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Motivation for physical activity in young people: entity and incremental beliefs about athletic ability

STUART J.H. BIDDLE,[1] C.K. JOHN WANG,[2] NIKOS L.D. CHATZISARANTIS[3] and CHRISTOPHER M. SPRAY[1]*

[1]*Institute of Youth Sport, School of Sport and Exercise Sciences, Loughborough University, Loughborough, UK,* [2]*National Institute of Education, Nanyang Technological University, Singapore and* [3]*School of Sport and Health Sciences, University of Exeter, Exeter, UK*

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Three studies are reported of children and youth aged 11–19 years ($n = 3478$) examining the nature of beliefs about athletic ability. Drawing on related research in academic, moral and stereotyping domains, development of a psychometric instrument assessing athletic ability beliefs is detailed. Support was found for a multidimensional hierarchical structure that is invariant across age and gender. Confirmatory factor analysis revealed a structure comprising two higher-order factors of entity and incremental beliefs underpinned by beliefs that athletic ability is stable and a gift (entity), and is open to improvement and can be developed through learning (incremental). Incremental beliefs, indirectly through a task goal orientation, and entity beliefs directly, predicted self-reported amotivation towards physical education and sport. On the other hand, enjoyment of physical activity in youth was predicted directly by task orientation and incremental beliefs. Predictions concerning the moderating role of perceived competence were not supported. Our findings highlight the importance of ability beliefs and goals in understanding the determinants of physical activity in children and youth.

Keywords: amotivation, children, enjoyment, psychometrics, youth.

Introduction

The study of physical activity in young people is considered important for many reasons, including the need to identify determinants of a physically active lifestyle for the health, educational and social benefits that can accrue (Biddle *et al.*, 1998). In addition, there is a need to understand better the determinants of physical activity in youth (Sallis *et al.*, 1992, 2000). In this paper, we focus on the measurement of beliefs concerning the nature of athletic ability and how such beliefs might be related to motivational outcomes in physical activity.

Although sport psychologists have investigated the role of beliefs concerning ability, competence and related constructs, less has been written in the physical domain concerning Dweck's (1999) approach to the study of motivation. Dweck and her colleagues have proposed a model of individual differences centred on beliefs concerning ability or other human attributes (Dweck *et al.*, 1995; Dweck, 1996, 1999). Initially in the domain of intelligence, and more recently extended to include views of morality and stereotyping, Dweck and colleagues have proposed that two clusters of beliefs underpin people's judgements and actions (Dweck and Leggett, 1988; Dweck, 1992, 1996; Dweck *et al.*, 1995; Levy *et al.*, 1998; Mueller and Dweck, 1998). These beliefs centre on the way people view the malleability of attributes such as intelligence. Those subscribing to the view that a particular attribute is fixed and relatively stable hold an 'entity' view or 'entity theory'. Conversely, those seeing the attribute as changeable and open to development hold an 'incremental' view or theory.

According to Dweck and Leggett (1988), entity theorists are more likely to endorse performance/ego goals, whereas incremental theorists have been shown to endorse learning/task goals. Performance goals operate when individuals are concerned with gaining favourable judgements of their competence in relation to others; learning goals are salient when individuals are concerned with self-referenced mastery of tasks and

* Address all correspondence to Christopher Spray, School of Sport and Exercise Sciences, Loughborough University, Loughborough LE11 3TU, UK. e-mail: c.m.spray@lboro.ac.uk

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increasing their competence. Dweck and Leggett's research has shown that those holding an entity view and endorsing performance goals are more likely to have negative reactions when faced with achievement setbacks. Despite evidence in support of entity and incremental beliefs, Dweck *et al.* (1995) state that 'systematic effort is required on the part of behavioral scientists to identify them and to map out their effects' (p. 267). In addition, they say that entity and incremental beliefs can be domain-specific. Beliefs in the domain of intelligence, for example, may be unrelated to those concerning moral behaviour or athletic ability.

Researchers have begun to investigate entity and incremental beliefs in the physical activity domain. In replicating the study by Dweck and Leggett (1988), Sarrazin *et al.* (1996) found some support for the relationship between beliefs concerning the nature of athletic ability and the adoption of different goals in physical activity (specifically sport) for children aged 11–12 years. Those choosing a 'learning' (task) goal were more likely to endorse incremental beliefs about sport ability than those adopting performance (ego) goals, although the trends were less obvious than reported in the academic domain by Dweck and Leggett.

Further studies in the physical domain have endorsed these links between ability beliefs and achievement goals (Biddle *et al.*, 1999; Lintunen *et al.*, 1999; Ommundsen, 2001a,b; Cury *et al.*, 2002). In contrast to Dweck's approach, these researchers used measures of goal orientations that allow participants to endorse both task (self-referenced learning) and ego (normative performance) goals, rather than forcing them to indicate a preference for one type of goal. Dweck (1999) acknowledges that goals can be assessed independently, although has typically adopted a research design that pits goals against each other at the situational level. Physical activity research, on the other hand, has focused on ability beliefs and achievement goals at the contextual level. Thus, ability beliefs are not equated with Nicholls' (1984, 1989) notions of undifferentiated and differentiated conceptions of ability, which he argued underpin goals at the situational level (e.g. the differentiated conception reflects notions of ability as *current* capacity and promotes ego *involvement*). Physical activity investigators have addressed the question of whether beliefs about longer-term changeability of capacity influence individuals' *dispositional* tendencies for judging competence and defining success.

To date, however, the measurement of beliefs in the physical domain has been inconsistent and requires attention. Poor measurement technology may hamper the identification of important constructs and links. Dweck and colleagues have used scales suitable for children or adults and these have been modified to suit the area of investigation, such as intelligence or personality (Dweck *et al.*, 1995; Dweck, 1999). However, while the assessment of such scales has met with support, one could argue that ability in physical activity (or the classroom) is more complex than suggested. Nicholls (1992) has said that 'we cannot effectively study children's conceptions of intelligence or sport competence by simply asking . . . whether such skills are changeable or not. Intelligence can have many referents' (p. 45).

Based on such ideas, Sarrazin *et al.* (1996) proposed a multidimensional view of athletic (sport) ability. In the motor behaviour literature (Fleishman, 1964; Schmidt, 1982), abilities are defined as relatively stable, genetically determined and not easily modified by practice. Schmidt (1982) suggests that 'abilities represent the collection of ''equipment'' that one has at his or her disposal' (p. 395). As such, abilities limit the effect of learning on performance. Skills are seen as modifiable through practice and learning, and are more specific to a task or group of tasks. These concepts of abilities and skills may underpin people's views about the nature of their athletic ability. Specifically, the notion of abilities may promote an entity view, whereas the notion of skills may lead to an incremental view. In contrast to the conceptualization of implicit beliefs by Dweck and colleagues, Sarrazin and colleagues' (1996) work suggested that entity and incremental views may not represent opposite endpoints of a continuum. It is possible for individuals to hold entity and incremental views if they believe that *both* abilities and skills contribute to athletic performance.

Sarrazin *et al.* (1996) thus proposed a multidimensional assessment of sport ability beliefs. Their Conceptions of the Nature of Athletic Ability Questionnaire (CNAAQ) contained 21 items. Incremental beliefs were assessed by the three sub-scales of *learning* (sport ability is the product of learning), *incremental/improvement* (sport ability can change) and *specific* (sport ability is specific to certain sports or groups of sports). Entity beliefs were measured by the three sub-scales of *general* (sport ability generalizes across many sports), *stable* (sport ability is stable across time) and *gift* (sport ability is a gift, i.e. 'God-given'). Sarrazin *et al.* reported satisfactory internal consistency for all sub-scales with the exception of the specific sub-scale. Studies that have since used the CNAAQ with Hungarian (Biddle *et al.*, 1999), Finnish (Lintunen *et al.*, 1999) and Norwegian (Ommundsen, 2001a,b) youth have also reported psychometric weaknesses with the questionnaire. There is a need, therefore, for the CNAAQ to be assessed more rigorously for its psychometric properties. In addition, further investigation of the relationships

between ability beliefs and motivational variables, such as goal orientations, is warranted.

