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Measuring Decentering as a Unidimensional Construct: The Development and Initial Validation of the Decentering Scale for Sport

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Abstract

Decentering, the ability to observe one's thoughts and feelings from a detached view, has gained increased attention in recent years. With this renewed interest comes a need for a reliable and valid tool to measure decentering in sport contexts. Therefore, in this multi-study paper we report the development and initial validation of a sport-specific self-report measure of decentering, the Decentering Scale for Sport (DSS). Based on an initial pool of context-specific items with acceptable content validity, a unidimensional decentering construct was confirmed in four independent athletic samples (n = 1255). Satisfactory internal consistency reliability and partial measurement invariance across gender and sport type was demonstrated. Convergent and concurrent validity of the DSS was established by showing positive and medium to large associations with mindfulness, well-being, flow, vitality, enjoyment and positive affect, and negative and medium to large associations with cognitive fusion, experiential avoidance, anxiety and negative affect. Discriminant validity of decentering with mindfulness and self-compassion was also established. Findings suggest that the DSS is a reliable and valid measure of decentering in sport contexts, and can be applied in future research and applied practice to measure decentering.

Keywords: Athlete; cognitive defusion; decentering; factor analysis; re-perceiving; scale development

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The ability to observe thoughts, feelings and bodily sensations as transient mental events rather than self-related truths or facts in decentering (Safran & Segal, 1990) can help athletes deal with perceived pressure, performance anxiety and even avoid choking. If athletes are able to take on a detached view of their thoughts and feelings, they can avoid poor performance by viewing stressful situations as challenges or simply psychological events rather than threats (Jones, Meijen, McCarthy, & Sheffield, 2009). For example, confronted with pre-competition anxiety, an athlete engaged in a decentered state might say "I think that I feel nervous right now" instead of "I am nervous", which can alleviate the maladaptive influences of the interpretation of anxiety. On the other hand, when faced with a verbally aggressive coach, athletes who adopt a decentering approach might choose to respond based on the interaction itself rather than their perceived norm (e.g., negative experiences) of the coach (Gardner & Moore, 2007). In short, decentering enables athletes to distinguish "what the mind is and what the mind tells us it is" (Gardner & Moore, 2007, p. 91).

Traditionally, decentering has been described as a central change process in cognitive therapies that help clients to experientially realize the role their own minds play in constructing their reality, namely, "stepping outside one's immediate experience and observing oneself in the process of constructing that experience" (Safran & Segal, 1990, p. 117). Initial efforts to measure decentering can be traced back to the measurement of the related construct of metacognitive awareness from the Measure of Awareness and Coping in Autobiographical Memory (MACAM; Moore, Hayhurst, & Teasdale, 1996). However, the MACAM is time consuming and unpractical given that it requires people listen to taped vignettes and also complete a semi-structured

interview (Fresco, Moore, et al., 2007). The psychometric assessment of decentering originated with the development of the Experiences Questionnaire (EQ; Fresco, Moore, et al., 2007), which originally consisted of fourteen items to measure the factor of decentering and another six rumination items designed to control for response bias. The items of the decentering factor were developed to capture people's ability to distinguish their thoughts from a sense of one's self and to engage with negative experiences without reacting to them, as well as the capacity to extend compassion to one's self. Subsequent analyses did not support the two-factor model, and an 11-item unidimensional EQ was confirmed after removing the rumination factor. The unidimensional construct of decentering has gained support in a Spanish sample of people with and without psychiatric disorders (Soler et al., 2014) and also in a sample of Portuguese people with a wide age range from 14 to 66 years old (Gregório, Pinto-Gouveia, Duarte, & Simões, 2015). However, there is evidence to suggest that the unidimensional structure does not always generalize. For example, two dimensions of accepting self-perception and distanced perspective were revealed in a sample of German university students (Gecht, Kessel, Mainz et al., 2014), whereas subscales relating to cognitive defusion and self-as-context were identified in a sample of people with chronic pain (McCracken, Barker, & Chilcot, 2014). Therefore, the question remains as to whether decentering is a multidimensional or a unidimensional construct.

Recently, scholars have critiqued the conceptualization of decentering in the EQ in that it is unclear why and how items of the self-compassion facet relate to the core construct of decentering (Forman et al., 2012; Gillanders et al., 2014). This criticism appears warranted, given that self-compassion is viewed as an independent construct that includes three components: self-kindness (treating oneself kindly), common humanity (linking with others in extenso), and mindfulness (living with one's thoughts and feelings non-reactively) (Neff, 2003a).

Although it seems that self-compassion represents a positive view of one's self, the inclusion of this multidimensional concept as part of what is proposed to be a unidimensional construct of decentering muddies the conceptual boundaries. Relatedly, there are several concepts similar to decentering that do not include the facet of self-compassion, such as re-perceiving (disidentify from the contents of consciousness and view one's moment-by-moment experience with greater clarity and objectivity; Shapiro, Carlson, Astin, & Freedman, 2006, p. 377) and cognitive defusion (distancing from thoughts, literally experiencing thoughts as mental events that do not necessarily need to be acted on; Hayes, Strosahl, & Wilson, 2011). Although decentering originated from the traditional cognitive therapies, re-perceiving is a similar concept widely recognized along with the mindfulness-based therapies (Shapiro et al., 2006), and cognitive defusion is another similar concept that is grounded on the acceptance-based therapy (i.e., acceptance and commitment therapy; Hayes et al., 2011); sometimes these concepts have been used interchangeably (Hayes-Skelton, Calloway, Roemer, & Orsillo, 2015).

Decentering is a key construct that is related to individuals' adaptive and maladaptive psychological constructs (Bernstein et al., 2015). In previous decentering scale development studies, initial evidence has shown that decentering is positively associated with mindfulness, cognitive reappraisal, positive affect, and satisfaction with life, and negatively related to experiential avoidance, rumination, negative affect, depression, anxiety, stress, expressive suppression, brooding, and cognitive fusion (e.g., Fresco, Moore, et al., 2007; Gregório et al., 2015). Experimental evidence has supported the protective role of decentering in that, even with high levels of rumination, individuals high in decentering produced better task performance when exposed to interpersonal criticism (Kaiser, Andrews-Hanna, Metcalf, & Dimidjian, 2015). Moreover, mediation analyses have supported decentering as a mediator of the effect from

mindfulness and cognitive reappraisal to anxiety symptoms (Hayes-Skelton & Graham, 2013; Pearson, Brown, Bravo, & Witkiewitz, 2015), mindfulness to depressive symptoms (Gecht, Kessel, Forkmann et al., 2014; Pearson et al., 2015), self-focus to negative thinking in depression (Lo, Ho, Nicky, & Siu, 2014), and rumination to depression (Gregório et al., 2015).

In applied settings, decentering represents an immediate and approximate process in the changing mechanism of various psychotherapies and psychological training, including cognitive behavioral therapy (Fresco, Segal, Buis, & Kennedy, 2007), relaxation interventions (Hayes-Skelton, Usmani, Lee, Roemer, & Orsillo, 2012) and mindfulness training (Orzech, Shapiro, Brown, & McKay, 2009). To cultivate a decentered perspective on thoughts, sensations, and emotions, clients might be repeatedly required to observe and identify their thoughts through writing them down (Safran & Segal, 1990) or formal mindfulness meditation (Segal, Williams, & Teasdale, 2002). Initial evidence has supported decentering as an ability that precedes anxiety disorders across both applied relaxation and acceptance-based behavioral therapy treatments (Hayes-Skelton et al., 2015). Moreover, decentering has also been proposed as one of the mechanisms of change in mindfulness interventions (Sauer & Baer, 2010). Neuroimaging research has corroborated the mediating role of decentering, in which non-meditators who practiced mindful attention could produce decentering to help them reduce the perceived stress through disengaging their embodied self from the imagined stressful situation (Lebois et al., 2015).

