

Adaptation and validity of the Sports Injury Anxiety Scale in Chinese collegiate athletes

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This study aimed to revise the Sports Injury Anxiety Scale (SIAS) and assess its reliability and validity among Chinese collegiate athletes. Six hundred thirty collegiate athletes aged from 17 to 27 years old agreed to complete the Sports Injury Anxiety Scale and a Chinese version of the Tampa Scale for Kinesiophobia (TSK). The results showed that the final Chinese version of the SIAS contained 6 factors, including loss of athleticism, being perceived as weak, experiencing pain, loss of social support, reinjury and letting down important others. Second, all factors of the SIAS were moderately or weakly correlated with the TSK, indicating that the validity of the SIAS was acceptable. Third, female athletes had significantly higher levels of anxiety than male athletes with respect to losing athleticism, being perceived as weak, letting down important others and loss of social support. More importantly, significant differences in the factor of anxiety related to experiencing pain were found among athletes with different numbers of injuries or risk of injury. Conclusion: The Chinese version of the SIAS is a reliable, valid and highly useful instrument in assessing sports injury anxiety.

KEY WORDS: Sports injury; Anxiety; Risk of injury; Sports injury anxiety.

Introduction

Sports injury refers to all kinds of injuries that occur in the process of sports (Bai, Zhang & Chen, 2011). Typically, sports injury anxiety is defined as a kind of fear. However, except for fear, there are many internal hidden factors in sports injuries that can induce anxiety among athletes (Walker, Thatcher & Lavalley, 2010). It is very common for athletes to suffer from sports injury anxiety worldwide. In China, according to a survey of collegiate athletes from seven universities in Guangzhou, 51.0% of respondents reported a history of sports injuries (Bai et al., 2011). However, the relevant

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studies concerning sport injury anxiety among collegiate athletes is very limited in China due to the lack of measurements in this area. Thus, this study aimed to adapt the Sports Injury Anxiety Scale (SIAS) to the Chinese language and culture.

Sports Injury Anxiety Scale

Many instruments have been developed to measure injury anxiety in athletes, such as the Tampa Scale for Kinesiophobia (TSK) and the Sports Injury Anxiety Scale (SIAS; Cassidy & Mclain, 2006; Glazer, 2009). However, most of these scales are one-dimensional or ignore the influence of sports injury on losing athleticism and social support. To solve these problems, Camille (2006) developed the SIAS in the America using collegiate athletes. The SIAS has 29 items across 7 factors, namely, loss of athleticism, being perceived as weak, experiencing pain, loss of social support, reinjury, letting down important others and having an impaired self-image. The reliability of the SIAS have been shown to be acceptable in American collegiate athletes' samples (Cassidy & Mclain, 2006). The SIAS was revised again by the original author in 2016, and the reliability and validity of the overall scale remained satisfactory after 8 items were deleted (Rex & Metzler, 2016). The SIAS was translated into Turkish and only had 19 items. In the Turkish version, one factor, namely, "letting down important others", was deleted (Caz, Kayhan & Bardakci, 2019). These findings suggest that the SIAS needs to be re-examined and adapted for the Chinese culture and language to develop a valid tool to assess Chinese athletes' sports injury anxiety.

To justify the adaptation and validation of the SIAS, differences between the collegiate athletes of China and America were taken into consideration in line with the guidelines of International Test Commission (2001). On one hand, differences in diet may cause Chinese athletes to have a different capacity for anxiety than American athletes. Low water content in the body increases anxiety and tension (Walker et al., 2010). On the other hand, Chinese and American collegiate athletes differ in internal motivation, training purposes and external motivation of scholarships (Dan, Lanping & Wartenberger, 2018). Hence, although the level of self-confidence among Chinese athletes is similar to that of American athletes, the levels of cognitive anxiety and physical anxiety among Chinese athletes are lower than those of American athletes (Cox & Liu, 1993).

