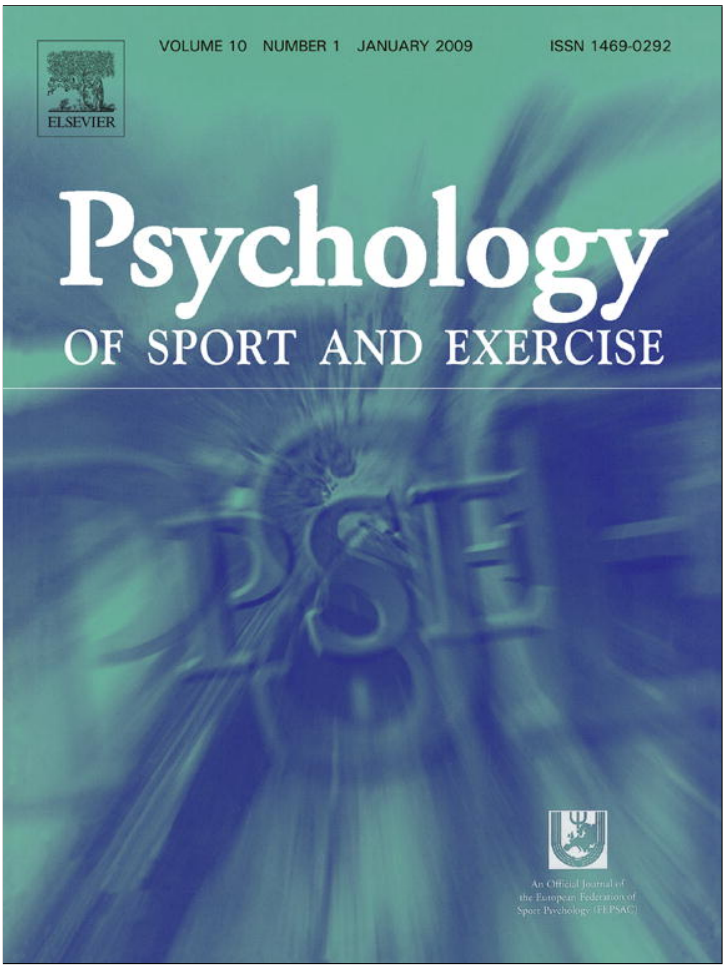

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Rasch calibration of a unidimensional perfectionism inventory for sport

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ABSTRACT

Objective: The purposes of this study were to generate and calibrate a unidimensional sports perfectionism scale for competitive athletes using the Rasch model, and validate the scale through the convergent and known-difference validity approach.

Method: The instrument, called the *Sport Perfectionism Scale* (*SPS*), was administered to 323 undergraduate students at a university in the southeastern U.S., ranging in age from 17 to 44 yrs, who previously competed on their high school team or currently compete at the intercollegiate level.

Results: Using the Rasch model, the level of item difficulty (i.e., most and least difficult) and the athlete's level (i.e., intensity) of perfectionism were estimated. Model-data fit was determined by Infit and Outfit statistics ($\geq$0.5 and $\leq$1.5). With the exception of one item, the model fits the data well. Rasch analysis supported the measure of perfectionism in sport as a unidimensional construct. Data from the *SPS* were positively related with those from Stoeber, Otto, Pescheck, Becker, and Stoll's ([2007]. Perfectionism and competitive anxiety in athletes: differentiating striving for perfection and negative reactions to imperfection. *Personality and Individual Differences, 42*, 959–969.) *Perfectionism During Competitions* measure ($r = 0.63$), and there was a significant difference in athlete's perfectionism between levels of competition, F (3, 314) = 5.21, $p = 0.002$, partial eta-squared, 0.05. This result supports convergent and known-difference evidence of validity for the SPS.

Conclusions: These results lend credence to using the Rasch model as a unique approach to validate evidence of perfectionism as a unidimensional construct in competitive sport.

Perfectionism is considered a stable pattern of thinking and behavior that changes relatively little over time, as opposed to a variable measure of a person's state at any particular moment (Anshel & Eom, 2002; Antony & Swinson, 1998). Researchers, therefore, consider perfectionism a trait, not state, measure that is developed very early in life (Frost & Henderson, 1991). Frost, Marten, Laharat, and Rosenblate (1990) define perfectionism as "the setting of excessively high standards of performance in conjunction with a tendency to make overly critical self-evaluations" (p. 450). This definition infers that perfectionism is an undesirable characteristic that often hinders success. Perfectionism, however, has been examined as a function of both positive and negative qualities.

