Implicit Theories of Ability in Physical Education:

Current Issues and Future Directions

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Abstract

Purpose: In light of the extensive empirical evidence that implicit theories have important motivational consequences for young people across a range of educational settings we seek to provide a summary of, and personal reflection on, implicit theory research and practice in physical education (PE).

Overview: We first introduce the key constructs and theoretical propositions associated with implicit theories. We then include a brief summary of the research findings on ability beliefs in school PE, which we draw on to identify several key issues that we feel are crucial to furthering our understanding of this topic. We conclude by offering a number of ideas for future research and discuss the potential misinterpretation of implicit theories when applied to professional practice in PE.

Conclusion: We argue that researchers need to address more nuanced questions around implicit theories to prevent this area of inquiry from stalling. Moreover, we need to provide teachers with more specific recommendations to help them integrate theory and research into practice.

Keywords: implicit theories of ability; incremental beliefs; entity beliefs; PE; young people; motivation; review
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Introduction

We have recently seen an explosion of interest in the body of work of Carol Dweck and her ‘growth mindset’ in schools across both the UK and US (Dewitt, 2015). As schools embrace, what some might call, the latest trend in the identification of a panacea for learning, motivation, and achievement in the classroom, many have adopted a whole-school approach and identify themselves as having a growth mindset culture. However, what does this mean for physical education teachers where athletic ability rather intelligence is the attribute that is the focus of the mindset? Physical Education (PE) is a unique part of the school curriculum; it combines the educational values of learning and improvement with some activities that are inherently competitive and are associated with the general discourse that sport ability is a natural talent (for a discussion see Houlihan & Green, 2006; Lee, 2004). Applying the work on mindsets to PE requires an appreciation and understanding of this and how the teaching and learning environment may differ to that of a traditional classroom. It is important to note that while mindsets may be the popularised term, the research literature adopts a number of terms such as implicit theories of ability, self-theories of ability, implicit beliefs, beliefs about ability, theories of change, and conceptions of ability (Spray, in press).

In light of the popularity of this topic within schools and the idiosyncrasies associated with applying the growth mindset in PE, it is appropriate and timely to offer an examination of research in this area and its application to PE within this special issue on student motivation. In appraising this area of work, we first provide a brief theoretical overview that introduces the key concepts and theoretical propositions of implicit theories of ability. We

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1 Within the literature, the terms athletic ability and sport ability are both used to refer to people’s views about the nature of ability in the physical context and are thus used interchangeably within the literature and this review. Moreover the use of ability in these terms refers to the possession of the talents and skills necessary to perform a current task or as defined by Schmidt (1982, p.395) “the collection of “equipment” that one has at their disposal” which makes it possible for an individual to achieve a task in the physical context.
then include a brief summary of the research findings on ability beliefs in PE that focus on samples under 18 years of age, which we draw on to identify several issues that we feel are crucial to furthering our understanding of this topic. From this discussion, we offer a number of ideas for future research and conclude with issues in the application to practice. We include some of the potential misconceptions in the application of Dweck’s work in the classroom and take into account the unique aspects of the teaching and learning environment in PE and beliefs about athletic ability. Arguably, research in PE (and sport) has ‘stalled’ in recent years and we hope that one outcome of this review will be to rejuvenate scientific inquiry into implicit beliefs.

**Theoretical Overview**

The ‘growth mindset’ has become a popular term, emerging from an extensive programme of research by Dweck and her colleagues (see Dweck, 1999; Dweck & Molden, 2005 for overviews). Initial work focused on student’s helplessness and attributional patterns after failure and identified that an individual’s implicit theory, their view about the stability or malleability of human attributes and behaviors (in this case intelligence) can affect students’ motivation, achievement, learning and behavior (Dweck, 1986, 1990, 1999; Dweck & Elliott, 1983; Elliott & Dweck, 1988). Two implicit theories were identified: an incremental theory of ability that reflects the view that our attributes and behaviors are malleable, controllable qualities that can be developed; and an entity theory of ability that reflects the view that our attributes and behaviors are fixed, stable quantities. Dweck (1999) argues that the two implicit theories create a meaning system through which students attempt to understand their world and organise their experiences. Beliefs act as a lens through which students view and judge their achievements and disappointments.

