To improve or to compete

Implicit theories of ability and parental behavior as determinants of achievement goals in sport

Weltevreden, G.M.

Publication date
2021
Document Version
Other version
License
Other

Chapter 2

Validation of a Dutch Measure for Implicit Theories of Ability in Sport (CNAAQ-2-NL)

This chapter is based on:

Weltevreden, G. M., Van Hooft, E.A.J., & Van Vianen, A. E. M. (2019). Validation of a Dutch Measure for Implicit Theories of Ability in Sport (CNAAQ-2). *Manuscript submitted for publication*.

Abstract

Our goal was to validate the Conceptions of the Nature of Athletic Abilities Questionnaire (CNAAQ-2) in a Dutch context. We conducted three studies to examine its psychometric qualities. In Study 1 we performed exploratory factor analyses on two samples (N = 400, and N = 341), which supported a solution of four factors labeled entity-stable, entity-gift, incremental-learning, and incremental-improvement. To further improve the reliability, 25 items were added and in Study 2 we merged three samples that were then randomly split in two halves. A principal component analysis of the first half of the data (N = 255) led to a selection of 21 items (the CNAAQ-2-NL), which was verified in a confirmatory factor analysis of the second half of the data (N = 255). The fit of a model with four lower-order factors (entity-stable, entity-gift, incremental-learning, and incremental-improvement) was acceptable, as was the fit of a four-plus-two higher-order factor model, with entity and incremental as higher-order factors. In Study 3 (N = 322) we administered the CNAAQ-2-NL along with other measures, at two points in time three weeks apart. Test-retest reliability was good and convergent validity was supported by relations with Dweck's measures of implicit theories of intelligence and sport abilities. Predictive validity was supported by relations with achievement goals. We conclude that the factor structure of the CNAAQ-2-NL was according to theory and that validity was sufficiently supported. However, our findings also suggest that the role of implicit theories may be different in sport than in the context of intelligence and needs further investigation.

Introduction

People differ in their beliefs about the malleability of human abilities. Some believe that abilities are innate and largely fixed, while others believe that abilities can be developed. Dweck's (1999) theory about implicit theories of ability labels the first an entity view and the second an incremental view. Entity and incremental beliefs relate to motivation, goals, affect, and behavior in the context of intelligence (Mueller & Dweck, 1998). In the context of sport and physical activity, entity and incremental beliefs relate to important motivational outcomes such as achievement goals (Vella et al., 2016), self-determined motivation (Biddle et al., 2003; Moreno-Murcia, Gimeno, Galindo, Hernández, & Buñuel, 2014), amotivation (Biddle et al., 2003), enjoyment (Biddle et al, 2003), self-handicapping (Chen et al., 2008; Ommundsen, 2001b), competence (Wang & Liu, 2007), attributions, and anxiety (Gardner, Vella & Magee, 2015).

To measure implicit theories of ability in sport, Biddle and colleagues (2003) revised Sarrazin et al.'s (1996) Conceptions of the Nature of Athletic Ability Questionnaire (CNAAQ), developing the CNAAQ-2. Some studies have provided initial support for the reliability and validity of the CNAAQ-2 but its psychometric properties varied across these studies, thus further validation of this instrument is needed. Furthermore, the CNAAQ-2 needs to be tested in different cultural contexts as to promote cross-cultural comparisons of research findings with this instrument.

Our first aim is to develop a Dutch version of the CNAAQ-2, and examine its psychometric properties. As earlier studies on the CNAAQ-2 have not always shown the same dimensional structure, a second aim of this study is to test the dimensionality of the CNAAQ-2 and to further investigate the validity of the scales and subscales. Moreover, as to enhance the validity and generalizability of the CNAAQ-2 we test the CNAAQ-2 among experienced athletes, which extends prior research on implicit theories that predominantly examined school children in the context of physical education classes.

Our research comprises three studies. In Study 1, we developed a Dutch version of the CNAAQ-2 and investigated its construct validity and reliability in two samples. In Study 2, we further developed the Dutch CNAAQ-2 (i.e., the CNAAQ-2-NL) by generating additional items, and cross-validated this measure in a third sample. In Study 3, we investigated the test-retest reliability of the improved CNAAQ-2-NL, as well as its convergent and predictive validity. All studies were approved by the Ethical Review Board of the University of Amsterdam. All participants provided their written consent for the use of their data.

Implicit Theories

Implicit theories were introduced to explain why children react differently to setbacks. Some children showed a helpless response pattern, characterized by a sense of failure, negative self-cognitions, task avoidance, loss of self-confidence, negative affect, and performance decrements. Other children showed a mastery response pattern, marked by a combination of task-related self-instructions, heightened effort, and the absence of negative cognitions (Dweck & Leggett, 1988). These different response patterns were theorized to originate from children's beliefs about the malleability of intelligence and to reflect their achievement goals. The literature on achievement goals (e.g., Elliot & McGregor, 2001) distinguishes between *performance goals,* expressing the desire to demonstrate superior ability compared to others, and *mastery goals*, expressing the desire to learn, develop and improve. To account for the emergence of these goals and response patterns, Dweck and Leggett (1988) proposed two frames of reference: an entity view and an incremental view.

An entity view reflects the idea that intelligence is a fixed and innate ability that cannot be changed. People with an entity view perceive performance situations as a moment where their abilities are compared to those of others which elicits concerns about not being smart enough, a focus on the outcome of the comparison, worries about failure, and avoidant behavior. Consequently, an entity view leads to the pursuit of performance goals and a helpless pattern, especially after failure is encountered.

An incremental view reflects the idea that intelligence is malleable and can be developed through practice, learning, and effort. People with an incremental view tend to view performance situations as self-assessments that can inform them about their current level of ability and possible areas for improvement, which leads to mastery goals and a mastery reaction pattern.

Implicit Theories in Sport

Because research suggests that implicit theories are domain specific (Burnette et al., 2013; Dweck, Chiu & Hong, 1995), they have been studied separately in the sports domain. Multiple studies have shown support for the relation between implicit theories and achievement goals in sport (e.g., Wang, Liu, Lochbaum, & Stevenson, 2009). Moreover, Spray et al. (2006) have provided support for the causality of this relation by manipulating implicit theories about golf ability in junior high school students. Their results showed that the entity group was more likely than the incremental group to adopt performance goals,

and the incremental group was more likely than the entity group to adopt mastery goals (but only after failure).

