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Published

2013

Journal Title

Human Movement Science

Version

Accepted Manuscript (AM)

DOI

[10.1016/j.humov.2013.08.004](https://doi.org/10.1016/j.humov.2013.08.004)

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9 **Motivation for Physical Activity in Children: A Moving Matter in Need for Study**

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1 Abstract

2 Motivation for physical activity in children below the age of 12 years is a largely
3 underrepresented issue in contemporary research. Although engagement in sufficient physical
4 activity is highly important for children's current and later health, relatively little is known of
5 the factors that motivate children to be physically active. Various theories have been
6 developed in an attempt to explain motivation toward physical activity in adults. Recent
7 developments have focussed on integrating constructs of these theories in order to attain a
8 comprehensive account of motivated behavior. The relationships between different
9 motivational constructs have generally been investigated in healthy adolescents and adults.
10 This manuscript outlines why more theoretically driven research into children's motivation
11 toward physical activity is needed. Constructs stemming from various motivational theories
12 and their interrelationship as evidenced in youth and adults will be summarized. The current
13 state of research on the applicability of these motivational constructs to children, and the
14 generalizability of the interrelationship between the constructs to child samples will be
15 outlined. A deeper insight into the motivational determinants of physical activity participation
16 in children could inform the design of interventions to facilitate the development of
17 physically active lifestyles that persist at older ages.

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1. Importance of physical activity

The health benefits of engagement in regular physical activity have been widely discussed in literature, both in relation to children (Janssen & LeBlanc, 2010) and adults (Warburton, Nicol, & Bredin, 2006). Regular physical activity has been associated with health-related physical fitness, which involves cardiovascular fitness, musculoskeletal fitness, body composition and metabolism (Janssen & LeBlanc, 2010; Warburton et al., 2006). Apart from its role in the promotion of physical health, physical activity also promotes psychological well-being (see Biddle, Fox, & Boutcher, 2000; Parfitt & Eston, 2005; Strong et al., 2005). On the other hand, insufficient physical activity, both in children and adults, has been linked to the aetiology of numerous chronic health problems. These include cardiovascular disease (Anderssen et al., 2007; Boreham et al., 2002; Erikssen, 2001), certain cancers (Byers et al., 2002; Culos-Reed, 2002; Hardman, 2001), obesity (Hills, King, & Armstrong, 2007; Janssen & LeBlanc, 2010; Yang, Telama, Viikari, & Raitakari, 2006), and Type II diabetes (Kahn, Hull, & Utzschneider, 2006; Sinha et al., 2002).

It is important that a deeper understanding emerges on how to stimulate engagement in sufficient physical activity to obtain health benefits from a young age onwards. We will argue in this review why motivation is an essential construct in relation to physical activity¹, and why it is important for motivational research in the physical activity domain to extend its focus to childhood, particularly late-childhood (9 to 12 years). A selection of motivational theories that have received considerable empirical support in relation to understanding physical activity behaviour will be outlined. Consequently, we will describe how these theories are interrelated, as explanatory value is increased when the theories are combined. The limited research evidence regarding children's motivation for physical activity will be outlined, and the generalizability of findings of motivational research in youth and adults to primary school-aged children will be discussed. It should be noted here that when age is referred to, this is only an indication of average age. There is a large inter-individual variation in the rate of development. Lastly, the valuable role physical education could play in enhancing children's motivation toward physical activity will be outlined. We expect that the gaps in the literature and limitations in the currently-available research on motivation toward

¹ It is important to note that our focus is on physical activity for health. For the purposes of this review, physical activity is defined as any active bodily movement produced by the contraction of skeletal muscles that increases the metabolic rate above the resting level (Caspersen, Powell, & Christenson, 1985). It includes activities involving bodily movements that are done as part of play, work, active transport, chores, recreation, sport and exercise. As a lot of research has focussed on sport and exercise, and sport and exercise play an important role in physical activity for health (Khan et al., 2012), results of studies focussing on motivation towards these types of physical activity will be also discussed.

1 physical activity in children will provide the basis for new theoretical perspectives and assist
2 in the development of future studies.

3 **1. Importance of motivational research with children**

4 Despite the widely known maladaptive consequences of physical inactivity, a large
5 proportion of the population in industrialised countries engages in low levels of physical
6 activity (Dumith, Hallal, Reis, & Kohl, 2011; Ekelund, Tomkinson, & Armstrong, 2011;
7 Janssen et al., 2005). Several studies have indicated that over the last decade activity levels
8 have remained relatively stable (Chau et al., 2008; Ekelund et al., 2011; Lowry, Lee, Fulton,
9 & Kann, 2009). In contrast to the absence of significant societal changes over recent years, a
10 decline in activity levels with age has been observed (Dollman, Norton, & Norton, 2005;
11 Nader, Bradley, Houts, McRitchie, & O'Brien, 2008; Riddoch et al., 2004; Troiano et al.,
12 2008). Decreasing physical activity levels with age have consistently been observed in
13 various countries and over many years, with the earliest longitudinal study into this issue
14 dating back to 1977 (see Dumith, Gigante, Domingues, & Kohl, 2011). The decline has been
15 characterised as non-linear (Larouche, Laurencelle, Shephard, & Trudeau, 2012; Raymore,
16 Barber, & Eccles, 2001), and is particularly prominent during the adolescent period (Dumith,
17 Gigante, et al., 2011; Nelson, Neumark-Stzainer, Hannan, Sirard, & Story, 2006; Sallis, 2000;
18 Troiano et al., 2008). This is reflected in results of both longitudinal and cross-sectional
19 studies applying accelerometry methodology, where relatively large proportions of children
20 have been found to comply to the public health guidelines for physical activity of 60 minutes
21 or more of moderate to vigorous physical activity per day (WHO, 2010), while fewer
22 adolescents reach the guidelines (Nader et al., 2008; Riddoch et al., 2004). In other studies
23 low levels of physical activity have already been identified in young children, with further
24 declines in activity levels over adolescence (Troiano et al., 2008). It has been proposed that
25 shifts in physical activity behaviour may be related to life changes, such as changing roles,
26 relationships and ecological contexts (Hirvensalo & Lintunen, 2011). In line with this,
27 physical activity has been reported to exhibit lower levels of stability during transitional
28 phases in life, such as the transition from childhood to adolescence (Telama, 2009). Post-
29 adolescence the stability of activity levels has been found to increase (Telama, 2009). It is
30 important to gain a deeper insight into how to promote engagement in sufficient physical
31 activity during the period of instability between childhood and adolescence. This may
32 facilitate the prevention of the age-related decline in activity levels and the emergence of
33 positive physical activity habits that persist at older ages. A life-course approach to the

1 promotion of physical activity is needed, and therefore the inclusion of the child population is
2 important.