Sports injury anxiety, number of injury and risk of injury

Studies have found that sports injury anxiety is strongly associated with the risk of injury and the number of injuries (Cassidy & Mclain, 2006; Reid, 1993). Regarding the risk of injury, athletes reported more severe anxiety when competing in sports with a moderate risk of injury than when competing in sports with a low risk of injury (Cassidy & Mclain, 2006). On the other hand, collegiate athletes who had been injured more than twice reported significantly more severe pain-related anxiety than athletes who had not been injured (Cassidy & Mclain, 2006). Another study also found that athletes who suffered more injuries reported higher levels of anxiety (Reid, 1993). More importantly, sports injury anxiety is also related to the fear of reinjury. For example, some studies have found that scores on the TSK were positively correlated with scores on the SIAS. That is, the higher the TSK score, the higher the pain-related anxiety (Neblett, Hartzell, Mayer, Bradford & Gatchel, 2016; Gómez-Pérez, López-Martínez & Ruiz-Párraga, 2011). However, other studies found no significant difference in sports injury anxiety between athletes who have never been injured and those who have been injured once or twice (Cassidy & Mclain, 2006). These findings highlight that more studies should explore the relationship between the number of injuries and sports injury anxiety.

Sports Injury Anxiety And Demographic factors

Demographic factors have also been shown to influence SIAS scores, but the results have been inconsistent. Some studies have found that women tend to report lower levels of sports injury anxiety than men with respect to factors such as perceived weakness, impaired self-image, reinjury and experiencing pain (Cassidy, 2007), while other studies have shown no difference in sports injury anxiety between men and women (Tomalski, 2013). Regarding age, younger athletes have reported significantly higher levels of anxiety than older athletes (Taheri & Afshari, 2010). Notably, no studies in the literature have examined the relationship between years of training and sports injury anxiety.

Aim of the present study

The first aim of this study is to adapt and validate the SIAS for Chinese culture. To achieve this aim, EFA and CFA were conducted to explore the structure

of the scale, and the associations between the factors of the SIAS and the TSK were examined to assess the validity of the scale. The second aim of this study was to explore the differences in the SIAS factors by sex, number of injuries and risk of injury to develop some interventions for collegiate athletes in China.

Method

PARTICIPANTS

The present study was approved by the Logistics Department for Civilian Ethics Committee of Liaoning Normal University. Six hundred forty-five collegiate athletes enrolled at Beijing Sport University, Shanghai Sport University, Liaoning Normal University and Shenyang Sport University agreed to participate in this study. Data from 15 participants were excluded due to missing answers. The final sample included 471 males (74.76%) and 159 females (25.24%). Most of the participants were students majoring in physical education and some of them had participated in national and provincial competition. The participants competed in cricket ($n=1$), bludgeon ($n=3$), baseball ($n=2$), Chinese winter sports ($n=9$), rugby ($n=24$), golf ($n=4$), fighting sports ($n=5$), fencing ($n=2$), fitness ($n=11$), basketball ($n=107$), softball ($n=8$), speed skating ($n=3$), volleyball ($n=21$), rock climbing ($n=1$), canoeing ($n=2$), table tennis ($n=21$), hockey ($n=3$), shooting ($n=2$), handball ($n=5$), wrestling ($n=3$), taekwondo ($n=3$), gymnastics ($n=5$), sports dance ($n=16$), athletics ($n=171$), tennis ($n=12$), martial arts ($n=60$), swimming ($n=15$), badminton ($n=33$), cycling ($n=1$), and football ($n=70$).

The participants' age ranged from 17 to 27 years ($M=20.79$, $SD=1.64$), and their years of involvement in sports ranged from 0.5 to 17 years ($M=5.09$, $SD=2.86$). The number of injuries that they experienced ranged from 0 to 50 ($M=3.97$, $SD=5.40$). The participants were divided into two samples according to the time of data collection. Detailed demographic information is shown in Table I.

