Increased participation in

such behaviors will likely lead to the behavior being internalized and finally integrated into the person's repertoire of behaviors that satisfy these needs. As a result, people may not perform physical activity for the activity itself as in the 'classic' definition of intrinsic motivation. Rather, they perform it to achieve an intrinsic 'outcome' which is highly valued and perceived part of the person's 'true self'.

It is also important to note that the three basic needs are complimentary – that is, optimal functioning and truly integrated behavior can only result if all three psychological needs are supported. For example, competence alone, i.e. mastering a technique or skilled action alone is not sufficient for a behavior to be perceived to be need satisfying. Competence along with a perception that the behavior is performed out of a true sense of self, without external contingency, perceived or real, and out of choice and volition (i.e., autonomously motivated) and that behavioral engagement is supported by others in an autonomous fashion (i.e., relatedness) is necessary for an action to be fully integrated and to support psychological needs. Research in the physical activity domain has suggested that the basic needs tend to be strongly correlated and can be subsumed by a single global factor (Hagger, Chatzisarantis, & Harris, 2006; Ntoumanis, 2005; Standage et al., 2005) and interventions that provide synergistic support for the needs of autonomy, competence, and relatedness tend to result in greater behavioral engagement than support for each individual need alone (Deci, Eghrari, Patrick, & Leone, 1994). Overall, the satisfaction of basic psychological needs has been shown to be related to autonomous forms of motivation in physical activity contexts from the perceived locus of causality consistent with self-determination theory (Edmunds et al., 2007; Hagger et al., 2006; Standage, Gillison, & Treasure, 2007) and interventions supporting autonomous motivation was found to increase psychological need satisfaction as well as motivational regulations (Edmunds et al., 2007). While research examining the role of psychological need satisfaction as the origin of autonomous motivation in physical

activity, this research is relatively new and there is considerable scope for further investigation to answer questions relating to the role of needs in determining physical activity behavior. For example, what happens to physical activity when needs are not fulfilled or thwarted? Such questions will be addressed in the ‘theoretical advances’ section of this chapter.

(h2) Achievement goal theory and the 2 x 2 framework

Achievement goal theory was developed to examine the effects of perceptions of success and failure on motivation in education contexts (Nicholls, 1989). Central to the theory is the manner in which people tend to view or interpret success or failure when engaged in competence-relevant behaviors. The original conceptualization of the theory identified two pervading dispositional and enduring motivational orientations: mastery-oriented and performance-oriented. Individuals with a mastery-oriented or *self-referenced* goal orientation tend to view success and failure in terms of personal improvement, effort, self-referenced goals, and learning. Analogously, people with a performance-oriented or *other-referenced* goal perspective tend to view their success and failure in terms of their performance compared to others, fulfilling normative standards, other-referenced goals, competition, and normative comparison. This classic dichotomous conceptualization of achievement motivation has formed the basis of numerous theoretical traditions that have viewed achievement goals as generalized orientations that affect individuals’ interpretation of competence across a wide variety of contexts (Ames, 1992; Dweck, 1986; Nicholls, 1984) including physical activity (e.g., Cury et al., 1996; Treasure & Roberts, 2001; Vlachopoulos & Biddle, 1997).

A relatively recent framework proposed by Elliot and others (Elliot, 1999; Pintrich, 2000) views achievement goals as more dynamic, flexible, and changeable interpersonal constructs that not only vary in terms of the definition of competence in achievement settings but also in their valence as either approach or avoidant. The integration of an approach-

avoidance valence concurrent with the mastery-performance dichotomy has led to the development of a 2 x 2 conceptualization of achievement goals (Elliot & Church, 1997; Elliot & Conroy, 2005; Elliot & McGregor, 2001). The theory proposes that not only can people define their competence with respect to future actions as self-referenced, either according to a personal or absolute standard, or other referenced, but also in terms of whether it will lead to adaptive, desirable outcomes or maladaptive, undesirable outcomes. Such evaluations are automatically paired with an approach or avoidance response such that courses of action that are expected to lead to desirable outcomes are approach valenced and actions leading to undesired outcomes are avoidance valenced (Bargh, 1997; Elliot & McGregor, 2001). As a consequence, people will tend to perceive their competence with respect to future actions in terms both the definition and valence dimensions.

The 2 x 2 framework integrates the definition and competence dimensions to produce four distinct achievement goal constructs: Mastery-approach goals in which competence is defined in terms of mastering skills, improving technique, and enhancing self-referenced outcomes and is positively valenced, performance-approach goals in which competence is defined in normative terms and relative to the performance of others and is positively valenced, mastery-avoidance in which competence is defined as personally-referenced and is negatively valenced, and performance-avoidance goals in which competence is defined normatively and is negatively valenced. These goal orientations should be viewed as “situation-specific regulators of achievement behavior that are energized and impelled by underlying motive dispositions” (Elliot & Church, 1997, p. 228). Therefore, global goal orientations and motivational dispositions may influence or give rise to these goals and the goals are also affected by environmental and situational factors that define the behavioral response.

Research with the 2 x 2 model has illustrated that mastery-approach goals are most strongly related to adaptive outcomes such as need for achievement (Elliot & Murayama, 2008), self-concept (Hein & Hagger, 2007), perceived competence (Cury, Elliot, Da Fonseca, & Moller, 2006), self-determined forms of motivation (Barkoukis, Ntoumanis, & Nikitaras, 2007; Hein & Hagger, 2007; C. K. J. Wang, S. J. H. Biddle, & A. J. Elliot, 2007), enjoyment (Pekrun, Elliot, & Maier, 2006; C. K. J. Wang et al., 2007), and behavioral persistence (Elliot, Cury, Fryer, & Huguet, 2006; Elliot & Murayama, 2008). Research has also investigated relations between achievement goals using the 2 x 2 framework in physical activity contexts, but investigations have largely focused on competitive sport behavior (e.g., Adie, Duda, & Ntoumanis, 2008; Barkoukis et al., 2007; Conroy, Elliot, & Hofer, 2003; Conroy, Kaye, & Coatsworth, 2006). Elliot and Conroy (2005) point out that relations between the 2 x 2 achievement goal constructs and health-related physical activity has not been fully investigated: “Although the value of the expanded 2 x 2 conceptual framework [of achievement goals] in sport and physical activity domains is a relatively open empirical question, we are optimistic of its potential for enhancing our understanding of achievement motivation in these contexts and eagerly await further investigation” (p. 21).