In sport, one important aim of mindfulness training is to cultivate athletes' ability to decenter from previously formed automatic connections among thoughts, feelings, and behavioral choices (Gardner & Moore, 2004). In mindfulness training, athletes are encouraged to view their thoughts as simply passing events that may or may not accurately reflect the realities

around them, and the decentering ability is produced accordingly (Gardner & Moore, 2007). Adaptive psychological experiences such as flow and aspects of self-confidence are enhanced along with the increase of decentering (Kaufman, Glass, & Arnkoff, 2009). On the other hand, maladaptive psychological experiences will be low in individuals with high levels of decentering, in particular perceptions of stress (Lebois et al., 2015) and stress-related symptoms (e.g., burnout). Decentering skills can also help injured athletes to take an objective view of frustration, boredom or anxiety during their rehabilitation (Mahoney & Hanrahan, 2011). Further, investigating the mediating role of decentering in sport would allow for the development of more systematic evidence-based interventions through addressing an important gap in the existing evidence of a changing mechanism of mindfulness training in sport contexts. The identification of mediational pathways (e.g., decentering) will allow researchers to systematically tailor interventions to increase the effectiveness of mindfulness training. Recently, sport-specific mindfulness questionnaires have been developed for athletic populations, such as the Mindfulness Inventory for Sport (MIS; Thienot et al., 2014) and the Athletes Mindfulness Questionnaire (AMQ; Zhang, Chung, & Si, in press). Yet, the systematic investigation of the mediating role of decentering in mindfulness-based interventions in sport cannot be established without a psychometrically sound tool to assess this concept.

More research is needed to clarify and synthesize decentering by testing it in different contexts and using different populations. In the current study, we aimed to examine the conceptualization of decentering in sport contexts. Specifically, the purpose of the current study was to develop a psychometrically sound self-report questionnaire that captures decentering in a sport context, entitled the Decentering Scale for Sport (DSS), using four samples of Chinese athletes. In so doing, we sought to further examine whether decentering is best conceptualized as

a unidimensional (Fresco, Moore, et al., 2007; Soler et al., 2014) or multidimensional construct (Gecht, Kessel, Mainz et al., 2014; McCracken et al., 2014). Efforts have also been made to ensure that decentering is not conceptualized in the same way as mindfulness, because they have been demonstrated to represent two independent constructs (Gecht, Kessel, Forkmann et al., 2014). It should be noted that mindfulness emphasizes sustained self-regulation of attention, awareness and attitude of accepting thoughts, feelings, and sensations (Fresco, Moore, et al., 2007), whereas decentering focuses on the cognitive distance from what our mind tells us and what the truth is.

A multi-study approach was adopted in this research program. In Study 1, an initial pool of decentering items was generated based on the conceptualization of decentering in two facets (Fresco, Moore, et al., 2007), excluding the facet of self-compassion. Items were generated from semi-structured interviews with coaches and athletes. In Study 2, exploratory factor analysis (EFA) was conducted in a sample of Chinese athletes (n = 271), in order to explore the dimensionality of the item pool and to provide initial information on the model fit indices of the measurement model. In Study 3, confirmatory factor analysis (CFA) was conducted to confirm the factor structure of the DSS, explore convergent and concurrent validities, and test its invariance across gender and sport type. A package of self-report measures of mindfulness, experiential avoidance, well-being and dispositional flow, along with the DSS was completed by another independent sample of Chinese athletes (n = 357). In Study 4, the factor structure of the DSS, confirmed in Study 3, was cross-validated, and its concurrent validity was further examined in a third independent sample of Chinese athletes (n = 295) by asking them to provide self-report assessments of athlete burnout, anxiety, enjoyment, positive and negative affect, and vitality. In Study 5, the DSS confirmed in Studies 3 and 4, was further tested in a fourth sample

of Chinese athletes (n = 332) along with self-report measures of mindfulness, self-compassion, cognitive fusion, and rumination, with the aim to examine the discriminant (with mindfulness and self-compassion) and concurrent validities of the DSS.

Study 1 – Item Generation and Content Validity

Study 1 aimed to develop and provide evidence for the content validity of a pool of items that were designed to tap athletes' decentering in sport context, using athletes, coaches, and experts' qualitative and quantitative feedback.

Method

Participants. In total, 27 Chinese athletes (16 males and 11 females) and 8 Chinese coaches (6 males and 2 females) from five competitive sports (diving, gymnastics, synchronized swimming, table tennis, and wushu) participated in this study. The coaches' experience ranged from 1 to 25 years (M = 10.13; SD = 9.28). The athletes were aged between 18 and 27 years (M = 20.93; SD = 2.29) and their competitive experience (15 at national level and 12 at international level) ranged from 7 to 23 years (M = 13.37; SD = 4.34). A panel of seven Chinese mindfulness and CBT experts were also consulted to review the content validity of the items.

Procedure. The items, referring to decentering in a sport context, were developed over several stages. At the first stage, the EQ (Fresco, Moore, et al., 2007) and relevant decentering literature were used as a reference in the development of the sport-specific items. At the second stage, we performed five semi-structured interviews with coaches (30-60 mins), one focus group with three wushu coaches (52 mins), and five focus groups (90-110 mins) with athletes. At the third stage, athletes who participated in stage two assessed the relevance of each item in the context of sport using a dichotomous scale (1 = *applicable*, 0 = *inapplicable*). Items that were deemed inapplicable by one third (33%) or more of the athletes were eliminated. Applicable

items that were rated below 5 were considered problematic (1 = *not at all clear* to 7 = *extremely clear*); athletes were encouraged to suggest alternative wordings for these problematic items. At the final stage, a reduced pool of items was sent via email to seven national experts. Two steps were taken in this stage. Firstly, the experts were asked to rate the representativeness of each item with regard to the concept of decentering, using a 4-point response scale from 1 (*not relevant*) to 4 (*highly relevant*). Secondly, four of the seven experts were again asked to rate the representation of the revised items using the same 4-point response scale (see Polit, Beck, & Owen, 2007).

Data analysis. The item-level content validity index (I-CVI; Lynn, 1986; Polit et al., 2007) was calculated for each item by dividing the number of experts who rated the item as a quite relevant or highly relevant (rating 3 and 4) by the total number of experts who provided ratings. When an expert panel consists of six or more reviewers, I-CVIs over the .78 criteria are considered to be excellent (Lynn, 1986). The scale-level content validity index (S-CVI/Ave) was calculated by averaging all the I-CVIs; an S-CVI/Ave over .90 is considered to be satisfactory (Polit et al., 2007).

Results and Discussion

Initially, 28 items were generated and another 21 items were suggested by coaches and athletes, which formed a pool of 49 items. Based on the athletes' evaluations, 21 items were deemed inapplicable in the sport context and were thus eliminated (e.g., "During training and competition, I view the emerged experiences from a wider perspective"), whereas 14 items were modified to improve their clarity and broaden their applicability across sports (e.g., "During training and competition, I notice that all kinds of thoughts and feelings are temporary, not *necessarily* the truth"). Of the remaining 28 items, five items that displayed a CVI of .71 (5/7) or

below were deleted. Minor modifications were made to the wording of six items and one new item was added. This process resulted in a pool of 24 items, with a satisfactory S-CVI/Ave of .98.

Study 2 – Examination of the Factor Structure of DSS

In Study 2, we examined the factorial composition of the pool of 24 items generated in Study 1 using exploratory factor analysis (EFA) in order to avoid the misspecification of number of factors in the decentering construct.

Method

Participants. A total of 271 athletes (136 females and 135 males; M_{age} = 21.55 years, SD_{age} = 3.15; range 18 - 33) participated in Study 2. All participants were recruited from two elite sport training centers in China, and drawn from 18 different sports, comprising a variety of individual (*n* = 209; e.g., archery, athletics, and weightlifting) and team (*n* = 62; e.g., basketball, handball, and water polo) disciplines. The majority of participants were competing at national levels (*n* = 176), with some athletes competing or had competed at the international level (*n* = 95). On average, athletes had participated in their sport competitively for 9.03 years (*SD* = 4.29; range 1 - 22).