Despite a great deal of documented research on task and ego goal orientations in the sport psychology literature (for reviews, see Duda and Whitehead, 1998; Duda and Hall, 2001), little is known about possible antecedents of such goals. Dweck and Leggett (1988) have suggested that goals in the academic domain may be related to implicit beliefs about intelligence. Specifically, they hypothesized that 'different theories about oneself ... would orient individuals toward the different goals' (p. 256). One reason might be that those holding entity views focus more on *proving* their ability, whereas those with stronger incremental views focus on *improving* their ability (Dweck *et al.*, 1995). In the physical domain, research has supported these propositions. Ommundsen (2001a), for example, found that incremental views of ability predicted task orientation in school physical education classes. Task orientation was shown to have a negative effect on pupils' self-handicapping strategies. Ommundsen (2001b) also reported positive links between incremental beliefs, task orientation and satisfaction in physical education.

Research in physical settings, however, has been beset with conceptual and methodological weaknesses. Specifically, doubt surrounds the general and specific sub-scales of the CNAAQ. Generality and specificity are relative terms. It appears difficult, on face value, to endorse the view that individuals can excel in absolutely all physical activities. In terms of specificity, does a 'specific belief' refer to one sport as a whole (as assessed by the CNAAQ) or to particular sub-skills within a sport? For example, individuals may believe that ability in football bears no relationship to ability in gymnastics, but they may also believe that a footballer can master certain aspects of the game (e.g. control of the ball using feet) yet encounter difficulty in mastering other aspects (e.g. heading skills). From an empirical perspective, research has consistently reported low internal reliability for the specific sub-scale (Sarrazin *et al.*, 1996; Biddle *et al.*, 1999; Lintunen *et al.*, 1999; Ommundsen, 2001a,b). In addition, exploratory factor analyses have revealed that items from the stable and learning sub-scales either cross-load on other sub-scales or fail to load adequately. In part, these psychometric weaknesses may be due to translation processes. The need remains, however, to develop a reliable and valid English-language version of the CNAAQ.

Our main aim, therefore, was to develop a suitable psychometric instrument for the assessment of beliefs concerning athletic ability. In addition, we tested associations of beliefs with other motivational constructs. The paper comprises three studies, with a total of 3478 participants ranging in age from 11 to 19 years from over 50 schools sampled in all regions of England. Study 1 was concerned with the development of a measurement instrument. Study 2 used a large sample to test further the psychometric properties of the instrument as well as to test a model predicting amotivation towards physical activity. Finally, Study 3 used a similar model to Study 2 to predict enjoyment of physical activity. Normal informed consent and ethical procedures conforming to standards set by the British Psychological Society were adhered to throughout the research process.

Study 1: psychometric development

The main aim of this first study was to examine the psychometric properties of an instrument for the assessment of lay beliefs about athletic ability among British children. Given that Sarrazin *et al.* (1996) have already developed a scale (the CNAAQ), but some problems with its structure have been noted (Biddle *et al.*, 1999; Ommundsen, 2001a,b), further testing of the CNAAQ appeared warranted. The main analyses involved testing the factor structure of three measurement models, which were proposed following an examination of the extant literature and pilot work conducted as part of the present research.

Methods

Pilot work

Twenty-five 14- to 15-year-old adolescents from a school in the Midlands of England were asked to classify each item into the six purported sub-scales of the CNAAQ. This procedure revealed three problematic items, in that fewer than 70% of participants classified these items 'correctly' (Weber, 1990). In addition, interviews with eight male basketball players showed support for four of the six sub-scales, but there was no evidence for the salience of general and specific conceptions of ability. Given these findings and the conceptual and methodological difficulties encountered with these sub-scales in previous research in physical settings, we felt justified in removing the general and specific sub-scales along with the problematic items from other sub-scales from further analyses. Thus, 12 items from the original 21-item CNAAQ were retained for psychometric testing, reflecting stable, gift, learning and improvement sub-scales.

Participants

The participants ($n = 352$), drawn from four schools in the Midlands of England, were pupils aged 14–18 years

(15.9 ± 1.1 years; mean ± *s*). There were 218 males and 134 females.

Procedures

After securing permission from the head teachers, the heads of physical education departments were contacted. Pupils were informed by the research assistant that their participation in the study was voluntary and they were free to withdraw at any time. They were also assured that their responses would be kept in confidence. All pupils provided informed consent and took 15 min to complete a battery of questionnaires administered at the beginning of physical education lessons. Only results pertaining to the CNAAQ will be reported here. The remaining findings are reported in Study 3.

Measures

Twelve items from the English version of the CNAAQ (Sarrazin *et al*., 1996) were used to examine four sub-scales: *stable* (3 items; e.g. 'you have a certain level of ability in sport and you cannot really do much to change that level'); *gift* (3 items; e.g. 'to be successful in sport you need to be born with the basic qualities which allow you success'); *learning* (3 items; e.g. 'you need to learn and to work hard to be good at sport'); and *improvement* (3 items; e.g. 'how good you are at sport will always improve if you work at it'). The improvement sub-scale was labelled 'incremental' by Sarrazin and colleagues. However, to avoid confusion with the higher-order incremental factor used by Dweck (1999), we have adopted the term improvement. All responses were provided on 5-point Likert scales anchored by 1 (strongly disagree) and 5 (strongly agree).

Data analysis

Confirmatory factor analysis was conducted to examine the factorial validity of the revised CNAAQ using EQS for Windows 5.7 (Bentler and Wu, 1998). Three different measurement models were compared. Model 1 tested a two-factor model of incremental and entity beliefs. Model 2 was a four first-order factor model. Model 3 was a hierarchical model comprising four first-order factors and two higher-order factors (incremental and entity). The first model was based on Dweck's work using just two belief dimensions. Model 2 was based on the work of Sarrazin *et al*. (1996) but excluded the first-order factors general and specific. The third model was based on the proposition that the common variance among stable and gift sub-scales, and among learning and improvement sub-scales, could be accounted for within the higher-order entity and incremental beliefs, respectively, and thus represented a more parsimonious model than Model 2.

In addition, convergent validity and discriminant validity were tested. Convergent validity refers to the extent to which measures hypothesized to indicate the respective constructs actually load highly on the construct (Bagozzi and Kimmel, 1995). It is suggested that convergent validity is best tested using confirmatory factor analysis (Bentler and Bonnet, 1980). Discriminant validity refers to the extent to which measures of different sub-scales are different from each other.

The following indices of fit provided by EQS were examined to evaluate the adequacy of the models: Satorra-Bentler scaled chi-square statistic with associated degrees of freedom; the non-normed fit index; the comparative fit index; the robust comparative fit index; root mean squared residual; and root mean square error of approximation. The chi-square statistic estimates the fit between the sample covariance matrix and the estimated population covariance matrix. The non-normed fit index evaluates an estimated model by comparing the chi-square value of the model to the chi-square value of the independence model, taking into account the degrees of freedom of the model under consideration. The comparative fit index employs the non-central chi-square distribution with non-centrality parameters to compare a hypothesized model with the independence model. Both the non-normed fit index and comparative fit index reflect fit well at all sample sizes. The robust comparative fit index is more trustworthy than the comparative fit index when the multivariate normality distribution assumption is not met. Hu and Bentler (1999) recommend a cut-off value close to 0.95 for these fit indices, although it should be noted that values for the non-normed fit index can be outside the 0–1 range.

The root mean squared residual estimates lack of fit and represents the square root of the mean of the squared discrepancies between the implied and the observed covariance matrices. The root mean square error of approximation also assesses lack of fit in a model compared with the saturated model. Low root mean square residuals are indicative of a good-fitting model; for the root mean square error of approximation, a cut-off close to 0.06 is recommended (Hu and Bentler, 1999).