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2 Following this initial work on intelligence a range of human attributes and behaviors have been studied in relation to implicit theories, for example, athletic ability, interpersonal relationships, personality, social judgement, stereotyping, and morality.

3 For the purpose of this article, we will adopt the terms incremental and entity rather than growth and fixed mindsets to be consistent with the scientific literature in physical education.
Consequently, the endorsement of one theory over the other has potentially important consequences for the individual as the theories are viewed as alternative ways of constructing meaning. Implicit beliefs can influence what the student values, how they approach tasks and challenges, and how they respond to the outcomes of tasks. This is achieved through underpinning the goals that students focus on (Elliott & Dweck, 1988).

Specifically, the endorsement of an incremental implicit theory is proposed to lead to the adoption of mastery goals and focuses the individual on improving their ability. It is associated with a range of positive cognitive, affective and behavioral outcomes, such as, higher achievement, lower levels of anxiety and self-handicapping, higher levels of satisfaction and enjoyment, and more effective self-regulation (Biddle, Wang, Chatzisarantis, & Spray, 2003; Blackwell, Trzniewniewski, & Dweck, 2007; Good, Rattan, & Dweck, 2012; Ommundsen, 2001ab, 2003). On the other hand, the endorsement of an entity implicit theory is proposed to lead to the adoption of performance goals and focuses the individual on proving their ability and is associated with a more negative set of outcomes, depending of the individual’s level of perceived competence (i.e., one's beliefs about his or her ability in an achievement domain). These outcomes include higher levels of amotivation, self-handicapping and anxiety and lower levels of satisfaction and self-regulation (Biddle et al., 2003; Ommundsen, 2001ab, 2003). The differences between the two implicit theories and students’ motivational responses become most evident when students are facing challenges or setbacks. For an entity theorist, the different processing framework created by this belief and its links with associated structures such as performance goals, lead the individual to perceive their ability “to be an important and permanent personal attribute” (Dweck & Leggett, 1988, p. 264). Consequently, when entity theorists encounter failure they regard it as an indicator that, since their current ability is inadequate, their future ability will be inadequate too. They therefore doubt their ability to be successful in the future and exhibit a maladaptive response
to failure. In contrast, individuals who endorse incremental beliefs and encounter failure do not view it as indicating that their current ability level is fixed and permanently inadequate. The belief that current ability level can be improved leads them to exhibit a more adaptive response to the failure such as making attributions to personal and controllable factors. These contrasting responses and outcomes experienced by individuals’ endorsing different implicit theories have been evidenced across a range of human attributes and behaviors (Dweck & Molden, in press), including athletic ability (Biddle et al., 2003; Ommundsen, 2001abc, 2003; Warburton & Spray, 2008, 2009, 2013).

**Research Findings in Physical Education**

In this section, we review studies that have focused on the conceptualisation and application of Dweck’s incremental and entity theories of ability in PE. We are mindful that a related area of research is that of the undifferentiated and differentiated conceptions of ability grounded in the work of Nicholls (1989). We refer readers to this parallel research literature for further reading (Li & Xiang, 2007; Xiang, Lee, & Williamson, 2001; Xiang, Solomon, & McBride, 2006).

A recent systematic review and meta-analysis of implicit theory research identified 16 empirical studies conducted in the PE context prior to September 2014 (Vella, Braithwaite, Gardner, & Spray, 2016). Eleven of these studies in PE were cross-sectional, descriptive studies (plus 3 longitudinal studies and 2 experimental studies), with all but one study using either the original version of the Conceptions of the Nature of Athletic Ability Questionnaire (CNAAQ; Sarrazin et al., 1996) or the revised version (CNAAQ-2; Biddle et al., 2003).

Fourteen of the studies focused on child/adolescent samples (age range 10-16 years) and these had sample sizes ranging from 98 in one of the experimental studies to 682 in one of the

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4 An updated search, using the terms from this paper for the period from September 2014 to November 2016, revealed no empirical studies have been published since this time.