Hamachek (1978) first categorized perfectionism as normal (also called positive, healthy, functional, or adaptive) or neurotic (also referred to as negative, dysfunctional, or maladaptive). Positive forms of perfectionism are usually described by the dimensions of setting high personal standards, what Hewitt and Flett (1991) call self-oriented perfectionism, or striving for excellence (Hill et al., 2004). Positive perfectionism reflects setting high, but reasonable goals, being more forgiving of one's own mistakes, modifying standards in accordance with the situation, and continually striving for success (Enns & Cox, 2002).

In contrast, negative perfectionism often develops when praise, adoration, recognition, and approval from a child's significant other occurs repeatedly when the child behaves according to that person's expectations (Hamachek, 1978; Missildine, 1963). Negative forms of perfectionism, which have received the preponderance of support in the perfectionism in sport research literature, have usually consisted of concern over mistakes (Frost et al., 1990), socially prescribed perfectionism (Hewitt & Flett, 1991), or the discrepancy between expectations and results (Slaney, Rice, Mobley, Trippi, & Ashby, 2001). Negative perfectionism describes several characteristics such as a person's tendency to set excessively high standards and to be overly self-critical. One area in which perfectionism has received extensive study, with particular respect to its maladaptive properties, is competitive sport.

Hopkinson and Lock (2004), for example, found that perfectionism significantly affected disordered eating behavior among females, a condition relatively common among female gymnasts and dancers. Others (e.g., Flett & Hewitt, 2005; Frost & Henderson, 1991; Gotwals, Dunn, & Wayment, 2003; Hall, Kerr, & Matthews, 1998) have concluded that perfectionism in sport is associated with

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severe anxiety among athletes which, in turn, could impair performance. Haase, Prapavessis, and Owens (2002) found that perfectionism was related to social physique anxiety and disordered eating. Ommundsen, Roberts, Lemyre, and Miller (2005) speculated that unrealistic and excessive parental criticism and parental expectations could impel adolescent players to develop maladaptive perfectionist tendencies. Thus, prolonged negative manifestations of perfectionism can lead to reductions in sport satisfaction, intrinsic motivation, and self-esteem among sports participants (Anshel & Eom, 2002; Anshel & Mansouri, 2005; Gotwals et al., 2003). Perfectionism, however, also has desirable qualities.

From a positive, or adaptive, perspective the study of perfectionism in competitive sport is important, particularly with respect to the level of enjoyment, achievement, and intrinsic motivation of athletes. For example, striving for perfectionism has been highly correlated with task goal orientation, while maladaptive (abnormal, negative) perfectionism was related to ego orientation (Dunn, Dunn, & Syrotuik, 2002). In other studies, perfection was associated with intrinsic motivation, higher effort, and higher achievement among skilled high school musicians (Stoeber & Eismann, 2007), and has predicted superior performance in a novel basketball task (Stoll, Lau, & Stoeber, 2007). Stoll et al. also found that athletes with combined high levels of striving for perfection and high levels of negative reactions to imperfection showed the greatest performance increments over trials. In another study, Anshel and Mansouri (2005) found that critical feedback resulted in higher negative affect and poorer motor performance on a balancing task among individuals with higher perfectionism scores, as compared to their less perfectionistic counterparts. Perfectionism, then, has properties and performance outcomes that may be considered both positive and negative. This is important with respect to novel methods of measuring this construct, which forms the focus of the present study.

One area of controversy in the sport perfectionism literature is the uncertainty among researchers on the ways to describe and measure this construct. Traditionally, perfectionism has been conceptualized and measured as a multidimensional construct. For example, most relatively recent sport perfectionism studies (e.g., Anshel & Eom, 2002; Anshel & Mansouri, 2005; Dunn et al., 2002; Hall et al., 1998; Stoeber & Otto, 2006; Stoll, Lau, & Stoeber, 2007) have examined sub-dimensions following the dimensions created by Frost et al. (1990). These include personal standards, concerns about mistakes, parental criticism, and coach criticism. In a rare study of perfectionism among exercisers, Anshel and Seipel (2007) found that two perfectionism dimensions not included in studies of competitive athletes, organization and doubts about actions, were related to social physique anxiety among university student exercisers. Clearly, researchers have not been in full agreement concerning the description and categorization of perfectionism in sport.

Given the propensity of competitive athletes to demonstrate numerous maladaptive characteristics of perfectionism (e.g., unrealistic personal expectations and standards, concerns about making mistakes, highly self-critical, high standards and expectations by significant others, such as parents and coaches), perfectionism is an area that requires additional study in the context of sport. However, a valid measure to describe perfectionism among competitive athletes has received only scant attention. One novel approach to the study of sport perfectionism, heretofore absent in the extant literature, is to measure perfectionism as a unidimensional construct.