Results

In the initial examination of the data, there was evidence of multivariate non-normality in the distribution. Although all the univariate statistics had skewness and kurtosis values between +2 and −2, Mardia's coefficient was 107.45 and the normalized estimate was

32.43. Consequently, the robust maximum likelihood method, which is best for controlling for the over-estimation of chi-square, underestimation of adjunct fit indices and underestimation of errors, was used (Hu and Bentler, 1995).

Table 1 shows the fit indices for the three models. There was less support for the two-factor only model (i.e. Model 1: incremental and entity beliefs) than Models 2 and 3. Table 2 details the factor loadings and the measurement errors for each item with regard to Models 2 and 3. Given the high loadings on the two higher-order factors shown in Table 3, the existence of the two higher-order factors was supported. Therefore, the hierarchical structure in Model 3 was accepted on the basis of it being a more parsimonious model. Cronbach's alpha coefficients showed that both the entity and incremental scales were internally consistent ($\alpha = 0.74$ for entity and 0.80 for incremental).

The high loadings and low errors of the items and first-order factors shown in Tables 2 and 3, together with the information on the adequacy of the goodness-of-fit indices, indicated that convergent validity was achieved. Items hypothesized to indicate their respective factors loaded highly on these factors. In addition, this suggested that the measures of each factor shared significant amounts of common variance.

To test for discriminant validity, the confidence interval of the correlation between entity and incremental beliefs was calculated. The correlation was -0.17 (standard error 0.075, upper bound confidence interval -0.02). Since the correlation was substantially less than unity, discriminant validity was supported.

Discussion

The main aim of Study 1 was to assess the psychometric properties of a revised version of the CNAAQ (Sarrazin *et al.*, 1996). Three measurement models were compared following pilot work that failed to support the relevance of the general and specific sub-scales. Using confirmatory factor analysis, it was revealed that the hierarchical model with four first-order factors and two higher-order factors was best suited. Convergent validity and discriminant validity were demonstrated, as was internal consistency. To distinguish the new scale from the CNAAQ developed by Sarrazin *et al.* (1996), it will be labelled the CNAAQ-2. (A complete list of items comprising the CNAAQ-2 is provided in the Appendix.)

Having removed the general and specific sub-scales together with three other problematic items, and tested three competing models, we contend that the resulting CNAAQ-2 is both a conceptually and empirically robust measure of individuals' beliefs about the nature of athletic ability. Its structure supports Nicholls' (1989) view that there is a need to take a more differentiated view of constructs such as sport ability

Table 1. Fit indices for the three alternative CFA models (Study 1)

Fit index	Model 1 (two factors)	Model 2 (four first-order factors)	Model 3 (hierarchical six factors)
Scaled χ^2	136.31	82.97	89.78
Degrees of freedom	53	48	51
NNFI	0.927	0.928	0.927
CFI	0.891	0.948	0.944
Robust CFI	0.900	0.958	0.953
RMSR	0.054	0.040	0.044
RMSEA	0.077	0.056	0.057

Abbreviations: NNFI = non-normed fit index; CFI = comparative fit index; Robust CFI = robust comparative fit index; RMSR = root mean squared residual; RMSEA = root mean square error of approximation.

Table 2. First-order standardized loadings for Models 2 and 3 (Study 1)

Scale	Item	Model 2	Error variance	Model 3	Error variance
Stable	1	0.48	0.87	0.50	0.87
	3	0.57	0.83	0.56	0.83
	10	0.62	0.78	0.62	0.78
Gift	4	0.66	0.75	0.66	0.75
	7	0.69	0.72	0.69	0.73
	11	0.78	0.63	0.78	0.62
Improvement	6	0.69	0.72	0.69	0.72
	9	0.76	0.65	0.77	0.64
	12	0.73	0.69	0.73	0.69
Learning	2	0.66	0.76	0.66	0.75
	5	0.60	0.80	0.58	0.81
	8	0.62	0.78	0.62	0.78

Table 3. Second-order loadings of the sub-scales of the CNAAQ-2 (Model 3; Study 1)

	Entity	Error variance	Incremental	Error variance
Stable	0.77	0.64		
Gift	0.88	0.47		
Improvement			0.86	0.50
Learning			0.91	0.41

and intelligence to understand their motivational consequences. However, the CNAAQ-2 essentially remains wedded to Dweck and Leggett's (1988) work in the academic domain. Dweck and Leggett did not refer to the generality of intelligence, but highlighted notions of stability and controllability (whether or not intelligence is increasable). These ideas are embedded within the new measure of athletic ability, and are postulated to underpin two parsimonious second-order entity and incremental belief dimensions.

Thus, having provided initial evidence to support the CNAAQ-2 in Study 1, our attention turned to an examination of the links between ability beliefs and goal orientations, and the ability of such constructs to predict important motivational outcomes in physical activity.

Study 2: further psychometric tests and prediction of amotivation

This study had two main objectives. The first was to test the psychometric properties of the CNAAQ-2 using a new and larger sample of young people. The invariant factor structure of the measurement model across gender and age was examined. Second, proposed relationships between athletic ability beliefs, goal orientations, perceived competence and amotivation were tested.

Amotivation is an important construct to study as an outcome variable in the context of youth physical activity. There is concern that too few youth are active enough for health gains and further work is required to identify correlates of physical activity motivation (Biddle *et al.*, 1998). Vallerand and Fortier (1998) suggested that the study of amotivation 'may prove helpful in predicting lack of persistence in sport and physical activity' (p. 85). Amotivation refers to the relative absence of motivation where a lack of contingency between actions and outcomes is perceived and reasons for continuing involvement cannot be found (Pelletier *et al.*, 1995; Vallerand and Fortier, 1998). This lack of perception of control over environmental forces is what Deci and Ryan (1985) refer to as amotivation at the 'external boundary' and is seen to be similar to feelings of helplessness.

The relationship between achievement goals and motivational variables has been well documented (Nicholls, 1989; Duda and Hall, 2001), although self-reported amotivation has not been the specific focus of studies in the physical domain. Nevertheless, prior research, and achievement goal theory (Nicholls, 1989), suggest that task orientation will be negatively associated with amotivation, whereas ego orientation may be positively associated with amotivation for those holding low perceptions of competence and negatively associated with amotivation for those with high perceptions of competence. This is because amotivation is likely to have greater salience among individuals who doubt that they can demonstrate normative competence. Individuals who are confident in the comparative adequacy of their ability are less likely to express feelings such as lack of control and helplessness, as are individuals primarily concerned with self-referenced mastery of physical skills.

Specifically, based on the psychometric analyses in Study 1 and the literature reviewed earlier, we hypothesized that entity beliefs would be underpinned by stable and gift beliefs, and incremental beliefs would be underpinned by learning and improvement beliefs. In turn, entity and incremental beliefs would predict ego and task goal orientations, respectively. Moreover, we expected that task orientation would be negatively associated with amotivation irrespective of perceived competence. Ego-oriented youth confident in their physical ability would be less likely to report amotivation, whereas those who doubt their competence would be more likely to endorse amotivation. Based on theorizing by Dweck (Dweck and Leggett, 1988; Dweck *et al.*, 1995), entity beliefs were hypothesized to have a positive association with amotivation irrespective of perceived competence. Believing that one's athletic ability is not increasable is arguably more likely to promote feelings of uncontrollability and possibly helplessness in physical settings.

Methods

Participants

The study involved 2969 pupils (1566 girls and 1453 boys) from 49 schools in England. The pupils, aged 11–14 years (12.9 ± 0.9 years), were attending physical education classes in Years 7, 8 and 9. They were believed to be representative of several socio-economic and ethnic minority groups in England, although this was not tested. Classes were randomly sampled within age and gender groups and were from schools taking part in a larger project.

