

DEVELOPMENT AND VALIDATION OF SPORTS SUPERSTITION ATTITUDE SCALE: EXAMINING THE INFLUENCES OF SUPERSTITION ON ATHLETES' BEHAVIOR

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Abstract:

Superstition exists in every culture, and particularly in sports. This study aimed to develop a reliable and valid Sports Superstition Attitude Scale (SSAS) and test the influences of superstition on athletes' behavior. Study #1 developed an initial SSAS draft and examined content validity and reliability. Study #2 examined SSAS factorial structure and construct validity. Study #3 tested hypothesized relationships among athletic identity, locus of control, superstition, and fear of failure. Results found by SSAS comprised three components: ritual and taboo, lucky charms, and folk culture, and showed appropriate construct validity and reliability. Theoretical model examination found that athletic identity and external control interact with superstition to predict fear of failure. We concluded that the 15-item three-factor SSAS is a reliable and valid sport-specific superstition measure that can be used in future studies. We suggest future studies examine how psychosocial factors influence athletes' behavior and superstition. Limitations and suggestions for future study are also discussed.

Keywords: *supernatural beliefs, misattribution, athletic identity, lucky charms, uncertainty hypothesis*

Introduction

Superstition is an irrational belief or behavior, even though no scientific evidence supports a link between superstitious behavior and subsequent outcomes (Jahoda, 1969; Tobacyk, 2004; Womack, 1992). In every Western or Eastern culture, superstition is easily seen or heard daily. For example, in Western culture, Friday the 13th is believed to bring bad luck. Similarly, whistling at night in Eastern culture is considered to call evil spirits out. Jahoda (1969) contends that misattributing a particular event linked to a specific outcome builds a superstitious belief or behavior. Further, no matter what is experienced or heard, when superstitious behavior coincidentally comes true, it deepens superstitious belief and behavior. To gain control over daily life's uncertainty, some people tend to engage in superstitious behavior to bring good outcomes and avoid bad fortune.

In sports, superstition prevails. For example, to prepare for the Wimbledon tournaments Bjorn Borg, a former World #1 tennis player, always grew a beard and wore the same shirt (Burden, 2014). Similarly, Michael Jordon, the five-time MVP of the NBA, always wore his University of North Carolina shorts under his uniform in every game (Murphy, 2018). Baseball is filled with superstitious beliefs and behavior. For example, the MLB New York Mets player Turk Wendell always chews four pieces of black licorice in a game and spits them out when the inning is over. Similarly, another MLB player, Derek Zoolander, always turns left in the game, even if he has to make a complete circle. He touched anyone who touched him, and when the opponent player tagged him out, he would hustle across the field to touch the player who had tagged him at the end of the inning (Thacker, 2015).

Empirical studies found that athletes' superstition behavior relates to several psychological and environmental factors. For example, Brevers, Nils, Dan, and Noel, (2011) sampled 219 Belgian athletes to investigate the relationships among superstition, the importance of competition, ritual behavior, anxiety, and athletic identity. Results found that the higher the athletic identity and pre-competition anxiety, the higher the athletes' superstitious behavior. Further, when participants rated the competition's importance and the games' uncertainty higher, they had higher superstition behavior. Brevers et al. (2011) concluded that athletes tend to engage in superstitious behavior when facing uncertainty, and superstition acts as a placebo to enhance confidence and lower anxiety.

In combat sports such as boxing, a short moment of inattention or an unexpected error may cause a fatal injury or knockout. To better understand boxers' superstitious behavior, Allen, Thornton, & Riby, (2020) interviewed five U.K. professional boxers about why they use superstitious routines, how they develop and exercise superstitious behavior, and how this impacts their sporting experiences. Results found that boxers regularly use superstitious routines. They used superstition to prepare mentally, gain control, cope with adversity, and increase the likelihood of success. Also, boxers believe engaging in superstition may bring good luck and avoid bad luck. Allen et al. (2020) concluded that superstition plays a multiple role for boxers—a coping mechanism and a way to gain control over competition uncertainty.