TABLE I
Demographic information of participants

Demographic information	Sample 1 ($n=300$)				Sample 2 ($n=330$)			
	Min	Max	Mean	SD	Min	Max	Mean	SD
Age (year)	18	26	21.13	1.78	17	27	20.48	1.44
Gender ^a	1	2	1.35	0.48	1	2	1.16	0.37
Years of training (year)	0.5	15	4.60	2.62	0.5	17	5.53	3.00
Experience of competing (yr)	0.5	15	4.60	2.62	5	17	5.53	3.00
Number of injuries	0	25	3.76	4.49	0	50	5.50	6.90

Note: ^a 1 = Male, 2 = Female

QUESTIONNAIRES

Sports Injury Anxiety Scale

The original SIAS across 7 factors: loss of athleticism (5 items), being perceived as weak (4 items), experiencing pain (4 items), loss of social support (4 items), reinjury (4 items), letting down important others (4 items) and having an impaired self-image (4 items). Participants were asked to rate each item on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (not applicable).

The translation of the SIAS items was conducted by two qualified researchers following the translation/ back-translation procedure with the permission of the rights holder of the scale. One researcher first translated the items into Chinese, and then, the other researcher translated the Chinese version into English. Two experts in the field of athletes' sports injury (1 male) were invited to read and rate the items in terms of accuracy of wording. A high level of agreement in accuracy and frequency was achieved on 28 items except for one item (When I am injured, some people think I'm just being a baby). To make this item culturally adaptive to Chinese, we replaced it with a similar meaning (When I am injured, some people think I behaved to catch attention). Finally, an initial scale with 29 items was got.

Chinese version of the Tampa Scale for Kinesiophobia (TSK)

The 17-item Chinese version of the TSK measures fear of reinjury due to movement and physical activity (Hu, 2012). Participants rated the items on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). In this study, the internal consistency reliability of the TSK was 0.78.

DEMOGRAPHIC QUESTIONNAIRE

Participants were asked to provide demographic information, including gender, age, years of training, risk of injury (according to the average rate of injuries with time loss per 1000 exposures; Powell & Dompier, 2004) and number of injuries during college.

PROCEDURES

The SIAS and TSK were administered to 645 college students at Beijing Sport University, Shanghai Sport University, Liaoning Normal University and Shenyang Sports University. Data were collected from September 25 to October 10, 2020 for the first round of data collection and from January 1 to 15, 2021 for the second round of data collection. All participants signed informed consent forms and were required to complete all scales within 30 minutes. Upon completion, each participant received a small gift (10 RMB).

DATA ANALYSIS

The data were analyzed using SPSS 18.0. First, the psychological properties of the items were examined, including the mean, SD, kurtosis, skewness and corrected item-total correlation. Second, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted to explore the factorial structure of the Chinese version of the SIAS (SIAS-C) using

sample 1 and sample 2, respectively. Third, the relationships between the SIAS-C factors and the TSK and number of injuries were examined to assess its validity. Finally, as in previous studies (Cassidy & Mclain, 2006), the differences in the SIAS-C factors by gender, years of training experience and number of injuries were examined using independent samples t-tests and one-way ANOVA using sample 1.

Results

DESCRIPTIVE STATISTICS

The psychological properties of the items, including the mean, SD and corrected item-total correction were shown in Table II. The kurtosis and skewness values of each item were less than 5 and less than 3, respectively (Hu & Bentler, 1999), indicating that the data were normally distributed. The mean of each item showed that there were no ceiling or floor effects.