A unidimensional approach to measuring perfectionism in sport

As indicated earlier, several researchers have measured perfectionism as a multidimensional construct in both the general psychology (e.g., Flett, Hewitt, Blankstein, & Koledin, 1991; Frost et al., 1990; Hamachek, 1978; Hewitt & Flett, 1991; Slaney et al., 2001) and sport psychology literature (e.g., Anshel & Eom, 2002; Anshel & Mansouri, 2005; Dunn et al., 2002; Dunn, Gotwals, & Cosgrove Dunn, 2005; Gotwals et al., 2003; Haase & Prapavessis, 2004; Stoeber & Otto, 2006; Terry-Short, Owens, Slade, & Dewey, 1995; Vallance, Dunn, & Causgrove Dunn, 2006). Perhaps the two most popular scales that have been adapted by sport psychology researchers include Hewitt and Flett's (1991) Multidimensional Perfectionism Scale (MPS), which consists of three subscales, and Frost et al.'s Multidimensional Perfectionism Scale (FMPS; 1990) consisting of six subscales. While a multidimensional approach has the advantage of capturing various components of a construct that best explain or predict its cognitive or behavioral manifestations, there are also disadvantages.

In their critique of current (non-sport) perfectionism inventories, Enns and Cox (2002) and Kline (2005) have noted several limitations with current measures. These include the lack of content validity evidence of many items, relatively low Cronbach alphas to measure subscale internal consistency, and the frequent failure to psychometrically separate adaptive (normal/positive) from maladaptive (abnormal/negative) perfectionism. Use of exploratory factor analytic techniques that identify the appropriate latent trait, however, leads to subjective (and, therefore, perhaps inaccurate) factor labels, factors that usually combine relatively stronger with weaker items (thereby reducing predictive validity), and inventories that are not compatible with, nor intended for, clinical treatment.

Kline (2005) contends that exploratory factor analysis (EFA) eliminates items that are not highly correlated (or loaded) onto other factors. EFA, however, does not identify which of the large pool of items should remain in subsequent analyses for inventory validation in conjunction with the characteristics of each item. In addition, if an item does not contribute unique information to defining the trait, that item is often considered redundant and removed from the scale. There are other limitations with existing perfectionism scales used in the context of competitive sport.

Current perfectionism in sport scales was constructed based on Likert-type scales in which the respondent's perfectionism level typically depends on the total scores of the scale items (Enns & Cox, 2002). Unfortunately, reliance on total scores on the Likert-type scale items and use of traditional statistical tools may result in a misleading interpretation of the data. Because the distances between scale points differ from item to item, and the difficulty levels for the scale items are not identical, total scores for several items can be biased. When using Likert-type scales, it is essential to verify that either the inventory is perceived and used as an interval scale or that the total scores from the ordinal scale are converted to interval (additive) data before proceeding with data analysis (Zhu, 1996).

Of equal concern is the pervasive use of two Likert-type scales in the sport perfectionism literature, Hewitt and Flett (1991) MPS and the Frost et al. (1990) MPS. In their critique of perfectionism measures, Enns and Cox (2002) contend that these scales have limitations. Weaknesses of the Frost MPS include lack of evidence of predictive power based on longitudinal studies and limited evidence of the diagnostic specificity of the dimensions used. In addition, Frost et al. have not found adequate reliability for two dimensions, organization/neatness and doubts about actions. Subsequent related studies in the sport psychology literature have followed their suggestions and also negated these dimensions. In contrast to the Frost et al. framework, the Flett and Hewitt MPS has received relatively rare attention by sport psychology researchers. In addition, in promoting the use of their MPS conceptual framework in the study of sport perfectionism, Flett and Hewitt (2005) view perfectionism as a maladaptive construct in the context of sport.

While each of these scales has received extensive psychometric scrutiny in the non-sport literature (e.g., see Enns & Cox, 2002, for a review), they have not reflected all relevant dimensions of perfectionism in the context of competitive sport. For example, both scales do not include the role of parents and coaches in the early development of perfectionism as experienced in sport settings (Anshel & Eom, 2002; Dunn et al., 2002). Selected items (and dimensions) from both scales are inherent in the inventories used in sport perfectionism research. In addition, previous use of sport-related perfectionism scales has failed to account for the specific dimensions or factors that best identify evidence of perfectionism among competitive athletes. In the current study, we contend that the severity, or extent, of perfectionism has been missing in the extant sport perfectionism literature. One approach to addressing this limitation is use of the Rasch model.