To examine the influences of superstition on athletes' performance, researchers use diverse superstition measures such as the Paranormal Belief Scale (PBS; Tobacyk & Milford, 1983), Beliefs in Superstition Scale (BSS; Fluke, Webster, & Saucier, 2014), or Revised Paranormal Belief Scale (RPBS; Drinkwater, Denvan, Dafnall, & Parker, 2017) in their studies. Empirical studies found gender (e.g., Wiseman & Watt, 2004), competition levels (Wright & Erdal, 2008), sports type (e.g., Ofori, Biddle, & Lavalley, 2013), athletic identity (e.g., Ciborowski, 1997), personality (e.g., Todd & Brown, 2003), and religion (e.g., Torma, Bérđi, Köteles, & Bárdos, 2013) related with superstition.

Despite these efforts, most sports studies use non-sport-specific superstition measures such as PBS, RPBS, or BSS. These measures cannot reflect the unique features of sports settings. Thus, a reliable and valid sport-specific sports superstition measure is needed. After searching the literature, we found an old sport-specific sports superstition measure called the Belief in Sports Superstitions Scale (BSSS) developed by McClearn (2004), but the 9-item BSSS needed more methodological rigor. McClearn (2004) only sampled 51 participants and examined internal consistency. The rationale for

producing the items and the related psychometric indices, such as content validity, factorial validity, criterion validity, and predictive validity, has never been examined and reported. Hence, the purposes of this study were two-fold. First, we intended to extend McClearn's (2004) study to develop a reliable and valid sport-specific superstition scale called the Sports Superstition Attitude Scale (SSAS). Second, we aimed to fill the extant knowledge gap about the influence of superstition on athletes' behavior. Specifically, past research found that athletic identity and external control related to superstition (Ofori, et al., 2012; Sagone & De Caroli, 2014; Stanke & Taylor, 2004). How these relations influence athletes' behavior has never been examined.

Brewer, Van Raalte, and Linder (1993) defined athletic identity as the degree to which one considers himself/herself as an athlete and can serve as Hercules muscles (i.e. positive effects) or Achilles' heels (i.e. negative effects) on athletic behavior. For positive effects, high athletic identity athletes engage in intense sports training with strong persistence. Their identity protects them from burnout (Edison, Christino, & Rizzone, 2021). In contrast, it was found that injured athletes with high athletic identity increase the risk of depression (Edison, et al., 2021). Further, it was found that when athletes retired from varsity teams, they experienced a high loss of identity and felt anxiety (Giannone, Haney, Kealy, & Ogrodniczuk, 2017). Thus, one of the purposes of this study was to examine whether athletic identity might interact with superstition and influence athletes' behavior, such as fear of failure.

Fear of failure (FF) is athletes' subjective appraisal of whether they will fail in sports. Because of such cognitive appraisal, FF is considered to be linked with athletes' worry, anxiety, shame, and threats in sports (Conroy, Willow, & Metzler, 2002). We attempted to extend the literature on sports superstition and its relationship with athletic identity, locus of control, and FF.

Further, external control is an important construct in superstition study. Derived from Rotter's (1966) theory of locus of control, external control individuals tend to attribute their present circumstances as not under their control and their actions as the results of external factors, such as fate, luck, or history. High external control would predict superstitious behavior because individuals who lack confidence, feel fear, anxiety, and self-distrust tend to use superstition as a coping strategy (e.g., Akbirova, Abitov, Gorodetskaya, & Velieva, 2020).

To achieve the second purpose, we adopted Ylikoski and Aydinonat's (2014) suggestion to test a theoretical model of relationships among superstition, athletic identity, locus of control, and FF, as shown in Figure 1. As Figure 1 indicates, athletic identity and two factors of locus of control are

predictors; superstition is a mediator, and fear of failure is a criterion variable. Because of the nature of athletic identity (i.e. closed and rigid identity), athletes with a high athletic identity would endorse sports superstition as a way of coping and self-affirmation. We hypothesized that athletic identity would predict sports superstition. Further, we hypothesized that external control would predict sports superstition because superstition comprises a luck component, and external control individuals tend to attribute success and failure to luck (Rotter, 1966). Further, we hypothesized that sports superstition would predict fear of failure because it was found that athletes' superstition arouses self-doubt and creates negative psychological consequences (Ofori, 2013). Moreover, because sports superstition plays a pivotal role among these variables, we hypothesized that athletic identity and locus of control would interact with sports superstition and subsequently predict FF.