TABLE II
Descriptive statistics of the SIAS items and factor loading

Items	Mean	SD	Kurtosis	Skewness	Corrected item-total	Factor loading	Community
<i>Losing Athleticism</i>							
1	3.22	0.91	0.99	0.43	0.36**	0.62	0.47
2	3.52	0.80	0.76	-0.40	0.43**	0.59	0.45
3	3.56	0.70	0.25	-0.14	0.45**	0.65	0.58
4	3.56	0.73	0.25	0.13	0.46**	0.61	0.55
5	3.27	0.88	0.47	0.28	0.46**	0.68	0.53
<i>Being Perceived</i>							
6	2.85	1.07	0.23	0.24	0.41**	0.59	0.65
7	3.03	1.02	0.81	0.39	0.45**	0.63	0.65
8	3.19	0.90	0.40	-0.22	0.45**	0.88	0.80
9	3.14	0.91	0.05	-0.20	0.46**	0.82	0.77

(Continued) - TABLE II

(Continued) - TABLE II

Items	Mean	SD	Kurtosis	Skewness	Corrected item-total	Factor loading	Community
<i>Experiencing Pain</i>							
10	3.75	0.75	0.17	0.10	0.35**	0.81	0.68
11	3.56	0.80	1.46	0.99	0.38**	0.59	0.40
12	3.68	0.65	0.61	0.62	0.41**	0.84	0.76
13	3.67	0.69	0.26	-0.15	0.39**	0.76	0.65
26	3.62	0.72	0.58	0.07	0.46**	0.57	0.52
28	3.64	0.69	0.20	0.36	0.41**	0.62	0.62
<i>Loss of Social Support</i>							
14	3.14	0.87	1.17	0.30	0.40**	0.82	0.68
15	3.23	0.91	1.23	0.31	0.42**	0.65	0.51
16	3.13	0.76	0.16	-0.13	0.45**	0.77	0.65
17	2.98	0.89	0.86	0.20	0.44**	0.66	0.66
<i>Reinjury</i>							
18	3.43	0.78	0.28	0.04	0.52**	0.61	0.52
19	3.41	0.76	0.48	0.16	0.51**	0.73	0.63
20	3.46	0.72	0.58	-0.27	0.42**	0.88	0.79
21	3.64	0.69	1.29	0.37	0.41**	0.58	0.58
<i>Letting Down Important others</i>							
22	3.33	0.74	1.24	0.54	0.53**	0.71	0.58
23	3.20	0.83	0.68	-0.21	0.44**	0.81	0.67
24	3.23	0.77	0.67	0.10	0.50**	0.88	0.80
25	3.26	0.76	1.08	0.12	0.49**	0.88	0.79
27	2.97	0.90	1.12	0.34	0.42**	0.47	0.41

Note: * $p < 0.05$, ** $p < 0.01$

Factor Analysis

An EFA with principal component extraction and varimax rotation was conducted using sample 1. The results revealed a 7-factor structure that explained 62.27% of the variance (KMO=0.76, Bartlett=3820.47, $p<0.001$). The seventh factor with only one item was deleted. The remaining 28 items were submitted to a second EFA. The results revealed a 6-factor structure of the SIAS that explained 60.30% of the variance (KMO=0.77, Bartlett=3756.97, $p<0.001$). The 6 factors and factor loadings are shown in Table II.

The results of CFA, conducted via AMOS version 18.0 using sample 2, further showed the model fit indices for the scale were acceptable ($X^2=1107.31$, $df=331.0$, $X^2/df=3.35$, $CFI=0.91$, $TLI=0.90$, $RMSEA=0.08$). According to the criterion of (Hu & Bentler, 1999), the value of Goodness of Fit Index (GFI) and Comparative Fit Index (CFI) greater than 0.90 shows the model fitness was acceptable.

Reliability of the SIAS-C

Reliability analysis showed that the Cronbach's alpha coefficient for losing athleticism was 0.69, 0.78 for being perceived as weak, 0.83 for experiencing pain, 0.76 for loss of social support, 0.75 for reinjury, and 0.83 for letting down important others. The results show that reliabilities of the SIAS-C factors were acceptable.

Correlations between the SIAS-C factors, TSK and numbers of injuries

The correlations between the SIAS-C factors, the TSK and the number of injuries scale are shown in Table III. The results indicate that the construct validity of the SIAS-C was acceptable.