5 Readers are referred to the review but note that it covers research across PE, sport and physical activity. We have focussed here on the results associated with studies in PE.
cross-sectional studies. A range of variables were included in these studies in addition to implicit theories of ability, for example, motivational climate, achievement goals, perceived competence, enjoyment, autonomous and controlled motivation, anxiety, satisfaction, self-handicapping, self-regulation strategies, task difficulty, amotivation, performance on a task, achievement over time in PE, persistence, effort, boredom, and cheating acceptability. Support for the theoretical propositions of an entity theory of ability being associated with maladaptive outcomes and an incremental theory of ability being associated with adaptive outcomes was found in all types of study. Cross-sectional evidence (Biddle et al., 2003; Corrion et al., 2010; Cury, DaFonseca, Rufo, & Sarrazin, 2002; Ommundsen, 2001abc, 2003; Wang & Liu, 2007) identifies that individuals who more strongly endorsed the view that sport ability was a fixed, stable quantity were more likely to report higher levels of performance goals, cheating acceptability, perceptions of a performance climate, controlled motivation, anxiety and self-handicapping and lower levels of enjoyment, perceived competence, satisfaction and autonomous motivation. On the other hand, individuals who more strongly endorsed the view that sport ability was malleable were more likely to report higher levels of mastery goals, enjoyment, perceived competence, perceptions of a mastery climate, satisfaction and autonomous motivation and lower levels of cheating acceptability, controlled motivation, anxiety and self-handicapping in PE. Moreover, evidence also suggests that implicit theories of ability can apply to students’ views about their ability in specific activities in the PE curriculum in addition to the domain level of sport ability in general (Spray & Warburton, 2003). The nature of the activity and the skills and abilities required for success in the different activity areas of the curriculum appear to influence which implicit theory an individual endorses. For example, when students were participating in games activities they were more likely to
endorse an incremental belief, but when they were participating in gymnastic activities they were more likely to endorse an entity belief about ability (Spray & Warburton, 2003).

The longitudinal evidence in PE (Warburton & Spray, 2008, 2009, 2013) represents the only work of this type on implicit theories in the physical domain and has consistently revealed the importance for PE teachers to not only foster an incremental theory of ability but also to minimise the development of an entity theory of ability. Over time, the relationship between an entity theory of ability and performance goals strengthened, particularly for those focused on avoiding incompetence. These findings were evident across the transition from primary to secondary school and during Key Stage 3 (Warburton & Spray, 2008, 2009).

Specifically, in their 2008 study of 140 primary school children, Warburton and Spray found that across the transition to secondary school higher levels of an entity theory of ability in year 6 of primary school was associated with a focus on outperforming others in year 6 and that this association was maintained across year 7 of secondary school. However, students who reported an increase in their endorsement of an incremental theory of ability during year 7 reported an increase in their focus on goals concerning self-improvement and task mastery during this time. This evidence suggests that minimising the development of entity beliefs prior to the transition to secondary school is important if we are to encourage adaptive motivational responses in our young people.

Experimental evidence on implicit theories of ability in PE is limited in terms of the number and quality of studies (Vella et al., 2016). In a quasi-experimental design, Li (2006) examined the relationship between implicit theories and students’ understanding of the meaning of effort after practicing a novel task. Contrary to hypotheses, most students, regardless of their implicit theory, believed in the efficacy of effort and only partial support was found for students with stronger incremental views endorsing the view that trying hard

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6 Key Stage 3 refers to the three years of schooling in England and Wales when students are 11-14 years old (Education Act 2002, part 6).
would allow them to reach their full potential. However, the author noted some limitations of
the study design that need to be considered in future experimental work, such as the length of
time of engagement with the novel task, the types of effort statements used, and the use of an
ego-involved practice environment.