Recent research has provided evidence to support to Elliot and Conroy’s suggestion that the 2 x 2 model may offer a useful framework for the understanding of motivation in health-related physical activity contexts. Variables such as intrinsic motivation (Barkoukis et al., 2007), perceived competence (C.K.J. Wang, S.J.H. Biddle, & A. J. Elliot, 2007), and self-efficacy (Cumming & Hall, 2004) have been shown to be related to approach goals while fear of failure and extrinsic motivation have been shown to be related to avoidance goals (Barkoukis et al., 2007; Conroy & Elliot, 2004). This provides an indication of the utility and content of achievement goals in this context. For example, people may perceive engaging in physical

activity as an opportunity to achieve personally-relevant or self-determined outcomes such as mastering an exercise technique or losing the most weight in an aerobics class. They are therefore more likely to develop approach-valenced mastery or performance goals toward their behavioral regulation. However, they may also be motivated to avoid physical activity contexts if they perceive that they are unlikely to demonstrate competence and have a high likelihood of failure. For example, people may perceive that doing physical activities may reveal their lack of skills or that they are not as competent as others when it comes to lifting weights or running at speed on a treadmill. Such undesirable outcomes are likely to result in the development of avoidance-valenced mastery or performance goals. Just as high perceived competence and fear of failure may lead to the development of approach and avoidance goals, respectively, other variables related to competence may also be linked to achievement goals (Hein & Hagger, 2007).

While research in the field of achievement goals has been somewhat rejuvenated with the introduction of the 2 x 2 conceptual framework, questions still remain, particularly for the field of health-related physical activity. At the forefront of this future research should be the development of specific inventories for the physical activity context. Conroy et al.'s (2003) achievement goal questionnaire for sport (AGQ-S) has been shown to be a useful and valid instrument in measuring constructs from the 2 x 2 framework in sport contexts, but is not likely to be applicable to non-competitive, health-related physical activity contexts. In addition, future research in the physical activity domain should be directed towards establishing the links between the achievement goals from the 2 x 2 framework and the degree of internalization of physical activity behavior using the perceived locus of causality. It may be that the graded conceptualization of motivational regulations in the exercise domain may discriminate the different goal perspectives. There is also the need to examine achievement goals in relations to

constructs from other theories. For example, there are recognized congruences between achievement goal and self-determination, and these have been well-documented, generally (Ryan & Deci, 1989) and in the domain of physical activity (Standage, Duda, & Ntoumanis, 2003a). However, there is increased need to look at the overlap and distinctions in the context of the 2 x 2 framework. This will be investigated in more detail in the ‘integration of theories’ section of this chapter.

(h1) Theoretical advances

While the three motivational theories have informed exercise psychologists’ understanding of the factors that influence physical activity behavior and also provided a useful basis for interventions aimed at changing physical activity behavior and health-related outcomes, questions remain with respect to some of the limitations of the theories and the lack of information or research in particular areas in the physical activity context. I outlined some of these limitations and needs for research in the previous sections. For example, the theory of planned behavior is limited in that the link between intentions and behavior was relatively modest; there is relatively limited information on self-determination theory in the role that psychological need satisfaction plays on physical activity behavior; and there is little research on the conceptual and empirical links between theories like achievement goal theory, the theory of planned behavior, and self-determination theory in the physical activity domain. In the next two sections, I will outline recent developments in the field of motivation in physical activity that attempt to address these outstanding questions with a view to advancing knowledge and understanding of physical activity behavior.

(h2) Implementation intention approaches

One of the problems with motivational interventions based on theories like the theory of planned behavior is that their effects on actual behavior have been relatively modest (Hardeman et

al., 2002). The limited success of such interventions has been attributed to the comparatively weak relationship between intentions and behavior observed in formative research on the theory. For example, meta-analyses have demonstrated that the average effect size of the intention-behavior relationship for many health behaviors including physical activity, although significant, is comparatively weak and is further compromised by the inclusion of past behavior (Armitage & Conner, 2001; Hagger et al., 2002b). Furthermore, meta-analyses of interventions and experimental manipulations based on the theory of planned behavior aimed at changing intentions have corroborated these findings, demonstrating substantially larger effects of interventions on intentions than behavior (Webb & Sheeran, 2006). These data present a problem for interventions based on this theory as it seems that even though people may report that they have 'good intentions' to engage in physical activity, people do not always behave in accordance with their intentions.

Solutions to this problem have been presented in the form of implemental approaches to behavioral engagement. Heckhausen and Gollwitzer (1987) presented an action-phase model which identifies two complimentary processes that lead to action: an intentional (motivational) phase and an implemental (volitional) phase. The intentional phase encompasses the processes that lead to the formation of intentions to engage in a behavior captured aptly in the theory of planned behavior by the antecedents of intention. However, while intentions to engage in health-related behaviors may be a prerequisite for behavioral engagement, they are not always sufficient. The implemental phase outlines the process of how the identification of critical cues in the environment leads to the enactment of intentions and promotes strong links between the cue and the planned action. Proponents of the action-phase model have proposed that engaging in strategies that highlight a critical situation or contingency in which the behavior will be initiated will be effective in promoting behavioral engagement. Such strategies, known as *implementation*

intentions, require people to propose and write down when and where they will enact their planned behavior (e.g., “*if situation Y occurs, then I will perform response Z!*”). Such exercises promote behavioral engagement by promoting increased accessibility of the critical cue in the environment (Aarts, Dijksterhuis, & Midden, 1999) and developing a link in memory between the critical situation (*Y*) and the planned action (*Z*) (Brandstätter, Lengfelder, & Gollwitzer, 2001). When intentions are furnished with implementation intentions, behavioral initiation is therefore more efficient, guided by automatic processes, and less vulnerable to lapses in memory or reliant on conscious processing.