3 Various factors are related to physical activity engagement, including developmental,
4 environmental, psychological, biological, and socio-cultural factors (Sallis, Prochaska, &
5 Taylor, 2000). These factors are likely to undergo changes as children age, particularly during
6 the transition from childhood to adolescence, and from primary school to high school. To
7 understand changes in activity levels over the childhood period and later in life, a
8 multifaceted approach to physical activity behaviour is required. Motivation enables
9 researchers to take such an approach, as it is energised by various psychological and socio-
10 contextual factors, and in turn influences both physical activity initiation and adherence
11 (Standage, Duda, & Ntoumanis, 2003; Vallerand & Losier, 1999). For example, a recent
12 study found motivation to mediate the effect of environmental factors, such as perceived
13 neighbourhood safety and parental logistic support, on physical activity (Rutten, Boen, &
14 Seghers, 2013). This strengthens the proposition that motivation plays a critical role in
15 physical activity behaviour (Chen, 2001; Keegan, Harwood, Spray, & Lavallee, 2009), and
16 that it is affected not only by personal, but also social and contextual factors (see Zhang &
17 Solmon, 2013).

18 Similar to physical activity behaviour, motivation to participate in physical activity
19 has been found to decrease over the late-elementary, and high school years (Ntoumanis,
20 Barkoukis, & Thøgersen-Ntoumani, 2009; Xiang, McBride, & Guan, 2004). The prevention
21 of this decline, and facilitation of constructive motivational orientations could play an
22 important role in the development of adaptive physical activity habits that persist over
23 childhood and adolescence. Insight into which constructs are relevant for children's
24 motivation toward physical activity, which psychological and socio-contextual factors are
25 capable of inducing increases in motivation, and which constructs are most amenable to
26 change could inform the design of interventions to promote increased motivation toward
27 physical activity and ultimately physical activity engagement. This is important as research
28 has shown that the maintenance of physical activity from adolescence into adulthood leads to
29 adaptive health outcomes such as a reduced risk of cardiovascular disease (Rangul, Bauman,
30 Holmen, & Midthjell, 2012). Well-designed physical activity interventions could also play an
31 important role in the prevention and treatment of overweight and obesity in school-aged
32 children, a health issue of global concern (Janssen et al., 2005).

33 Motivational studies have generally focussed on samples of adolescents and young
34 adults (Bong, 2009; Cury, Da Fonseca, Moller, & Elliot, 2006; Duda, Fox, Biddle, &

1 Armstrong, 1992). The assumption has long prevailed that young children have not yet
2 developed the cognitive capacities to distinguish between different motivational constructs
3 (Eder, 1990; Nicholls, 1989; also see Butler, 2005). Contemporary research has found that
4 children start to differentiate between various motivational orientations at an earlier age than
5 previously assumed (see Butler, 2005), justifying a downward extension of motivational
6 research in the physical domain to include children. Nevertheless, there is still a lack of
7 motivational studies involving children, which may be partially a result of the methodology
8 used to assess motivational orientations. Motivation is commonly investigated using self-
9 report methods, which have previously been regarded as unsuitable for use with children.
10 Children's limited cognitive skills were expected to negatively affect the question-response
11 process (Scott, 1997). However, over the past decades evidence has emerged that, when age-
12 appropriate measures are used, self-report methods can be applied successfully with children
13 from the age of 8 years onwards (Borgers, de Leeuw, & Hox, 2000; Rebok et al., 2001; Riley,
14 2004).

15 Despite these new insights, there is a lack of questionnaires specifically designed to
16 assess motivational orientations that have been validated in child samples. Children might
17 experience difficulties comprehending questionnaire items, or articulating their responses to
18 items when assessed on questionnaires developed for use with adolescent and adult samples
19 (Borgers et al., 2000; de Leeuw, Borgers, & Smits, 2004).

20 Taken together, it is important that children engage in sufficient physical activity, and
21 continue to engage in adequate levels of activity over development. Thereby, motivation
22 plays an essential role. Based on the current knowledge, children can be expected to be
23 capable of discriminating between various motivational constructs from a young age
24 onwards, which can be assessed with the use of age-appropriate questionnaires. Before
25 proceeding to the discussion of motivational research with children, the theoretical
26 background of some of the most prominent contemporary theories in motivational research
27 will be outlined, followed by a discussion of the current state of knowledge regarding the
28 interrelationship between these theories in youth and adult samples in the physical activity
29 domain. This will provide the basis for the discussion of children's motivation toward
30 physical activity, as limited comparable research involving child samples is available.
31 Whereas the theories that will be discussed did not originate in the physical activity domain,
32 an abundance of research has tested and applied the principles of these theories with respect
33 to physical activity, exercise and sport (e.g., Conroy, Elliot, & Hofer, 2003; Dyrland, 2008;
34 Moreno, Gonzalez-Cutre, Sicilia, & Spray, 2010; Standage et al., 2003).

2. Motivational theories

3.1 Self-determination theory

Self-determination theory is a meta-theory comprising three subtheories, which was developed in an endeavour to explain human motivation and behaviour. The cognitive evaluation theory distinguishes between intrinsic and extrinsic motivation, and focuses on the determinants of intrinsic motivation (Deci & Ryan, 1985). When engagement in a behaviour is underpinned by a sense of interest, enjoyment and choice, in the absence of external contingencies, an individual is considered intrinsically motivated. Intrinsic motivation is a highly important factor in remaining physically active over time (Ryan & Deci, 2007). However, it is recognised that not all activities in which individuals engage are inherently interesting, or personally valued. Not all individuals enjoy engaging in physical activities. In this case, behaviours are engaged in for reasons that are extrinsic to the individual. The organismic integration theory extends the distinction between intrinsic and extrinsic motivation by differentiating between different types of extrinsic motivation (Deci & Ryan, 1985). The subtheory details a graded continuum of qualitatively different types of motivation, or regulational styles, ranging from more autonomous (or self-determined) to more controlled (or less self-determined) behavioural regulations. With *integrated behavioural regulation*, the most autonomous form of extrinsic motivation, behaviours are performed out of choice. The value of the behaviour has been integrated with other personal values, but engagement is underpinned by a separable outcome that is independent from the activity itself. For example, individuals engage in physical activities because engagement in fitness enhancing behaviours is considered to represent a fundamental part of who they are. When behavioural regulation is *identified*, individuals engage in a behaviour for its perceived personal importance and the value of associated outcomes. For example, individuals engage in physical activities because they value being healthy, and the belief that physical activity is beneficial to health. With *introjected regulation*, behaviours are self-initiated, but the engagement is energised by internal pressures such as the avoidance of shame, contingent self-esteem, and the need for approval. For instance, individuals engage in physical activities to avoid feelings of guilt. *External regulation* occurs when an individual engages in a behaviour solely for external reasons, with the purpose of fulfilling an external demand, achieve a reward, or avoid punishment. For example individuals engage in physical activities because their physician tells them to, despite disliking it.