The Rasch model (Rasch, 1960, 1980), an advanced measurement theory, overcomes several measurement limitations of the traditional approaches based on classical test theory. These measurement limitations include no control for the difficulty level of scale items and the non-additive feature of ordinal data (Bond & Fox, 2001; Kang & Kang, 2006; Zhu, 1996). First, in classical test theory, a person's ability level typically depends on the total score of the scale items, consisting of summing all responses of the scale items to form a total score. This assumes that the difficulty levels for scale items are the very similar, and that there is no control for the item difficulty. However, it seems illogical to treat different items as equal contributors to the scale, while the items represent different levels of the construct. Second, the results for Likert-type items are ordinal data, however, they are often incorrectly assumed to be interval data. Because ordinal scale data are not additive, the total score of all scale items may be biased and no longer useful for data analysis. Using the Rasch model, responses based on the ordinal items are transformed into an interval scale based on logits to which proper parametric statistics can be applied.

While the Rasch calibration has not been previously used to measure sport perfectionism, Kang, Zhu, Ragan, and Frogley (2007) and Zhu, Timm, and Ainsworth (2001) provide examples of using the Rasch model to examine the severity of perceived exercise and physical activity barriers among physically disabled youth and unfit females, respectively. The researchers used the Rasch rating scale model to calibrate the severity of barrier items. The Rasch calibration has shown to be an informative method to assess sport perfectionism. Further study is needed to investigate the most critical items that best describe and predict perfectionism in competitive sport. Thus, the purposes of this study, then, were to generate and calibrate a unidimensional sport perfectionism scale for competitive athletes using the Rasch model, and to further validate the scale through the convergent and known-difference validity approach.

Method

Participants

The data used in this study were collected from 175 males and 148 females ($N = 323$) who were currently attending a university in the Southeastern U.S. The students, ranging in age from 17 to 44 yrs ($M = 22.28$ yrs, $SD = 3.64$), had competed on their high school or college sports team in either team ($n = 268$) or individual ($n = 55$) sports. Participants who had competed in both team and individual sports were instructed to choose the sport in which they were most proficient. Students indicated their highest level of sport participation at one of four levels, community ($n = 34$), high school ($n = 91$), state/regional ($n = 76$), or college/national ($n = 117$). As part of IRB approval obtained from the university prior to testing, the students were informed that their participation was voluntary, and that they would not experience any negative consequences if they chose not to complete the inventory. All students who met the inclusion criteria agreed to complete the inventory, however.

Inventory development

Previous studies from the sport psychology literature (e.g., Anshel & Eom, 2002; Anshel & Seipel, 2007; Dunn et al., 2002; Gotwals et al., 2003; Haase & Prapavessis, 2004; Stoeber, 1998; Vallance et al., 2006) provided the primary sources of items for generating the current sport-related perfectionism inventory. Selected items used in this study were adapted from the Frost et al. (1990) MPS to fit a sport framework and, as explained by Dunn et al. (2002), "modified to make them contextually relevant" (p. 382). An initial inventory of 74 items was developed, and the Likert-type item responses ranged from 1 (*strongly disagree*) to 5 (*strongly agree*) inventory.

Two stages of analyses were conducted to reduce the number of items from 74 to create the 36-item Likert-type scale used in this study in two stages. First, many of these ordinal-level items exhibited collinearity (Sheng, Biswas, & Carriere, 2003). For example, "I am a neat (tidy) person" was highly correlated with "I try to be a neat (tidy) person" ($r = 0.72$). Image extraction in SPSS version 14.0's exploratory factor analysis procedure indicated that the amount of variance accounted for (R^2) between "I am a neat (tidy) person" and all other indicators was 0.77. Nineteen items were deleted to reduce collinearity.

Second, SAS version 9.1 was used to create a polychoric correlation matrix from the remaining 55 items. Polychoric correlations are preferred over Pearson correlations with data that are ordinal-level, and that may be skewed (Lopez & Rice, 2006; Nunnally & Bernstein, 1994). Polychoric correlations tend to be larger in magnitude than Pearson product correlations (Sheng et al., 2003). Factor analysis on this matrix revealed high levels of collinearity. Nineteen additional indicators were deleted from the pool of items, resulting in a final set of 36 items that measured sport perfectionism, which we named the *Sport Perfectionism Scale* (SPS).

Consistent with the previous related literature, items were selected under the assumption there were several underlying dimensions of perfectionism. When collinear items were removed, these dimensions were strongly related to each other, to the point that the items could represent one higher-order factor structure (Flora, Finkel, & Foshee, 2003), that is, a unidimensional concept of perfectionism. The image extraction in exploratory factor analysis for polychoric correlations of the 36 items indicated that 22.96% of the variance was accounted for by the first factor, supporting the assumption of unidimensionality (Reckase, 1979).

Procedure

Data were collected in a classroom environment at a university located in the Southeastern U.S. The criterion for engaging in this study was the student's previous participation as a competitive athlete at the community, high school, state, or national levels. The investigator informed participants that the study was an attempt to define personality characteristics of competitive athletes.