Measure and procedures. The items generated in Study 1 were converted into questionnaire format, and a 5-point scale ranging from 1 (*never true*), 2 (*rarely true*), 3 (*sometimes true*), 4 (*often true*), to 5 (*always true*) was assigned. Coaches and team managers were contacted directly; the purpose and nature of the study was explained and permission requested to approach the athletes. Upon receiving verbal approval, the researchers distributed the questionnaire to athletes in person and informed consent was received. Athletes either

completed the survey at the training venue prior to, or after the training session, or chose to take the survey home with them, and returned it at the next training session.

Data analysis. The 24 items were analyzed using exploratory factor analysis (EFA) within Mplus 7 (Muthén & Muthén, 1998-2012) to identify the underlying dimension(s) of decentering. Due to the documented shortcomings associated with maximum likelihood (ML) for the estimation of models with ordinal data (Schmitt, 2011), a polychoric correlation matrix using weighted least squares mean- and variance- adjusted (WLSMV) estimation procedure with an oblique Geomin rotation was carried out. The percentage of missing data was negligible (0.15%) and was treated using pairwise deletion to produce unbiased estimates for the parameters and their standard errors. Geomin rotation was selected in order to minimize cross-loadings while producing statistically significant factor loadings on the primary factors, which is likely to generate cleaner factor structures that are similar to CFA (Schmitt & Sass, 2011).

Following the recommendation of Schmitt (2011), the number of factors was determined with parallel analysis (PA) in Mplus 7, and then evaluated using model-data fit indices. Multiple fit indices including the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA) were used to assess support for the initial EFA model we obtained (Norberg, Wetterneck, Sass, & Kanter, 2011). According to existing interpretation guidelines for adequate and/or acceptable model-data fit (e.g., Hu & Bentler, 1998, 1999; MacCallum et al, 1996; Marsh, Hau, & Grayson, 2005; Marsh, Hau, & Wen, 2004), a value of CFI and TLI greater than .90 is considered as adequate model fit, greater than .95 and above has been suggested to indicate an excellent fit; a value of RMSEA less than or equal to .06 indicates a good fit, whereas less than or equal to .08 shows an adequate fit with the upper bound of the 90% RMSEA confidence interval $\leq .10$; the value for SRMR ranges from zero (perfect

model) to one, with a value below .08 deemed as acceptable. Nevertheless, it is important to acknowledge that these values represent *guidelines* rather than 'golden rule's (i.e., yes/no decision).

In terms of interpreting the extracted factors, items were removed in the following order: (1) items with high cross-loadings (i.e., > .30), and (2) items with primary factor loadings ≤ .40, indicating that items did not load on any factor. Items were removed independently based on the item severity following a sequence of factor analyses until an approximate simple structure was obtained. A minimum internal reliability of the factor using composite reliability (rho [ρ]; Raykov, 1997) was set as .70.

Results and Discussion

The initial EFA with 24 items revealed that a three-factor solution existed based on the parallel analysis (mean eigenvalue), but a number of items had either small primary factor loadings (λ < .40) or large cross-loadings (λ > .30). Based on our a priori criteria, eight items were removed in a series of factor analyses. Subsequently, a two-factor solution was supported based on the parallel analysis. The eigenvalues were 4.37 and 1.74 for Factors 1 and 2, which explained 27.31 and 10.88 percentage of variance, respectively. However, only two reverse-worded items (i.e., Item 15 and 16) had large primary factor loadings (λ > .40) on Factor 2, and item 21 had small primary factor loading (λ < .40) but large cross-loading (λ > .30) (see Table 1). In addition, the inter-factor correlation was very low in magnitude (r = .09). An inspection of the substantive content of these items revealed that all of them used the phrase of "thoughts and ideas", in which the factor appeared to be caused by a method factor (i.e., the similar description of items) rather than the existence of a true common theme. Therefore, the decision was made to remove Factor 2 through removing Items 21, 15, and 16. Another EFA was then conducted and a

unidimensional factor solution was supported by the parallel analysis, with acceptable model fit statistics, χ^2 (65) = 144.57, $p < .001$, CFI = .95, TLI = .94, SRMR = .055, RMSEA (90% *CI*) = .067 (.052, .082). An overview of the item factor loadings is detailed in Table 1. The unidimensional factor was internally reliable ($\rho = .85$).

Study 3 – Validation of the Factor Structure and Concurrent and Convergent Validities Evidence of the DSS

The purpose of Study 3 was to cross-validate the unidimensional model of decentering identified in the EFA findings of Study 2 using an independent sample. We also examined the invariance of DSS scores across sport type (individual and team sports) and gender. Furthermore, the concurrent and convergent validities of the DSS were examined with measures of mindfulness, flow, well-being, and experiential avoidance. In line with previous studies of decentering (Fresco, Moore, et al., 2007; Gregório et al., 2015), it was hypothesized that decentering would be positively associated with mindfulness, flow, well-being, and negatively associated with experiential avoidance.

Method

Participants. A total of 357 athletes (148 females, 208 males, and one unknown; M_{age} = 21.28 years, SD_{age} = 3.94; range 17 - 45) participated in Study 3. All participants were recruited from six elite sport training centers in China, and drawn from 27 different sports, comprising a variety of individual (n = 254; e.g., cycling, judo, and shooting) and team (n = 103; e.g., handball, rugby, and soccer) disciplines. The majority of participants were competing at national levels (n = 238), with some athletes competing or had competed at the international level (n = 119). On average, athletes had participated in their sport competitively for 6.91 years (SD = 4.13; range 1 - 27).

Measures.

Decentering scale for sport. The 13-item Decentering Scale for Sport (DSS) developed in Study 2.

Mindful attention awareness scale (MAAS; Brown & Ryan, 2003). The MAAS is a unidimensional scale measuring the presence or absence of attention to and awareness of present-moment experiences, with 15 items (e.g., "I rush through activities without being really attentive to them") rated on a 6-point scale from 1 (*almost always*) to 6 (*almost never*). The Chinese version of the MAAS has demonstrated satisfactory construct validity, and good internal consistency reliability (ρ = .86) and test-retest reliability (r = .66) in a sample of elite Chinese athletes (Chung, Si, Liu, & Zhang, 2013).

Acceptance and action questionnaire II (AAQ-II; Bond et al., 2011). The AAQ-II is a 7-item self-report measure used to assess the tendency to avoid aversive internal experiences (e.g., negative emotions, thoughts, and memories). Items (e.g., "I'm afraid of my feelings") are rated on a 7-point scale, from 1 (*never true*) to 7 (*always true*). The Chinese version of the AAQ-II has demonstrated satisfactory construct validity, and good internal consistency reliability (ρ = .85) and test-retest reliability (r = .74) in a sample of elite Chinese athletes (Zhang, Chung, Si, & Liu, 2014).

Short dispositional flow scale (SDFS; Jackson, Martin, & Eklund, 2008). The SDFS is a 9-item scale rated on a 5-point scale, ranging from 1 (*never*) to 5 (*always*) assessing the frequency with which people experience flow in a target activity, that is, fully immersed in what one does (e.g., "During training and competition, I know clearly what I want to do"). The Chinese version of the SDFS has demonstrated satisfactory construct validity, and good internal

consistency reliability (α = .73) and test-retest reliability (r = .70) in a sample of Chinese college athletes (Liu, 2010).

Training and competition well-being scale (TCWS; Zhang & Liang, 2002). The TCWS is a 6-item scale developed to assess Chinese athletes' subjective well-being during training and competition. Items (e.g., "I am satisfied with my training and competition") are scored on 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*). The TCWS has demonstrated satisfactory construct validity and good internal consistency reliability (α = .73) in a sample of elite Chinese athletes (Zhang & Liang, 2002).

Procedures. The data collection procedure was the same as outlined in Study 2.