One of the first studies of implicit theories of ability in the sports domain (Sarrazin et al., 1996) supported the relations between implicit theories and achievement goals, but the results were not as convincing as in studies about intelligence. To better capture the nature of athletic abilities, the researchers developed the Conceptions of the Nature of Athletic Abilities Questionnaire (CNAAQ), which consists of 21 items in six subscales, representing three dichotomies. They found relations between these CNAAQ-subscales and achievement goals that were more in line with theory.

However, the factorial structure of this original, French-language, version of the CNAAQ (Sarrazin et al., 1996) was not always confirmed in other languages. Different numbers of factors were sometimes found, and some items showed cross-loadings or loaded on factors they did not belong to (e.g., Ommundsen, 2001a, 2001b). This led to a revision of the CNAAQ into the CNAAQ-2 (Biddle et al., 2003), consisting of four subscales with three items each. Based on a confirmatory factor analysis, Biddle et al. (2003) selected a measurement model with four first-order factors reflecting that sport ability is (1) *stable* over time, (2) a *gift*, (3) the product of *learning*, and (4) open for *improvement*, and two higher-order factors (entity and incremental). A four-factor model provided a better fit to the data, but the four-plus-two factor model was chosen "based on the proposition that the common variance among stable and gift subscales, and among learning and improvement subscales, could be accounted for within the higher order entity and incremental beliefs, respectively, and thus represented a more parsimonious model" (Biddle et al., 2003, p. 976). The four-plus-two factor structure was supported in subsequent studies with different samples, as well as the hypothesized relations with achievement goals, amotivation, and enjoyment (Biddle et al., 2003).

The factor structure of the CNAAQ-2 has been investigated in several languages, sometimes supporting the four-plus-two factor model (Moreno-Murcia, Cervelló-Gimeno, Martínez-Galindo, & Moreno, 2013; Stenling, Hassmén, & Holmström, 2014; Wang et al., 2009), sometimes supporting a four-factor model (Moreno-Murcia et al., 2014; Stevenson and Lochbaum, 2008; Wang & Liu, 2007; Wang, Liu, Biddle, & Spray, 2005), and sometimes supporting a two-factor model (Chen et al., 2008; De Oliveira Durão, Moreira, Calvo, Cervelló, & Rubio, 2010).

In the current study, we developed a Dutch version of the CNAAQ-2, examined its factor structure, and compared the internal consistencies of the scales to those found in prior studies.

Study 1: Translation and initial validation of the CNAAQ-2

We developed a Dutch version of the CNAAQ-2 using translation-back translation procedures. First, we explored the four factor structure, which is the theoretical basis of the original CNAAQ-2. Because research has provided evidence for both a four-plus-two factor model, a four-factor model and a two factor model we next compared these models to find the best fit. Most studies investigating implicit theories in sports have recruited school children as respondents (e.g., Biddle et al., 2003; Ommundsen, 2001a, 2001b), but this might limit the generalizability of results to experienced athletes. We recruited study participants who had practiced their sport for a number of years as these experienced athletes may respond differently to the CNAAQ-2 items than school children who think of sport in general or as physical education.

Method

Participants

Because our aim was to develop an instrument that is valid and reliable for all levels of sport participation and across different sports, we recruited two samples for Study 1 consisting of respondents who were actively involved in a variety of sports at different competitive levels.

Sample 1. The first sample (N = 400; 165 female; 230 male; 5 did not report their gender; M_{age} = 20.2; SD = 1.96) was collected among college students at a school for higher professional education for sports teachers (n = 80) and for management and entrepreneurship in sports (n = 320). All participants in this sample actively practiced sports on a daily basis, for an average of 6.3 hours per week (SD = 3.7). Soccer players comprised the largest group in this sample (n = 133; 33.3%), followed by field hockey (n = 32; 8.0%), tennis (n = 23; 5.8%), and running (n = 19; 4.8%). Fifty participants (12.5%) practiced their sport on a recreational level and 333 (83.3%) on a competitive level, of which 24 took part in international competition (17 participants, 4.3% did not report their participation level). On average, participants had been practicing their sports for 10.4 years (SD = 4.6). Data were collected during class hours, using paper-and-pencil questionnaires.

Sample 2. The second sample (N = 341; 114 female, 216 male, 8 did not report their gender; M_{age} = 21.9 years; SD = 10.61) consisted of athletes from a variety of sports. Soccer players comprised the largest group (n = 101, 31.9%) followed by tennis (n = 42, 13.1%) and fitness (n = 36, 11.4%). One hundred twenty-two participants (35.8%) participated in sport on a recreational level and

218 (63.9%) on a competitive level, of which 22 took part in international competition (one participant did not report the level of sport participation). Data were collected using paper-and-pencil questionnaires.

Measures

Implicit theories of ability. After the first author had translated the CNAAQ-2 (Biddle et al., 2003) into Dutch, it was translated back into English by a researcher fluent in both English and Dutch. This procedure did not show any meaningful differences. Like the English version, the Dutch CNAAQ-2 consisted of twelve items that are expected to belong to four subscales, containing three items each: Stable (e.g., "You have a certain level of ability in sport and you cannot really do much to change that level."), Gift (e.g., "You need to have certain 'gifts' to be good at sports."), Learning (e.g., "To be successful in sport you need to learn techniques and skills, and practice them regularly."), and Improvement (e.g., "In sport, if you work hard at it, you will always get better."), Answers were provided using a Likert scale, ranging from 1 (*completely disagree*) to 5 (*completely agree*).

Results

To examine the factor structure, we performed a principal component analysis in both samples. We used oblimin rotation because the entity and incremental scales, as well as their four subscales, are expected to correlate. In both samples, the scree plot suggested retaining three factors, but the Kaiser criterion suggested four factors, explaining 59.47% and 58.86% of the variance, respectively. We chose a four factor solution, based on the Kaiser criterion and on the distribution of items over factors, which clearly followed the underlying theory.

Average factor loadings per subscale (for Sample 1 and Sample 2 respectively) were .68 and .64, for the stable scale, .81 and .77 for the gift scale, -.70 and .61 for the learning scale, and .80 and .84 for the improvement scale. All primary loadings were well above the .32 criterion, and all cross-loadings were well below (cf. Tabachnick & Fidell, 2012), except for Item 10 in Sample 2. This item belongs to the stable scale but had a higher, but negative, loading on the scale for learning (0.32 vs. -0.43), which is understandable, since these two scales represent opposing ideas (the idea that ability for sport can, or cannot, be developed).

Cronbach's alphas for the gift (.74 and .70) and improvement scales (.73 and .80) were satisfactory, but those for the stable (.46 and .48) and learning scales (.47 and .40) were too low. When items were removed, all alphas decreased, except when Item 5 in Sample 1 was removed.