Data analysis

The Rasch measurement computer program, called FACETS (Linacre, 2002a), was used to examine the level of perfectionism for competitive athletes. A two-facets Rasch model was estimated, including the item parameters (i.e., difficulty level of perfectionism items) and person (athlete) parameters (i.e., the athlete's level, or extent, of perfectionism).

The model-data fit was evaluated by Infit and Outfit statistics for each perfectionism item in the Rasch model. Infit and Outfit statistics are mean squares residuals reported in the form of chi-square statistics divided by their degrees of freedom. Thus, the indices have a ratio scale form, with values ranging from zero to positive infinity. The expected Infit and Outfit values were 1.0, which indicated a satisfactory model-data fit. Linacre (2002c) and Lunz, Wright, and Linacre (1990) have proposed a criterion for determining acceptable and unacceptable fit, where any Infit or Outfit value less than 0.5 and greater than 1.5 is considered a misfit. Values greater then 1.5 indicated large variability in scores, while values less than 0.5 reflected too little variation.

The perfectionism item difficulty was estimated during the calibration process by a logit score. The higher the logit score for an item, the more difficult it was for participants to agree if that item represented perfectionism in a sport context. Athletes' level of perfectionism was also examined, in which relatively higher logit scores were associated with greater perfectionism.

Next, a map illustrated the distribution of perfectionism items and person's level of perfectionism. Logits representing item difficulty and persons' ability levels were displayed on the map. The map provides the order of difficulty of items, the athlete's level of perfectionism, and the relative position of the athlete's perfectionism level for the various scale items. The rating scale was also evaluated for proper functioning by examining category thresholds (i.e., boundaries between rating categories). The category thresholds should increase across the rating scale (Linacre, 2002b).

For establishing evidence of convergent validity, an existing perfectionism scale called the *Perfectionism During Competitions* (PDC; Stoeber, Otto, Pescheck, Becker, & Stoll, 2007), was administered to a subsample of 121 athletes (48 male and 73 female; average age 23.25 ± 5.06). The PDC scale consists of 10 items, using an item response Likert-type format, ranging from 1 (*never*) to 6 (*always*). Satisfactory reliability evidence was provided across different samples with Cronbach's alphas ranging from 0.84 to 0.93 (Stoeber et al.). The Pearson correlation coefficient (r) was computed between the data of the two perfectionism in sport measures (SPS and PDC). A positive relationship between the two measures would support convergent evidence of validity for the perfectionism scale.

Because our results indicated that athletes who compete at higher levels of competition score higher for perfectionism than competitors at other levels, the athlete's perfectionism level as a function of competition level, categorized as community, high school, state, and national was examined using a one-way ANOVA using SPSS 14.0 statistical software. Alpha level was set at 0.05. A statistically significant mean difference in athlete's perfectionism among competition level would provide known-difference validity evidence for the perfectionism scale (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999).

Results

Model-data fit

Overall, a unidimensional perfectionism model fits the data well ($M \pm$ SD of Infit statistics $= 1.0 \pm 0.5$; Outfit statistics $= 1.0 \pm 0.5$). One item (I20), regarding thoughts about success ("After competing I tend to think about my successes I made rather than my failures and mistakes"), for which the values for the responses were reversed before analysis, was unrelated to perfectionism and, therefore, removed from the final estimations (Infit and Outfit statistics, 1.50 and 1.89, respectively). This finding also provided evidence for the embedded assumption of a unidimensional structure in the Rasch model.

Item-athlete map

A map of the distribution of perfectionism items and athletes' perfectionism level is illustrated in Fig. 1. The logit scale is shown on the left side of the map. The histogram located in the middle-left side of the map represents the distribution of the athlete's perfectionism level. Perfectionism items on the map's middle-right side are located according to their level of difficulty. The map reveals that the distribution of the items ($M \pm$ SD of logit: 0.0 ± 0.6) was well-targeted to the athlete's perfectionism level (0.0 ± 0.7). Both items and the athlete's perfectionism level were widely distributed along the logit scores. The response categories with thresholds are depicted on the right side of the map. Overall, the rating scale functioned well. The category thresholds increased across the rating scale, and response categories were spread over a broad and appropriate range.