Data analysis.

Factorial validity. To cross-validate the findings of the EFA, the 13 items were analyzed via CFA within Mplus 7 (Muthén & Muthén, 1998-2012) using the polychoric correlation matrix and the WLSMV estimator. The adequacy of the model was evaluated using model-data fit statistics (multiple fit indices) and estimated standardized factor-loadings. The fit statistics (i.e., χ^2, CFI, TLI, and RMSEA) outlined in Study 2 and the weighted root mean square residual (WRMR) were employed to evaluate model fit for the CFA. Values of WRMR close to or less than 1.0 have been suggested as indicative of adequate model fit (Yu, 2002). There was a negligible percentage of missing data (0.15%); however, all missing data were treated use pairwise deletion. Modification indices, standardized factor loadings, and standardized residuals were also examined. Items with factor loadings below .40 and large absolute values of standardized residuals (> 2.00) were considered for removal.

Concurrent and convergent validities. Descriptive statistics and internal consistency reliabilities of the DSS using composite reliability were calculated. Concurrent and convergent

validities were examined using latent factor correlations between the DSS, MAAS, AAQ-II, TCWS, and SDFS in Mplus 7. Although the traditional interpretation concerning the effect size of correlation coefficients follows the guidelines provided by Cohen (1988) as small (r = 0.1), medium (r = 0.3), or large (r = 0.5), recent research suggests that they are not representative of the findings in applied psychology (Bosco, Aguinis, Singh, Field, & Pierce, 2015). Based on an analysis of 147,328 correlational effect sizes published in the *Journal of Applied Psychology* and *Personnel Psychology* from 1980 to 2010, Bosco and colleagues proposed a revised set of empirical benchmarks (small, r = 0.09; medium, r = 0.16; large, r = 0.26). We employed these contemporary benchmarks to guide our interpretations in the current study.

Measurement invariance. To examine whether the DSS displayed invariance across gender and sport type (team and individual), a sequential model testing approach was employed via multisample CFA using the weighted least squares mean and variance (WLSMV) estimation on a polychoric matrix in Mplus 7. The invariance testing for ordinal data consists of two steps (e.g., Carrola, Yu, Sass, & Lee, 2012). The first step is to test configural invariance, that is, whether the same items are indicators of the same factor across groups. The second step is to test measurement invariance whereby factor loadings and thresholds are constrained to be equal across groups. Given that the data were ordinal Likert-type, item thresholds were modeled instead of intercepts or means. The factor loadings and thresholds were constrained in tandem because the item characteristic curve is influenced by both parameters (Millsap & Yun-Tein, 2004). To assess the degree of invariance, differences in chi-square values ($\Delta \chi^2$) were examined using the DIFFTEST procedure in Mplus 7. Statistical significance of the $\Delta \chi^2$ after a Bonferroni adjustment was considered given that the WLSMV estimator does not allow for a direct

388 comparison between a less restrictive and more restrictive models using ΔCFI, ΔRMSEA, and
389 ΔTLI (Sass, 2011).

390 **Results and Discussion**

391 **Confirmatory factor analysis.** Results of CFA on the 13-item measurement model
392 suggested an acceptable fit to the data, but indicated room for improvement: χ^2 (56) = 211.95, *p*
393 < .001, CFI = .94, TLI = .93, WRMR = 1.10, RMSEA (90% *CI*) = .08 (.068, .092). One item
394 (Item 23) exhibited low standardized factor loadings (λ = .359). Inspection of the substantive
395 content of this item revealed that it overlapped with that of another item (Item 7) in the list,
396 suggesting that it should be removed to improve model simplicity. Excluding Item 23 improved
397 the fit of the model to the data: χ^2 (54) = 156.97, *p* <. 001, CFI = .96, TLI = .95, WRMR = .97,
398 RMSEA (90% *CI*) =.07 (.060, .087). The 12-item DSS demonstrated good internal consistency
399 (ρ = .88). The item means, standard deviations, standardized factor loadings and residuals are
400 displayed in Table 1. Findings on the CFA of the measurement models of the criterion-related
401 measures are listed at Table 3.

402 **Invariance testing**. The goodness-of-fit indices for all multi-group models of gender
403 invariance and sport type invariance are displayed in Table 2. Male athletes in our samples did
404 not use the response option "(1) never true", leaving item 20 for male athletes with only three
405 thresholds (2-3, 3-4, 4-5). Therefore, item 20 was not included in further invariance tests for
406 gender. With regard to gender, factor loadings and thresholds of Items 5 and 19 between male
407 and female athletes exhibited the largest modification indices and were thus relaxed sequentially
408 to improve model fit, which resulted in an invariant measurement model. With regard to sport
409 type, the factor loading and threshold of Item 4 between individual and team athletes exhibited
410 the largest modification index and was therefore relaxed to improve model fit, which also

resulted in an invariant measurement model. Taken together, these analyses provided initial support for the partial measurement invariance of the DSS model across gender and sport type.

Concurrent and convergent validities. With regard to convergent validity, the DSS showed a significant and positive large correlation with mindfulness as measured by MAAS (r = .27, p < .001). With regard to concurrent validity, the DSS also showed a significant and positive large correlation with flow (r = .54, p < .001) and subjective well-being (r = .40, p < .001). In addition, the DSS indicated a significant and negative large correlation with experiential avoidance (r = -.30, p < .001) (see Table 3).

Study 4 – Cross-Validation of the Factor Structure of the DSS and Additional Concurrent Validity Evidence

Using another independent sample of athletes, the purpose of Study 4 was to cross-validate the unidimensional model of decentering supported in Study 3 via CFA. The concurrent validity of the DSS was further examined via associations with measures of anxiety, burnout, vitality, enjoyment, and positive and negative affect. In line with previous studies of decentering (Fresco, Moore, et al., 2007; Gregório et al., 2015), it was hypothesized that decentering would be positively associated with vitality, enjoyment, and positive affect, and negatively associated with anxiety, burnout, and negative affect.

Method

Participants. A total of 295 athletes (137 females and 158 males; M_{age} = 21.34 years, SD_{age} = 3.19; range 17 - 37) participated in Study 4. All participants were recruited from four elite sport training centers in China, and drawn from 20 different sports, comprising a variety of individual (n = 193; e.g., athletics, swimming and wrestling) and team (n = 102; e.g., baseball, volleyball, and water polo) disciplines. The majority of participants were competing at national

levels (n = 195), with some athletes competing or had competed at the international level (n = 97). On average, athletes had participated in their sport competitively for 7.33 years (SD = 3.83; range 1 - 23).

Measures.

Decentering scale for sport. The 12-item DSS developed in Study 3.

Athlete burnout questionnaire (ABQ; Raedeke & Smith, 2001). The ABQ is a 15-item self-report instrument representing three burnout subscales: emotional/physical exhaustion (5 items; e.g., "I am exhausted by the mental and physical demands of sport"), reduced sense of accomplishment (5 items; e.g., "I am not achieving much in sport"), and sport devaluation (5 items; e.g., "The effort I spent in sport would be better spent doing other things"). All items were rated on a 5-point scale ranging from 1 (*almost never*) to 5 (*almost always*).

Subjective vitality scale (SVS; Bostic, Rubio, & Hood, 2000). The SVS is a 6-item scale that measures athletes' levels of subjective vitality in sport, a positive feeling of aliveness and energy (e.g., "I feel alive and vital"). Responses were provided on a 7-point scale ranging from 1 (*not at all true*) to 7 (*very true*).

International positive and negative affect schedule short form (IPANAS-SF; Thompson, 2007). The IPANAS-SF is a 10-item scale that measures athletes' positive (5 items; e.g., "Active") and negative affect (5 items; e.g., "Upset"). Respondents were requested to rate the statement on a 5-point scale ranging from 1 (*never*) to 5 (*always*).