1 Lastly, to describe the state characterised by lack of intention to engage in a
2 behaviour, that is, an absence of motivation, self-determination theory has forwarded an
3 *amotivation* construct. Amotivation is likely to emerge if no contingency between behaviour
4 and outcome is experienced or when feelings of incompetence are experienced (Ryan & Deci,
5 2000a).

6 The motivational continuum forwarded by self-determination theory does not
7 represent a developmental continuum (Mullan & Markland, 1997). Rather, the continuum
8 describes the processes by which individuals assimilate behaviours that are externally
9 regulated, whereby the perceived causality of a behaviour shifts from external to internal, and
10 free from external control (Deci & Ryan, 2000). This process is referred to as internalisation.
11 The behavioural regulation is consequently incorporated within the individual's sense of self
12 and personal values and goals, a process referred to as integration (Deci & Ryan, 2000; Ryan
13 & Deci, 2000a, 2000b). Regulation of new behaviours does not necessarily start at the least
14 autonomous end of the motivational continuum, but can start at any point along the
15 continuum. Over time the perceived autonomy of behavioural regulation can move along the
16 continuum in either direction. Also, individuals can simultaneously hold multiple motives to
17 engage in an activity, that is, different behavioural regulations can concur (Ryan & Connell,
18 1989; Ryan & Deci, 2007).

19 In order to describe how socio-contextual factors impact upon motivation and the
20 internalisation of behaviours, Deci and Ryan (2000; 2008) forwarded basic psychological
21 needs theory, centred around three innate, psychological needs; the needs for competence,
22 autonomy and relatedness (Deci & Ryan, 2000, 2008; Ryan & Deci, 2000a). The need for
23 competence refers to the desire of individuals to interact successfully with the environment,
24 producing the anticipated outcomes (Deci & Ryan, 1985; White, 1959). The need for
25 autonomy reflects individuals' aspiration to experience choice, and feel personally
26 responsible for actions (deCharms, 1968). The need for relatedness describes the propensity
27 to feel connected to, and understood by others in the environment (Baumeister & Leary,
28 1995). If socio-contextual factors (e.g. instructional style of the coach/ physical education
29 teacher) facilitate satisfaction of the three needs, more autonomous forms of behavioural
30 regulation are likely to emerge (Deci & Ryan, 2000; Ryan & Deci, 2000b). Environments
31 that are perceived as controlling tend to undermine autonomous motivation (Ryan & Deci,
32 2000b). For the emergence of high levels of self-determined motivation, satisfaction of the
33 need for autonomy is essential.

1 **3.2 Achievement goal theory**

2 Another theory that has been widely applied to study physical activity behaviour is
3 achievement goal theory. Achievement goal theory focuses on individuals' reasons to engage
4 in behaviours that are relevant for competence related beliefs (Nicholls, 1989). The theory
5 describes different ways in which success or failure can be interpreted (different conceptions
6 of ability), which underlie an individual's goals in achievement situations (Ames, 1984;
7 Dweck & Leggett, 1988; Maehr & Nicholls, 1980; Nicholls, 1984). Different terms have
8 been used to capture the achievement goal construct, but the similarities between the varying
9 terms have been suggested to outweigh the differences (see Midgley, Kaplan, & Middleton,
10 2001; Pintrich, 2000). The terms 'mastery goal' and 'performance goal' will be used
11 throughout this manuscript, as they have become the most commonly applied in current
12 literature (Pintrich, Conley, & Kempler, 2003). An individual with a mastery goal focuses on
13 learning, improvement and task understanding. Competence is evaluated based on self-
14 referenced standards. In contrast, an individual endorsing a performance goal aims to
15 demonstrate competence and outperform others. Competence is judged based on the
16 comparison of performance with others (Ames, 1984; Dweck & Leggett, 1988; Maehr &
17 Nicholls, 1980; Nicholls, 1984).

18 It has been suggested that achievement goals can be further differentiated according to
19 whether competence is valenced positively or negatively. Achievement goals can be focussed
20 on attaining a positive, adaptive possibility (approach success) or a negative, maladaptive
21 possibility (avoidance of failure) (Elliot & Harackiewicz, 1996). To capture this, an
22 approach-avoidance dimension was added to the mastery-performance goal dichotomy. The
23 resultant 2 x 2 framework comprises mastery approach goals, mastery avoidance goals,
24 performance approach goals, and performance avoidance goals (Elliot & Church, 1997; Elliot
25 & Harackiewicz, 1996; Elliot & McGregor, 2001). Studies in the academic and physical
26 activity domain have found that the 2 x 2 framework describes the data better than the
27 original dichotomous framework, expanding the explanatory value of achievement goal
28 theory (e.g., Conroy et al., 2003; Elliot & McGregor, 2001; Wang, Biddle, & Elliot, 2007).
29 Each of the four goals has been associated with a different set of antecedents, processes, and
30 psychosocial, motivational and behavioural outcomes (e.g., Elliot & McGregor, 2001; Moller
31 & Elliot, 2006; Nien & Duda, 2008). Mastery approach goal endorsement can be expected to
32 result in the most adaptive outcomes, as both the approach component of this goal and the
33 orientation towards learning and improvement are positive in character (Elliot & McGregor,
34 2001). In contrast, performance approach goals have been characterised as 'valuable, yet

1 vulnerable forms of regulation' (Elliot & Moller, 2003, p. 345). Comparison of performance
2 with others is highly diagnostic of competence, and therefore, performance approach goals
3 may be a manifestation of the innate need for competence, which is a natural source of
4 motivation (Elliot & Moller, 2003). However, individuals endorsing performance approach
5 goals are generally susceptible to disruptive motivational concerns, such as self-presentation,
6 self-validation, and self-protection concerns. These concerns are likely to distract individuals
7 from learning, understanding, and improvement, thereby prospectively impeding
8 motivational and behavioural outcomes (Elliot & Moller, 2003; Elliot & Thrash, 2001).
9 Based on the negative character of the avoidance component, less positive outcomes can be
10 expected for mastery and performance avoidance goals respectively (Moller & Elliot, 2006).

11 **3.3 Implicit theory of ability**

12 Implicit theory of ability suggests that individuals can either hold an incremental
13 theory of ability, or an entity theory of ability. These two views are differentiated by the
14 extent to which ability is regarded as a skill that can be improved (incremental theory) or as a
15 stable attribute (entity theory) (Dweck & Leggett, 1988). Holding an incremental theory of
16 ability has been related to better regulation of effort and cognition, planning and more
17 positive affect compared to holding an entity theory, both in physical education
18 (Ommundsen, 2001, 2003) and sport settings (Biddle, Wang, Chatzisarantis, & Spray, 2003).