Augmenting intentions with implementation intentions has shown to be effective in promoting behavioral engagement in numerous health-related contexts including cancer screening (Orbell, Hodgkins, & Sheeran, 1997; Prestwich et al., 2005; Sheeran & Orbell, 2000b), dietary behaviors (Chapman, Armitage, & Norman, 2009; Prestwich, Ayres, & Lawton, 2008; Prestwich, Perugini, & Hurling, 2009; Scholz, Schuz, Ziegelmann, Lippke, & Schwarzer, 2008; van Osch et al., 2009; Verplanken & Faes, 1999), alcohol consumption (Murgraff, Abraham, & McDermott, 2007), and physical activity (Arbour & Martin Ginis, 2009; Chatzisarantis, Hagger, & Thøgersen-Ntoumani, 2008; De Vet, Oenema, Sheeran, & Brug, 2009; Luszczynska, 2006; Milne, Orbell, & Sheeran, 2002; Prestwich, Lawton, & Conner, 2003; Sniehotta, Scholz, Schwarzer et al., 2005). A meta-analysis has also demonstrated that implementation exercises have a strong effect on behavioral enactment (Gollwitzer & Sheeran, 2006). In addition, investigations have demonstrated that changes in behavior as a result of forming implementation intentions are not due to changes in intentions or other constructs from the theory of planned behavior (Orbell et al., 1997; Sheeran & Orbell, 1999b). Instead, there is evidence that the effect of implementation intention manipulations is mediated by the extent to which participants engage in the implementation intention exercises and form plans to enact their intentions (Scholz et al., 2008). Such mediators are important as they

demonstrate the mechanisms for the effects and also highlight the dependence of the effect on compliance with the implementation intention manipulations (Michie, 2008).

In the context of physical activity behavior, implementation intentions have been shown to be effective in producing increased physical activity participation and, therefore, reducing the intention-behavior 'gap'. The body of research adopting these kinds of intervention is increasing has been applied to numerous types of physical activity such as walking (Arbour & Martin Ginis, 2009) and regular moderate-to-vigorous physical activity (Luszczynska & Haynes, 2009; Prestwich et al., 2008; Prestwich et al., 2009; Stadler, Oettingen, & Gollwitzer, 2009) and in different populations such as those with chronic diseases like obesity (De Vet et al., 2009) and cardiovascular disease (Luszczynska, 2006; Sniehotta, Scholz, Schwarzer et al., 2005). Suffice to say that the trends in this research generally support the significant and positive effects for implementation intention interventions on physical activity behavior found in studies adopting this intervention approach in other behavioral contexts. A relatively recent advance in this field is the adoption of hybrid intervention approaches which target both intention promotion using traditional intervention approaches targeting the antecedents of intention from the theory of planned behavior and implementation using implementation intention strategies. This research has demonstrated that motivational interventions combined with implementation intentions have a synergistic effect on physical activity behavior (Milne et al., 2002; Prestwich et al., 2003). Such interventions have demonstrated considerable promise and indicate the importance of both motivation and implementation when it comes to intervening to enhance physical activity behavior. Hybrid interventions should therefore be advocated in the development of physical activity interventions based on motivational theories in future.

(h2) Psychological needs and need thwarting

Self-determination theory is a relatively unique approach in the melee of psychological theories applied to physical activity as it is an organismic approach that is based on three innate psychological needs: autonomy, competence, and relatedness (Deci & Ryan, 2000). According to the theory, it is the environmental support for these needs as well as the extent to which an individual perceives these needs to be satisfied that gives rise to autonomously-motivated behavior. The latter 'state' of motivation is clearly desirable for exercise psychologists, practitioners, and interventionists when it comes to behaviors like physical activity because it means that individuals are more likely to engage and persist with the behavior (i.e. be more effective at self-regulating their physical activity) in the absence of any external contingency (e.g., the presence of a social agent to 'prod' and 'coerce') or tangible reward (e.g., money). In the theory, it is assumed that all individuals require these needs to be satisfied to function effectively in their environment, and research has suggested that people recognize the value of these needs and that they are universal (Sheldon et al., 2001). As a consequence, there has been considerable recent interest in the role of psychological need satisfaction, motivational orientations toward physical activity, and actual physical activity engagement and behavior.

For example, several studies have shown global psychological need satisfaction to be associated with actual physical activity behavior (Edmunds et al., 2007; Hagger et al., 2003; Hagger et al., 2006; Wilson, Rodgers, Blanchard, & Gessell, 2003). However, this association was, unsurprisingly, mediated by contextual-level motivational orientations, indicating a process model. Psychological need satisfaction therefore act as a distal factor influencing physical activity behavior by promoting autonomous forms of motivation toward that specific behavior. Support for this process model has been relatively consistent in the literature for both physical activity and other health-related behaviors. In fact, a recent meta-analysis has demonstrated a significant indirect effect of satisfaction of the three psychological needs on health-related behavior, many of

which were conducted in a physical activity context (McLachlan & Hagger, 2010). This demonstrates the relatively consistent effects of psychological needs and the process model proposed by Deci and Ryan (1985b, 2000) in their exposition of the theory.