Sport enjoyment scale (SES; Scanlan, Carpenter, Schmidt, Simons, & Keeler, 1993). The 4-itme SES was used to measure athletes' positive affective response to their sport experience that reflects generalized feelings such as pleasure, liking, and fun (e.g., "Do you enjoy playing

your sport"). Responses were provided on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*very much*).

Sport competition anxiety test (SCAT; Martens, Vealey, & Burton, 1990). The SCAT is a 15-item self-report instrument measuring symptoms associated with anxiety that utilized a 3-point scale (1 = *hardly ever*, 2 = *sometimes*, 3 = *often*) (e.g., "Before I compete I feel uneasy").

Procedures. Prior to data collection, the abovementioned questionnaires were translated into Chinese using forward- and back-translation procedures (Hambleton, 2005). The data collection procedure was the same as those outlined in Studies 2 and 3.

Data Analysis

Data analysis methods included two aspects: (a) testing the factorial validities of the 12-item unidimensional DSS and the translated criterion-related measures via CFA within Mplus 7 (Muthén & Muthén, 1998-2012), and (b) examining the concurrent validity of the DSS via latent factor correlations between the DSS and the criterion-related measures. The percentage of missing data was negligible (0.20%) and were treated using pairwise deletion.

Results and Discussion

Confirmatory factor analysis. CFA of the 12-item unidimensional DSS displayed an acceptable fit to the data: χ^2 (54) = 136.78, $p < .001$, CFI = .94, TLI = .93, WRMR = .95, RMSEA (90% *CI*) = .072 (.057, .087). The DSS demonstrated good internal consistency (ρ = .83). The item means, standard deviations, standardized factor loadings and residuals are displayed in Table 1. Findings on the CFA of the measurement models of the criterion-related measures are listed at Table 4.

Concurrent validity. There were significant and medium to large positive associations between decentering as measured by the DSS and vitality as measured by the SVS (r = .25, p

< .001), positive affect as measured by the IPANAS-SF-PA (r = .20, p < .001), and enjoyment as measured by the SES (r = .18, p < .01). There were significant and medium to large negative correlations between decentering as measured by the DSS and negative affect as measured by the IPANAS-SF-NA (r = -.17, p < .01), anxiety as measured by the SCAT (r = -.19, p < .01), and reduced sense of accomplishment as measured by the ABQ (r = -.21, p < .01), but not the ABQ subscales of emotional/physical exhaustion and devaluation which were non-significant (see Table 4).

Study 5 – Cross-Validation of the Factor Structure of the DSS and Further Examination of the Concurrent and Discriminant Validities of the DSS

The purposes of Study 5 were to test the discriminant validity of the DSS with measures of mindfulness and self-compassion, as well as the concurrent validity with measures of cognitive fusion and rumination using another sample of athletes. With regard to the discriminant validity, the 95% confidence interval of the latent factor correlations (i.e., the upper or lower threshold does not include 1) and Wald test were used.

Method

Participants. A total of 332 athletes (134 females and 198 males; M_{age} = 18.91 years, SD_{age} = 3.29; range 13 - 37) participated in Study 5[1]. All participants were recruited from five elite sport training centers in China, and drawn from 16 different sports, comprising a variety of individual (n = 258; e.g., archery, boxing, and weightlifting) and team (n = 74; e.g., handball, synchronized swimming, and volleyball) disciplines. The majority of participants were

[1] Data collection for Studies 2-4 occurred during March-October in 2013, whereas Study 5 data was obtained during August-September in 2015. Thus, due to logistical (e.g., mobility of athletes) and ethical considerations (e.g., we did not obtain ethical clearance to gather personal information from participants, as the research aims did not require us to do so), it is possible that some athletes from Studies 2-4 may have completed the DSS a second time in Study 5 but we are unable to provide an exact estimate.

competing at national levels (n = 262), with some athletes competing or had competed at the international level (n = 70). On average, athletes had participated in their sport competitively for 6.27 years (SD = 3.58; range 1 - 20).

Measures.

Decentering scale for sport. The 12-item DSS confirmed in Studies 3 and 4.

Athlete mindfulness questionnaire (AMQ; Zhang, Chung, & Si, in press). The AMQ is a 16-item self-report questionnaire measuring athletes' levels of mindfulness during training and competition on three dimensions: present-moment attention (5 items; e.g., "I can maintain my attention on my training"), awareness (6 items; e.g., "During training or competition, I can be immediately aware of my emotional changes"), and acceptance (5 items; e.g., "During training and competition, it doesn't matter if the situation is good or bad, I can accept myself for who I am"). Items are rated on a five-point scale from 1 (*never true*) to 5 (*always true*). In the current study, the internal consistency reliabilities of the present-moment attention (ρ = .74), awareness (ρ = .74), and acceptance (ρ = .69) are all acceptable.

Self-compassion scale (SCS; Neff, 2003b). The 13-item SCS that measures self-kindness (5 items; e.g., "I try to be loving towards myself when I'm feeling emotional pain"), common humanity (4 items; e.g., "I try to see my failings as part of the human condition"), and mindfulness (4 items; e.g., "When something painful happens I try to take a balanced view of the situation") was used in the current study. The SCS has been validated and used among Chinese populations (Kwan, Kuang, & Hui, 2009; Neff, Pisitsungkagarn, & Hsieh, 2008). Participants were asked to indicate how often they behave in the stated manner, on a 5-point scale that ranged from 1 (*almost never*) to 5 (*almost always*). In the present study, the internal consistencies of self-kindness, common humanity, and mindfulness were ρ = .67, ρ =.61, and ρ =.63, respectively.

Cognitive fusion questionnaire (CFQ; Gillanders et al., 2014). The CFQ is a 7-item scale that measures psychological inflexibility in relation to cognitions. Items are rated on a seven-point scale from 1 (*never true*) to 7 (*always true*). For the CFQ, translation into Chinese and back translation into English procedure was closely followed (Hambleton, 2005). In the present study, the internal consistency of the Chinese CFQ is ρ = .85.

Rumination-reflection questionnaire (RRQ; Trapnell & Campbell, 1999). The RRQ measures two dimensions, rumination and reflection, on a 5-point scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). Although both rumination and reflection involve heightened attention to self, we were only interested in the construct of rumination, which is described as "self-attentiveness motivated by perceived threats, losses, or injustices to the self" (Trapnell & Campbell, 1999, p. 297). Accordingly, a 9-item rumination subscale was used in the current study. The internal and test-retest reliabilities of the rumination subscale of the Chinese version RRQ in a sample of Chinese colleague students (n = 1226) are α = .81 and r = .71, respectively (Yuan, Peng, Huang, & Zhou, 2010).

Procedures. The data collection procedure was the same as those outlined in Studies 2, 3, and 4.

Data Analysis

The percentage of missing data was negligible (1.11%) and were treated using pairwise deletion. The factorial validity of the measurement models of all measures in Study 5 were tested using CFA with Mplus 7 (Muthén & Muthén, 2012). We also examined the discriminant validity between the single-factor of decentering and factors of mindfulness and self-compassion by estimating a series of two-factor measurement models. Discriminant validity is demonstrated when the 95% confidence interval of factor correlations among latent factors does not include

545 unity (Bagozzi & Phillips, 1982). Further, discriminant validity between decentering and
546 mindfulness as well as between decentering and self-compassion would be demonstrated if
547 removing the constraint (i.e., correlations between factors were fixed to one) would lead to
548 significant change of model fit using Wald's (1943) test (Bagozzi, Yi, & Phillips, 1991; Shiu,
549 Pervan, Bove, & Beatty, 2011).

550 **Results and Discussion**

551 **Confirmatory factor analysis.** The 12-item unidimensional decentering model displayed
552 an acceptable fit to the data: χ^2 (54) = 169.57, $p < .001$, CFI = .91, TLI = .89, WRMR = 1.07,
553 RMSEA (90% *CI*) = .080 (.067, .094) and good internal consistency ($\rho = .82$). The item means,
554 standard deviations, standardized factor loadings and residuals are displayed in Table 1. Model
555 fit indices of the criterion-related measures are displayed in Table 5.