19 **3. Overarching motivational model in the physical domain**

20 It is unlikely that a single motivational theory will be able to fully explain the
21 complexities underpinning human motivation. Therefore, rather than considering different
22 motivational theories as competing, there is a need for theoretical integration in motivational
23 research (Bong, 1996; Eccles & Wigfield, 2002; Hagger, 2009). The uniqueness of different
24 motivational constructs and the specifics of the interrelationship between constructs
25 contribute information that is valuable for the generation of a complete account of
26 motivation. Collectively, motivational theories may provide a basis for examining the
27 mechanisms behind the links between various motivational constructs and motivational and
28 behavioural outcomes. These likely include the mediating and moderating effects of
29 motivational constructs, which play an important role in the effectiveness of interventions.
30 Particularly when children are involved it is important to take the interrelationship between
31 motivational constructs into account. A change in a motivational construct due to the child's
32 development or age-related changes in the environment is likely to have an impact on other
33 motivational constructs and could ultimately impact upon their engagement in physical

1 activity. The next section of this manuscript outlines an overarching motivational model,
2 based on the motivational theories outlined in the previous sections. This model forms the
3 foundation for the discussion of the interrelationship between motivational constructs in
4 children that follows.

5 In the foregoing paragraphs, self-determination theory and achievement goal theory
6 have been discussed individually, as distinct motivational theories. There is an increasing
7 body of theoretical literature examining the commonalities and distinctions between
8 achievement goal theory and self-determination theory and the extent to which the two
9 theories provide complementary explanations of motivated behaviour. For example, Butler
10 (1987) argued that taking achievement goal theory into account, alongside self-determination
11 theory, would provide an enhanced framework for analysing the effect of socio-contextual
12 factors on motivation, interest, and behaviour. Socio-contextual factors that stimulate effort
13 and personal improvement, thereby promoting the adoption of mastery goals, were proposed
14 to be positively linked to intrinsic motivation. In contrast, socio-contextual factors that
15 facilitate the adoption of performance goals were considered to be unrelated to intrinsic
16 motivation, or to have undermining effects, as they arouse a focus on external contingencies
17 for success (Butler, 1987). In response to Butler's article, Ryan and Deci (1989) elucidated
18 that achievement goals are an explicit part of self-determination theory. Self-determination
19 theory considers autonomy support in the environment as essential for the emergence of high
20 levels of autonomous motivation (Ryan & Deci, 1989). Performance goals are characterised
21 by internal control or pressure that individuals apply to themselves; the individual has to
22 perform well in order to validate self-worth (Ryan, 1982). This internal pressure thwarts
23 satisfaction of the need for autonomy, similarly to external constraints or external pressures in
24 the environment, which consequently impedes the emergence of high levels of autonomous
25 motivation. Mastery goals in contrast, are expected to facilitate perceptions of autonomy, and
26 the emergence of high levels of autonomous motivation (see Ryan & Deci, 1989).

27 Support has emerged for the integration of the motivational continuum forwarded by
28 self-determination theory and achievement goal theory (both the dichotomous and 2 x 2
29 framework) in the physical domain, with converging results in relation to exercise, sport and
30 physical education (Hein & Hagger, 2007; Moreno, Gonzalez-Cutre, Sicilia, et al., 2010;
31 Ntoumanis, 2001a; Spray, Wang, Biddle, & Chatzisarantis, 2006; Standage & Treasure,
32 2002).

33 Although the relationship between achievement goals and the different levels of self-
34 determined motivation has been widely investigated in the physical domain, very limited

1 research has been devoted to examining the relationship between achievement goals and need
2 satisfaction. Based on theory, mastery goals are more likely to actualise need satisfaction
3 compared to performance goals (see Ntoumanis, 2001a). With mastery goals, self-referenced
4 criteria are used to estimate competence. This facilitates satisfaction of the need for
5 competence as individuals have personal control over the perceived level of competence
6 (Duda et al., 1992; Nicholls, 1989; Ntoumanis, 2001a). Satisfaction of the need for autonomy
7 is also anticipated to be facilitated when mastery goals are endorsed, as the focus is on
8 features inherent to the activity, and not on controlling outcomes such as outperforming
9 others (Dyrlund, 2008; Nicholls, 1989). In comparison, individuals endorsing performance
10 goals are reliant on the competence level of others to reach their achievement goal, that is, to
11 outperform others with less or equal effort. Behaviour is controlled by the urge to seek social
12 approval and achieve rewards, and the demonstration of superior ability, which interferes
13 with satisfaction of the need for competence and autonomy (Ntoumanis, 2001a).
14 Furthermore, individuals endorsing performance goals often continuously compare their
15 performance with others, and as a result feelings of rivalry are likely to emerge. This may
16 undermine social relationships, and thereby satisfaction of the need for relatedness (Elliot &
17 Moller, 2003; Ntoumanis, 2001a).

18 Preliminary support has been found for the anticipated relationships between
19 achievement goals and satisfaction of the three needs in the physical activity domain. A
20 recent study investigating need satisfaction in a large sample of adults found that
21 achievement goals influenced the participants' level of self-determined motivation for
22 exercise both directly and indirectly through need satisfaction (Dyrlund, 2008). In physical
23 education settings, studies involving secondary school students have identified a mediational
24 role of need satisfaction in the relationship between motivational climate (i.e., environments
25 that are more or less mastery-oriented) and behavioural regulations (Ntoumanis, 2001b;
26 Standage et al., 2003). It is likely that in these studies the motivational climate was related to
27 the students' goal adoption, which would imply a relationship between goals, need
28 satisfaction and behavioural regulation.

29 Only one study is known to have related the 2 x 2 achievement goal theory to the
30 three needs forwarded by self-determination theory. This study involved a sample of 11 to 18
31 year old students in a physical education setting (Wang et al., 2007). Applying a cluster
32 analysis, this study found that a cluster with high achievement goals (high scores on all four
33 goals), and a cluster with high mastery approach, and mastery avoidance goals only, yielded
34 the most optimal outcomes in terms of satisfaction of the needs for competence and

1 relatedness, level of autonomy of behavioural regulation, and behavioural and affective
2 outcomes (Wang et al., 2007). A relative autonomy index (composite score of the behavioural
3 regulations) was used as an indication of autonomy need satisfaction in this study.

4 Implicit theory of ability (Dweck, 1986) is considered an important antecedent of
5 achievement goals (Dweck, 1991; Nicholls, 1989). An incremental theory of ability is posited
6 to prompt the endorsement of mastery goals, as the belief that effort has utility is likely to
7 engender a focus on improvement, learning and development of new skills (Dweck &
8 Leggett, 1988). In contrast, an entity theory is postulated to facilitate performance goal
9 endorsement, as concerns about the level of ability are likely to arise due to this view of
10 ability levels as fixed, together with the urge to demonstrate normative ability (Dweck &
11 Leggett, 1988). Cross-sectional studies have supported the relationship between implicit
12 theory of ability and achievement goals (in a dichotomous framework) in physical education
13 and sport settings (e.g., Biddle et al., 2003). The relationship has also been confirmed
14 experimentally (Spray, Wang, Biddle, Chatzisarantis, & Warburton, 2006) in a sample of
15 high school students. Spray and colleagues (2006) found that inducing an incremental theory
16 of ability in sport increased the likelihood that students endorsed mastery goals, while
17 inducing an entity theory facilitated the endorsement of performance goals. Similarly,
18 inducing an incremental theory of ability in 12 to 16 year old physical education students has
19 been found to result in more intrinsic motivation toward a lateral movement task compared to
20 inducing an entity theory (Moreno, Gonzalez-Cutre, Martin-Albo, & Cervello, 2010). This
21 effect of implicit theory of ability on motivation may have been mediated by achievement
22 goals, however, achievement goals were not taken into account within this study.