Table 2.1 presents descriptives and correlations of the four subscales as well as the entity and incremental scales. The correlation between the entity and incremental scales was close to zero (Sample 1: $r = .07$, $p = .17$; Sample 2: $r = -.05$, $p = .34$.). The stable and gift scales correlated not very strongly with each other (Sample 1: $r = .12$, $p = .01$; Sample 2: $r = .07$, $p = .20$), indicating that they are two separate aspects of the entity view. The learning and improvement scales did not correlate strongly either (Sample 1: $r = .15$, $p = .002$; Sample 2: $r = .19$, $p < .001$), indicating that they are two separate aspects of the incremental view. The low correlations of subscales with the opposing views' total scores, support the theoretical proposition that they are related but different constructs. However, interpretation of these correlations is hampered by the low reliabilities of the stable and learning scales.

Conclusion

The results of the factor analyses provided support for the factor structure of the Dutch version of the CNAAQ-2. Items theoretically belonging together loaded on the same factor and the dimensionality was also clearly reflected in the pattern of correlations between scales.

The reliabilities of the gift- and improvement scales were satisfactory, but the reliabilities of the stable and learning scales were below .60 and thus needed improvement. Because the entity and incremental scales are combinations of the stable and gift subscales and the improvement and learning subscales, respectively, the reliabilities of the entity and incremental scales were also rather low. Some studies reported higher reliabilities for the subscales than we found (Moreno-Murcia et al., 2013; Wang & Liu, 2007), but other studies also reported low reliabilities for the stable- and learning scales (Biddle et al., 1999).

A first explanation for the low reliabilities could be that the items were unclear to respondents. The exact translation of English items into Dutch may have caused expressions that are less common in Dutch. A second explanation could be that items in the stable and learning scales may not represent one single underlying idea or that the underlying idea was not clear enough to the respondents. The central idea of the stable scale is that, even if you try, it is hard to change how good you are in a sport. Because most people believe that one can improve sport performance through practice, this idea may be counterintuitive, which may have caused irregular responses. This is supported by the fact that the average score on this subscale was the lowest of the four in both our samples, indicating that respondents agreed the least with these items.

Table 2.1
Descriptive Statistics and Intercorrelations of the Scales of the CNAAQ-2 in Study 1(Samples 1 and 2)

	Sample 1		Sample 2							
CNAAQ-2 subscale	*M (SD)*	α	*M (SD)*	α	1.	2.	3.	4.	5.	6.
Entity total	2.72 (0.48)	.60	2.66 (0.51)	.55	-	.07	.61**	.86**	.09	.03
Incremental total	3.71 (0.54)	.62	3.90 (0.53)	.65	-.05	-	-.13**	.17**	.61**	.88**
Stable	1.97 (0.50)	.46	1.97 (0.54)	.48	.59**	-.09	-	.12*	-.12*	-.09
Gift	3.47 (0.77)	.74	3.36 (0.82)	.70	.84**	.00	.07	-	.19**	.10
Learning	4.15 (0.53)	.47	4.17 (0.50)	.40	.14**	.61**	-.11	.25**	-	.15**
Improvement	3.27 (0.87)	.73	3.63 (0.85)	.80	-.14**	.89**	-.05	-.13*	.19**	-

Note. Correlations in the upper diagonal are from Sample 1 (N = 400). Correlations in the lower diagonal are from Sample 2 (N = 341). Entity total = the average of the stable scale and the gift scale. Incremental total = the average of the learning scale and the improvement scale.
* $p < .05$ ** $p < .01$.

The learning subscale also did not perform well enough. The central idea of this scale is that to reach a high level in sport, it is necessary to practice and learn. Possibly, respondents found this idea so evident that they thought there was a deeper meaning behind the items. For example, the item with the lowest factor loading was: 'You need to learn and to work hard to be good at sport'. Indeed, this subscale had the highest average score of the four subscales in both samples, indicating most respondents endorsed this viewpoint.

Because of the low reliabilities for the stable and learning subscales, we decided to adjust some items and generate additional ones. This revised Dutch version of the CNAAQ-2 (i.e., the CNAAQ-2-NL) was empirically tested in Study 2.

Study 2: Development of the CNAAQ-2-NL

The aim of Study 2 was to develop a reliable and valid CNAAQ-2-NL. We improved the Study 1 items and generated a number of additional items, which we administered to three samples: soccer players, dancers, and competitive swimmers. We decided to collect data in these three distinct sports domains to assure that the CNAAQ-2-NL would be applicable in a broad range of contexts. The three samples were combined into one dataset and this set was split in two random parts. Based on an exploratory factor analysis on the first half, we made a selection of items. This selection was then cross-validated with the second half of the data file, using confirmatory factor analysis.

Further Instrument Development

Based on the scale descriptions in prior articles (Biddle et al., 2003; Sarrazin et al., 1996), we generated additional items that capture the central idea of the subscales. The central idea of the stable scale is that the level of ability that people have, cannot be changed much and limits the performance level they can achieve. The central idea of the gift subscale is that innate talent is necessary to become successful in a sport. The central idea of the learning subscale is that learning and training is the way to keep improving in a sport. The central idea of the improvement scale is that people can always improve their skill level in a sport if they work for it, and that there is no limit to the performance level they can achieve.

As a first step, we re-evaluated the content of the twelve existing items. Where necessary, we slightly rephrased items to align them with the description of the scale they belonged to, or to formulate them in more common and contemporary Dutch. Then, we generated 105 new items based on literature about implicit theories of ability and the conceptualization of the scales (Biddle et

al., 2003, Dweck, 1999; Sarrazin et al., 1996). Finally, based on careful considerations by the first two authors we selected the best 25 items. Together with the original twelve items, this resulted in a 37-item questionnaire. In this revised version, the stable scale was formed by eight items, the gift scale by nine items, the learning scale by eleven items and the improvement scale by nine items. Answers were provided using a Likert scale, ranging from 1 (*completely disagree*) to 5 (*completely agree*).

Method

Participants

We collected data from three subsamples. The first subsample consisted of junior soccer players from two soccer schools (n = 211; all boys; M_{age} = 14.65; SD = 2.83). The second subsample consisted of dancers, recruited through dancing schools and summer camps for young dancers (n = 154; 24 boys, 130 girls; M_{age} = 15.12; SD = 3.47). The third subsample consisted of swimmers (n = 145; 74 boys, 71 girls; M_{age} = 18.12; SD = 3.64). The combined sample (N = 510; 309 boys, 201 girls; M_{age} = 15.84; SD = 3.52) was split in two random halves. Following the procedure outlined in Gerbing and Hamilton (1996), we conducted an exploratory factor analysis on the first part of the sample (n = 255; 164 boys, 91 girls; M_{age} = 15.86, SD = 3.20; 114 soccer players; 64 dancers, and 77 swimmers) to select the best items. Then, we performed a confirmatory factor analysis on the second part of the sample (n = 255; 145 boys, 110 girls; M_{age} = 15.82, SD = 3.83; 97 soccer players, 90 dancers, and 68 swimmers) to cross-validate the item selection.