So what does the future hold for research into psychological needs? I propose two new steps. First, there has been comparatively little attention paid to occasions where psychological needs remain unsatisfied or are thwarted (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009). It could be argued that is equally important to examine the effects of occasions when individuals in physical activity contexts fail to have their psychological needs satisfied and whether that impacts on their physical activity participation. If a person perceives the physical activity domain not to be a context in which their needs are likely to be satisfied this is probably have two effects on their behavior in that domain. First, it would likely lead to an avoidance response and desistance from physical activity participation and, second, the individual may likely seek the satisfaction of those needs elsewhere, in other behavioral domains. These effects are most likely to occur when the context fails to support needs. Recent evidence for this comes from some research conducted on adolescent girls' unhealthy weight-control behaviors (such as skipping meals, taking laxatives and vomiting). The research demonstrated that low psychological need satisfaction was associated with high levels of these behaviors and this was mediated by body image concerns (Thøgersen-Ntoumani, Ntoumanis, & Nikitaras, 2010). However, perceptions that significant social agents such a parents supported autonomy was positively related to psychological need satisfaction. This indicates that interventions that target autonomy-supportive behaviors of social agents may be a useful means to promote psychological need satisfaction and, as a consequence, autonomous motivation to engage in physical activity. Indeed, our meta-analysis has demonstrated a significant relationship between both perceived and actual autonomy support and psychological need satisfaction (McLachlan & Hagger, 2010). It may be that thwarted

psychological needs in certain contexts are not irreparable, and the provision of autonomy support may be most effective in bringing about changes in motivation for people with low need satisfaction. However, there is relatively little research adopting this approach in a physical activity context, and there is a clear need for further inquiry in this direction to confirm these hypotheses.

(h2) Integration of theories

(h3) The theory of planned behavior and self-determination theory

Recently, researchers have sought to integrate psychosocial models such as the theory of planned behavior with other motivational theories like self-determination theory. This is because these approaches are deemed to provide complimentary explanations of the processes that underlie motivated behavior (Hagger, 2009). This is important with regard to the theory of planned behavior as it provides information as to the origins of the attitudes, subjective norm and perceived behavioral control constructs. Several researchers have integrated these approaches in mediational models to illustrate the processes that lead to decisions to engage in social behavior. For example, self-determined or autonomous motives from self-determination theory have been shown to directly predict behavioral intentions (Chatzisarantis et al., 2002; Hagger, Chatzisarantis, & Biddle, 2002a; Standage et al., 2003a; Wilson & Rodgers, 2004). However, some researchers have tested a more complete model in which different regulatory styles of autonomous and controlled motivation from self-determination theory predict intentions via the mediation of attitudes and perceived behavioral control. This motivational sequence has been supported in a number of studies (Chatzisarantis et al., 2002; Hagger et al., 2005; Hagger et al., 2002a; Hagger et al., 2003; Hagger et al., 2006).

The proposition that self-determination theory (Deci & Ryan, 1985b, 2000) can augment social cognitive theories such as the theory of planned behavior has been suggested previously, but

has only recently received empirical support. Numerous authors have proposed that motivational, organismic theories such as self-determination theory could potentially offer explanations for the origins of constructs in social cognitive theories. As Andersen, Chen, and Carter (2000) state, “most information processing [social cognitive] models are silent on matters central to self-determination theory” (p. 272). Deci and Ryan (1985b) have suggested that social cognitive theories identify the immediate antecedents of behavior, but neglect the origins of the antecedents: “Cognitive theories begin their analysis with what Kagan (1972) called a motive, which is a cognitive representation of some future desired state. What is missing, of course, is the consideration of the conditions of the organism that makes these future states desired” (p. 228). Constructs such as attitudes, perceived behavioral control, and intentions from social cognitive theories like the theory of planned behavior are measured as explicitly-stated expectancies regarding future behavioral engagement. Therefore the integration of these theories may offer more information as to the mechanisms that underlie intentional behavior such as physical activity.

The integration of the theory of planned behavior and self-determination theory is based on two key premises. The first premise is based on the hypothesis that the relationship between autonomous motives from self-determination theory and the constructs from the theory of planned behavior is a *formative* one. People who have high levels of autonomous motivation in a given domain are likely to experience their behavior in that domain as personally relevant and valued in that it is concordant with their psychological need for self-determination (Sheldon, 2002). As a consequence, autonomously-motivated people will have a greater tendency to critically examine the importance and value of the outcomes of engaging in any future target behavior. In the case of physical activity, autonomous people will be likely to find information that points to the importance of activity and thus form a positive attitude towards future participation in that physical activity. In contrast, people who report high levels of controlled forms of motivation will

tend to focus on external contingencies of the future engagement in physical activity, which are likely to have little to do with the valued consequences of participating in physical activity. Individuals with high levels of autonomous motivation are likely to feel more confident in reaching their goals and engaging in subsequent behavior to satisfy these goals because they quench their need for competence. Links between autonomous motivation and perceived competence have been found in previous research (e.g., G. C. Williams, Gagne, Ryan, & Deci, 2002; G. C. Williams, McGregor, Zeldman, & Freedman, 2004).

The second premise relates to the relative degree of generality reflected by the constructs from the two theories. The autonomous motives from self-determination theory reflect dispositional motivational orientations in a particular context and are therefore expected to predict behavioral engagement across a variety of behaviors in that context. In the case of physical activity this can mean formal kinds of exercise (e.g., going to the gym, participating in an aerobics class), sport (e.g., training for a particular sport and competition), and informal or incidental physical activity (e.g., walking to work, using stairs instead of the elevator). Vallerand (2000) labels this form of motivation, *contextual-level motivation*, as it reflects motivational orientations that affect all forms of behavior in a given context. However, the constructs from the theory of planned behavior are *expectations* for engaging in the behavior in future and measures of these constructs therefore specify explicitly the behavior and time frame of that bout of behavior. Vallerand suggested that contextual level motivation affects motivational orientations at the situational level in a top-down fashion (see also Guay, Mageau, & Vallerand, 2003). Intentions in the theory of planned behavior are hypothesized to be located at this level because they reflect expectations for engaging in a specific target behavior at as specific future point in time. They are therefore conceptualized as orientations to engage in a behavior at the situational level. In addition, Vallerand also hypothesized that contextual level motivation would also influence cognitions at

the situational level. It is therefore expected that motivation at the contextual level would influence the beliefs that underlie engagement in specific bouts of a behavior in the future, which, according to the theory of planned behavior, are constructs like attitudes and perceived behavioral control. In accordance with this theory, it would be expected that contextual level motives would predict the performance of behavior at the situational level and its antecedents.