23 Studies in the physical domain have provided initial evidence that the relationship
24 between implicit theory of ability and achievement goals is typically maintained when the 2 x
25 2 achievement goal framework is applied. An incremental theory has typically been related to
26 mastery-approach or avoidance goals, while an entity theory has generally been found to be
27 associated with performance-approach or avoidance goals (Moreno, Gonzalez-Cutre, Sicilia,
28 et al., 2010; Wang, Liu, Lochbaum, & Stevenson, 2009; Warburton, 2009). Whether
29 approach or avoidance goals are endorsed is thought to be influenced by the individual's level
30 of perceived competence. A positive relationship between high perceived competence and
31 (both mastery and performance) approach goals has been documented in physical education
32 (Wang et al., 2009; Warburton, 2009; Warburton & Spray, 2008), and sport settings (Moreno,
33 Gonzalez-Cutre, Sicilia, et al., 2010; Morris & Kavussanu, 2007; Nien & Duda, 2008). Low
34 perceived competence is likely to orient individuals to focus on negative possibilities, and

1 consistent with this low perceived competence has been related to avoidance goals (Moreno,
2 Gonzalez-Cutre, Sicilia, et al., 2010). However, the anticipated negative relationship between
3 perceived competence and avoidance goals could not be confirmed in a longitudinal study
4 involving 10 to 11 year old physical education students (Warburton & Spray, 2008). There is
5 a need for continued research, as controversy exists regarding the relationship of perceived
6 competence with other motivational constructs in the literature.

7 In sum, the integration of constructs of implicit theory of ability, achievement goal
8 theory, and self-determination theory is likely to result in a deeper understanding of
9 motivated behaviour in the physical domain, including sport, exercise and physical education.
10 Implicit ability beliefs are suggested to relate to achievement goals (in a 2 x 2 framework),
11 which are in turn expected to be related to need satisfaction and level of self-determined
12 motivation (see Figure 1). The role of perceptions of competence in this motivational
13 sequence is to be further investigated. In the next sections the applicability of these existing
14 motivational theories to child samples will be reviewed in relation to physical activity.

15 Insert Figure 1 about here

16 **4. Motivational constructs in children**

17 One of the assumptions of self-determination theory is that it is in human nature to
18 engage in novel and challenging activities (Ryan & Deci, 2007). This results in learning and
19 development, and is reflected in intrinsic motivation (Ryan & Deci, 2000a). The curious and
20 active nature of humans is observable from birth onwards, such as in the early engagement in
21 play that is directed to learn and explore in the absence of external incentives (Ryan & Deci,
22 2000a; White, 1959). However, not all behaviours are inherently interesting, and already at a
23 young age children encounter situation where they have to perform behaviours that they do
24 not enjoy doing, such as tidying up after play. In a study involving 5 to 13 year old children,
25 initial evidence was found for children's endorsement of extrinsic or internalised
26 motivational orientations towards unenjoyable behaviours (Chandler & Connell, 1987).
27 While children included in the study were found to be mostly intrinsically motivated towards
28 enjoyable behaviours, extrinsic and internalised motivational orientations were found to
29 dominate with regard to unenjoyable behaviours. Furthermore, findings suggested that
30 extrinsic motivation declined with age, while internalised motivation increased, suggesting a
31 developmental process where the regulation of unenjoyable behaviours based on external
32 sources gradually shifts to being internally regulated as the behaviour becomes personally
33 valued (Chandler & Connell, 1987). In line with Chandler's (1987) study, Ryan and Connell

1 (1989) were able to identify external, internalised (introjected regulation and identified) and
2 intrinsic behavioural regulation as distinct types of motivation underlying behaviour in 9 to
3 12 year old children in an academic setting. The motivational continuum that was found
4 relevant for 9 to 12 year old children in the academic domain has since been largely applied
5 in the physical domain, involving samples of youth and adults, but not children.

6 Despite a lack of empirical evidence, we expect the motivational continuum that was
7 identified in primary school-aged children in the academic setting to be applicable to the
8 child population in physical activity settings. We base our hypothesis on several sources of
9 evidence. For example, considering the evidence that young children typically consider
10 physical activities inherently enjoyable and value participation in them (Cumming, Smith,
11 Smoll, Standage, & Grossbard, 2008), we anticipate that children are likely to express
12 intrinsic motivation towards physical activities. However, external and internalised
13 behavioural regulations are also expected to be relevant in relation to children's motivation
14 for physical activity. For example, primary school-aged students may participate in physical
15 education because they think it is important to do well at it, want to impress the teacher, or
16 want to win an award. Integrated behavioural regulation is not expected to be largely relevant
17 to children's motivation, as it is a developmentally more advanced form of regulation. The
18 range of behaviours that can be assimilated into the self, and thereby the likelihood that
19 integrated motivation is endorsed, increases with the development of cognitive capacities and
20 a personal identity (see Vallerand, 1997).

21 Self-determination theory considers the three needs as described in basic
22 psychological needs theory as innate, implying that satisfaction of the needs is critical
23 throughout all stages of life (Deci & Ryan, 2000). In a study involving 7 to 18 year old
24 gymnasts, satisfaction of the three needs as a result of autonomy support and involvement
25 from parents and coaches was associated with higher levels of autonomous motivation, more
26 positive affect and self-esteem, and less negative affect (Gagné, Ryan, & Bargmann, 2003).
27 These outcomes mirror the effects of need satisfaction that have been identified in older
28 samples (Deci & Ryan, 2000), suggesting a comparable role of need satisfaction in children
29 and adults.

30 In relation to the development of achievement goals, Nicholls (1989) argued that
31 children establish achievement goal orientations as they have acquired a mature conception of
32 ability. Children who have developed a mature understanding of ability are capable of
33 accurately discriminating between effort and ability. With this insight, they become more
34 likely to judge their performance relative to others, that is, to adopt a performance goal

1 orientation (Nicholls, 1989). In the academic domain, this was originally not expected to
2 occur before the age of 11 or 12 years (Nicholls, 1978).