All the factors of the SIAS-C were positively and significantly correlated with the TSK. The losing athleticism, being perceived as weak, loss of social support and reinjury factors were also positively correlated with the number of injuries. Additionally, most factors correlated positively with each other, indicating that the content validity of the SIAS-C was acceptable.

Examining Differences among Groups

GENDER

The mean and standard deviation of male and female drivers in the SIAS-C factors are shown in Table IV.

TABLE III
Correlations between the SIAS-C factors, TSK and numbers of injuries

SIAS-C factors	1	2	3	4	5	6
1. Losing Athleticism	-					
2. Being Perceived as Weak	0.22**	-				
3. Experiencing Pain	0.35**	-0.03	-			
4. Loss of Social Support	0.27**	0.35**	-0.04	-		
5. Reinjury	0.34**	0.16**	0.45**	0.18**	-	
6. Letting Down Important Others	0.16**	0.30**	0.13**	0.27**	0.18**	-
TSK	0.35**	0.15**	0.34**	0.21**	0.31**	0.16**
Numbers of injuries	0.12**	0.17**	0.04	0.19**	0.15**	0.09

Note: * $p < 0.05$, ** $p < 0.01$

TABLE IV
Differences in the SIAS-C factors by gender

SIAS-C factors	Male ($n=195$)		Female ($n=105$)		t	Cohen's d
	M	SD	M	SD		
Losing Athleticism	3.47	0.54	3.34	0.52	2.03*	0.25
Being Perceived as Weak	3.11	0.78	2.93	0.71	2.06*	0.24
Experiencing Pain	3.65	0.51	3.67	0.56	-0.28	-0.04
Loss of Social Support	3.17	0.61	3.03	0.70	1.75*	0.21
Reinjury	3.48	0.56	3.50	0.54	-0.31	-0.04
Letting Down Important Others	3.25	0.63	3.10	0.58	2.09*	0.25

Note: * $p < 0.05$, ** $p < 0.01$

Independent samples t -tests showed that there were between-gender differences in the losing athleticism ($t=2.03$, $p<0.05$), being perceived as weak ($t=2.06$, $p<0.05$), and letting down important others factors ($t=2.09$, $p<0.05$). In addition, male athletes also scored higher on the loss of social support factor than females; this difference was marginally significant ($p=0.08$).

Years of training

The athletes were divided into two groups according to the years of training they suffered. The first group had trained for five years or less

($n=154$), and the second group had trained for more than five years ($n=146$). The means and standard deviations for different groups are shown in Table V.

Independent samples t-tests showed that significant difference were found in the losing athleticism factor ($t=-2.14$, $p<0.05$, *Cohen's* $d=-0.24$). Specifically, collegiate athletes who had trained for more than 5 years scored higher on the losing athleticism factor than those who had trained for five years or less. Difference was also found in the reinjury factor, but the difference is marginally significant ($t=-1.78$, $p=0.07$, *Cohen's* $d=-0.20$). Collegiate athletes who had trained for five years or less scored lower on the reinjury factor than those trained more than five years.

TABLE V
Differences in the SIAS-C factors by years of training

SIAS-C factors	0.5~5 years ($n=158$)		More than 5 years ($n=142$)		<i>t</i>	<i>Cohen's</i> d
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Losing Athleticism	3.37	0.55	3.50	0.52	-2.14*	-0.24
Being Perceived as Weak	3.03	0.72	3.07	0.80	-0.46	-0.05
Experiencing Pain	3.62	0.52	3.69	0.53	-1.22	-0.13
Loss of Social Support	3.06	0.60	3.18	0.68	-1.59	-0.19
Reinjury	3.43	0.50	3.54	0.59	-1.78	-0.20
Letting Down Important Others	3.20	0.59	3.19	0.65	0.17	0.02

Note: * $p < 0.05$, ** $p < 0.01$

Number of Injuries

The athletes were divided into three groups according to the number of injuries they suffered. The first group had no injuries ($n=49$), the second group had 1~2 injuries ($n=105$), and the third group had more than two injuries ($n=146$). The means and standard deviations for different injury groups are shown in Table VI.