There is a growing body of research that has supported the integration of the theory of planned behavior and self-determination theory. The development of research in this area began with Chatzisarantis, Biddle, and Meek (1997) who found that intentions based on self-determination theory (autonomous intentions) were a better predictor of behavior than 'traditional' forms of intentions. Similarly, Sheeran, Norman, and Orbell (1999) found that intentions based on attitudes were more likely to predict behavior than intentions based on subjective norms, and suggested that intentions based on attitudes reflected pursuing behaviors for personally valued outcomes (akin to an identified regulation), and therefore for more autonomous reasons than intentions based on subjective norms which reflected more controlling aspects of motivation such as external or introjected regulations. Together these results paved the way for more comprehensive studies in which the effects of self-determined forms of motivation influenced behavior.

Following these pioneering studies, researchers have been committed to comprehensive tests integrating the theories adopting hypotheses from both component theories to address hypotheses relating to behavior in numerous contexts. Prominent among these studies are those that outline a clear motivational sequence in which the generalised motivational orientations from self-determination theory influence constructs from the theory of planned behavior in a physical activity context (e.g., Chatzisarantis et al., 2002; Hagger et al., 2002a). In such studies, the theory of planned behavior acts as a conduit for the effects of autonomous forms of motivation on

physical activity behavior. The decision-making constructs from the theory of planned behavior reflect the formation of plans to engage in physical activity in the future and represent situational motivational orientations toward physical activity behavior. The self-determination theory motives serve to indicate a source of information that influences the decision-making process. For example, autonomous forms of motivation from self-determination theory are hypothesised to influence attitudes from the theory of planned behavior as an autonomous motivational disposition in a particular domain is likely to be an impetus to the formation of attitudes oriented towards servicing personally-valued goals and mediate the effects of autonomous motivation on physical activity intentions.

Hagger, Chatzisarantis, and Biddle (2002a) found that self-determined forms of motivation affected intentions to engage in physical activity behavior, but only via the mediation of attitudes and perceived behavioral control. This provided support for the hypothesis that autonomous forms of motivation bias individuals' decision making in favour of forming attitudes congruent with their personal goals (attitudes) and perceptions that the behavior will lead to competence-related outcomes (perceived behavioral control). This was corroborated in a subsequent study which furthered these findings to actual behavior. Autonomous motives affected behavior via a motivational sequence beginning with autonomous forms of motivation and ending with behavioral engagement mediated by attitudes, perceived behavioral control, intentions, and effort (Chatzisarantis et al., 2002). Since this initial research, the indirect effect of autonomous motives from self-determination theory on intentions and behavior as stipulated by the proposed motivational sequence has been corroborated in several studies in the domain of physical activity (e.g., Hagger et al., 2005; Hagger et al., 2003; Hagger, Chatzisarantis et al., 2009; Shen, McCaughy, & Martin, 2007, 2008). A recent meta-analysis of all studies adopting these theories and testing some of the components of the integrated motivational sequence has provided support

for the sequence (Hagger & Chatzisarantis, 2009b). The meta-analysis demonstrated across 36 studies, the majority of which were in a physical activity context, that the effect of self-determined motivation on behavior was mediated by the theory of planned behavior variables. This provides useful information for the process by which social contexts influence behavior and provides recommendations for intervention. For example, we have shown that interventions can be designed in such a way to change perceptions at any stage of the motivational sequence, targeting either autonomous motives as a distal influence on intentions or attitudes and perceived control as a proximal influence. This may lead to hybrid interventions that adopt techniques from both self-determination theory (Chatzisarantis & Hagger, 2009) and the theory of planned behavior (Chatzisarantis & Hagger, 2005) to promote increased physical activity participation.

(h3) 2 x 2 achievement goal perspectives and self-determination theory

Achievement goal theory was developed by researchers interested in examining the effects of young people's perceptions of success and failure on motivation in education contexts (Ames, 1992; Nicholls, 1989). An important tenet of the theory is that cues from the social context, known as the *motivational climate*, have pervasive effects on motivation and behavior. Two dimensions have emerged from research examining the effects of motivational climate on motivation in educational settings: a task or *mastery*-oriented climate and an ego or *performance*-oriented climate. A mastery oriented motivational climate tends to promote hard work, effort, co-operation, and personal development among individuals acting in that climate while a performance oriented climate tends to engender comparisons with others, competition, success based on ability, and reward and punishment schedules for success and failure. Research in education has suggested that a mastery oriented climate tends to engender adaptive motivational patterns and is linked to increased psychological well-being and persistence in behavior (Ames, 1995; Ntoumanis & Biddle, 1999).