Perfectionism item difficulties

The perfectionism item difficulty, including calibrated logit scores with standard errors and Infit and Outfit statistics, is reported

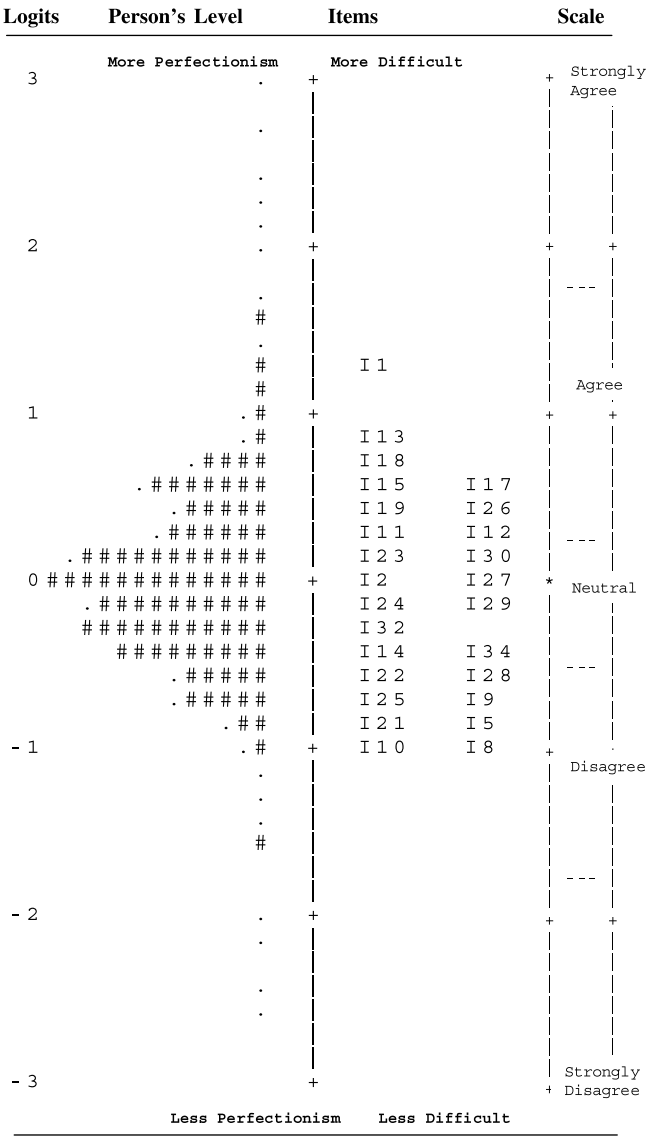

Fig. 1. Item-person map for the 35-item perfectionism scale. Note: each "#" represents three athletes, while a "·" denotes a single athlete. Number on the middle-right side of the map represents perfectionism item numbers.

Table 1
Summary of perfectionism items (35 fit items)

Items	Calibration logit	SE logit	Infit MnSq	Outfit MnSq
1. Punished as a child when not perfect	1.24	0.07	1.47	1.37
13. I am inferior in all skills	0.80	0.06	1.29	1.44
18. Get behind in activities	0.65	0.06	1.07	1.13
36. Coach rarely compliments me	0.63	0.06	1.18	1.22
17. Doubts about everyday things	0.58	0.06	1.06	1.07
35. Coach's standards are too high	0.57	0.06	1.12	1.18
3. Poor performance: failed as a person	0.56	0.06	1.00	0.99
15. People will not respect me	0.56	0.06	0.90	0.90
7. An error is bad game	0.53	0.06	0.98	1.00
26. Not very happy with performance	0.45	0.06	0.80	0.80
19. Few mistakes, people like me	0.44	0.06	0.96	0.99
11. Parents always expected excellence	0.28	0.06	1.20	1.24
16. Parents had high future expectations	0.24	0.06	1.15	1.19
12. People think less of me	0.23	0.06	0.95	0.99
30. Coach expects perfection	0.21	0.06	0.75	0.76
6. Complete failure if I partly fail	0.18	0.06	0.92	0.97
31. I criticize myself	0.09	0.06	0.79	0.79
23. Coach becomes angry or punish me	0.08	0.06	0.96	0.96
2. Set highest standards or be second-rate person	−0.04	0.06	1.15	1.15
27. Coach asks me to perform better	−0.05	0.06	0.94	0.96
33. Think about weaknesses	−0.09	0.06	0.97	1.00
29. I cannot relax until it is perfect	−0.13	0.06	0.86	0.85
24. Coach points out mistakes	−0.18	0.06	1.01	1.06
32. My goals guide my every move	−0.28	0.06	1.02	1.04
14. Others accept lower standards	−0.39	0.06	0.83	0.93
34. Parents want me to be the best	−0.41	0.06	1.25	1.25
4. Upset after making an error	−0.42	0.06	1.20	1.22
22. Usually have regrets	−0.50	0.06	0.69	0.68
28. Mistakes bother me	−0.53	0.06	0.71	0.69
9. Hate being less than the best	−0.74	0.06	0.87	0.84
25. Making up for mistakes	−0.77	0.06	1.00	1.06
21. Frustrated or angry if make mistake	−0.80	0.06	0.92	0.92
5. Set higher goals than others	−0.92	0.07	1.08	1.05
10. Have extremely high goals	−1.03	0.07	1.17	1.18
8. Could have done better	−1.05	0.07	1.00	0.97