Results

Exploratory Factor Analysis

We performed a principal component analysis with oblimin rotation because factors were expected to correlate. Ten factors had an eigenvalue above 1 and the scree plot suggested either a two-, or four-factor solution, explaining 33.61% or 44.06% of the variance, respectively. A two-factor solution was chosen because it reflected the entity- and incremental distinction and we could then select the highest loading items of each of the four subscales. Table 2.2 presents the items, the factor loadings and reliabilities after rotation and item selection. The items of the CNAAQ-2–NL in Dutch are presented in Appendix A.

Table 2.2

Factor Loadings of the Principal Component Analysis in Study 2 (First Half of Sample 3).

Scale	Item#	Factor 1	Factor 2	Scale	Item#	Factor 1	Factor 2
Ent-Gif	30	.19	.71^{Ent}	Inc-Lea	15	.73^{Inc}	.16
Ent-Gif	11	.22	.69^{Ent}	Inc-Lea	19	.73^{Inc}	
Ent-Gif	4	.24	.68^{Ent}	Inc-Imp	20	.72^{Inc}	
Ent-Gif	7	.12	.63^{Ent}	Inc-Imp	32	.72^{Inc}	
Ent-Gif	26		.62^{Ent}	Inc-Lea	23	.66^{Inc}	
Ent-Gif	14		.61	Inc-Imp	9	.65^{Inc}	
Ent-Gif	22	.11	.57	Inc-Imp	16	.64^{Inc}	
Ent-Sta	13		.53^{Ent}	Inc-Lea	5	.64^{Inc}	.16
Ent-Gif	33 (R)	-.16	.51	Inc-Lea	8	.61^{Inc}	.14
Ent-Sta	17	-.31	.49^{Ent}	Inc-Lea	2	.61	.10
Ent-Sta	21	-.39	.48^{Ent}	Inc-Imp	24	.59^{Inc}	-.13
Ent-Sta	1		.43^{Ent}	Inc-Lea	36	.58	
Ent-Sta	25	-.10	.41^{Ent}	Inc-Lea	34	.58	
Ent-Sta	3	-.20	.39^{Ent}	Inc-Imp	6	.49	
Ent-Sta	29	-.39	.32	Inc-Imp	12	.49	
Ent-Sta	10	-.31	.28	Inc-Imp	35 (R)	.37	-.29
Ent-Gif	18	-.14	.20	Inc-Lea	27	.35	.12
				Inc-Lea	37 (R)	.32	-.25
				Inc-Imp	28 (R)	.27	-.43
				Inc-Lea	31 (R)	.25	

Alpha for all selected entity items (marked with superscript Ent, *k*= 11)	.79
Alpha for the entity-stable items (*k*= 6)	.69
Alpha for the entity-gift items (*k*= 5)	.79
Alpha for all selected incremental items (marked with superscript Inc, *k* = 10)	.87
Alpha for the incremental-learning items (*k* = 5)	.78
Alpha for the incremental-improvement items (*k* = 5)	.81

Note. *N* = 255. Results of a principal component analysis with forced two factor solution and oblimin rotation. Entity items and incremental items were analyzed together but are presented as separate sets for clarity. Selected items are marked with a superscript. Factor loadings below .10 have been omitted. Ent-Sta = Entity Stable; Ent-Gif = Entity Gift; Inc-Lea = Incremental Learning; Inc-Imp = Incremental Improvement.

We selected items based on a factor loading above .32 and a cross-loading below .32 (Tabachnick & Fidell, 2012). Moreover, items of the original CNAAQ-2 were preferred over newly formulated items. The final selection consisted of twenty-one items. We selected the six highest loadings of the stable scale (α = .69), and the five highest loading items of the gift scale (α = .79), the learning scale (α = .78), and the improvement scale (α = .81). For the stable scale we selected six items for reasons of reliability, to include Item 3 that was part of the original CNAAQ-2, and to keep Item 21 that had one of the highest factor loadings. Selecting six items for this scale resulted in a reliability of .69 for the stable scale which is acceptable but below the threshold of .70.

Confirmatory Factor Analysis

We performed a confirmatory factor analysis on the second part of the combined Sample 3. We compared three models. Model 1, with two first order factors (entity and incremental) was based on Dweck's (1999) model of implicit theories of ability. Model 2, with four first-order factors (gift, stable, learning and improvement) is the model closest to the theoretical starting point for developing the CNAAQ (Sarrazin et al., 1999). Model 3, with four first-order factors and two higher-order factors, was based on the work by Biddle et al. (2003) that led to the revision of the CNAAQ into the CNAAQ-2.

Model 3 was unidentified, which we solved by constraining the first two factor loadings of the indicators to be equal for every first order factor, as well as constraining the factor loadings of the latent factors on their respective higher-order latent factors to be equal. This procedure reduces the number of paths to be estimated which resulted in the model being identified (Porath, Spreitzer, Gibson, & Garnett, 2012). Based on modification indices, the residual variances of some items were allowed to covary (Model 1 and 2: items 1 and 13, 4 and 11, and 15 and 19; Model 3: items 1 and 13, 4 and 11, and 25 and 26). All items originated from the same subscales except for items 25 and 26.

Model 1 (two first-order factors) did not fit the data well (χ^2 = 371.85, *df* = 184, χ^2/df-ratio = 2.02, RMSEA = .07, NNFI = .89, AIC = 479.28). Model 2 (four first-order factors) did fit the data well (χ^2 = 277.33, *df* = 180, χ^2/df-ratio = 1.54, RMSEA = .05, NNFI = .94, AIC = 372.62) as did Model 3 (four first-order plus two higher-order factors; χ^2 = 298.29, *df* = 187, χ^2/df-ratio = 1.60, RMSEA = .05, NNFI =.93, AIC = 379.39). The AIC was in favor of Model 2, but because of the small difference in fit between Model 2 and 3, we concluded that both models were tenable and that the four factors (stable, gift, learning, and improvement) as well as the two higher-order factors (entity and incremental) were all valid indicators of underlying latent variables.