556 **Concurrent and discriminant validities.** There were significant and medium to large
557 negative correlations between the DSS and cognitive fusion as measured by the CFQ ($r = -.21$, p
558 $< .001$), but the correlation between decentering as measured by the DSS and rumination as
559 measured by the RRQ ($r = -.11$, $p > .05$) was not significant. All of the 95% confidence intervals
560 of the latent factor correlations did not include 1, and the Wald test was significant ($p < .001$)
561 thereby providing support for the discriminant validity of decentering with mindfulness and self-
562 compassion (see Table 5).

563 **General Discussion**

564 The primary purposes of this multi-study project were to develop a questionnaire
565 designed to assess the concept of decentering in the context of training and competition in sport,
566 and evaluate the construct validity of this scale in multiple, independent samples of Chinese
567 athletes. Given the debate regarding the dimensionality of the decentering construct, we were

able to examine whether decentering is best conceptualized as a unidimensional or multidimensional construct in an athletic population. A series of four related studies provided support for the validity and reliability of a unidimensional decentering measure, the Decentering Scale for Sport (DSS). Partial measurement invariance of the DSS was established across gender and sport type. The DSS demonstrated associations with theoretically meaningful criterion-related measures in expected directions thereby providing support for its convergent and concurrent validities. Additionally, the discriminant validity between decentering as measured by the DSS with mindfulness and self-compassion was established. Taken together, these findings indicate that the DSS is a psychometrically sound sport-specific decentering inventory.

The findings of this multi-study project support the notion that the DSS assesses a unidimensional construct of decentering in a sport context, which is in line with the construct dimension of decentering in the Experiences Questionnaire (EQ; Fresco, Moore et al., 2007). Given the concerns raised by researchers about the inclusion of self-compassion into the composition of the EQ (Forman et al., 2012; Gillanders et al., 2014), the initial pool of items were developed based on two facets of decentering, namely, the ability to distinguish thoughts from a sense of one's self and to engage with negative experiences without reacting to them. The discriminant validity between decentering and self-compassion provides support for our decision to exclude this content from the initial pool of items, and therefore support the notion that decentering and self-compassion are two independent constructs. However, it should be noted that the model-data fit indices of the three-factor measurement model of the SCS were below the recommended guidelines in our study, which is in line with the recent criticism of the problems with the psychometric validity of the SCS (e.g., López et al., 2015). Thus, caution is urged when interpreting the discriminant validity evidence between decentering and self-compassion as

reported in this study. Although other researchers have found two decentering dimensions using the EQ in different populations (Gecht, Kessel, Mainz et al., 2014; McCracken et al., 2014), results of this project obtained with multiple samples and using both exploratory and confirmatory analyses provided evidence for the unidimensional nature of the decentering construct (Gregório et al., 2015; Soler et al., 2014). As we did not include rumination items when developing the initial pool of decentering items, we further examined the association between DSS and rumination in Study 5. Given that rumination and decentering are viewed as two closely-related but opposite concepts, the negative but non-significant association between these two variables revealed in our study requires further investigation.

Researchers have attempted to differentiate decentering from similar concepts. For example, Gillanders and colleagues (2014) stated that, compared to decentering, cognitive defusion is a more narrowly defined and behaviorally oriented process, which is described as facilitating the action that is taken to be consistent with individual's values rather than changing metacognitive beliefs. Although re-perceiving is defined as a more cognitively oriented process after the mindfulness practice, decentering in the current study is defined from both the behaviorally and cognitively oriented perspectives, that is, (a) individuals cognitively differentiate one's thoughts one's true self and truth, and (b) behaviorally ceased the habitual reaction to one's experiences. In addition, it should be noted that many unidimensional self-report measures of cognitive defusion have been developed (e.g., Forman et al., 2012). This approach is in line with the findings of the current study and the development of EQ as a unidimensional construct (Fresco, Moore, et al., 2007). However, the negative and medium to large association (r = -.21) between decentering and cognitive fusion (the opposite of cognitive defusion) suggests that decentering and cognitive defusion are conceptually similar but two

independent constructs. Although it can be argued that decentering, re-perceiving, and cognitive defusion are different constructs in terms of their theoretical origins, they also might be different names for the same construct. As such, in order to clarify the conceptual overlap or distinctions between these constructs (Hagger, 2014), further empirical and theoretical work is required to examine and compare the thematic and experiential meaning of these constructs. Although mindfulness and decentering are two closely-related concepts, it should be noted that decentering in the current project was conceptualized as an independent construct rather than a component of mindfulness (Lau et al., 2006), and the magnitude of their association in Studies 3 and 5 supported this conceptualization. These findings are consistent with previous research that has shown mindfulness and decentering are two independent constructs (e.g., Gecht, Kessel, Forkmann et al., 2014).

In line with previous studies of decentering (Fresco, Moore, et al., 2007; Gregório et al., 2015), the current study revealed that decentering is positively associated with adaptive psychological characteristics such as mindfulness, well-being, flow, vitality, positive affect, and enjoyment, and inversely related with psychological characteristics such as experiential avoidance, athlete burnout, negative affect, and anxiety. The positive correlation between decentering and mindfulness and the negative association between decentering and experiential avoidance further corroborate their close associations. Given that the reduction of experiential avoidance in uncomfortable thoughts and emotions is central to mindfulness-based interventions for athletes (e.g., Gardner & Moore, 2004, 2007), further investigation into the reciprocal relations between mindfulness, decentering and experiential avoidance within a mindfulness-based intervention is necessary. Building on the established association between mindfulness and flow (e.g., Aherne, Aidan, & Lonsdale, 2011), a positive relation between decentering and

mindfulness and between decentering and flow suggests that the ability to adopt decentering might be related to the experience of flow during training and competition. Moreover, positive associations between decentering and subjective well-being, enjoyment, vitality, and positive affect, as well as the negative associations between decentering and negative affect, and anxiety indicate that interventions that target improving decentering capability might help foster adaptive and minimize maladaptive outcomes.

The DSS can be applied to the assessment of decentering in sport contexts in order to explore the effectiveness of various mental training programs as well as their potential changing mechanisms. For example, applying the DSS in different types of interventions (e.g., CBT, relaxation, and mindfulness interventions) can clarify the similarities and differences when utilizing these programs in athletes' mental training (e.g., Hayes-Skelton et al., 2015). The DSS can also be used to track the progress of change during interventions using the N-of-1 randomized controlled trials (N-of-1 trials; Kazdin, 1982), in which time periods within each participant are randomly allocated to different conditions. The N-of-1 trials can serve as an alternative to between-subjects RCTs in applied sport contexts, in particular the small sample of athletes at the international level. Given that decentering has been proposed as one of the mechanisms of change in mindfulness-based interventions (Sauer & Baer, 2010) and cognitive behavioral therapy (Sanfran & Segal, 1990), the DSS may prove useful in allowing researchers to test the mediational role of decentering from mindfulness to adaptive and maladaptive psychological variables. Future research can use the DSS to examine whether decentering is a proximal or distal variable of mindfulness based therapies for flow, mood, anxiety and other psychological variables (e.g., Tanay, Lotan, & Bernstein, 2012).