Only two experimental studies have attempted to mirror the early work of Dweck and
her colleagues (Dweck & Leggett, 1988; Dweck, 1999) to manipulate or prime students’
imPLICIT theories prior to a PE task and observe the effect on a range of outcomes (Moreno,
Gonzalez-Cutre, Martin-Albo, & Cervello, 2010; Spray, Wang, Biddle, Chatzisarantis, &
Warburton, 2006). These studies revealed initial evidence of a causal link between implicit
theories, goal preference, ability attributions and situational intrinsic motivation. Students in
the incremental group were found to report higher levels of situational intrinsic motivation
(Moreno et al., 2006) and focus on goals that valued learning, self-improvement, and mastery
of the task following failure feedback (Spray et al., 2006). Students in the entity group were
more likely to focus on goals that valued outperforming others and being the best both before
and after failure feedback. They were also more likely to blame their ability for their failure
than those in either the incremental or the control conditions (Spray et al., 2006). Despite
these initial encouraging findings, it is important to note that of these two studies only Spray
and colleagues included a manipulation check to determine if the priming of the implicit
belief had been effective. In their discussion, they noted that although they were successful in
priming the beliefs in the two experimental groups, there was no significant difference in
incremental beliefs between the incremental group and the control group. It seems that the
participants in the study were predisposed to endorsing incremental beliefs and thus reading a
passage was not sufficiently compelling to create a difference in incremental beliefs (see
Spray et al., 2006).

Reflections on Implicit Theory Research in Physical Education
Conceptualisation of Implicit Theories of Ability in Physical Education

Although we can trace the conceptualisation of the two implicit theories to the work of Dweck and her colleagues (Dweck, 1986; Dweck & Leggett, 1988) in that we are referring to the view of athletic ability as a stable or malleable attribute, there are important conceptual and measurement nuances that need to be considered. Much of the early research of Dweck and her colleagues was experimental and laboratory-based and focused on priming a dominant implicit theory for a particular task or activity and observing differences in responses. There has been very little of this type of research in PE where research interest in this area was developed with a view to exploring implicit theories using survey-based research designs in the field. Consequently, as noted above, research in PE has overwhelmingly relied on two particular measures of implicit theories of ability, the CNAAQ and the CNAAQ-2, which reflect a multidimensional view of athletic ability.

In developing the CNAAQ, Sarrazin and colleagues (1996) drew on the wider achievement motivation and motor behavior literatures to conceptualise athletic ability. Combining the work of Fleishman (1964), Ackerman (1990) and Schmidt (1982), Sarrazin and colleagues distinguished between skills and abilities to consider that athletic ability can be viewed both in terms of the underlying aptitudes, basic capabilities, and capacities that reflect abilities, and specific skills that are learned through participation and performance. Initially, in line with Dweck’s measures of implicit theories, students were asked to choose between dichotomies of whether sport ability was the result of a gift or the result of learning, if it was stable or unstable, and if it was general to many sports or if it was specific to particular sports. However, students were not able to exclusively choose between conceptions of sport ability in this way since they perceived that both options in the dichotomy contributed to sport ability. Consequently, athletic ability was conceptualised via six separate
dimensions (gift, stable, general, learning, unstable/incremental, specific) and the strength of endorsement for each dimension was assessed using a Likert scale (Sarrazin et al., 1996).

The conceptualisation of athletic ability was developed further by Biddle and colleagues (2003) in the CNAAQ-2 as there was limited empirical support for the general and specific subscales of the CNAAQ (see Biddle et al., 2003 for a discussion of these limitations). The CNAAQ-2 proposes a hierarchical structure to the conceptualisation of athletic ability, with the higher order incremental belief underpinned by improvement and learning subscales, and the higher order entity belief underpinned by gift and stable subscales. The conceptualisation and measurement of implicit theories in PE therefore allow students to indicate their level of endorsement of these lower-order beliefs. However, despite this attention to developing an appropriate conceptualisation of athletic ability and suitable measurement instruments, there has been no research that has used the lower-order subscales of the CNAAQ-2. Instead, researchers have invariably chosen to collapse the four subscales into the higher-order incremental and entity scales.