Procedure and measures

Questionnaires were administered by trained research assistants in quiet classroom conditions. The following instruments were used:

Achievement goal orientations. Pupils' dispositional task and ego goal orientations were assessed using an established English language (British) version of the Task and Ego Orientation in Sport Questionnaire

(TEOSQ) (Duda *et al.*, 1992; Duda and Whitehead, 1998). The stem for the 13 items was 'I feel most successful in sport and physical education when. . .'. Answers were given on a 5-point Likert scale anchored by 1 (strongly disagree) and 5 (strongly agree). Internal reliability was acceptable ($\alpha = 0.76$ for task orientation and 0.83 for ego orientation).

Sport ability beliefs. Beliefs were measured by the CNAAQ-2 derived from Model 3 in Study 1.

Amotivation. Amotivation was assessed by three items modified by Goudas *et al.* (1994) from the Academic Motivation Scale (Vallerand *et al.*, 1992, 1993). The stem for the items was 'I take part in physical education and sport . . .'. The three items were: 'but I really don't know why', 'but I don't see why we should have sport/PE' and 'but I really feel I'm wasting my time in sport/PE'. Answers were given on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha for this measure was 0.69.

Perceived competence. The six sport competence items from the Physical Self-Perception Profile for Children (PSPP-C) (Whitehead, 1995) were administered. This scale adopted a forced-choice format whereby participants chose one of two statements that best described them; for example, 'some kids do very well at all kinds of sports' (positive pole). The participant then rated whether it was 'sort of true for me' or 'really true for me'. This produced a 4-point scale ranging from 1 to 4 ($\alpha = 0.80$).

Data analysis

Using confirmatory factor analysis, the purported hierarchical structure of the CNAAQ-2 was once more tested. The next phase involved testing the factorial invariance of the CNAAQ-2 across gender and age through multi-group analyses. First, the data set was split by gender and school year. Model testing proceeded by fitting the same hierarchical model of the CNAAQ-2 to each sub-group separately. Next, the invariance of the model across gender and year group was tested by simultaneously fitting the model to the data for males and females, and subsequently to the data for the three year groups. Equality constraints were imposed on all the parameters to be estimated but not on the fixed parameters. These equality constraints included factor loadings, factor correlations, factor variances, measurement errors, factor patterns and disturbances. The equivalency of the measurement model between gender and age was then assessed.

Multiple criteria were used to assess the fit of the data to the model, including the chi-square value and associated degrees of freedom, non-normed fit index, comparative fit index, root mean squared residual and root mean square error of approximation. In addition, model modifications were investigated through the use of the Wald and Lagrange multiplier tests. The Wald test assesses whether any free parameters of a model can be restricted without substantial loss of information (Bentler, 1995). The Lagrange multiplier test examines the opposite – that is, whether any parameters that were set to zero in the model are, in fact, not zero. It tests the effect of adding free parameters to a model (Bentler, 1995). Although these *post-hoc* modifications can be influenced by chance, the information may be useful in providing insight into variations of the hypothesized model. Changes are usually advised only when theoretically or logically justified (Tabachnick and Fidell, 2001).

Results

Factor structure of the CNAAQ-2

Initial inspection of the data resulted in the deletion of 94 cases due to either missing values or outliers. Subsequently, the univariate statistics of the 2875 cases indicated that the values for skewness and kurtosis were within the range of -2 and $+2$. Maximum likelihood was chosen as the appropriate estimation method.

The fit indices for the confirmatory factor analysis of the CNAAQ-2 were acceptable and better than those in Study 1 ($\chi^2 = 262.85$, d.f. = 51, non-normed fit index = 0.965, comparative fit index = 0.973, root mean squared residual = 0.032, root mean square error of approximation = 0.038). The internal consistency of the sub-scales was satisfactory ($\alpha = 0.70$ for entity and 0.75 for incremental). The fit indices for the single group analyses showed acceptable fit for all groups (see Table 4). Table 5 presents the fit statistics for the simultaneous test of invariance across gender and age. These results provided strong support for the invariance of the CNAAQ-2 measurement model across gender and age.

Prediction of amotivation

The next stage of the analyses examined the relationships between conceptions of sport ability, goal orientations and amotivation with perceived competence as a moderator. The overall sample was split using scores on perceived competence. Given the large sample, it was possible to use more extreme groups in comparison to a mean or median split used in most other studies. Consequently, those in the lower quartile were labelled as 'low perceived competence' (mean value 1.89 ± 0.29; $n = 577$) and those in the upper quartile as 'high in perceived competence' (mean

Table 4. Initial fit statistics for the CNAAQ-2 by groups (Study 2)

Fit statistics	Male	Female	Year 7	Year 8	Year 9
n	1348	1527	856	981	1034
$\chi^2(51)$	193.70	138.89	160.49	121.74	138.10
NNFI	0.951	0.971	0.928	0.967	0.965
CFI	0.962	0.977	0.944	0.975	0.973
RMSR	0.036	0.030	0.040	0.033	0.039
RMSEA	0.046	0.034	0.050	0.038	0.041

Abbreviations: NNFI = non-normed fit index; CFI = comparative fit index; RMSR = root mean squared residual; RMSEA = root mean square error of approximation.

Table 5. Fit statistics for multi-group analyses of the CNAAQ-2 (Study 2)

Fit statistics	Gender	Age
χ^2	449.97	622.39
Degrees of freedom	122	194
NNFI	0.954	0.945
CFI	0.957	0.946
RMSR	0.039	0.057
RMSEA	0.031	0.028

Abbreviations: NNFI = non-normed fit index; CFI = comparative fit index; RMSR = root mean squared residual; RMSEA = root mean square error of approximation.

3.57 ± 0.22; $n = 572$). Table 6 presents the descriptive statistics for the variables in each group.

Figure 1 shows the hypothesized structural model. Task orientation was predicted by incremental beliefs and ego orientation by entity beliefs. Goal orientations and entity beliefs were specified to influence amotivation in both groups. For clarity, only the latent factors are presented. Initial analysis was conducted with the high perceived competence group using all the indicators in the full latent model. We found that the fit was marginally acceptable ($\chi^2 = 696.96$, d.f. = 340, non-normed fit index = 0.893, comparative fit index = 0.904, root mean squared residual = 0.049, root mean square error of approximation = 0.043). A closer examination of the univariate statistics showed that three items had unacceptable kurtosis, ranging from 3.54 to 10.73 (items Task 4, Task 7 and Amotivation 1). These items were deleted and the fit of the model to the data was reassessed. The fit indices improved as a result and were marginally acceptable. Table 7 shows the global indices of fit following item deletion for the high and low perceived competence groups. Figures 2a and 2b present the standardized solutions and error variances for the two groups.

The results of the structural equation modelling suggested that the hypothesized model fit the high perceived competence group better than the low perceived competence group. Multi-group analyses of covariance structure were conducted on the two perceived competence groups. The fit statistics are included in Table 7. Based on the equality constraints set for path coefficients on all latent variables and the covariance between incremental and entity beliefs, the Lagrange multiplier test suggested that, if the constraints on the path coefficients between entity beliefs and ego orientation and the covariance between incremental beliefs and entity beliefs were released, significant improvement in fit would result. The single group analyses indicated that path coefficients between entity beliefs and ego orientation for the high and low perceived competence groups were 0.399 and 0.115, respectively. For the covariances between incremental and entity beliefs, it was -0.034 for the high perceived competence group and -0.456 for the low perceived competence group.

The results suggest that entity beliefs predict ego orientation better for the high perceived competence group than for the low perceived competence group. In addition, the two implicit beliefs are not related in the high perceived competence group but are negatively correlated in the low perceived competence group. Finally, more variance in amotivation was accounted for in the low perceived competence group (39.3%) than in the high perceived competence group (20.8%).