In both models, all factor loadings were significant (*t*-values ranging from 4.32 to 7.46, all *p*'s < .01) as well as the loadings of the primary latent factors on the higher order latent factors (*t*-values -6.02 and 6.60 respectively, both *p*-values < .01). Average standardized factor loadings (for Model 2 and Model 3 respectively) per subscale were .49 and .49, for the stable scale, .56 and .56 for the gift scale, .41 and .42 for the learning scale, and .42 and .41 for the improvement scale.

Conclusion

In Study 2, we developed new items and analyzed the total item pool with a principal component analysis resulting in the 21-item CNAAQ-2-NL. We tested the dimensionality of the CNAAQ-2-NL using confirmatory factor analysis. A two-factor model did not fit the data well, but both the four-factor model and the four-plus-two factor model showed an acceptable fit, which was comparable to the fit reported in earlier studies (Biddle et al., 2003; Moreno-Murcia et al., 2013).

Study 3: Validity of the CNAAQ-2-NL

As a final step we investigated the test-retest reliability of the CNAAQ-2-NL, its convergent validity, and the predictive validity for achievement goals.

Test-Retest Reliability

To assess the stability of the CNAAQ-2-NL, we administered it twice with a three-week interval. The correlation between these scores is an indicator of the test-retest reliability (Furr, 2011). The test-retest interval in our study was three weeks, which is too long for participants to remember their scores, and too short to expect their implicit theories to have changed. To control the error variance, testing situations were equal on both occasions in terms of the presence or absence of other people, time of day, and location.

Relations with Other Measures of Implicit Theories

To assess the convergent validity, we examined relations between the CNAAQ-2-NL and three conceptually related measures: (a) a different measure of implicit theories in sport, (b) a measure of implicit theories of intelligence, and (c) a question about the relative importance of talent and hard work for success in sport. As a different measure of implicit theories in sport, we adapted the items developed by Dweck (1999) to measure implicit theories of intelligence, to apply to sport. This resulted in a Dweck-sport-entity scale and a Dweck-sport-incremental scale. We expected a positive relationship between the (a) entity-total scale, (b) entity-stable scale, and (c) entity-gift scale of the CNAAQ-2-NL and the

Dweck-sport entity scale, and a positive relationship between the (d) incremental-total scale, (e) incremental-learning scale, and (f) incremental-improvement scale of the CNAAQ-2-NL and the Dweck-sport incremental scale (*Hypothesis 1a-f*).

We also examined the relation between the CNAAQ-2-NL and implicit theories of intelligence, as measured by the Dweck-intelligence-entity scale and the Dweck-intelligence incremental scale (Dweck, 1999). Although studies show that people hold different views about the malleability of abilities in different domains, there is also overlap between domains, which suggests that some people generally are more entity oriented and others are generally more incremental oriented (Dweck et al., 1995). Therefore, we expected to find the same pattern of relations between the CNAAQ-2-NL and implicit theories of intelligence as between the CNAAQ-2-NL and implicit theories in sport, but we expected the relations with beliefs about intelligence to be weaker than those about sport. Specifically, we expected a positive relationship between the (a) entity-total scale, (b) entity-stable scale, and (c) entity-gift scale of the CNAAQ-2-NL and the Dweck-intelligence entity scale; and a positive relationship between the (d) incremental-total scale, (e) incremental-learning scale, and (f) incremental-improvement scale of the CNAAQ-2-NL and the Dweck-intelligence incremental scale (*Hypothesis 2a-f*).

To verify the CNAAQ-2 against a different measure of beliefs about the influence of talent and effort on success in sport, we asked participants how important they thought talent and hard work are for success (cf. Li et al., 2006). We expected positive relationships between the (a) entity-total scale, (b) entity-stable scale, and (c) entity-gift scale of the CNAAQ-2-NL and the importance assigned to talent for success in sport. Also, we expected positive relationships between the (d) incremental-total scale, (e) incremental-learning scale, and (f) incremental-improve scale of the CNAAQ-2-NL and the importance assigned to hard work for success in sport (*Hypothesis 3a-f*).

Relations between Implicit Theories and Achievement Goals

In accordance with extant theory (Dweck, 1999), we expected implicit theories to relate to achievement goals. To test this relationship, we used the 2x2 framework of achievement goals (Elliot & McGregor, 2001), which is composed of two dimensions: the mastery-performance dimension and the approach-avoidance dimension. The four achievement goals thus formed are performance-approach goals (I want to be better than others), performance-avoidance goals (I do not want to be worse than others), mastery-approach goals (I want to learn and develop myself), and mastery-avoidance goals (I want to avoid missing out on chances to learn and develop myself). The literature on implicit theories of ability

predicts that the entity view, with its focus on fixed innate abilities, will lead to performance goals (both approach and avoidance), and that the incremental view, with its focus on learning and development, will lead to mastery goals (both approach and avoidance; Biddle et al., 2003; Dweck & Leggett, 1988). We therefore expected positive relationships between the (a) entity-total scale, (b) entity-stable scale, and (c) entity-gift scale of the CNAAQ-2-NL and performance-approach goals, and positive relationships between the (d) entity-total scale, (e) entity-stable scale, and (f) entity-gift scale of the CNAAQ-2-NL and performance-avoidance goals (*Hypothesis 4a-f*). Furthermore, we expected positive relationships between the (a) incremental-total scale, (b) incremental-learning scale, and (c) incremental-improve scale of the CNAAQ-2-NL and mastery-approach goals, and positive relationships between the (a) incremental-total scale, (b) incremental-learning scale, and (c) incremental-improve scale of the CNAAQ-2-NL and mastery-avoidance goals (*Hypothesis 5a-f*).

Method

Procedure

Data were collected from psychology students at a Dutch university. These students participated in two group-wise, computerized sessions with a three-week interval. In the first session respondents answered questions about demographics and filled out the CNAAQ-2-NL (first time), the Dweck implicit theories in sport scale, and answered the question about the importance of talent and hard work for success in sport. In the second session respondents filled out the CNAAQ-2-NL (second time), the achievement goal questionnaire, and the Dweck implicit theories of intelligence scale.

Participants

A total of 363 psychology students participated for course credit (N_{total} = 363; n_{t1} = 341; n_{t2} = 318). After each session we asked if participants had answered the questions seriously (1 = *not seriously at all*; 5 = *very seriously*). Respondents who indicated they had not seriously answered the questions in one or both of the sessions, were removed (i.e., n = 41). All variables were screened for outliers, but none were removed based on the outlier analyses.