Overall, the CNAAQ-2 can be argued to have made a useful contribution in supporting and developing implicit theory research in PE and sport. However, work in other domains has more closely aligned the measurement of implicit theories to that of Dweck and her colleagues (see Dweck, 1999 for an overview). It is noticeable that the entity items in other domains do not have the hierarchical structure of the CNAAQ-2 and have a clear focus on the issue of a lack of change or difficulty in changing an attribute or behavior. While that is the case for the ‘stable’ subscale of the CNAAQ-2, one could question whether the classification of the ‘gift’ subscale as indicative of an entity belief is warranted. The items on this subscale focus on the idea of natural talent, being born with certain qualities, and having certain gifts to be good at sport or PE. However, why should having a ‘gift’ or ‘natural talent’

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7 It should be noted that Ommundsen’s (2001ab, 2003) work on implicit theories of ability in PE did explore the lower-order scales; however his research used the CNAAQ and not the CNAAQ-2.
for sport or PE be considered to represent a fixed, stable view of ability? Indeed, many athletes and coaches speak of natural talent and how it can be developed and built upon through hard work and effort, suggesting that a talent or gift for sport is not wholly affiliated with a view of ability as a stable, fixed entity (Jowett & Spray, 2013). Attending to these measurement and conceptualisation issues is necessary if future research in PE and sport is to advance our understanding of the effect of implicit theories in these achievement domains.

**Fluidity and Antecedents of Implicit Theories of Ability**

Dweck and her colleagues (Blackwell et al., 2007; Molden, Plaks, & Dweck, 2006; Murphy & Dweck, 2010) have demonstrated that implicit theories of intelligence are sensitive to intervention and can be manipulated through direct priming. However, much of the research on implicit theories in PE has focused on how ‘chronic’ individual differences in theory endorsement are associated with a range of adaptive or maladaptive outcomes (Biddle et al., 2003; Ommundsen, 2001ab, 2003). In other areas of research (personality, intelligence, social intelligence, and stereotypes), implicit theory endorsement has been found to change without direct message priming, suggesting fluidity in implicit theory endorsement (Leith et al., 2014; Steimer & Mata, 2016). When individuals were sufficiently motivated by a salient situational goal (protection of their self-concept or self-esteem, or self-enhancement), they shifted their implicit belief in service of the goal. Even though these shifts were small in both studies (Leith et al., 2014; Steimer & Mata, 2016), the shift in the strength of endorsement was strategic as it resulted in important consequences for individuals (i.e., reactions to failing a test, perceptions about their strengths and weaknesses or successes and failures, willingness to overlook past transgressions, and judgements about criminals’ rehabilitation). These strategic shifts in implicit theories appear to play an important role in personal decisions and Leith and colleagues (2014) suggest that understanding when, how, and why individuals shift their implicit theory could provide useful information for designing interventions and making
recommendations for practice. For example, students could be more receptive to an incremental message after a failure rather than a success, since they would not want to view a failure as something that was stable and enduring (Leith et al., 2014; Steimer & Mata, 2016). These issues concerning the self-regulation of implicit beliefs have yet to be explored in PE but would appear fruitful and useful in developing our understanding of motivation in PE.

**Can an Entity Theory of Ability Be Adaptive?**

The evidence in education for the negative effects of an entity theory of ability on learning, motivation, and achievement is compelling, particularly for the chronic endorsement of an entity belief (for overviews see Dweck, 1999, Dweck & Molden, in press, 2005). However, the recent research on the fluidity and antecedents of implicit theories raises the question of whether an entity theory of ability could be adaptive (Leith et al., 2014; Steimer & Mata, 2016). For example, in these studies when an individual was considering their strengths, weaknesses, successes, and failures, a move towards viewing their strengths and successes as stable and enduring (entity) and their weaknesses and failures as subject to change (incremental) allowed them to reach desired conclusions about themselves that boosted or protected their self-esteem. In this case, an entity theory of ability served an adaptive purpose in relation to self-enhancement. In the PE context where our successes, failures and competence are so salient and evaluated so publicly, the ability to move towards an incremental or entity theory based on situational demands would appear to be a useful self-regulatory ability in young people.

Moreover, further support for the adaptive aspects of an entity belief can be argued if we concede that in PE an entity belief includes the view that sport ability is a natural gift, as per the conceptualisation in the CNAAQ-2. This additional aspect to an entity belief about sport ability means that not only are successes and strengths viewed as being stable and enduring but also as due to an innate natural talent. It is conceivable, and intuitively
appealing, that when individuals have a particular strength or are successful in PE that believing this is due to a natural gift will also serve an adaptive function in relation to self-enhancement. Therefore, believing that something they are good at is due to something special about them that will not change in the future has the potential to lead to positive cognitions, affect, and behaviour among students. The fluidity of implicit theories of ability and the associated implications on learning, motivation, and achievement have yet to be explored in the educational setting.