Discussion

The main aim of this study was to test the factor structure of the CNAAQ-2 with a large sample. The results showed that the proposed model was represented well across three age groups and in both girls and boys. The scale appears to be suitable for use with children and adolescents. Confirmation of the two higher-order factors is consistent with Dweck and Leggett (1988). The hierarchical model of the CNAAQ-2, therefore, is both justified and recommended.

Table 6. Variable means, standard deviations and intercorrelations by perceived competence (PC) sub-groups (Study 2)

Variable	Mean ± *s*	1	2	3	4	5	6
High PC	3.57 ± 0.22						
1. Task orientation	4.33 ± 0.44						
2. Ego orientation	2.99 ± 0.88	0.06					
3. Stable	2.35 ± 0.75	−0.06	0.10				
4. Gift	2.41 ± 0.97	−0.00	0.26**	0.26**			
5. Learning	4.40 ± 0.56	0.33**	0.07	−0.08	0.12**		
6. Improvement	4.47 ± 0.62	0.27**	−0.02	−0.01	−0.11**	0.26**	
7. Amotivation	1.49 ± 0.56	−0.16**	0.02	0.26**	0.01	−0.20**	−0.07
Low PC	1.89 ± 0.29						
1. Task orientation	3.83 ± 0.60						
2. Ego orientation	2.50 ± 0.87	0.10*					
3. Stable	2.66 ± 0.82	−0.14**	0.02				
4. Gift	2.33 ± 0.90	−0.22**	0.14**	0.42**			
5. Learning	4.02 ± 0.67	0.41**	−0.05	−0.08	−0.03		
6. Improvement	3.97 ± 0.78	0.37**	−0.06	−0.23**	−0.33**	0.44**	
7. Amotivation	2.34 ± 0.88	−0.37**	0.02	0.30**	0.28**	−0.24**	−0.25**

*$P < 0.05$, **$P < 0.01$.

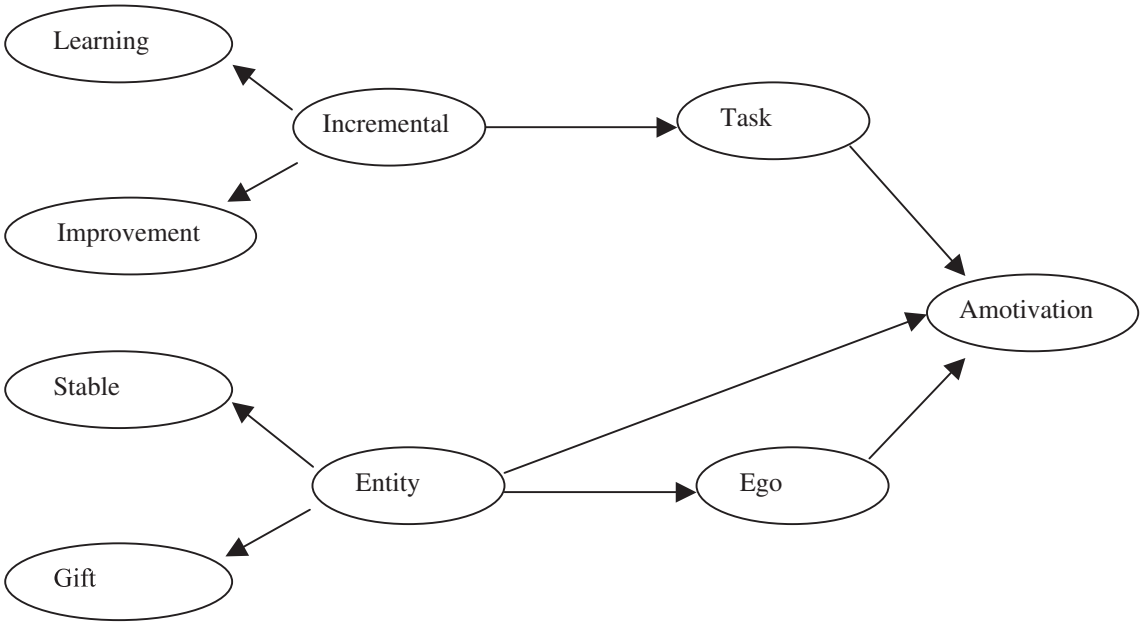
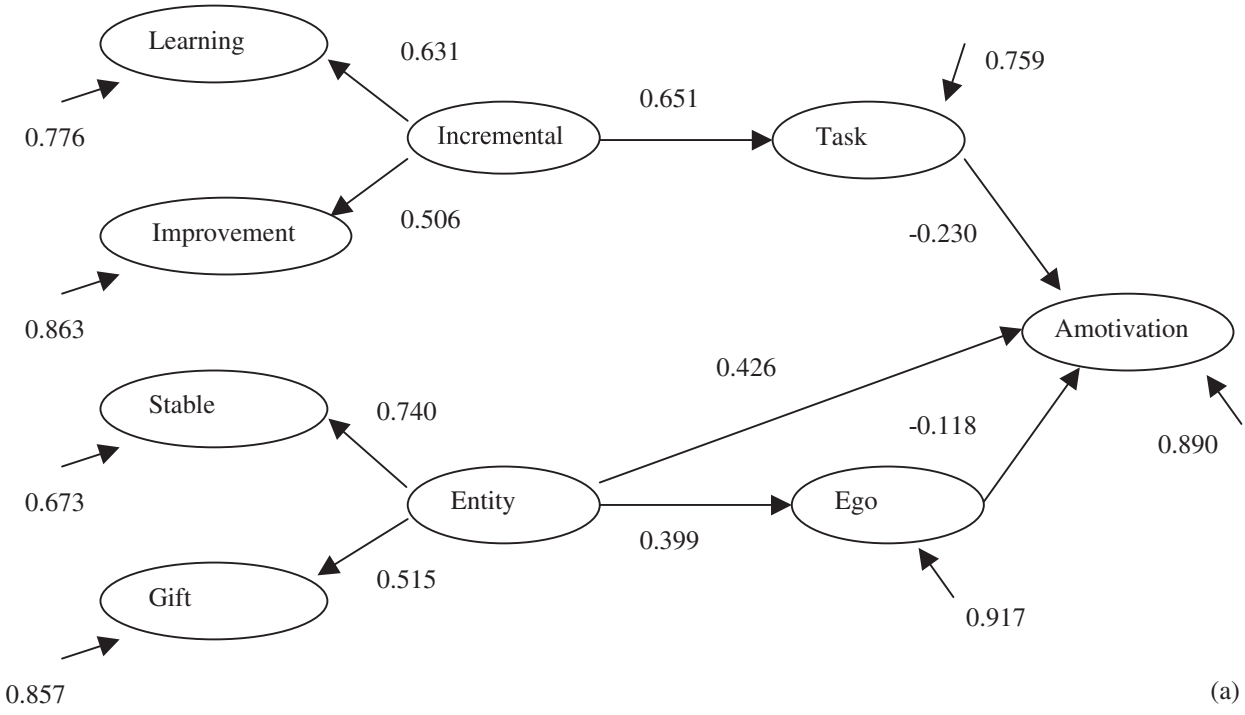


Fig. 1. Proposed full latent model of the relationships between conceptions of sport ability, goal orientations and amotivation (Study 2).