The concepts of motivational climate and intrinsic motivation from self-determination theory have been viewed as providing complementary explanations of motivation. A mastery-oriented motivational climate, in supporting effort, personal improvement, and self-references improvement is directly compatible with autonomous motivation because such contexts have been shown to enhance intrinsic motivation (Butler, 1987). In contrast, performance-oriented climates have not been associated with autonomous forms of motivation, and may even undermine autonomous motivation given its focus on external contingencies for success. Recently, Deci and Ryan (2000) have explicitly linked a mastery-oriented motivational climate with the development of intrinsic motivation, stating that “both [theories] suggest that the use of salient performance-based rewards, social comparisons, and normatively based goal standards as motivational strategies yield manifold hidden costs [and] that environments that are less evaluative and more supportive of the intrinsic desire to learn provide the basis for enhanced achievement and well-being” (p. 260). These theoretical links have been supported empirically across many achievement related behaviors (Rawsthorne & Elliot, 1999). A burgeoning body of literature in the physical activity domain has also supported these theoretical links and it seems a mastery motivational climate promotes exercise adherence and is attributable to the context enhancing intrinsic motivation and competence (Cury et al., 1996; Cury, Da Fonséca, Rufo, Peres, & Sarrazin, 2003; Cury, Elliot, Sarrazin, Da Fonseca, & Rufo, 2002; Escarti & Gutierrez, 2001; Goudas & Biddle, 1994; Hein & Hagger, 2007; Kavussanu & Roberts, 1996; Papaioannou, 2004; Treasure & Roberts, 2001).

Recent research has sought to examine the role of motivational climate in physical activity contexts in promoting or thwarting autonomous forms of motivation (Ntoumanis, 2001; Standage, Duda, & Ntoumanis, 2003b). Such studies adopt a longitudinal approach, similar to those examining the effect of perceived autonomy support on motivation and intention (Hagger & Chatzisarantis, 2007b, 2007c), and there is considerable congruence in the motivational sequences

put forward in these models. However, these models have tended to focus on participation within physical education rather than physical activity outside of school. Importantly, these authors make explicit the links between a mastery-oriented motivational climate and contexts that support psychological needs and recognize the congruences between the features of the social context that support autonomous forms of motivation from both theoretical perspectives (Ntoumanis, 2005; Standage et al., 2005; Standage et al., 2007).

The achievement goal perspective has also been adopted alongside constructs from self-determination theory in terms of dispositional orientations that reflect perceptions about success and failure (Ntoumanis, 2005; Standage et al., 2003b). Until recently, research in achievement goal perspectives had identified two pervading achievement goal orientations: task-oriented and ego-oriented. A task oriented motivational orientation means an individual will tend to view success and failure in physical activity contexts relative to personal improvement, effort, self-referenced goals, learning and improvement. Analogously, ego-oriented persons will tend to view their success and failure relative to their performance compared to others, fulfilling normative standards, other-referenced goals, and competition and normative comparison. Research in physical activity contexts has suggested that individuals who attach high value to task-oriented goals tend to have more adaptive motivational patterns and, in particular, report high levels of intrinsic motivation in tasks (Boyd, Weinmann, & Yin, 2002; Brunel, 1996; Hein & Hagger, 2007; Newton & Duda, 1999; Standage et al., 2003b; Wang & Biddle, 2003). This is irrespective to whether they also endorse an ego-oriented goal perspective and it is only when task orientation is comparatively low, that maladaptive motivational patterns such as avoiding evaluative situations and low intrinsic motivation arise (Goudas et al., 1994; Goudas, Biddle, & Underwood, 1995). It must, however, be stressed that there is a relative dearth of research examining the effects of motivational climate on autonomous forms of motivation in physical activity contexts, and, most

importantly, even fewer studies that have examined the role of interventions to manipulate or change motivational climate and its effects on self-determination theory variables and physical activity behavior (Hagger, Hein, & Chatzisarantis, in press). These should be prioritized in future research.

(h1) Measurement and methodological advances

In this final section I outline two important methodological advances that offer much promise in contributing to the understanding of the motivational influences on physical activity behavior. The first focuses on the development of new measures of implicit, nonconscious constructs in the field of social psychology and applying them alongside the explicit measures of motivation traditionally operationalized in theories and models of motivation in physical activity contexts. Such an approach acknowledges that motivated behaviors like physical activity are not simply a function of explicit, conscious decision-making processes but are also subject to more spontaneous, impulsive psychological variables (Hagger, 2010; Hagger, Wood, Stiff, & Chatzisarantis, 2009, 2010; Hofmann, Friese, & Wiers, 2008). The second focuses on the importance of using cutting edge methodological features when designing interventions based on motivational theories in physical activity research. I will argue for the consideration of intervention mapping and reporting of intervention protocols such that there is clear congruence between the target theoretical constructs and the intervention components as well as the need for state-of-the-art techniques to establish the effectiveness of the intervention including treatment fidelity checks.

(h2) Implicit motivation

Research in social psychology over the past 10 years has begun to shift away from models that focus solely on deliberative, intentional, and explicit influences on behavior and sought to develop theories that account for the non-conscious, impulsive and implicit influences on human

behavior (Bargh & Chartrand, 1999; Greenwald et al., 2002; Hofmann, Friese, & Strack, 2009; Kehr, 2004; Nosek, Greenwald, & Banaji, 2007; Strack & Deutsch, 2004). Such approaches have given rise to so-called *dual route* models of motivation that recognise that behavior is a function of reflective, deliberative, volitional and planned inferences as well as those that are impulsive, automatic, nonconscious, and unplanned (Hofmann et al., 2009; Strack & Deutsch, 2004). Interest in these automatic and implicit processes has been mirrored by concomitant advances in methods to measure implicit processes. Research adopting implicit processes alongside more traditional self-report measures of cognition has illustrated that behavior is influenced by both explicit and implicit social cognitive variables and these effects are relatively independent (Perugini, 2005; Spence & Townsend, 2007).