3 Researchers have argued that the age at which children start to differentiate between
4 motivational orientations varies by setting (Dweck, 2002; Fry & Duda, 1997). Results of
5 previous studies suggest that children may develop the capability of distinguishing between
6 effort and ability at an earlier age in the physical domain compared to the academic domain
7 (Fry & Duda, 1997). The emergence of achievement goal orientations may not be contingent
8 solely on children's developing cognitive abilities, but also on children's level of experience
9 with the specific situation (Butler, 2005). In early stages of skill acquisition children focus on
10 learning and determining what is required to successfully complete a task. Only after a
11 certain amount of practice and experience has been acquired, children begin to compare their
12 performance to that of others (Butler, 2005). When children encounter ample exposure to a
13 specific situation at a young age, they are likely to engage in social comparison to evaluate
14 their performance from a young age onwards, increasing the likelihood of performance goal
15 adoption.

16 Apart from experience, cues available in the environment also impact upon the
17 development of achievement goals. At young ages, children are generally surrounded by
18 environments in which a focus on learning and mastery predominates. Consequently, children
19 are more likely to adopt mastery goals, as these goals are more closely tailored to the
20 environment. However, children have been found capable of adopting performance goals at a
21 young age, as long as tasks are meaningful, and information regarding their performance is
22 accessible and easy to process (Smiley, 1994). In the physical domain high effort is
23 accompanied with bodily responses such as sweating, increased breathing, muscle tension or
24 fatigue (Cumming et al., 2008). This makes it easier for children to estimate how hard they
25 are working. The public, physical and competitive nature of physical activities facilitates
26 evaluation of ability and effort expenditure relative to others (Cumming et al., 2008; Duda et
27 al., 1992; Fry & Duda, 1997). As a consequence, achievement goals can be expected to
28 develop at an earlier age in the physical domain compared to domains where less
29 performance and effort cues are apparent (Cumming et al., 2008; Fry & Duda, 1997). In line
30 with this, it was shown that children could reliably distinguish between mastery and
31 performance goals by the age of 9 years in a sport setting (Cumming et al., 2008). No
32 evidence could be found for the existence of separate approach and avoidance goals in this
33 study (Cumming et al., 2008).

1 Inconsistent with the assumption that goal orientations develop at an earlier age in the
2 physical domain, a study in the academic domain found children as young as first grade
3 (which typically involves 6 to 7 year old children) to already endorse both approach and
4 avoidance goals (Bong, 2009). However, the studies of Cumming et al. (2008) and Bong
5 (2009) applied different methods, criteria and measures. For example, Cumming et al. (2008)
6 were unable to generate independent approach and avoidance goals, as the correlations
7 between approach and avoidance subscale-scores were considered too strong. The existence
8 of equally high correlations between the four achievement goals was accepted by Bong
9 (2009). When stricter criteria are applied to the data of Bong (2009), correlations between the
10 2 x 2 achievement goals suggest that the youngest children included in the study
11 differentiated between mastery approach and mastery avoidance goals, but not between
12 performance approach and performance avoidance goals or mastery approach and
13 performance approach goals. This implies that children may start to discriminate between
14 potential success or failure situations, and related outcome expectancies which they want to
15 approach or avoid, before they are capable of reliably differentiating between situations
16 where success is achieved by task mastery or outperforming others (definition of achievement
17 goals). This notion is in line with Elliot and Covington's (2001) depiction of approach and
18 avoidance tendencies as congenital, conceivably driven by a neuroanatomical structure of the
19 brain.

20 In contrast to the development of children's capability to differentiate between
21 mastery and performance goals, which has already been studied in early stages of
22 achievement goal research (e.g., Nicholls, 1978), little research has focussed on the
23 development of approach and avoidance goals. Based on the available literature a
24 developmental progress of the four goals can be suggested. Young children are generally
25 found to be mastery oriented (Anderman, Austin, & Johnson, 2002; Nicholls, 1989; Stipek &
26 Mac Iver, 1989). They tend to see achievement situations as attractive rather than aversive
27 (Stipek & Mac Iver, 1989), and approach new situations with confidence to do well and the
28 aspiration to learn. After initial experience has accumulated, children start to discriminate
29 between situations in which they expect to be successful and situations where failure is
30 anticipated. Experiences of failure are associated with unpleasant feelings, which children try
31 to avoid when anticipated. When ample success and failure experiences are incorporated in
32 children's self-schema this is believed to direct them to the adaption of approach or
33 avoidance goals specific to the achievement situation were these experiences were
34 encountered (Bong, 2009).

1 correlations have previously been found between approach and avoidance goals (e.g.,
2 Cumming et al., 2008; Moreno, Gonzalez-Cutre, Sicilia, et al., 2010). These high correlations
3 may not necessarily imply children's incapability to differentiate between the goals, but may
4 be partially due to measurement issues. The quantitative, questionnaire-based evaluation
5 methods that are generally applied to assess achievement goals do not provide insight into
6 how the items are interpreted by respondents. Previously, a qualitative study found that a
7 large percentage of senior high school students' accounts of their positive responses on items
8 tapping performance avoidance goals were in fact characteristic of performance approach
9 goals (Urda & Mestas, 2006). Particularly when younger samples are involved, items may
10 not be interpreted as intended by the researcher, which negatively impacts upon the validity
11 of study results. Furthermore, items tapping achievement goals have not always been fully
12 consistent with the definition of goals forwarded by achievement goal theory. For example,
13 the studies of Bong (2009) and Cumming et al. (2008) applied achievement goal
14 questionnaires that included items referring to motives, value and emotion. Though related to
15 achievement goals, such attributes are not part of their definition. Values and beliefs may
16 develop at a younger age than achievement goals (see Wigfield & Eccles, 1992; Wigfield,
17 Eccles, Roeser, & Schiefele, 2008), and therefore, tapping value in achievement goal items
18 could confound the results of studies investigating the development of achievement goals.

19 Lastly, in relation to children's implicit theories of ability, individual differences, but
20 no consistent age difference, have been identified (see Dweck, 2000; Kinlaw & Kurtz-Costes,
21 2003). Children of all ages appear capable of adopting either an incremental, or an entity
22 theory of ability.

23 As reviewed, some motivational studies involving primary school-aged children,
24 focussing on single motivational constructs, have been conducted in the physical activity
25 domain. The limited research available suggests that children discriminate between the
26 motivational constructs discussed, with more refined discriminations within the constructs
27 emerging over childhood. Since the motivational constructs appear to bear relevance to
28 children, it seems imperative that more developmentally appropriate measures are developed
29 to adequately assess children's motivational orientations, in order to facilitate continued
30 research. Such research should investigate the relationship between motivational constructs
31 from different theories in primary school-aged children. The interrelationship that has been
32 identified in older samples (see Figure 1) is not likely to be generalisable to the child
33 population, for example, as not all motivational orientations are endorsed by younger children
34 (as illustrated earlier in relation to achievement goals). No study to date has examined this

1 issue, however, in the following sections preliminary suggestions in the literature regarding
2 the interrelationship between motivational constructs in children will be reviewed.