Note. Item names are descriptions of the content and do not reflect the exact wording of the question. MnSq = mean square residuals.

in Table 1. As indicated earlier, the higher the logit score for an item, the more difficult it was for participants to agree that the item reflected perfectionism in sport. Perfectionism item difficulty ranged from −1.05 to 1.24 logits. Results of the calibration indicated that the *most* difficult items of agreement, listed in descending order (see Table 1), were, "As a child, I was punished for doing things less than perfect" (logit = 1.24), followed by "If someone has better skills at a particular sport than I do, then I feel like I am inferior in all skills or sports" (logit = 0.80), and "I tend to get behind in my activities because I repeat things over and over" (logit = 0.65).

The *least* difficult items for agreement were, in descending order (see Table 1), "Even after I perform well, I think about something I could have done better during the competition" (logit = −1.05), followed by "I have extremely high goals" (logit = −1.03), and "I set higher goals for myself than most people set for them" (logit = −0.92).

Level of perfectionism

The athlete's perfectionism level, reported as a logit score, was estimated during the calibration process. A higher logit score was equated with greater perfectionism, as previously noted. The overall mean perfectionism level for these athletes was 0.01 logit (SD = 0.72), ranging from −2.59 to 3.05. The average logit score shows a large variation in perfectionism level.

Convergent validity and known-difference validity evidence

The SPS used in this study and the PDC measure (Stoeber et al., 2007) were compared to establish validity evidence. There was a moderate to high positive relationship ($r = 0.63$) between the two measures, which supported convergent evidence of validity of the perfectionism inventory for sport scale. The extent of perfectionism was also compared to competition level (community, high school, state, and national) to further establish validity evidence. Results of one-way ANOVA indicated a significant difference between levels of competition, $F(3, 314) = 5.21$, $p = 0.002$. Athletes at the state and national level scored higher for perfectionism than athletes at the high school level, which supported the known-difference evidence of validity. The descriptive statistics for the athletes' perfectionism by competition level and one-way ANOVA results are summarized in Table 2.

Table 2
Summary of athlete's level of perfectionism by competition level

Competition level	Person's level of perfectionism (in logits)		
	n	*M*	SD
Community	34	0.07	0.92
High school	91	−0.05	0.59
State	76	0.24[a]	0.62
National	117	0.32[a]	0.74

[a] Significantly different ($p < 0.05$) than high school level.

Discussion

The purposes of this study were to generate and calibrate the unidimensional sports perfectionism scale for competitive athletes using the two-facets Rasch rating scale model: the item parameters (i.e., difficulty level of perfectionism items) and person (athlete) parameters (i.e., extent of the athlete's perfectionism level). There was one misfit item (I20), "After competing, I tend to think about my successes I made rather than my failures and mistakes," that was not related to perfectionism in competitive sport. As a result, this item was eliminated from the final instrument calibration.

The *most* difficult items of agreement, in descending order, were "As a child I was punished for doing things less than perfect," "If someone has better skills at a particular sport than I do, then I feel like I am inferior in all skills or sports," and "I tend to get behind in my activities because I repeat things over and over." The *least* difficult items for agreement were "Even after I perform well I think about something I could have done better during competition," "I have extremely high goals," and "I set higher goals for myself than most people set for themselves." These items reflect maladaptive forms of this construct (Flett & Hewitt, 2002).

Taken together, these results suggest that goal orientation appears to be a particularly strong indicator of perfectionism among competitive athletes. Perfectionism related to goal orientation in sport has been supported in earlier studies. Dunn et al. (2002) contend that individuals who focus on achievement behavior in sport would exhibit characteristics of adaptive perfectionism and a striving toward excellence. They found that athletes with a strong dispositional task orientation have similar needs to achieve and improve upon their current self-imposed standards were significantly related to high perfectionism scores. Along these lines, Dunn et al. (2002) also have found similarities between ego orientation (i.e., individuals whose primary source of motivation is to compare their performance favorably against others) and maladaptive forms of perfectionism. It is plausible to surmise that task orientation is linked to adaptive perfectionism, while ego orientation is associated with maladaptive perfectionism.