Having established a satisfactory factor structure, it is important to establish how such beliefs link with other variables. Our results showed that beliefs are related to goal orientations at the contextual level of motivation, and are in accordance with previous research in physical education and sport (Biddle *et al.*, 1999; Lintunen *et al.*, 1999; Ommundsen, 2001a,b). Although much of Dweck's work examined beliefs as situational predictors of preferred goals when faced with adversity, Dweck and Leggett (1988) state that 'a consistent predictor of children's goal *orientation* is their ''theory of intelligence'', that is, their implicit conception about the nature of ability' (p. 262, emphasis added). Present findings thus support Dweck's propositions within the physical domain. Both Dweck's and Nicholls' conceptualizations of goals,



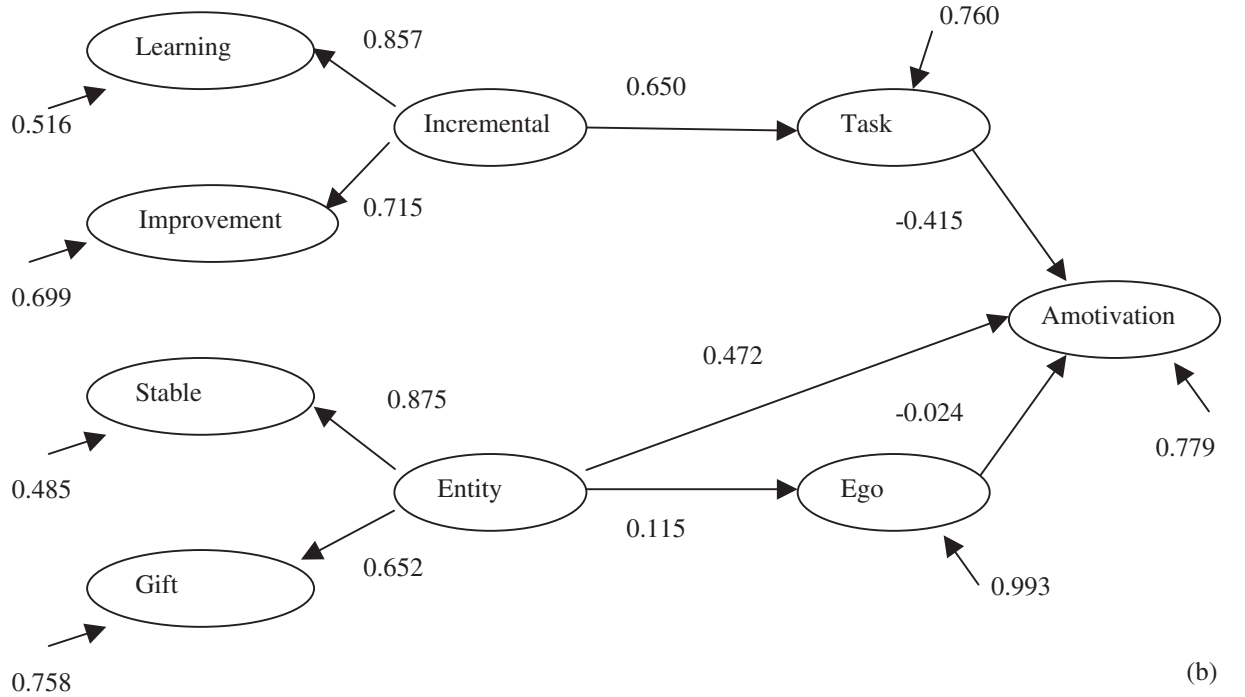


Fig. 2. Standardized solutions for the proposed model of the relationships between conceptions of sport ability, goal orientations and amotivation with perceived competence as a moderator: (a) high perceived competence group, Study 2; (b) low perceived competence group, Study 2. All paths shown are significant ($P < 0.05$) except that for ego-amotivation ($P > 0.05$).

whether situational or dispositional, are fundamentally concerned with normative versus self-referenced mastery views of success. Our data showed support for the ideas of both Dweck and Nicholls in that incremental beliefs were linked with self-referenced conceptions of success, whereas entity beliefs were linked with normative conceptions of success in sport and physical education.

Table 7. Fit statistics for the hypothesized structural model following item deletion by perceived competence (PC) groups (Study 2)

Fit statistics	High PC group	Low PC group	Multi-group analysis
χ^2	530.85	670.57	1226.24
Degrees of freedom	265	265	538
NNFI	0.912	0.889	0.897
CFI	0.922	0.901	0.908
RMSR	0.052	0.064	0.067
RMSEA	0.042	0.052	0.033

Abbreviations: NNFI = non-normed fit index; CFI = comparative fit index; RMSR = root mean squared residual; RMSEA = root mean square error of approximation.

A secondary aim of this study was to examine the relationship between beliefs and goal orientations in the prediction of self-reported amotivation in physical education and sport. Given that perceived competence is proposed to moderate the effect of ego orientation on motivational processes (Nicholls, 1989), analyses were conducted for youth differing in this construct. Unlike most studies, we created two 'extreme' groups of perceived competence representing the top and bottom quartiles of the distribution.

Our results showed that amotivation is predicted directly and indirectly by beliefs, and directly by achievement goals. Specifically, entity beliefs were strong predictors of amotivation regardless of perceived competence. Given the early stage of development in the measurement and testing of implicit beliefs in the physical domain, this is an important finding. Believing that athletic ability is a gift and is stable appears to be motivationally maladaptive, even for those individuals confident in their own ability. One reason for this could be that such perceptions do not allow feelings of confidence and control over future outcomes. In particular, if one feels incompetent and believes that athletic ability cannot change a great deal, feelings of helplessness may ensue. Further research is warranted to explicate the repercussions of entity beliefs in individuals differing in perceived athletic competence.

The motivationally adaptive nature of task orientation was supported (Duda and Hall, 2001). Specifically, task orientation showed moderate and small negative relationships with amotivation among youth possessing low and high perceived competence, respectively. Ego goals were not significantly associated with amotivation. The predicted relationship between ego orientation and amotivation for those low in perceived competence failed to materialize. Although goal orientations theory predicts motivational difficulties for ego-oriented individuals low in perceived competence (Nicholls, 1989), results in the physical domain have not always provided support for this. For example, Vlachopoulos and Biddle (1997) found no relationship between an ego orientation and perceived success in school physical education for children either high or low in perceived physical ability. The effect of low perceived competence for high ego-oriented individuals is likely to be complex and the present research design may have been too undifferentiating to allow for this. Nicholls (1984), for example, distinguished between three types of individuals perceiving their competence to be low. In addition, recent work in the education domain has proposed at least two types of ego goals – approach and avoidance – which are linked to different antecedents and motivational consequences (see, for example, Elliot and Harackiewicz, 1996; Elliot, 1999). In the current study, the predicted relationships between ego orientation and amotivation may have been attenuated as a result of not addressing these types of ego goals.

Entity beliefs predicted ego orientation rather better in those with high rather than low perceived competence. This is not readily explainable, although it may be a function of high perceived competent youth wanting to 'look good' on a physical task, striving towards superior normative performance, thereby proving the adequacy of their stable and 'God-given' competence (Dweck, 1999). Whether this is inconsistent with the prediction that motivational deficits are more likely for those high in entity beliefs under conditions of adversity remains to be seen. These notions require further testing.

The results also showed that more variance in amotivation was explained in the low perceived competence group than in the high perceived competence group. This is to be expected, since amotivation is much lower for those perceiving their competence to be high and, therefore, as a construct is less salient to such individuals. Relationships will be attenuated in this situation. Moreover, work on beliefs (Dweck and Leggett, 1988; Dweck *et al.*, 1995; Kasimatis *et al.*, 1996; Mueller and Dweck, 1998) suggests that the strongest motivational effects will be in the face of adversity. This is more likely to be the case for those low in perceived competence.

In conclusion, the proposed CNAAQ-2 hierarchical factor structure was supported with a large sample and was shown to be invariant across gender and age groups. Ability beliefs and goal orientations predicted amotivation for both those low and high in perceived competence, although more variance was explained in amotivation for youth low in perceived competence.