This resulted in a final sample of N = 322 (M_{age} = 20.22, SD = 3.16; 99 males, 211 females, 2 respondents identified as 'other', 10 gender values were missing). At the time of testing 189 respondents regularly practiced a sport and 115 did not (18 missing values; sports most practiced were fitness, n = 58, 18.0%; soccer, n = 23, 7.1%; and running, n = 22, 6.8%). Most respondents (n = 286) had

practiced sports between the ages of 12 and 18. The most popular sports were soccer (n = 52, 16.1%), hockey (n = 45, 14.0%), and various types of dancing combined (n = 41, 12.7%). Ninety-four respondents (30.9%) had participated in sport on a recreational level and 210 (63.5%) had participated in sport on a competitive level.

Measures

Implicit theories of ability were measured on Time 1 and 2. We used the 21-item CNAAQ-2-NL that was developed and tested in Study 2 which includes four subscales: the entity-stable scale (6 items; α_{t1} = .63, α_{t2} = .71), entity-gift scale (5 items; α_{t1} = .82, α_{t2} = .87), incremental-learning scale (5 items; α_{t1} = .84, α_{t2} = .85), and incremental-improvement scale (5 items ; α_{t1} = .88, α_{t2} = .88). A higher order entity-total scale (α_{t1} = .79, α_{t2} = .83) was calculated as the average of the entity-stable scale and the entity-gift scale, and a higher order incremental-total scale (α_{t1} = .87, α_{t2} = .89) was calculated as the average of the incremental-learning and the incremental-improvement scales. Answers were provided using a Likert response format, ranging from 1 (*completely disagree*) to 5 (*completely agree*).

We performed separate confirmatory factor analyses on the data from Time 1 and Time 2. Modification indices suggested that some items shared error variance. To attain a better fit, the residual variances of some items were allowed to covary (Time 1: items 1 and 3, 4 and 5, 7 and 9, 13 and 20, 18 and 20; Time 2: items 1 and 3, 1 and 6, 4 and 5, 7 and 9, 14 and 15). Except for items 13 and 20, all connected items belonged to the same subscale.

The fit of the 4 + 2 factor model on Time 1 was good (χ^2 = 332.34, df = 181; RMSEA = 0.05; NNFI = .94; CFI = .95) and on Time 2 it was acceptable (χ^2 = 360.03, df = 181; RMSEA = 0.06; NNFI = .93; CFI = .94).

Dweck implicit theories in sport scale was administered on Time 1. We adapted six items that are regularly used in studies of implicit theories of intelligence (Dweck, 1999). Three items measured entity beliefs (e.g., "You have certain qualities in sport, and you really can't do much to change that."; α = .73) and three items measured incremental beliefs (e.g., "No matter who you are, you can always become much better in a sport." ; α = .83). Answers were provided on a Likert scale from 1 (*completely disagree*) to 6 (*completely agree*).

Dweck implicit theories of intelligence scale was administered on Time 2. Participants responded to the six original items that measure implicit theories of intelligence (Dweck, 1999). Three items measured entity beliefs (e.g., "You have a certain amount of intelligence, and you really can't do much to change it." ; α = .90) and three items measured incremental beliefs (e.g., "No matter who you are,

you can change your intelligence a lot." ; α = .83). Answers were provided on a Likert scale from 1 (*completely disagree*) to 6 (*completely agree*).

Importance of talent and hard work was measured on Time 1. We asked participants to indicate the importance of hard work and talent for success in sport by using two sliders ranging from 0% to 100%. The question was: "We would like to know how important you think hard work and talent are for success in sport. Can you give your answer by distributing 100% using the two sliders below?" The first slider was labeled "Extent to which success in sport is determined by talent". The second slider was labeled "Extent to which success in sport in determined by hard work and practice". The sliders were connected such that the answer was only accepted when it added up to 100%. This procedure has been shown to be a valid way to assess people's beliefs about the importance of talent in sport (Li et al., 2006).

Achievement goals were measured on Time 2 with the revised Achievement Goal Questionnaire (AGQ-R; Elliot & Murayama, 2008), which was translated to Dutch and adapted to be used in a sport context. This questionnaire is composed of 12 items in four subscales of three items each: performance approach (e.g., "I try to do well compared to other athletes" ; α = .82), performance avoidance (e.g., "I try to avoid performing worse than other athletes" ; α = .89), mastery approach (e.g., "My goal is to learn as much as possible in my sport" ; α = .79), and mastery avoidance (e.g., "My goal in my sport is to avoid learning less than I could learn" ; α = .72). Answers were provided on a 5-point Likert scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). When respondents did not practice a sport at the moment, they were asked to think back to when they were practicing a sport[1].

Results

Descriptive statistics, correlations, and Cronbach's alphas are presented in Table 2.3. Important to note is that similar to previous studies (Biddle et al., 2003; Wang et al., 2009) there is a negative correlation between entity-total and incremental-total, r_{t1} = -.17, r_{t2} = -.35, both *p*-values < .001.

[1] The results were largely the same for active and non-active athletes.

Table 2.3

Descriptive Statistics, Pearson Correlations and Cronbach's Alpha Reliabilities in Study 3