Another aspect that has the potential to elucidate positive aspects of an entity belief is the interaction between an entity belief and perceived competence. This has received little empirical attention in the PE literature despite being a key element of the Achievement Motivation Model (Dweck, 1986, 1990; Dweck & Leggett, 1988). The model predicts that an individual with an entity belief is likely to adopt a performance goal and when accompanied by high perceived competence should lead to adaptive outcomes. However, the initial work to validate the CNAAQ-2 concluded that there was no support for the moderating role of perceived competence (Biddle et al., 2003) and little further testing of this proposition has occurred. Furthermore, in the approach-avoidance framework (Elliot, 1997, 1999), implicit theories and perceived competence are both proposed to be antecedents of achievement goal adoption. To date, research, has tended to examine these antecedents in isolation to observe their effect on approach-avoidance goal adoption (Ommundsen, 2001ab; Warburton & Spray, 2008, 2009).

Research in PE has also done little to explore the proposition that the differences in implicit theories and motivational outcomes will be most apparent under conditions of failure (Dweck, 1999). The limited experimental evidence that does exist in the PE literature suggests that there were differences in goal preferences and ability attributions following failure between incremental and entity theorists but not on affective reactions or future
participation intentions (Spray et al., 2006). In their discussion, Spray and colleagues note the need to create more realistic failure manipulations such that the failure feedback is compelling and more akin to the on-going nature of feedback in PE classes. This will help to exploit the differences in implicit theory endorsement and their likely effects on motivation, learning, and achievement. Consequently, addressing this issue and exploring the effects of the interaction of entity beliefs with perceived competence would help clarify the adaptive or maladaptive effect of entity beliefs in PE.

Future Research Directions

In light of the current empirical research and the key issues we highlight above, we offer some avenues of inquiry that we hope will further develop our understanding of implicit theories of ability in the PE context. Specifically, three avenues for future research are presented.

Chronic and Fluid Implicit Theories

We know little about how or when young children develop an implicit theory about their sport ability. In his recent chapter, Spray (in press) highlights the need to explore the socialisation of implicit beliefs, in terms of who is important in this process. We also need to explore how our chronic implicit theories are formed, for example, what role do early experiences of success and failure in PE play in shaping our beliefs? If our implicit theories are used to help us reach desired conclusions about ourselves, then being exposed consistently to situations where a particular belief supports this conclusion may lead to that theory becoming the dominant theory (Leith et al., 2014). What temporal patterns of success and failure are required to develop a ‘chronic’ incremental theory of ability? Evidence from education suggests that students who constantly succeed or who are praised for performance are likely to develop an entity theory of ability (Mueller & Dweck, 1998), but at what age are children susceptible to these messages about their sport ability?
Following the line of inquiry in social psychology, we also need to explore the fluidity of beliefs in the PE context. Are particular students more able to self-regulate their implicit theory? If so, who are they, what are their characteristics, what conditions facilitate or hinder this, and what are the consequences of this self-regulation of implicit theories? Moreover, what salient situational goals are present in PE that would motivate such shifts? Once established that students in PE can self-regulate their implicit theory of ability, we can explore the relationship between chronic and fluid implicit theories of ability and the effects on motivation, learning, and achievement in PE.

**Priming of Implicit Beliefs in Physical Education**

Future research should also focus on experimental work to develop more compelling ways to prime students’ implicit beliefs. This work is important as it has potential practical implications for supporting and guiding teachers in how to influence young people’s implicit theories in their classes. We need to know what is the best way to deliver the message (written, verbal, video), what does the message need to contain, what is the optimal dose, and who should we give it to (primary or secondary school children)? We also need to explore the practical aspects of incorporating an incremental message into a school curriculum for teachers. For example, is it a generic message followed up with specific individual interactions with each student? How is it incorporated into a unit of work particularly if the unit of work is 6-8 weeks in length, and will students believe they can improve and develop if the unit of work is not long enough?