3 **5. Interrelationship between motivational constructs in children**

4 The relationship between self-determination theory and achievement goal theory in
5 children has been investigated in sport and physical education settings. In a sport setting,
6 Cumming et al. (2008) revealed a positive relationship between mastery goals and more
7 autonomous types of motivation, and a negative relationship between mastery goals and
8 extrinsic and amotivation in children as young as 9 years of age. No association between
9 performance goals and level of self-determined motivation could be identified in the youngest
10 age group involved in this study (9-10 y). However, a positive relationship between
11 performance goals and the more controlled types of motivation was found in the overall
12 sample (9-14 y) (Cumming et al., 2008). Another study, involving 10 to 13 year old physical
13 education students, has identified relationships between mastery and performance goals, and
14 autonomous and controlled types of motivation respectively (Mouratidis, Lens, & Sideridis,
15 2010). These results suggest that consistent relationships between achievement goals and level
16 of self-determined motivation emerge in late-childhood.

17 **Taking the distinction between approach and avoidance goals into account, a study**
18 **involving competitive swimmers between the ages of 7 and 18 years investigated the effect of**
19 **achievement goals on the different types of motivation (Conroy, Kaye, & Coatsworth, 2006).**
20 **The relationships found between the four goals and different levels of self-determined**
21 **motivation were largely consistent with the theory and previous findings in older samples.**
22 **Mastery approach goals were found to be positively related to more autonomous types of**
23 motivation and negatively related to more controlled types of motivation, while the opposite
24 was found for both avoidance goals. Performance approach goals were associated with more
25 controlled types of motivation, and were found to be unrelated to intrinsic motivation. These
26 are valuable preliminary results, as no other study to date has investigated the 2 x 2
27 achievement goal framework, and its interrelationship with other motivational constructs in
28 children. However, caution is required with the interpretation of the results. Motivational
29 constructs were assessed with the use of self-report questionnaires that had previously been
30 validated in older samples only (Conroy et al., 2006). Age of participants was not considered
31 a factor of importance either for the assessment of motivational constructs, or for the analysis.
32 However, as our previous analysis of the literature on the differentiation of motivational
33 constructs in children illustrates, it is not valid to consider children's motivational

1 orientations as identical to those of adults, nor is it valid to assume that children's
2 interpretation of questionnaire items is identical to that of adults without testing these
3 assumptions. As age was not taken into account, it remains unclear whether the constructs
4 were related in a similar fashion in across all ages.

5 Studies investigating the relationship between achievement goal theory and self-
6 determination theory have largely omitted to take need satisfaction into account. There is a
7 lack of knowledge about how the satisfaction of these three needs is related to achievement
8 goals and the different levels of self-determined motivation in children. Intrinsically
9 motivated behaviour occurs naturally in very young children, and in order to be sustained
10 satisfaction of the needs for competence, autonomy and relatedness is required (Ryan & Deci,
11 2000b). As the three needs are considered innate (Deci & Ryan, 2000), it is likely that the
12 link between need satisfaction and different levels of self-determined motivation already
13 exists at a young age.

14 The mediating role of need satisfaction in the relationship between achievement goals
15 and levels of self-determined motivation is likely to be contingent to the development of
16 achievement goals. As achievement goals develop, the specific goal that is endorsed is likely
17 to have an impact on motivational and behavioural outcomes, including satisfaction of the
18 innate needs. It seems plausible that the same mechanism behind the relationship between
19 achievement goals and the three needs in adults, as described earlier, are pertinent to child
20 samples. For example, a child who endorses a performance approach goal, and constantly
21 tries to outperform peers in the physical education class may feel controlled by this goal and
22 experience feelings of rivalry. This is likely to have an impact on satisfaction of the innate
23 needs for autonomy and relatedness respectively. Research is needed to test these
24 assumptions in the physical activity domain, as no empirical evidence regarding these
25 relationships in children is available as yet.

26 Lastly, the relationship between implicit theory of ability and achievement goal
27 theory, as evidenced in college-aged and adult samples, is likely to hold for children. Young
28 children generally believe in the malleability of ability, thereby holding an incremental theory
29 of ability (Dweck & Leggett, 1988; Nicholls, 1989). This is in accordance with the
30 predominant endorsement of mastery goals that has often been observed in children in the
31 physical activity domain (e.g., Barkoukis, Hagger, Lambropoulos, & Tsorbatzoudis, 2010;
32 Digelidis & Papaioannou, 1999), suggesting the presence of a relationship between the two
33 constructs already at a young age. The belief that effort is required to achieve success in sport
34 prevailed in a sample of middle-school students with an average age of 10 years, along with a

1 primary endorsement of mastery goals (Duda et al., 1992). Both constructs loaded on the
2 same factor, suggesting the existence of an interrelationship between the constructs in late-
3 childhood (Duda et al., 1992). A relationship between entity theory of ability and
4 performance goals was also suggested by the results of this study (Duda et al., 1992). Duda et
5 al. (1992) proposed that children's achievement goals are a logical embodiment of their
6 beliefs about the origin of success in physical activities (Duda et al., 1992). No recent studies
7 in the physical activity domain have tested the propositions of Duda and colleagues.

8 In short, based on the available literature, it can be expected that the relationships
9 between implicit theory of ability, achievement goal theory and self-determination theory that
10 have been identified in youth and adult samples (presented in Figure 1) are generalizable to
11 children, contingent to the development of these motivational orientations. However, there is
12 a need for studies to systematically investigate these relationships in children below the age
13 of 12 years. Also, research is needed to further investigate the age at which children start to
14 differentiate between the various motivational constructs in the physical domain, and also to
15 which extent this age is dependent on socio-contextual conditions and the child's level of
16 experience. Previous findings regarding the development of motivational orientations in
17 children are inconsistent, which may be due to the diverse settings in which studies have been
18 performed. Different environments emphasise different values, and place different demands
19 on children, which afford the endorsement of different motivational orientations, and may
20 facilitate the emergence of motivational attitudes at different times. Research should,
21 therefore, be domain specific and careful consideration of the differential impact of children's
22 development and the changing environment over development on research findings is
23 required.

24 The strength of relationships between motivational constructs increases over
25 childhood (Kinlaw & Kurtz-Costes, 2007; Wigfield, 1994). The association between
26 motivational constructs and outcomes also becomes stronger with age, and therefore, it
27 becomes increasingly important to ensure that adaptive motivational orientations are
28 endorsed. More research is needed to investigate at what age motivational constructs become
29 consistently related in a theoretically predictable way, as this has implications for the design
30 of effective interventions to promote physical activity.