Given the increasing attention being paid to implicit processes, recent research has endeavoured to examine the role of implicit processes in self-determined motivation and behavior. This is based on theoretical premises that suggest that people have an implicit bias or propensity to approach behaviors in an autonomous or controlling manner. For example, Deci and Ryan (1985a) proposed causality orientations theory which introduced the notion that people have a generalised capacity to be oriented towards and interpret situations as supportive of their self-determination. Therefore people exhibit interindividual differences in their generalised causality orientations, which are global and relative enduring, developed through experience, and affect motivation and behavior in a variety of contexts. Such orientations may moderate the effects of situational factors that support or thwart intrinsic motivation on behaviour (Hagger & Chatzisarantis, 2011). In addition, it has been supposed that these causality orientations may affect behavior independent of conscious decision-making (Elliot, McGregor, & Thrash, 2002), in much the same way as individual difference and personality constructs tend to influence behaviors independent of intentional processes (Conner & Abraham, 2001; Rhodes et al., 2002). Indeed, recent evidence

examining mediational models of motivation adopting OIT and basic needs theory have indicated that generalized constructs such as basic need satisfaction predict exercise behavior directly independent of contextual motivational orientations and intentions (Hagger et al., 2006). These processes therefore transcend the deliberative route by which these psychological constructs lead to behavior and suggests that people's global causality orientations may affect behavior directly, and the process is likely to be one with which the person is unaware and therefore implicit in nature.

Recent research has included implicit motivational constructs in the prediction of behavior adopting a self-determination theory approach. Levesque and Pelletier (2003) adopted priming techniques used in previous studies examining implicit processes to activate either autonomous or non-autonomous (termed *heteronomous*) motivational orientations. Using this method they found that priming autonomous and heteronomous motivation influenced participants' perceptions of intrinsic motivation, choice and competence as well as persistence with subsequent problem solving tasks consistent with explicit, consciously regulated motivational orientations. Similarly, Burton, Lydon, D'Allesandro, and Koestner (2006) used a lexical decision task to measure implicit autonomous motivation and found that this measure predicted psychological well-being and academic performance independent of explicit measures of autonomous motivation. Together these studies suggest that the motivational influences from self-determination theory can influence behavior and other outcomes implicitly and these effects are independent of explicit motivational orientations.

Recently we have conducted a series of studies to extend this research to a physical activity context and adopt recently-developed measures of implicit motivational orientations from self-determination theory (J. Harris & Hagger, 2010; Keatley & Hagger, 2010). The studies required

the development of an implicit measure of motivational orientations based on self-determination theory using the Implicit Association Test (IAT) and then evaluate the extent to which the implicit motives tapped by the new measure predicted variance in physical activity behavior. The IAT is essentially a sorting task which requires individuals to sort items from two pairs of contrasted categories into logical sets and in doing so measures the strength of association between mental constructs that are bipolar in nature. The IAT was developed with the distinction between “intrinsic” and “extrinsic” as categories of motivation and “pleasant” or “unpleasant” as the associated attributes. The words that represented the category were derived from a pilot study in which participants were required to write down words associated with intrinsic and extrinsic categories.

In our studies, we used the newly-developed implicit measure of motivation to predict self-reported physical activity behavior alongside more explicit measures of motivational orientations from the perceived locus of causality. Scores on the IAT were such that higher scores represented a strong link between the positive attribute and self-determined motivation. Although there were relations between the implicit and explicit measures of motivation, there was no direct effect of the implicit motivational orientations on physical activity behavior. Rather, the explicit measures of autonomous and controlling motivation both significantly predicted physical activity intentions and behavior. In one sample, there was a mediated effect from the implicit motivational orientation to intentions via the mediation of explicit controlling forms motivation. This preliminary evidence suggests that the implicit measure of self-determined motivation may have a role in influencing physical activity intentions, but the route is subsumed by explicit forms of motivation. Nevertheless, this is an important finding as it suggests that physical activity is largely an intentional behavior under the volitional control of the individual and requires conscious and deliberative motivational factors to be enacted. However, research using implicit measures is in its

infancy and requires further validation work and research examining the independent prediction of implicit autonomous motives on motivation and physical activity. Furthermore, the present studies focused on self-reported physical activity and, therefore, likely a more considered, intentional form. It may be that implicit motivational orientations are more important in predicting forms of activity which are less to do with explicit, deliberate motivational processes. This is clearly an important avenue for future research and it will provide new and important information on the relative contribution of the implicit and explicit motivational systems on physical activity behavior.

(h2) RCTs and intervention mapping

The randomized controlled trial (RCT) has often been cited as the gold standard for the evaluation of clinical trials of any intervention and a considerable body of evidence has been recently established examining the efficacy of theory-based psychological intervention on physical activity behavior (Michie & Abraham, 2008). Indeed, meta-analyses have extolled the effectiveness of RCT evaluations of theory-based interventions on physical activity behavior and health-related outcomes such as fitness and weight loss in numerous contexts (e.g., Conn, Hafdahl, Cooper, Brown, & Lusk, 2009; K. C. Harris, Kuramoto, Schulzer, & Retallack, 2009; Jenkins, Christensen, Walker, & Dear, 2009; Wu, Gao, Chen, & van Dam, 2009). There have also been meta-analyses focusing on intervention based on specific theories like the theory of planned behavior (Hardeman et al., 2002) and self-determination theory (McLachlan & Hagger, 2010) or theory-based intervention protocols like motivational interviewing (Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010). However, many of these systematic reviews and meta-analyses have been hampered and limited by the low quality of many of the constituent studies. A key quality component that has often be cited a lacking is the sufficient detail in the reporting of the intervention and a lack of provision of clear protocols to permit the replication of the intervention

and the identification of the components of the intervention that are effective in changing behavior (Michie & Abraham, 2008; Michie et al., 2005; Michie, Johnston, Francis, Hardeman, & Eccles, 2008). These limitations have made it difficult to draw definitive conclusions as to the effectiveness of particular interventions based on particular theories. For example, without sufficient detail it is difficult to establish whether the intervention satisfactorily targeted the theoretical variable proposed by the researchers running the intervention and resulted in changes in the dependent variable (Michie & Abraham, 2008). Recent solutions to this have arisen in the need to clearly map the intervention components onto the theoretical constructs the components are purported to change (Michie, 2008; Michie et al., 2008). A further problem is whether there is sufficient detail and checks whether the intervention has been carried out by those administering the intervention as it is outlined in the intervention protocol. This would require checks to ensure that those administering the intervention were keeping to task and whether the participants reported carrying out the intervention correctly and accurately. This is known as *treatment fidelity* (Bellg et al., 2004) and has only very recently been applied to behavioral interventions in physical activity contexts (Hardeman et al., 2007).