Study 3: predicting enjoyment from beliefs and goals

The third study examined the relationships between conceptions of sport ability, goal orientations, perceived competence and enjoyment using structural equation modelling path analysis. The rationale for such a study was to examine a motivational construct – enjoyment – that can be described as being distinctly opposite to amotivation (Vallerand and Losier, 1999) and one seen as critical for continued motivation in the physical domain (Harter, 1981; Scanlan and Simons, 1992). Such an analysis may throw further light on the important issue of understanding physical activity motivation in young people. This study was designed to complement Study 2 and included participants in sixth-form education as well as those of compulsory school age. Including slightly older adolescents in the sample was not expected to influence the proposed network of relationships.

The hypothesized model predicted enjoyment directly from task orientation and incremental beliefs. As in Study 2, task orientation was predicted by incremental beliefs and ego orientation by entity beliefs. Meta-analytic evidence on physical activity suggests that positive affect is moderately strongly associated with task orientation but hardly associated at all with ego orientation (Ntoumanis and Biddle, 1999). Therefore, ego orientation was not modelled to predict enjoyment. However, based on achievement goal theory, we thought it of interest to examine whether enjoyment would be positively associated with ego orientation among those high in perceived competence but negatively associated with ego orientation among those low in perceived competence. Individuals who are confident in their normative ability should arguably be more likely to report positive affect in physical settings, whereas negative emotions would be expected among those who feel unable to demonstrate the adequacy of their ability. Thus, as in Study 2, we examined the moderating role of perceived competence, but with a contrasting motivational outcome.

We hypothesized that incremental beliefs would predict enjoyment directly, as well as indirectly through task orientation. This is based on Dweck's argument that incremental theorists will seek to improve their ability and use adaptive behavioural and learning strategies (Dweck and Leggett, 1988; Dweck *et al.*, 1995). For example, given that incremental theorists are more likely to use effort attributions and have a greater sense of personal control, links with intrinsically motivated states, including enjoyment, appear justified.

Methods

Participants

Data were collected from two separate samples and in combination ($N = 570$). The first (Sample A, $n = 352$) was the same sample used in Study 1. The second sample (Sample B, $n = 218$) consisted of 115 boys and 103 girls, aged 16–19 years (mean 17.4 ± 0.7 years), attending a sixth-form college in the south-east of England. For Sample B, 15 tutor groups were selected at random.

Measures

The same measures used in Study 2 were administered to assess beliefs, goal orientations and perceived competence. One additional scale to measure enjoyment was included. This comprised three items adapted from the enjoyment/interest sub-scale of the Intrinsic Motivation Inventory (McAuley *et al.*, 1989). The participants were asked the extent to which they enjoyed physical education and sport, felt that physical education and sport were fun, and were interesting. Responses were given on a 5-point Likert scale ranging from 1 (not at all) to 5 (very much so). The alpha coefficients for both samples were above 0.89.

Results

Descriptive statistics and a full correlation matrix are shown in Table 8. Task orientation was moderately correlated with incremental beliefs and enjoyment, whereas ego orientation was weakly associated with entity beliefs and enjoyment. As expected, the strongest correlation with enjoyment was for perceived competence.

Prediction of enjoyment

Figure 3 shows the proposed network of relationships between conceptions of sport ability, goal orientations and enjoyment. To test for the potential moderating role of perceived competence, as in Study 2 we split the sample into groups differing in perceived competence. Because of the smaller sample size in comparison to Study 2, we used a mean split (mean 2.96) to create high perceived competence ($n = 336$) and low perceived competence ($n = 234$) groups. Moreover, hypothesized relationships among each group were tested initially using measured rather than latent variables with EQS.

The fit of the data to the model was fair for both groups (high perceived competence: $\chi^2 = 13.30$, d.f. = 3, non-normed fit index = 0.815, comparative fit index = 0.939, root mean squared residual = 0.030, root mean square error of approximation = 0.092; low

Table 8. Variable means, standard deviations and correlation matrix for the overall sample (Study 3)

Variable	Mean ± *s*	1	2	3	4	5
1. Task orientation	3.87 ± 0.57					
2. Ego orientation	2.81 ± 0.85	0.23**				
3. Perceived competence	2.96 ± 0.80	0.28**	0.31**			
4. Incremental	3.99 ± 0.57	0.42**	0.12**	0.17**		
5. Entity	2.59 ± 0.65	−0.16**	0.18**	0.12**	−0.15**	
6. Enjoyment	3.89 ± 1.00	0.45**	0.21**	0.60**	0.33**	−0.02

**$P < 0.01$.

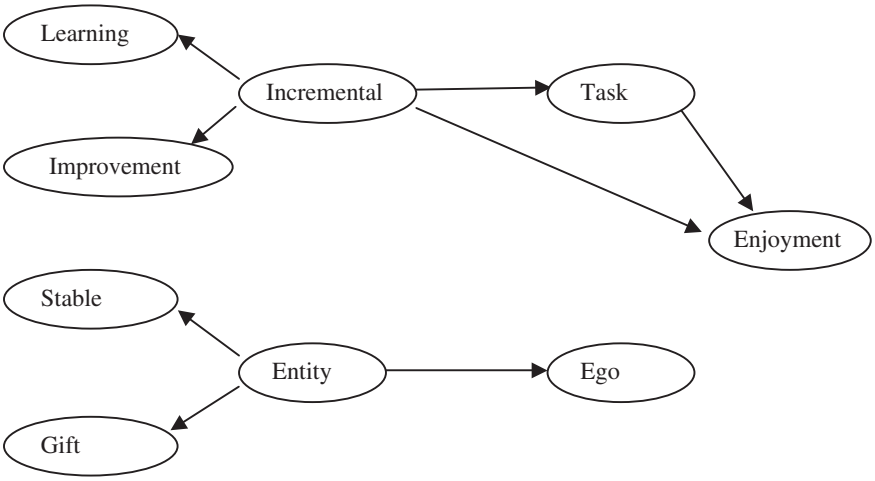


Fig. 3. Proposed full latent model of the relationships between conceptions of sport ability, goal orientations and enjoyment (Study 3).

perceived competence: $\chi^2 = 13.61$, d.f. = 3, non-normed fit index = 0.893, comparative fit index = 0.917, root mean squared residual = 0.030, root mean square error of approximation = 0.102). For the high perceived competence group, 21.5% of the variance in enjoyment was explained, whereas this figure dropped slightly to 19.2% for the low perceived competence group. To test for invariance across groups, a multi-group analysis was conducted with all paths set to be equal. Statistics showed a good fit, suggesting that the two groups did not differ from each other ($\chi^2 = 33.04$, d.f. = 14, non-normed fit index = 0.910, comparative fit index = 0.937, root mean squared residual = 0.036, root mean square error of approximation = 0.049). Consequently, the two samples were combined and a full latent model was tested. The overall fit was acceptable ($\chi^2 = 815.49$, d.f. = 343, non-normed fit index = 0.915, comparative fit index = 0.921, root mean squared residual = 0.065, root mean square error of approximation = 0.047). Figure 4 shows the standardized solution for the combined sample analysis. The model explained 29.1% of the variance in enjoyment, with a strong link shown for task orientation.

Discussion

The results of Study 3 support Study 2 and the theoretical propositions of Dweck and co-workers (Dweck and Bempechat, 1983; Dweck and Leggett, 1988). Specifically, incremental beliefs appear to orientate individuals towards a task orientation and entity beliefs appear to orientate individuals towards an ego orientation, the former rather more so than the latter.