**The Lower-Order Beliefs**

Following our discussion of the conceptualisation issues of implicit theories in the PE literature, we believe it is important for future research to clarify the conceptualisation of incremental and entity beliefs. We highlight that the lower-order gift belief may not be conclusively associated with an entity theory of ability. Future research that explores the
effects of the lower-order beliefs on a range of outcomes may help elucidate some of these concerns regarding the conceptualisation of implicit theories of ability. Moreover, this research will also be useful in the practical context in that it could provide teachers with a more specific focus for their feedback. For example, does believing your ability can improve have a greater effect than believing it can be learned when participating in an educational setting such as PE?

Application to Practice

Misconceptions in the Application to Practice

In a recent series of articles, Dweck (2015, 2016ab) Dweck recognised that there are a number of misconceptions in how her theory and research are being translated into practice in schools. She expressed her “fear that the mindset concepts, which grew up to counter the failed self-esteem movement, will be used to perpetuate that movement” (Dweck, 2015, p. 20), or will be used to justify why some students are not learning and improving, and acknowledged that there is an outbreak of false growth mindsets in educators. We summarise three common misconceptions below.

**Misconception 1: Effort alone will lead to an incremental implicit theory and the associated learning and achievement outcomes.** Dweck (2015) identified this misconception as the most commonly associated with an incremental implicit theory. Effort and an incremental theory are often viewed as interchangeable, but as identified earlier in this article, the incremental theory is about the meaning system it creates in our interpretation of and connection to a range of behaviors and attributes, of which effort is but one. In an incremental theory, effort is an important part of the learning and improvement process, but it is only one element of a repertoire of skills and strategies (i.e., resilience in the face of failure, seeking out challenges, focusing on mastery goals) that students with this theory have at their disposal. The risk with this misconception is that teachers will focus their praise on effort,
that effort praise will be used when learning outcomes are poor or absent, and teachers may
neglect to focus on helping students to focus on new or different strategies for learning.

**Misconception 2: We are either an incremental or an entity theorist.** Much of
Dweck and her colleagues’ (Dweck, 1999) research has been based on the priming of an
incremental or an entity theory in students prior to the completion of a task and then
examining how the prime affected students’ motivation, behavior, and performance. Students
were labelled as incremental or entity theorists based on the priming that had taken place.
Responses to a series of entity-focused items evaluated the effectiveness of the priming in
which high scores reflected an incremental theory and low scores an entity theory. This
priming focus is an important aspect of the research evidence that has largely been ignored or
lost in translation to educators and has led to the belief that students have either an
incremental or an entity theory of ability. Students may therefore be labelled as incremental
or entity theorists, rather than having access to both implicit theories which are primed or
accessed based on environmental cues and self-concerns.

**Misconception 3: An incremental theory means that students can achieve anything.**
An incremental theory of ability is not associated with the belief that students can achieve
anything. Instead, it is a belief that with effort, motivation, the right strategies, help, and
support, students can improve on their current level of achievement. It is not suggesting that
all students will achieve to the highest level or become the next most talented mathematician,
writer or sportsperson. Embedded in Dweck’s (Dweck, 1986, 1990; Dweck & Leggett, 1988)
framework are two key ideas: (a) people are capable of change, not that they will change their
current behavior; and (b) that people’s future potential cannot be predicted by their current
behavior or from a small subset of behaviors shown at a relative early stage in their life. This
misconception does not mean that educators should not set high expectations for their
students. Instead, these expectations should be appropriate to the student and the teacher should help the student to develop the skills and strategies to successfully meet them.