One-way ANOVA revealed that there were differences in the experiencing pain factor ($F_{[2,300]}=3.54$, $p<0.05$, $\eta_p^2=0.02$). A post hoc test (Bonferroni) revealed that collegiate athletes who had not been injured scored significantly lower than those who had been injured 1~2 times ($p<0.05$).

TABLE VI
Differences in the SIAS-C factors by number of Injuries

SIAS-C factors	No injury (n=49)		1~2 injuries (n=105)		More than 2 injuries (n=146)		F
	M	SD	M	SD	M	SD	
Losing Athleticism	3.38	0.43	3.39	0.62	3.47	0.51	0.96
Being Perceived as Weak	3.11	0.64	2.95	0.71	3.10	0.82	1.43
Experiencing Pain	3.48	0.44	3.72	0.57	3.66	0.51	3.54*
Loss of Social Support	3.10	0.55	3.04	0.66	3.18	0.66	1.67
Reinjury	3.36	0.49	3.49	0.61	3.52	0.52	1.70
Letting Down Important Others	3.22	0.52	3.16	0.67	3.22	0.61	0.25

Note: *p < 0.05, **p < 0.01

Risk of Injury

Participants were divided into three groups: low (n=116), medium (n=126) and high risks of injury (n=58). Low-risk sports include swimming, tennis, track and field, handball, kayaking and golf. Medium-risk sports include taekwondo, table tennis, baseball, martial arts, hockey, volleyball, softball, basketball, sports dance, and Chinese winter sports. High-risk sports include football, gymnastics, speed skating, fighting, table tennis, bodybuilding, rock climbing, fencing, badminton, and handball. The mean scores for each group are shown in Table VII.

TABLE VII
Differences in the SIAS-C factors by risk for Injury

SIAS-C factors	Low-risk (n=116)		Medium-risk (n=127)		High-risk (n=57)		F
	M	SD	M	SD	M	SD	
Losing Athleticism	3.39	0.54	3.45	0.54	3.47	0.55	0.53
Being Perceived as Weak	3.08	0.75	3.00	0.77	3.09	0.75	0.42
Experiencing Pain	3.68	0.53	3.70	0.54	3.49	0.48	3.33*
Loss of Social Support	3.12	0.70	3.10	0.65	3.15	0.49	0.14
Reinjury	3.47	0.53	3.54	0.60	3.39	0.46	1.34
Letting Down Important Others	3.21	0.59	3.19	0.67	3.18	0.54	0.07

Note: *p < 0.05, **p < 0.01

One-way ANOVA revealed that there were group differences in the experiencing pain factor ($F_{[2,300]}=3.33$, $p<0.05$, $\eta_p^2=0.02$). A post hoc test (Bonferroni) revealed that collegiate athletes participating in medium-risk sports scored significantly higher than those athletes participating in high-risk sports ($p<0.05$).

Discussion

This study translated the Sport Injury Appraisal Scale (SIAS) from English to Chinese and examined whether the Chinese version of the SIAS could accurately assess the experience of sports injury anxiety. The results suggested that the revised scale has acceptable reliability and validity in Chinese collegiate athletes.

First, in line with the original factorial structure of previous studies (Cassidy & Mclain, 2006; Caz et al., 2019), the final Chinese version of the SIAS has 28 items. The SIAS-C contained 6 factors, including loss of athleticism, being perceived as weak, experiencing pain, loss of social support, reinjury and letting down important others. Significant correlations were found among the six factors of the SIAS-C, and the same trend among the factors was also found in the American collegiate athletes sample (Cassidy & Mclain, 2006). In addition, the reliabilities of the SIAS-C factors were also acceptable.

Second, the significant associations between the SIAS-C factors and the TSK showed that the discriminant validity of the scale was acceptable. This study found that the SIAS-C score was significantly positively correlated with the TSK score. In other words, the higher the score of each factor of the SIAS-C is, the higher the TSK score is, and the more afraid athletes are of movements. Previous studies have shown that individuals with high anxiety sensitivity reported higher levels of cognitive anxiety, pain-related fear, and general negative emotions (Vlaeyen & Linton, 2000).