Despite the adequate psychometric properties of the single-factor DSS, a number of limitations should be acknowledged that might also indicate directions for future research. In terms of the study samples, we only collected data from elite Chinese athletes. As such, future research should examine the extent to which the DSS generalizes to Western athletic populations. Secondly, the test-retest reliability of the DSS should be examined to provide insight into the traitness of this construct, and the predictive validity of the DSS can possibly be established by applying mindfulness training to increase positive and decrease negative psychological states. Thirdly, although we confirmed the unidimensional nature of decentering in the current study using athletic populations, future research should examine the dimensionality of the decentering construct further through validating the DSS and EQ using different populations or by developing new measurements based on the conceptualization of decentering (Safran & Segal, 1990). Fourthly, although decentering was conceptualized as a dispositional construct in our study, future research can design a state measure of decentering in sport contexts using the timeframe of right now, and examine levels of decentering immediately after mindfulness and or CBT practice. Fifthly, many of the validation questionnaires (e.g., measurements of enjoyment, experiential avoidance, well-being, and vitality) employed in this project evidenced high RMSEA values over .10. Models with small degrees of freedom can have artificially large values of the RMSEA, such that some researchers propose not to compute the RMSEA for measurement models with low degrees of freedom (Kenny, Kaniskan, & McCoach, 2015). Finally, although we conceptually differentiated decentering with similar concepts such as cognitive defusion and re-perceiving, further research is needed to clarify and synthesize this construct through testing of the similarities and differences of these concepts regarding the semantic and measurement levels (Hagger, 2014).

In conclusion, in this multi-study project we developed and offered initial validity evidence for a sport-specific tool to measure decentering in sport contexts using four separate samples of Chinese athletes. The unidimensional nature of the decentering construct has been confirmed, with satisfactory internal consistency reliability, and the establishment of convergent and concurrent validities. Future research can also pursue to confirm the dimensionality of the decentering construct the effectiveness of mindfulness and CBT training on decentering and to further examine its predictive validity on sport performance and adaptive and maladaptive psychological variables.

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Table 1

Factor Loading Matrix, Factor Loadings (λ) and Error Variances (θ), Item Means (M) and Standard Deviations (SD), and Composite Reliabilities (CR) of the DSS (Studies 2, 3, 4, and 5)

DSS items	**Study 2: EFA (*n* = 271)**			**Study 3: CFA (*n* = 357)**				**Study 4:CFA (*n* = 295)**				**Study 5:CFA (*n* = 332)**			
	Two factor		One factor												
	F1	F2	*λ*	*M*	*SD*	*λ*	*θ*	*M*	*SD*	*λ*	*θ*	*M*	*SD*	*λ*	*θ*
Item2	**.64***	.24*	**.68***	3.07	.89	.69	.52	3.23	.89	.59	.65	3.04	.87	.61	.62
Item5	**.53***	.03	**.54***	3.45	.87	.63	.61	3.53	.85	.42	.82	3.51	.89	.54	.71
Item4	**.61***	.18*	**.64***	3.15	.96	.60	.65	3.18	.88	.64	.59	2.94	.92	.38	.85
Item7	**.49***	-.14	**.47***	3.25	.95	.49	.76	3.26	.88	.52	.73	3.15	1.01	.45	.80
Item9	**.52***	.15*	**.55***	3.29	.94	.60	.64	3.38	.93	.64	.60	3.21	1.02	.61	.63
Item6	**.48***	-.12	**.46***	3.34	.98	.47	.78	3.21	.95	.47	.78	3.06	1.04	.39	.85
Item11	**.54***	-.08	**.52***	3.36	.90	.52	.73	3.22	.94	.47	.78	3.15	1.03	.43	.82
Item12	**.52***	.23*	**.55***	3.16	.93	.57	.68	3.17	.89	.50	.75	3.10	.98	.54	.71
Item14	**.51***	.00	**.51***	3.57	.97	.59	.65	3.53	1.03	.52	.73	3.58	1.05	.59	.65
Item18	**.66***	-.03	**.65***	3.22	.95	.74	.45	3.29	.96	.69	.52	3.15	1.06	.63	.60
Item19	**.62***	-.03	**.61***	3.54	.99	.66	.57	3.46	.97	.63	.60	3.40	1.06	.53	.72
Item20	**.57***	.16*	**.60***	3.48	.86	.57	.67	3.47	.89	.41	.84	3.39	.96	.50	.75
Item23	**.50***	-.28*	**.43***												
Item21	.34*	**-.38***													
Item15 [a]	-.11*	**.48***													
Item16 [a]	.00	**.79***													
CR			.85			.88				.83				.82	

Note. DSS = Decentering Scale for Sport; EFA = exploratory factor analysis; CFA = confirmatory factor analysis; Items 23, 21, 15, and 16 were not included in the final 12-item DSS scale after EFA in Study 2 and CFA in Study 3. [a] = reverse-worded items. Numbers in bold face indicate primary loadings of EFA, with statistically significant ($p < .05$) loadings are marked with an "*". All factor loadings of Studies 3, 4, and 5are statistically significant at $p < .05$.

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Tale 2

Model-Fit Indices for Invariance Analysis of the DSS Measurement Model (Study 3; n = 357)

Model	χ^2	*df*	$\Delta\chi^2$	Δ*df*	CFI	ΔCFI	TLI	ΔTLI	RMSEA	ΔRMSEA
Gender										
Male	126.397	44			.960		.950		.073	
Female	99.540	44			.954		.943		.092	
CI	201.753	88			.950		.937		.085	
MI	276.351	141	101.633*[a]	53	.940	-.010	.953	.016	.074	-.011
PMI(i2)	263.869	136	88.753*[b]	48	.956	.006	.965	.028	.064	-.021
PMI(i2 and i11)	244.252	131	69.665	43	.950	.000	.958	.021	.070	-.015
FVI	222.298	132	2.047	1	.960	.010	.967	.009	.062	-.008
Sport Type										
Individual	131.035	44			.935		.919		.088	
Team	89.653	44			.944		.929		.100	
CI	219.574	88			.938		.922		.092	
MI	280.089	141	96.013*[c]	53	.934	-.004	.949	.027	.074	-.018
PMI(i3)	249.768	136	66.631	48	.946	.008	.957	.035	.069	-.023
FVI	223.450	137	1.543	1	.959	.013	.967	.01	.060	-.009

Note. DSS = Decentering Scale for Sport; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = configural invariance; MI = measurement invariance; PMI = partial measurement invariance; FVI = factor variance invariance. Item numbers (i4, i5 and i19) in the parenthesis refer to partial measurement invariance with their factor loadings and thresholds were estimated to be equal across sport type. *[a] = statistically significant $\Delta\chi^2$statistic (p = .0002) after a Bonferroni correction α (.05/53) = .0009; *[b] = statistically significant Δ χ2statistic (p = .0003) after a Bonferroni correction α (.05/48) = .001); *[c] = statistically significant $\Delta\chi^2$statistic (p = .0003) after a Bonferroni correction α (.05/53) = .0009. Given that $\Delta\chi^2$ tests were conducted using DIFFEST procedure, the $\Delta\chi^2$ is not equal to the difference in χ^2 between two models.

Table 3

Means (M), Standard Deviations (SD), Composite Reliability (CR), and Model Fit Indices of All the Criterion-related Measures, and Latent Factor Correlations with the DSS (Study 3; n = 357)

Scales	Descriptive statistics			Model fit Indices						Latent Correlations with DSS	
	M	*SD*	CR	χ^2	*df*	CFI	TLI	RMSEA 90% *CI*	WRMR	*r*	95% *CI*
AAQ-II	21.02	7.91	.88	121.13***	14	.96	.93	.146 [.123, .171]	.998	-.30***	-.40, -.20
TCWS	24.88	6.65	.77	59.61***	9	.95	.92	.126 [.096, .157]	.853	.40***	.29, .50
MAAS	4.18	.69	.88	383.43***	90	.91	.90	.096 [.086, .106]	1.295	.27***	.17, .37
SDFS [a]	30.76	4.65	.79	34.41**	14	.98	.97	.064 [.037, .091]	.655	.54***	.45, .63

Note. DSS = Decentering Scale for Sport; AAQ-II = Acceptance and Action Questionnaire–II; MAAS = Mindful Attention Awareness Scale; TCWS = Training and Competition Well-being Scale; SDFS = Short Dispositional Flow Scale; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence invariance; WRMR = weighted root mean square residual. **$p < .01$; ***$p < .001$. [a] In our data, Items 2 and 8 of the SDFS were removed due to their low factor loadings (i.e., $\lambda < .30$).