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender[a]	0.33	0.48	-												
2. Age	20.22	3.16	.12*	-											
3. Hours train now	3.25	4.19	.19**	.03	-										
4. Hours train youth	8.38	7.12	.15**	.12*	.30**	-									
5. Level	2.91	1.08	.10	.14*	.24**	.55**	-								
6. Perf app	3.32	0.90	.14*	.08	.27**	.24**	.28**	(.82)							
7. Perf avoid	3.27	1.01	.03	.00	.19**	.09	.10	.64**	(.89)						
8. Mast app	3.57	0.81	.11	.10	.26**	.16**	.20**	.36**	.27**	(.72)					
9. Mast avoid	3.05	0.73	.06	.06	.15*	.14*	.19**	.33**	.24**	.62**	(.72)				
10. Entity-total t1	2.79	0.61	.09	.03	.10	.17**	.14*	.12*	.01	-.01	-.05	(.79)			
11. Incremental-total t1	4.25	0.48	-.02	-.03	.12*	.22**	.14*	.15*	.08	.27**	.18**	-.17**	(.87)		
12. Ent-Stable t1	2.66	0.63	.10	.05	.05	.08	.03	.02	-.06	-.06	-.08	.81**	-.22**	(.63)	
13. Ent-Gift t1	2.97	0.81	.03	.01	.10	.19**	.19**	.18**	.06	.01	-.01	.85**	-.06	.41**	(.82)
14. Inc-Learning t1	4.42	0.47	-.04	-.08	.09	.14*	.10	.07	.03	.16**	.11	.02	.79**	-.03	.05
15. Inc-Improve t1	4.08	0.66	.00	.01	.11	.22**	.13*	.17**	.09	.28**	.18**	-.26**	.90**	-.30**	-.13*
16. Dweck sport Ent	3.02	0.85	-.13*	.02	.02	.12*	.09	.09	.02	-.07	-.06	.61**	-.20**	.45**	.60**
17. Dweck sport Inc	4.45	0.81	.05	-.01	.16**	.16**	.11	.11	.07	.25**	.23**	-.40**	.56**	-.38**	-.26**
18. % Talent	35.13	14.85	.04	.13*	.10	.12*	.10	.18**	.10	.03	-.03	.48**	-.22**	.35**	.48**
19. % Hard work	64.87	14.85	-.04	-.13*	-.10	-.12*	-.10	-.18**	-.10	-.03	.03	-.48**	.22**	-.35**	-.48**
20. Entity-total t2	2.87	0.66	.07	.04	.07	.11	.05	.12*	.04	-.07	-.07	.73**	-.19**	.62**	.65**
21. Incremental-total t2	4.22	0.52	.01	-.07	.06	.02	.00	.12*	.05	.29**	.23**	-.31**	.58**	-.35**	-.17**
22. Ent-Stable t2	2.74	0.68	.07	.05	.07	.10	.05	.03	.00	-.09	-.06	.66**	-.24**	.70**	.47**
23. Ent-Gift t2	3.03	0.85	.02	.03	.04	.07	.03	.14*	.03	-.02	-.04	.58**	-.07	.37**	.64**
24. Inc-Learning t2	4.41	0.48	.00	-.09	.04	-.03	-.03	.06	-.01	.20**	.18**	-.16**	.49**	-.20**	-.05
25. Inc-Improve t2	4.02	0.70	.01	-.05	.05	.05	.03	.14*	.09	.30**	.22**	-.35**	.54**	-.39**	-.21**
26. Dweck intell Ent	3.49	1.03	.02	-.05	.05	-.03	.05	.12*	.03	-.03	-.11	.34**	-.12	.31**	.27**
27. Dweck intell Inc	3.58	0.94	-.08	-.01	-.02	.04	.01	-.04	-.04	.06	.12*	-.32**	.22**	-.31**	-.23**

Table 2.3 (continued)

	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1. Gender[a]														
2. Age														
3. Hours train now														
4. Hours train youth														
5. Level														
6. Perf app														
7. Perf avoid														
8. Mast app														
9. Mast avoid														
10. Entity-total t1														
11. Incremental-total t1														
12. Ent-Stable t1														
13. Ent-Gift t1														
14. Inc-Learning t1	(.84)													
15. Inc-Improve t1	.44**	(.88)												
16. Dweck sport Ent	-.09	-.23**	(.73)											
17. Dweck sport Inc	.29**	.61**	-.35**	(.83)										
18. % Talent	-.14*	-.23**	.43**	-.27**	-									
19. % Hard work	.14*	.23**	-.43**	.27**	-1.00**	-								
20. Entity-total t2	-.01	-.26**	.64**	-.35**	.54**	-.54**	(.83)							
21. Incremental-total t2	.40**	.57**	-.25**	.46**	-.25**	.25**	-.35**	(.89)						
22. Ent-Stable t2	-.06	-.30**	.56**	-.36**	.43**	-.43**	.82**	-.42**	(.71)					
23. Ent-Gift t2	.03	-.13*	.55**	-.22**	.48**	-.48**	.86**	-.15**	.44**	(.87)				
24. Inc-Learning t2	.47**	.38**	-.14*	.27**	-.16**	.16**	-.18**	.83**	-.23**	-.06	(.85)			
25. Inc-Improve t2	.28**	.59**	-.28**	.50**	-.27**	.27**	-.40**	.93**	-.47**	-.19**	.55**	(.88)		
26. Dweck intell Ent	-.03	-.15*	.30**	-.21**	.31**	-.31**	.36**	-.17**	.32**	.29**	-.07	-.21**	(.90)	
27. Dweck intell Inc	.08	.25**	-.21**	.35**	-.22**	.22**	-.28**	.30**	-.29**	-.15**	.16**	.34**	-.69**	(.83)

Note. *N* varies between 264 and 312 due to incidental missing values. Pearson correlations are presented. Numbers on the diagonal are Cronbach's alphas. Perf app = performance approach goals; Perf avoid = performance avoidance goals; Mast app = mastery approach goals; Mast avoid = mastery avoidance goals; Ent = entity; Inc = Incremental.

[a]Categories include 0 = female; 1 = male.

*$p < .05$, two-tailed **$p < .01$, two-tailed.

Test-Retest Reliability

Test-retest reliabilities were: Entity-total, r = .73; incremental-total, r = .58; entity-stable, r =.70; entity-gift, r = .64; incremental-learning, r = .47; incremental-improve, r = .59 (all p-values < .001). All test-retest reliabilities were large, except for incremental-learning, which was medium in size (Cohen, 1992).

Relations with Other Measures of Implicit Theories

The hypothesized relations between the CNAAQ-2-NL scales and the Dweck implicit theories in sport scales were examined with the CNAAQ-NL measured at both time points. There were significant medium to strong relations of the entity-total, entity-stable, and entity-gift scales with the Dweck sport-entity scale, and of the incremental-total, incremental-learning, and incremental-improvement scales with the Dweck sport-incremental scale (all r-values > .29, all p-values < .001; Hypotheses 1a-f supported).

The hypothesized relations between the CNAAQ-2-NL scales and the Dweck implicit theories of intelligence scales were also examined with the CNAAQ-NL measured at both time points. There were significant small to medium-sized relations of the entity-total, entity-stable, and entity-gift scales with the Dweck intelligence-entity scale, and of the incremental-total and incremental-improvement scales with the Dweck intelligence-incremental scale (all r-values > .22, all p-values < .001; Hypotheses 2a-d, and Hypothesis 2f supported). The correlation between the incremental-learning scale and the Dweck intelligence-incremental scale was only significant at the second time point (r_{t1} = .08, p = .17, r_{t2} = .16, p = .01; Hypothesis 2e partly supported).

The hypothesized relations between the CNAAQ-2-NL scales and the importance assigned to talent and hard work for success were examined with the CNAAQ-NL measured at both time points. There were significant, medium-sized relations of the entity-total, entity-stable, and entity-gift scales with the importance assigned to talent (all r-values > .35, all p-values < .001; Hypotheses 3a-c supported). There were significant, small to medium-sized relations of the incremental-total, incremental-learning, and incremental-improve scales with the importance assigned to hard work (all r-values > .14, all p-values < .02; Hypotheses 3d-f supported).