In support of this tendency, Frost and Henderson (1991) found that self-evaluations such as items regarding concern over mistakes or personal standards were highly correlated with overall perfectionism among athletes. According to Frost and Henderson, athletes who score high in perfectionism take more responsibility for

making a mistake, appraise the mistake as challenging, and focus their attention to make up for the mistake rather than responding with heightened anxiety or other negative reactions. In all likelihood, then, skilled athletes' relatively high levels of self-expectations, personal standards, and high self-esteem foster these reactions. In addition, their relatively rich history of success likely is more influential than experiencing one unsuccessful event experienced during the contest. Making overly critical self-evaluations and setting excessively high standards of performance have been found to be two primary characteristics of perfectionists, among both athletes (Anshel & Eom, 2002) and non-athletes (Frost et al., 1990). Thus, feeling inferior in all skills or sports due to comparing one's own skills against those of teammates or opponents usually runs counter to perfectionistic thinking in sport contexts.

These results reflect personal characteristics of the least difficult items and perceptions and comparisons in the most difficult items based on Hewitt and Flett's (1991) self-oriented vs. socially prescribed perfectionism. As indicated earlier, Hewitt and Flett categorize perfectionism as self-oriented, socially prescribed, and other-oriented. Self-oriented perfectionism consists of setting excessively high standards for oneself, whereas socially prescribed is the perception that others hold excessively high standards of oneself. Other-oriented perfectionism consists of holding unrealistic standards of performance or behavior for significant others. The most difficult items in our findings ("As a child I was punished for doing things less than perfect," "If someone has better skills at a particular sport than I do, then I feel like I am inferior in all skills or sports," "I tend to get behind in my activities because I repeat things over and over") reflect a strong social-oriented form of this construct. The least difficult items, on the other hand ("Even after I perform well I think about something I could have done better during competition," "I have extremely high goals," "I set higher goals for myself than most people set for themselves") reflect self-oriented disposition.

As Hewitt and Flett (1991) explain, whereas normal perfectionism is defined as striving for reasonable and realistic standards that leads to a sense of self-satisfaction and enhanced self-esteem, "neurotic perfectionism is a tendency to strive for excessively high standards and is motivated by fears of failure and concern about disappointing others (p. 11). In the context of competitive sport, perfectionism appears highly related to perceived worry, or state anxiety (Stoeber et al., 2007). However, the researchers are careful to partial out different forms of perfectionism with state anxiety. They found that striving for perfection was unrelated to anxiety, whereas negative reactions to imperfection are more deleterious to performance due, in part, to heightened anxiety and lower self-confidence. Clearly, perfectionism has a variety of meanings and dimensions that need to be further studied and understood, particularly with respect to its adaptive and maladaptive components.

Another component of the present study included comparing athletes' perfectionism level to competition level (i.e., community, high school, state, and national) to establish known-difference validity evidence, and the results of a one-way ANOVA indicated a significant difference among levels of competition. Athletes at the state and national level scored higher for perfectionism than athletes at the high school level.

This result is consistent with at least one previous study (Frost & Henderson, 1991), with respect to a maladaptive form of perfectionism. The researchers examined the relationship between perfectionism and reactions to mistakes during competition among 40 college female athletes. They found that perfectionism was most closely and consistently related to negative reactions to mistakes. In addition, high perfectionists were rated by their coaches as "reacting poorly to mistakes, pressure, and competition" (p. 330). Frost and Henderson surmise that perfectionists who are overly concerned with mistakes "view evaluated performance as an opportunity for failure and therefore feel threatened in those contexts" (p. 331). Vallance et al. (2006) speculate that "as the perceived importance of an event (or goal) increases, so too does an individual's emotional vulnerability to that situation" (p. 401). Higher skilled athletes are more competitive, possess a higher need to achieve (in sport settings), have higher expectations, and are more likely to fear the consequences of failure (Anshel, 2003). Vallance et al. contend they are also more emotionally vulnerable toward perfectionistic thinking than their less skilled counterparts. Perhaps it is not surprising, then, that the results of this study lend credence to the tendency of high perfectionists to make intra-individual judgments about their competence, rather than comparing their skills or competencies against opponents.

Previous approaches to measuring perfectionism have used a multidimensional approach (e.g., Flett et al., 1991; Frost et al., 1990) that includes identifying the items that belong to each dimension for competitive sport. There is widespread uncertainty among researchers, however, concerning the strength of items that provide the most powerful description or prediction of the perfectionism construct. Another approach, heretofore ignored in the sport perfectionism literature, is to consider the manner in which each scale item "behaves" in regard to the measurement of a latent trait. This study attempted to measure sport perfectionism based on a unidimensional approach using the Rasch model. Zhu et al. (2001) contend that the development of Rasch model is "one of the most significant advances in measurement in the past several decades" (p. 110). Clearly, Rasch calibration is a novel approach to validate the unidimensional sport perfectionism scale and warrants further study.

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