The variance accounted for in enjoyment is far from modest given that it would be predicted that perceived competence itself is strongly related to enjoyment and may even be the best predictor from commonly assessed motivational variables. The correlations presented in Table 8 support this view. Therefore, our results show that ability beliefs and goal orientations are important variables beyond perceived competence in

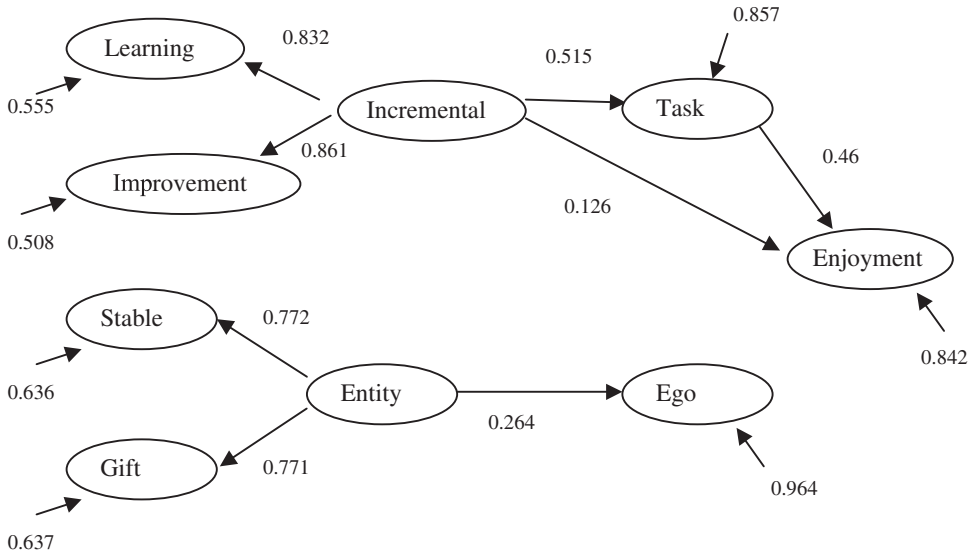


Fig. 4. Standardized solution for the proposed model of the relationships between conceptions of sport ability, goal orientations and enjoyment (Overall Sample; Study 3). All paths shown are significant ($P < 0.05$).

the prediction of enjoyment. Confidence in this finding is enhanced by replication across samples differing in perceived competence. In summary, the results show that feelings of enjoyment are more likely to transpire when young people hold a task orientation and have beliefs that sport ability is incremental.

Our results also support Study 2 in showing that perceived competence is less influential than achievement goal theory predicts. The network of relationships was the same for the two groups differing in perceived competence. Proponents of achievement goal theory might predict that an ego orientation will be positively associated with enjoyment for those high in perceived competence and negatively associated with enjoyment for those low in perceived competence. However, our model hypothesizing no such relationships, based on meta-analytic evidence (Ntoumanis and Biddle, 1999), was supported and modification indices did not suggest paths be added from ego orientation to enjoyment.

General discussion

There were two main aims to this research. First, we wished to develop and test a psychometric measure of the beliefs concerning sport/athletic ability. Second, we examined the relationships between implicit beliefs and motivational variables, specifically amotivation and enjoyment, in the physical domain with young people.

The development and testing of the hierarchical CNAAQ-2 proved successful. Deleting the general and specific sub-scales and other problematic items from the CNAAQ improved the conceptual and empirical bases of the instrument. The CNAAQ-2 has good factorial, convergent and discriminant validity as well as internal consistency. The factor structure is invariant across three age groups and both sexes. Given the large samples involved in the testing of the instrument, we recommend that the CNAAQ-2 be used in future research.

Dweck *et al.* (1995) suggested that incremental and entity beliefs are important in many life domains, yet little research has been conducted in the physical domain. The research reported here, therefore, adds a new dimension to the study of implicit beliefs. In addition, the hierarchical and multidimensional model underpinning the CNAAQ-2 extends previous measurement technology in this field (Dweck *et al.*, 1995; Dweck, 1999). When assessed independently, as in the present studies, it would appear that entity and incremental beliefs are largely uncorrelated. This may lead to the examination of belief permutations and their motivational correlates in future work.

The results support the role of implicit beliefs, in conjunction with goal orientations and perceptions of competence, for furthering our understanding of motivated behaviour of youth in physical activity. Specifically, it would appear that entity beliefs are important independent predictors of amotivation, and incremental beliefs are important independent predictors of enjoyment. Most descriptive studies in youth sport (Gould and Horn, 1984; Biddle, 1995) have found that enjoyment is an important factor reported by participants. In addition, it is suggested that amotivation may be an important construct in understanding physical activity motivation. In combination, therefore,

the results provide further insight into physical activity correlates in young people.

Confidence in the importance and robustness of the findings is enhanced for two reasons. First, the sample sizes used were quite large and from numerous and diverse locations, particularly in Study 2. Second, the results predicting motivational variables are conceptually coherent. Amotivation was predicted directly by entity beliefs and greater variance was accounted for among those low in perceived competence. Amotivation is a construct more salient to such people. In contrast, but equally coherent, enjoyment was predicted directly by incremental beliefs.

An unexpected contribution of the results from Studies 2 and 3 was that perceptions of competence had little impact on the role of ego orientation, despite predictions to the contrary from goal orientations theory (Nicholls, 1989). Although there is plenty of evidence to suggest that ego-oriented participants in sport and physical activities are motivationally more fragile when their perceived competence is low (Cury *et al.*, 1997; Duda and Hall, 2001), this appears not to be invariably the case. Including the results reported here, there is sufficient evidence now to show that the effect of perceived competence is inconsistent (see, for example, Vlachopoulos and Biddle, 1997). This inconsistency may be a reflection of the variety of measures of perceived competence used across research studies, which differ in their emphasis on self- or normatively-referenced ability (Biddle, 1997). Although it was not the purpose of Studies 2 and 3 to be direct tests of goal perspectives theory, the results suggest that the influence of perceived competence appears more complex than sometimes acknowledged in similar research. We also recommend that the proposals of Elliot and Harackiewicz (1996) and Skaalvik (1997) concerning more differentiated measures of goal orientations be followed up. A more fine-grained analysis of the antecedents and consequences of goal orientations in sport and physical activities should ensue.

Although this paper provides a viable measuring instrument and supports conceptually coherent relationships between beliefs and motivational variables, there is much still to be done. First, the studies reported here are cross-sectional. We need prospective, longitudinal and experimental studies to test for causality. Preliminary evidence supports causality in other domains (Dweck *et al.*, 1995; Levy *et al.*, 1998), but work is required in physical activity.

Additional investigation is warranted into the role of beliefs for those experiencing success and failure. Dweck *et al.* (1995) have shown that the effects of such beliefs are particularly strong under conditions of adversity. This was partly supported by our findings in Study 2, where amotivation was more strongly predicted for those low rather than high in perceptions of competence. We recommend taking this research further by investigating attributional and affective reactions to success and failure, in conjunction with implicit beliefs (Hong *et al.*, 1999). This might help us to understand when, how and why different beliefs might be advantageous. For example, entity beliefs, while sometimes appearing motivationally maladaptive, might also provide 'order' to events and be a parsimonious way of organizing one's view of the world (Dweck *et al.*, 1995).

Whereas goal orientations research has shown that differentiating individuals on the basis of how they construe competence and define success is informative, the preliminary research reported here supports the view that how people see the nature of athletic ability is also an important distinction to make in motivational research. Further work combining such beliefs with goals, and other constructs, is recommended to explicate more clearly the key determinants of physical activity in youth.

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Appendix: Conceptions of the Nature of Athletic Ability Questionnaire-2

Responses are made on a 5-point scale anchored by 1 (strongly disagree) and 5 (strongly agree).

My beliefs about ability in sport:

1. You have a certain level of ability in sport and you cannot really do much to change that level
2. To be successful in sport you need to learn techniques and skills, and practise them regularly
3. Even if you try, the level you reach in sport will change very little
4. You need to have certain 'gifts' to be good at sport
5. You need to learn and to work hard to be good at sport
6. In sport, if you work hard at it, you will *always* get better
7. To be good at sport, you need to be born with the basic qualities which allow you success
8. To reach a high level of performance in sport, you must go through periods of learning and training
9. How good you are at sport will *always* improve if you work at it
10. It is difficult to change how good you are at sport
11. To be good at sport you need to be naturally gifted
12. If you put enough effort into it, you will *always* get better at sport