Table 4

Means (M), Standard Deviations (SD), Composite Reliability (CR), and Model Fit Indices of All the Criterion-related Measures, and Latent Factor Correlations with the DSS (Study 4; n = 295)

Scales	Descriptive statistics			Model fit Indices						Latent Correlations with DSS	
	M	*SD*	CR	χ^2	*df*	CFI	TLI	RMSEA 90% *CI*	WRMR	*r*	95%CI
ABQ				364.46***	87	.94	.93	.104 [.093, .115]	1.180		
RSA	13.28	3.50	.76							-.21**	-.32, -.08
Exhaustion	14.67	3.78	.82							-.05	-.18, .08
Devaluation	12.37	4.18	.87							-.05	-.17, .08
SVS	28.65	7.73	.91	99.08***	9	.97	.95	.185 [.153, .218]	.702	.25***	.13, .36
IPANAS-SF [a]				93.26***	26	.96	.94	.094 [.074, .115]	1.034		
PA	17.78	3.73	.84							.20***	.09, .32
NA	12.06	4.12	.76							-.17**	-.30, -.05
SES	15.60	3.70	.93	19.75***	2	1.00	.99	.173 [.109, .247]	.425	.18**	.06, .31
SCAT [b]	18.61	3.42	.80	33.70	27	.99	.99	.029 [.000, .057]	.643	-.19**	-.32, -.05

Note. DSS = Decentering Scale for Sport; ABQ = Athlete Burnout Questionnaire; RSA = Reduced Sense of Accomplishment subscale; SVS = Subjective Vitality Scale; PA = Positive Affect; IPANAS-SF = International Positive and Negative Affect Schedule Short Form; NA = Negative Affect; SES = Sport Enjoyment Scale; SCAT = Sport Competition Anxiety Test; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence invariance; WRMR = weighted root mean square residual. ***p* < .01; ****p* < .001. [a] In our data, Item 3 of the IPANAS-SF was removed due to its low factor loading (i.e., $\lambda < .30$). [b] In our data, Item 8 of the SCAT was removed due to its low factor loading (i.e., $\lambda < .30$).

Table 5

Means (M), Standard Deviations (SD), Composite Reliability (CR), and Model Fit Indices of All the Criterion-related Measures, and Latent Factor Correlations and Wald Tests with the DSS (Study 5; n = 332)

Scales	Descriptive statistics			Model fit Indices						Latent Correlations with DSS		Wald Test
	M	*SD*	CR	χ^2	*df*	CFI	TLI	RMSEA 90% *CI*	WRMR	*r*	95%CI	
AMQ				219.09***	101	.94	.93	.059 [.049, .070]	.989			
Attention	18.16	3.11	.74							.72***	.64, .80	47.79***
Awareness	21.41	3.68	.74							.57***	.47, .66	75.52***
Acceptance	16.96	3.07	.69							.77***	.70, .84	40.90***
SCS				261.41***	62	.85	.81	.099 [.087, .111]	1.340			
Self-kindness	15.71	3.69	.67							.49***	.38, .59	89.48***
Humanity	13.45	3.11	.61							.53***	.40, .66	52.22***
Mindfulness	13.60	2.99	.63							.69***	.60, .77	51.89***
CFQ	25.77	7.52	.85	60.51***	14	.97	.96	.101 [.076, .128]	.711	-.21***	-.32, -.10	
RRQ [a]	30.19	5.40	.81	84.22***	27	.95	.93	.081 [.061, .100]	.890	-.11	-.25, .03	

Note. DSS = Decentering Scale for Sport; AMQ = Athlete Mindfulness Questionnaire; SCS = Self-Compassion Scale; CFQ = Cognitive Fusion Questionnaire; RRQ = Rumination-Reflection Questionnaire; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence invariance; WRMR = weighted root mean square residual. **$p < .01$; ***$p < .001$.

[a] In our data, Items 6, 9, and 10 of the RRQ were removed due to their low factor loadings (i.e., $\lambda < .30$).

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Appendix. The Chinese DSS items and Corresponding English Translations

运动领域去自我中心量表

Decentering Scale for Sport (DSS)

1	2	3	4	5
从来没有 **Never true**	很少这样 **Rarely true**	有时这样 **Sometimes true**	经常这样 **Often true**	总是这样 **Always true**
在训练或比赛中…… During training and competition……				
2. 我能够将自己从让人心烦的想法或画面中抽离出来，不受其控制。 2. I can pull myself out of annoying thoughts or images without being controlled by them.	**1**	**2**	**3**	**4**	**5**
5. 我能够区分出哪些是当时客观真实情况，哪些是自己内在想法。 5. I can distinguish thoughts which are objective reflections from those which are my personal thinking.	**1**	**2**	**3**	**4**	**5**
4. 我不会轻易地被自己的想法和情绪带着走。 4. I am not easily distracted by my thoughts and emotions.	**1**	**2**	**3**	**4**	**5**
7. 我注意到各种想法和感受只是短暂的，而并非事实。 7. I notice that all kinds of thoughts and feelings are temporary, not necessarily the truth.	**1**	**2**	**3**	**4**	**5**
9. 我能够觉察到自己有不愉快的情绪出现，但不会沉浸其中。 9. I can observe but not become immersed in unpleasant emotions.	**1**	**2**	**3**	**4**	**5**
6. 我能够只是意识到让人心烦的想法或画面，而不立即表现出任何反应。 6. I can just be aware of the annoying thoughts or images, without immediately reacting to them.	**1**	**2**	**3**	**4**	**5**
11. 我提醒自己，所感觉到的状态好与差未必会发生在实际情况中。 11. I remind myself that although I can feel good or bad states, the actual situation might not be like this.	**1**	**2**	**3**	**4**	**5**
12. 当出现让人心烦的想法或画面时，我很快就会平静下来。 12. When annoying thoughts or images appear, I can calm down quickly.	**1**	**2**	**3**	**4**	**5**
14. 我注意到自己在面对困难和压力时的消极思考方式，但明白自己并不是一个消极的人。	**1**	**2**	**3**	**4**	**5**

14. I notice the passive thinking style when I confront difficulty and pressures, while at the same time I understand that I am not a passive person.					
18. 我能够只是意识到让人心烦的想法或画面，不与其纠缠不清。 18. I can be aware of annoying thoughts or images without becoming entangled in them.	**1**	**2**	**3**	**4**	**5**
19. 我注意到焦虑不安的心情或负面的想法只是当下所感受到的，并不能代表全部的自己。 19. I notice that an agitated mood or negative thinking is not who I am or what the situation really looks like.	**1**	**2**	**3**	**4**	**5**
20. 我能够从容地对困难做出反应。 20. I can react to difficulties with calm.	**1**	**2**	**3**	**4**	**5**
*23. 我注意到认为自己无法再继续坚持下去只是一个想法和念头，而事实未必如此。 *23. I notice that what I think I cannot hold onto is just a thought or an idea, and not necessarily the truth.	**1**	**2**	**3**	**4**	**5**
*21. 我注意到对比赛结果的一切猜想和分析只是我自己的想法和念头，并且只会让比赛变得更加复杂。 *21. I realize that conjecture and analysis of the competition results are just my thoughts and ideas, which can make the competition more complicated.	**1**	**2**	**3**	**4**	**5**
* 15. 我控制不住自己的情绪不被负面想法和念头影响到。 * 15. I become emotionally affected by the negative thoughts and ideas on my emotions [a].	**1**	**2**	**3**	**4**	**5**
* 16. 我虽然觉察到了自己的一些想法和念头是负面的，但还是控制不了不受影响。 * 16. Although I am aware of negative thoughts and ideas, I still cannot avoid being affected by them [a].	**1**	**2**	**3**	**4**	**5**

Note. Items are marked with an "*" were not included in the final 12-item DSS scale. [a] = Reverse-worded Items.

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