31 **6. Motivation for physical education**

32 A unique setting to respond to this need for research on children's motivational
33 orientations toward physical activity, and to consequently implement interventions to

1 facilitate continued participation in sufficient physical activity, is provided by physical
2 education. Physical education is a mandated part of the primary school curriculum for most
3 children. Therefore, motivational research in physical education settings can capture the
4 motivational orientations of complete age-cohorts. As previously outlined, motivational
5 orientations are likely to be context specific and dependent on children's experiences.
6 Motivational research in physical education could provide knowledge for the development of
7 effective interventions specifically tailored to physical education. Such interventions have the
8 potential to impact on the motivational attitudes of all children, also those who do not
9 normally engage in organised or leisure-time physical activities. Motivation has been found
10 to transfer from the physical education context to leisure time physical activity (Barkoukis et
11 al., 2010; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003). Furthermore, positive
12 physical education experiences have been linked to higher levels of leisure-time physical
13 activity in young adolescents (Cox, Smith, & Williams, 2008; Hagger et al., 2009).

14 Researchers have suggested that the purpose of physical education is to equip children
15 with the necessary psycho-motor and psycho-behavioural skills to engage in lifelong physical
16 activity, and to facilitate the development of positive attitudes toward physical activity
17 (MacNamara et al., 2011). Physical education alone does not result in enough physical
18 activity to meet the physical activity recommendations (Fairclough & Stratton, 2005).
19 Therefore, its aim should be to engender adaptive motivational orientations in children
20 engaging in physical education, which may generalise to leisure time physical activity.
21 Teaching children adequate self-motivation, self-management, planning, and goal setting
22 skills during physical education could provide children with the capacity to choose to be
23 physically active outside of school (MacNamara et al., 2011).

24 It is acknowledged that this is a capacious aim for a school subject that only takes up a
25 very limited proportion of the school curriculum (McKenzie & Lounsbery, 2009). A
26 multitude of barriers hinder physical education's efficacy in promoting physical activity. The
27 time allocated to physical education during the school curriculum has declined globally
28 (Hardman, 2008; Puhse & Gerber, 2005), there is often a lack of sufficient resources, and
29 teachers are not always adequately prepared to instruct physical education classes (Hardman,
30 2008) (McKenzie & Lounsbery, 2009). It has been reported that the content of physical
31 education does often not line up with what is relevant for children's lifestyle and health.
32 Frequently, the main focus is on sport skill training and not on motivating students to engage
33 in physical activities outside of physical education (Hardman, 2008) (McKenzie &
34 Lounsbery, 2009). There is a need to restructure physical education lessons so that they

1 provide students with enjoyable experiences and simultaneously teach skills that are
2 transferable to various physical activity settings, such as sports and games in leisure-time and
3 later in life (McKenzie & Lounsbery, 2009). If more research was available identifying which
4 constructs are important in relation to children's motivation, the effectiveness of physical
5 education classes, and interventions promoting physical activity engagement could be
6 enhanced.

7 Until sufficient research has been conducted, preliminary recommendations regarding
8 the best practice during physical education can be made based on the available knowledge.
9 The belief that ability is malleable and related to effort should be fostered to facilitate the
10 students' endorsement of an incremental theory of ability (Moller & Elliot, 2006), for
11 example by signifying students' personal improvement over the course of the semester.
12 Children's endorsement of mastery approach goals could be promoted by creating an
13 atmosphere characterised by inter-student cooperation, in which effort, learning and
14 participation are valued, and minimal emphasis is placed on competition (Ames, 1992).
15 Fostering perceptions of personal control, competence, and positive relationships within the
16 peer-groups and with the teacher are likely to facilitate students' need satisfaction and may
17 consequently enhance intrinsic motivation (Deci & Ryan, 1985). To this end, it is important
18 that classes offer students optimal challenges in relation to their ability, and teachers provide
19 students with positive, informational feedback (Ryan & Deci, 2000b). Despite the controlled
20 character that is inherent in physical education, teachers could attempt to facilitate students'
21 perceptions of autonomy by providing them with choice, for example by letting them choose
22 between multiple activities. As not all students are equally motivated, and tasks are not
23 always regarded as enjoyable by students, teachers could acknowledge students' conflicts
24 regarding their engagement in physical tasks, and provide a rationale for the activities (e.g.,
25 Barkoukis et al., 2010; Taylor & Ntoumanis, 2007).

26 Ultimately, a multifaceted approach to the promotion of physical activity is needed,
27 including a focus on socio-contextual factors and the physical environment (see Zhang &
28 Solmon, 2013). For example, complementing physical education interventions, the
29 involvement of parents is essential, as they play an important role in the child's physical
30 activity participation outside of school (McKenzie & Lounsbery, 2009). By implementing
31 such multifaceted strategies, children's motivation for physical education and leisure time
32 physical activity may be enhanced, ultimately resulting in increased levels of physical
33 activity. Even though physical education provides only one of many potential setting of
34 intervention, it has been found to in itself account for approximately 8.7% - 23.7% of daily

1 steps in boys, and 11.4% - 17.2% in girls (Tudor-Locke, McClain, Hart, Sisson, &
2 Washington, 2009), and to affect activity levels outside of school (Dale, Corbin, & Dale,
3 2000; Morgan, Beighle, & Pangrazi, 2007). Its contribution can, therefore, be significant.
4

5 **7. Conclusion**

6 In conclusion, there is a relative scarcity of research into children's motivational
7 orientations in relation to physical activity. Most knowledge that has accumulated on this
8 issue stems from early work, and there is a clear lack of recent studies focussing on
9 motivation in primary school-aged children. Theoretically driven research is needed to
10 investigate motivation for physical activity in children. The three motivational theories that
11 have been discussed in this manuscript, and their interrelationship, could provide a valuable
12 framework for this purpose. The nature and strength of the relationship between the
13 motivational constructs discussed requires systematic investigation in the child population,
14 with the use of developmentally appropriate measures. As a result a deeper understanding
15 will emerge of what moves children to move, and how to facilitate the adoption of active
16 lifestyles that persist at older ages. This could consequently inform the development of
17 effective behaviour change interventions to motivate children to be physically active, and
18 remain active into adolescence and adulthood. Physical education provides a valuable setting
19 for the implementation of such interventions, as it has the potential to reach all school-aged
20 children. Ultimately, the implementation of multifaceted interventions, of which physical
21 education is one focus, could ameliorate the health prospects of the child population.
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Figure captions

Figure 1. Proposed relationship between motivational (sub-) theories.

Note. SDT = self-determination theory

Figure 2. Suggested progression of achievement goal development.

Figure 1

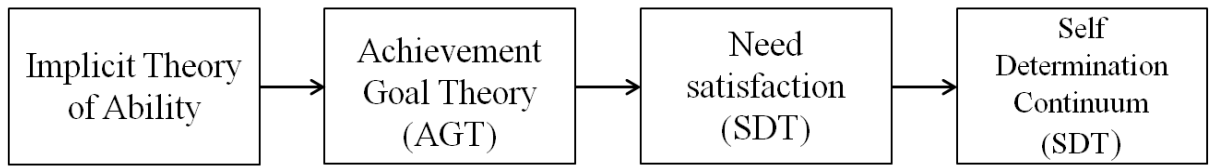


Figure 2