Relations with Achievement Goals

The hypothesized relations between the CNAAQ-2-NL scales and achievement goals were examined with the CNAAQ-NL measured at both time points to investigate the predictive and concurrent criterion-related validity. There were significant, but small relations between the entity-total scale and

performance-approach goals (r_{t1} = .12, p = .047, r_{t2} = .12, p = .047; Hypothesis 4a supported). There were no significant relations between the entity-stable scale and performance-approach goals (both r-values < .04, both p-values > .05; Hypothesis 4b not supported), but there were significant, but small relations between the entity-gift scale and performance-approach goals (r_{t1} = .18, p < .001, r_{t2} = .14, p = .02; Hypothesis 4c supported).

There were no significant relations between the entity-total, entity-stable, or entity-gift scales and performance-avoidance goals (all r-values < .06, all p-values > .05; Hypotheses 4d-f not supported).

There were significant, small to medium-sized relations between the incremental-total, incremental-learning, and incremental-improve scales and mastery-approach goals (all r-values > .16, all p-values < .01; Hypotheses 5a-c supported).

There were significant, but small relations between the incremental-total scale, the incremental-learning scale at T2, but not at T1 (r_{t1} = .11, p = .08), and the incremental-improvement scale and mastery-avoidance goals (all r-values > .18, all p-values < .001). Although one correlation did not reach significance, we nevertheless conclude that Hypotheses 5d-f were largely supported.

Conclusion

Our third study provided additional support for the fit of a 4 + 2 model of the CNAAQ-2-NL and showed that Cronbach's alpha reliabilities and test-retest reliabilities were generally acceptable to good. The hypothesized relations with other measures of implicit theories were supported, as well as the hypothesized relations with the importance assigned to talent and effort for success. Hypotheses about relations between implicit theories and achievement goals were also largely supported.

General Discussion

The main goal of the studies reported in this chapter was to validate the CNAAQ-2 in a Dutch context. Our first study confirmed the factor structure but the reliability of the entity-stable- and incremental-learning subscales was unsatisfactory. Therefore, we revised the original items and added 25 items. The total item set was administered to 550 athletes from three sports. Based on an exploratory factor analysis of the data of the first half of this sample, we selected 21 items (i.e., the CNAAQ-2-NL) and this selection was tested in a confirmatory factor analysis of the data of the second half of the sample. Two models showed adequate fit to the data: a model with four first-order factors and a four-plus-two

higher-order factor-model. Because the model with four-plus-two factors offers more opportunity to examine the beliefs athletes hold, we decided to examine this model further. In our third study we found additional support for the factor structure and test-retest reliability of the CNAAQ-2-NL. Convergent validity was supported through relations with Dweck's measures of implicit theories of ability in sport and about intelligence. Criterion validity of the CNAAQ-2-NL was supported through relations with achievement goals that were in line with previous studies and theory.

Relations between Implicit Theories and Achievement Goals

In Study 3 we found no relations between entity-stable beliefs and performance approach goals or performance-avoidance goals. We did find relations between entity-gift beliefs and performance-approach goals, but not between entity-gift beliefs and performance-avoidance goals. We found support for the hypothesized relations between incremental-learning and incremental-improvement beliefs on the one hand and mastery-approach and mastery-avoidance goals on the other hand.

The rather low correlations between entity beliefs and performance goals are put in a different light by the finding that entity beliefs, as measured by the Dweck sport-entity scale, were neither related to performance-approach goals nor to performance-avoidance goals. A recent meta-analysis (Vella et al., 2016) also showed weak relations between entity beliefs and performance-approach and performance-avoidance goals.

The pattern of relations between implicit theories and achievement goals that we have found, is in line with theoretical predictions and similar to the pattern found with the Dweck sport-scales. It is also comparable to what was found by Biddle et al. (2003) and Vella et al. (2016). We therefore conclude that our findings support the construct validity of the CNAAQ-2-NL.

Comparison of Implicit Theories in Sport and Implicit Theories about Intelligence

An interesting finding is that in all our samples we found small to medium correlations between the entity-total and incremental-total scales, which are smaller than the correlations found in studies about implicit theories of intelligence[2]. Low correlations between entity and incremental beliefs were also found in previous studies with the CNAAQ-2 (e.g., Biddle et al, 2003; Stevenson

[2] Hong, Chiu, Dweck, Lin, & Wan (1999) discuss the unpublished study by Levy & Dweck (1997) that reports correlations of r = -.81 to r = -.85, and Levy, Stroessner & Dweck (1998) present correlations ranging from r = -.69 tot r = -.86.

& Lochbaum, 2008) from which we conclude that in sport, entity and incremental beliefs are relatively independent, while studies about implicit theories of intelligence have concluded that entity and incremental beliefs are the endpoints of a continuum (e.g., Burnette et al., 2013). Apparently, people have different beliefs about the malleability of intelligence as compared to ability for sport. This idea is supported by our comparison of participants' scores on the Dweck scales for sport and for intelligence in Study 3. We found that people held stronger entity beliefs about intelligence than about sport, $t(263) = 6.70$, $p < .001$, and stronger incremental beliefs about sport than about intelligence, $t(263) = 14.10$, $p < .001$.

Strengths, Limitations, and Future Research

A strength of the first two studies is that we have recruited a large number of athletes, in the context of their sport, in order to develop scales that are based on answers provided by athletes in a sport setting. This way, we have developed an instrument that is suitable for use with competitive athletes by researchers and practitioners in sport psychology. Another strength is that our third study allowed us to do a test-retest analysis in a controlled environment, and to administer additional measures, which is often difficult to accomplish in the sport-practice.

A limitation is that we had to add items to the CNAAQ-2-NL, resulting in a 21-item questionnaire instead of the original 12 items. If researchers are in need of a short form, an option would be to use only the entity-gift scale and the incremental-learning scale.

With this paper we have taken an important step in the development of the CNAAQ-2 in a Dutch context, but we agree with Furr (2011) that "validity is a matter of degree, it is not all-or-none." (p. 53). Furr also states that "the 'appropriateness, meaningfulness, and usefulness' of scale scores is contextually constrained." (p. 53). Therefore, further support for the validity of the CNAAQ-2 can be found by studying the variables in Study 3 in a sample of athletes.

Conclusion

The study of implicit theories of ability in sport branched off from work on implicit theories about intelligence. Because sport and the academic setting have much in common, the effects were expected to be similar across domains. Although the pioneering study by Sarrazin et al. (1996) generally showed comparable relations, there were also differences. For example, our studies suggest that the entity-incremental divide is stronger for intelligence than for sport. We therefore believe that further research about implicit theories of ability in sport is needed and hope that our development of the Dutch version of the CNAAQ-2 is a good basis for this endeavor.