**Further Issues in Applying Implicit Theories in Physical Education**

In view of the considerable empirical evidence that exists regarding the adaptive consequences that follow from endorsing an incremental theory of ability, a number of authors (Spray, in press; Vella, Cliff, Okely, Weintraub, & Robinson, 2014; Warburton & Spray, 2017) have offered theoretically- and empirically-based suggestions to support teachers and coaches in applying this area of research to their practice. Vella and colleagues offer six instructional strategies that aim to promote the adoption of an incremental belief about ability while minimising the adoption of an entity belief. Their strategies include focusing on effort and persistence, facilitating challenge, promoting the value of failure, defining success as effort, the promotion of learning, and providing high expectations. Moreover, Spray offered an examination of how an understanding of implicit theories of ability could inform practice through the pedagogical practices used by teachers and coaches. We refer readers to these sources for a more detailed description. Our aim in this section of the review is not to repeat this information but to offer a discussion of some of the key issues that arise in the application to practice due to the nuances of the PE context.

*Focusing on effort and defining success as effort.* In the process of acquiring and developing physical skills, young people move through different phases of learning, cognitive, associative, and autonomous (Fitts & Posner, 1967). These phases reflect changes in the fluidity and proficiency of movement whereby an economy of effort in movement production is reflective of successful performance. Consequently, effort in the PE context may have different meanings for those in the different phases of learning. Teachers should avoid the inclination to provide generic effort feedback such as ‘keep on trying’ to all students. Instead, teachers could provide slightly different forms of effort feedback for
students in the different stages of learning. For example, students in the autonomous phase of learning require effort feedback related to the desire to continue improving and developing their skills in a range of movement situations. Those in the associative phase require effort feedback related to continuing to refine their skills and seeking feedback to improve further. Those in the cognitive phase require effort feedback related to persistence in the face of challenges and difficulties in trying to work out how to perform the skill, and continued effort in trial and error learning. Moreover, it is also important to ensure that effort feedback is accompanied by gains in learning and that success is not only defined as effort. All too often students can be praised for their effort without an accompanying improvement in learning, which may bolster their self-esteem at a particular moment, but does little in the long term to improve their skills and abilities.

Avoiding entity phrased feedback. The role of the teacher in providing feedback to students is critical in the promotion of an adaptive implicit theory of ability in PE. If teachers wish to minimise the adoption of an entity belief, avoiding entity phrased feedback such as ‘you really showed them,’ ‘you’re a quick learner,’ or ‘you’re a natural at this’ is important. These phrases may be used with little conscious awareness, as one of the challenges of the PE context is that the nature of learning environment means that much of the feedback provided to students in a lesson is verbal and instantaneous. While these phrases may be well intended in an attempt to boost students’ self-esteem and efforts to keep trying, they may lead to future motivational problems. Moreover, teachers themselves will have been exposed to the general discourse surrounding sport ability and that performers have a natural talent or ability and thus may be unaware of the negative implications of such feedback.

Promoting the value of failure. The public nature, and ease with which an individual’s (in)competence in PE can be evaluated by others, can mask the value of failure to the learning process. This salience of competence may promote a concern with self-
presentational aspects that reinforce the view that failure is an indicator that they are not good enough. Consequently, students become more likely to endorse an entity belief, cannot see that mistakes are an inevitable part of the learning process, and will strive to avoid any situation in which their competence in PE is challenged. These outcomes can be despite the best intentions of the teacher to provide opportunities for challenge and progression.

Conclusion

Physical education is an important context in which to study the motivational processes of young people, as it is the one physical setting experienced by all young people through its compulsory place in the school curriculum in many countries. PE provides many of our first experiences with competence and incompetence in the physical domain. Indeed ‘bad’ experiences of school PE are often cited as a reason for inactivity across the lifespan, and for the failure of young people to understand the importance of leading physically active lifestyles beyond the school curriculum. In light of these wider implications, and the continued global concern over young people’s health (World Health Organisation, 2016), it is imperative that we have an understanding of the motivational processes affecting young people’s experiences in PE.

Our review has shown that there is much to commend about the research on implicit theories of ability in PE. Young people’s views about the nature of their ability undoubtedly have important consequences in the PE setting. We identified a number of key issues that require further research attention and clarification and it is important that we address these aspects if we are to fully understand the influence of implicit theories of ability on young people’s motivation toward PE. In particular, the fluidity of implicit theories and the antecedents that influence students’ ability to regulate their self-theories represent important opportunities for future work. More widely, we look forward to undertaking and reading
about research endeavours that advance the utility of this long-standing motivation framework for professional practice in PE.
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