Third, this study also explored the relationships between the SIAS-C factors and sex, years of training, number of injuries and risk of injury. Male collegiate athletes scored higher than females on the losing athleticism, being perceived as weak, loss of social support, and letting down important others factors. It is possible that female Chinese athletes have achieved more in competitions and they have become more independent, more confident, and more in control of their own lives (Lu & Di, 2014). However, there are contradictory results from previous studies showing that female athletes scored higher on the being perceived as weak, experiencing pain and reinjury fac-

tors (Cassidy & Mclain, 2006). One possible explanation is the differences between Chinese and Western sports culture. Chinese people tend to attribute success to great effort and thus pay more attention to the process before achieving success than Americans do (Dan et al., 2018).

Furthermore, our results also showed that the Chinese version of the SIAS is a highly useful instrument in distinguishing athletes with and without injuries. This study found that collegiate athletes who had one or two injuries scored higher on the experiencing pain factor than those who had no injuries. There was no significant difference in the other SIAS-C factors between collegiate athletes with 1-2 injuries and those with 2 or more injuries. A previous study demonstrated that people become emotional about the values and goals to which they are strongly committed. Therefore, anxiety is more likely to occur when a person's ability to prevent or alter potentially negative outcomes is uncertain (Lazarus & Smith, 1988). Thus, collegiate athletes with a high number of injuries can understand the pain associated with injury and perceive it as a threat to their goals, thus generating higher levels of anxiety in relation to the person experiencing the pain.

This study also found that compared with collegiate athletes who participated in high-risk sports, collegiate athletes who participated in medium-risk sports had significantly higher levels of anxiety associated with experiencing pain. There are also contradictory results showing that athletes in high-risk sports had more stable emotions, could better control their emotions, and could deal with stress optimally. They tend not to give in to pressure easily and do not easily feel nervous and anxious (Lazarus & Smith, 1988). One study found that athletes in high-risk sports are more introverted, independent, individualistic, serious and calm than others (Kajtna, Tuak, Bari & Burnik, 2004). However, other studies found that athletes engaged in high-risk sports were extroverted, emotionally stable and more in line with social norms, and these athletes were more able to control their emotions than athletes participating in other sports (Burnik & Tušak, 1999). As a result, athletes in high-risk sports are better able to stabilize their emotions and relieve anxiety when they experience injury or pain.

There are limitations in this study. First, the present study adopted self-reported methods, and therefore, the associations among the SIAS-C factors, the TSK, and the number of injuries may be affected by social desirability. Second, only the TSK-C was used to test the validity of the SIAS-C. In future studies, other instruments, such as the Risk, Pain, and Injury Questionnaire (RPIQ; Caz et al., 2019; Cherry, Morgan, Larson, Shumway & Andrews 2020), could be used to further assess the validity of the SIAS-C. The third limitation is that the participants are not representative of all collegiate

athletes in China. Future studies with a larger sample are recommended to further explore the external validity of the SIAS-C.

This study provides an effective tool for measuring the sports injury anxiety of Chinese collegiate athletes. Although the samples are limited to collegiate athletes, this study took the first step to develop a reliable and valid instrument in China. Future work should focus on testing the validity of the SIAS-C in Chinese athletes. In addition, this study also explored the relationship between sports injury anxiety and athlete gender, training years, injury frequency and injury risk, providing evidence for the development of interventions in China.

In summary, the revised SIAS is a reliable and validated instrument to measure sports injury anxiety among Chinese collegiate athletes. This study not only revealed that the SIAS-C was significantly correlated with the TSK but also that the number of injuries and risk of injury were significantly associated with anxiety regarding experiencing pain. The findings provide evidence for the development of an intervention to decrease postinjury anxiety in Chinese collegiate athletes.

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