The aforementioned intervention components have been termed the ‘active ingredients’ of interventions and this has received much recent attention in the literature. Abraham and Michie (2008) have published a taxonomy of health related behavior change intervention components. The aim of the taxonomy is to provide a more systematic description of the components of interventions that target specific constructs from motivational theories of behavior change. This is an important step forward in terms of assisting researchers and intervention designers in being more explicit in identifying the specific components of interventions that are proposed to be making the change in behavior (Michie, 2008). This is clearly important when it comes to translational research aiming to capitalise on the research identifying antecedents and mechanisms

from motivational theories applied to physical activity contexts (Hagger, 2010a; Moss-Morris & Yardley, 2008). Furthermore, there is now a specific protocol for the coding of intervention components which provides a blueprint for mapping the intervention components that are the likely ‘active ingredients’ of interventions (Michie & Prestwich, 2010). This is not only a tool for those conducting systematic reviews and meta-analyses, but also for those designing interventions to consider when it comes to pinpointing the components from formative research examining psychological correlates likely to be the most viable target for intervention. Interventions aimed at changing physical activity behavior should therefore pay careful attention to providing clear details of the constructs that are the targets of interventions (based on formative research), the intervention components that will be adopted to give rise to the intervention, and a clear protocol, similar to an instruction manual, giving the precise details of the intervention so that it can be replicated.

Two other important methodological issues must be considered when it comes to the design, implementation, and evaluation of theory-based physical activity interventions. First, it is important that intervention designers include means to evaluate the treatment fidelity of the intervention (Bellg et al., 2004). This must come in two forms. First, it is important to evaluate whether the intervention has actually caused change in the specific theoretical variable or variables targeted by the intervention, similar to manipulation checks in experimental research. It is therefore essential that the intervention not only includes the primary outcome variables whether that be physical activity behavior, or any target outcome variables related to physical activity, but also measures of the psychological variables related to the intervention, both before and after the implementation of the intervention. Second, it is important that interventionists include means to identify whether the intervention has been carried out according to the proscribed protocol. If the intervention is delivered by a clinician or a social agent, an example of a fidelity check might

include some sort of observation of a sub-group of the agents delivering the intervention and coded independently for the specific behaviors expected of those carrying out the intervention. Of course, it is important that this is compared to similar observations for the social agents executing the control condition components of the intervention. This will ensure that the intervention is carried out precisely and effectively in the manner outlined in the protocol.

Finally, I mentioned previously the importance of including measures relating to the target theory-related variables that the intervention components are purported to target as a means to establish the effectiveness of the intervention (Hagger, 2010b; Hagger & Chatzisarantis, 2009a). However, these components are also likely to be the salient mediators of intervention components and will provide an important test of the mechanisms by which the intervention affects behavioral outcomes. As an illustration, two of our recent interventions adopting theory based interventions have demonstrated the importance of examining the psychological mediators of intervention components on behavior and motivational outcomes in physical activity (Chatzisarantis & Hagger, 2005, 2009). For example, in a school-based intervention aimed at increasing physical activity behavior among school pupils, we trained teachers to present their lessons in an autonomy supportive manner versus an information-only intervention (Chatzisarantis & Hagger, 2009). As predicted, physical activity behavior increased among the children randomly allocated to the intervention group, but this was mediated perceived autonomy support, which also served as the manipulation check, and autonomous motivation and behavioral intentions. Similarly, we found that the effects of a school-based intervention adopting the theory of planned behavior on physical activity intentions was mediated by attitudes and perceived behavioral control (Chatzisarantis & Hagger, 2005). These data were analysed using path analyses and the mediation analyses were conducted according to the criteria proposed by Baron and Kenny (1986). These analyses should

be considered essential for the identification the process by which the intervention exerts its effects on physical activity behavior and is recommended practice.

(h1) Conclusion

In this chapter I have reviewed three important motivational theories that have provided exercise psychologists and those interested in promoting physical activity behavior in a largely sedentary population with important knowledge of the factors that influence physical activity and the processes by which these factors affect physical activity: the theory of planned behavior, self-determination theory, and achievement goal theory. Although these theories have had success in explaining variance in physical activity behavior and serving as the basis for interventions to change physical activity, there are limitations and shortcoming in the theories and in current knowledge of the application of these theories to physical activity. These limitations include the link between intentions and behavior and the relations between constructs in the theories. I have therefore reviewed recent advances that have aimed to address these limitations and gaps in the research such as the adoption of implementation intentions and theoretical integration. In addition, I have also highlighted the importance of recent methodological advances in implicit motivational research and the design of interventions in developing future research in physical activity behavior and advancing knowledge and understanding of physical activity behavior. I think the overall message of this chapter, distilling the research on motivation in physical activity, is that there is some high-quality and innovative research that is not only moving motivational theory forward but has genuine application and practical relevance to interventionists and policymakers to adopt in order to promote physical activity in populations and produce healthier lifestyles.

(h1) Future directions

(1) Can an intervention designed to increase motivational climate as outlined by achievement goal theory result in changes in self-determined motivation, achievement goal orientations, and actual physical activity behavior?

(2) How do hybrid interventions that use motivational and implemental intervention components to promote physical activity affect the behavior people who are resistant to change and have low motivation versus those with high motivation?

(3) What are the differential effects of implicit and explicit motivational constructs on different types of physical activity such as formal exercise (e.g., going to the gym, attending an aerobics class) and more 'habitual' forms of physical activity (e.g., walking to work)?

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