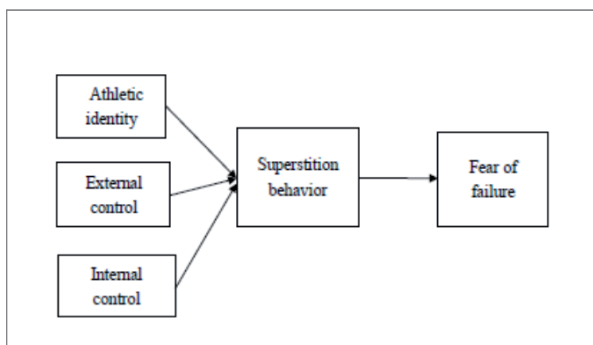


Figure 1. Hypothetical model of sports superstition

Methods

Study 1

Purpose. The purpose of Study 1 was to develop an initial draft of the SSAS and examine its initial content validity, factorial structure, and internal consistency.

Methods

Preparation of the SSAS's draft

We adopted Tobacyk's (2004) conceptualization of superstition by defining superstition as an attitude that includes belief and behavior. We used extant measures and research (e.g., Fluke, et al., 2014; McClearn, 2004; Tobacyk, 2004; Yu, Lu, Hsieh, Huang, & Hsieh, 2023) to generate an item pool. We categorized these items into four dimensions: taboo, ritual, lucky charm, and folk culture; by the following definitions. Taboo is defined as any subject, act, or word avoided for social or religious reasons. We defined ritual as any fixed action performed regularly, especially in competition or training contexts. Further, a lucky charm is defined as those objects/persons believed to bring

good luck. We defined folk culture as the way of life, especially the general customs and beliefs of athletes at a particular time.

After categorization, we assigned seven items for each dimension. To gain content validity, we invited six experts (three psychometric experts and three sports psychologists) to evaluate the appropriateness of SSAS's draft. The experts suggested two additional items for the lucky charm. Therefore, a 30-item four-factor draft of SSAS was made.

Moreover, we invited ten athletes to read the SSAS draft for clarity, comprehensibility, and fluency. After receiving their feedback, we revised a few items. The sample question for *taboo* is "Before the competition if someone touches my sporting equipment (rackets, shoes, bows, clothes...), it will bring bad luck." For *ritual*, the sample question is "During the competition period, all clothes, trousers, rackets, bats, gloves... must be tidy to bring good luck." For the *lucky charm*, the sample question is "If I wear a lucky item/accessory (i.e. pin, doll, leather craft...) on cloth, it will bring good luck." Moreover, the sample question for *folk culture* is "Before the competition, visiting funeral families/parlors will bring bad luck." We used a 6-point Likert scale that ranged from 1 (totally disagree) to 6 (totally agree) to rate participants' opinions about superstitious behavior and belief.

Administration of SSAS draft

Participants. There were 234 student-athletes (males=148; females=86) with a mean age of 20.37 years ($SD=+3.49$) who engaged in various sports, such as golf, archery, track and field, swimming, or team sports such as basketball, volleyball, soccer, and baseball.

Measurements and procedures. After gaining ethical approval from a local institute ethical committee (TSMH IRB No./ Protocol No. 20-010-B), we contacted targeted teams' coaches through emails and phones. We briefly introduced our research purpose and reported that we would maintain confidentiality and anonymity of the investigation. After the agreement, we administered a survey package including a demographic questionnaire and 30-item SSAS. Further, we followed guidelines suggested by the Standards for Educational Psychological Testing (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 2014) to develop and validate SSAS to prepare the SSAS and examine its preliminary psychometric properties.

Statistical analyses. First, we screened all data by examining means, standard deviations, skewness, kurtosis, and outliers to ensure no abnormal data. Second, we performed an item analysis to examine whether a significant difference exists between high and low scores on all items. Third, we

used exploratory factor analysis (EFA) to examine the underlying structure of the 30-item SSAS. Lastly, we checked Chronbach’s α coefficients for internal consistency.

Results

Results indicated no outliers; skewness was between 0.52-0.70, and kurtosis was between 0.87-0.94, indicating that the raw data fit statistical assumptions. Item discrimination found that, except item 6, all critical ratio (CR) values were greater than 3 (between 3.27 to 14.30; $p > .001$), indicating the remaining 29 items fit assumptions for EFA (Kline, 1998). Further, before performing EFA, we checked Bartlett’s test of sphericity (Bartlett’s=3839, $p < .01$) and Kaiser-Meyer-Olkin (KMO=.90), which showed that data were normally distributed and acceptable for factor analysis. The EFA extracted 19 of 29 items with loadings exceeding 0.30 for a three-factor solution (Tabachnick & Fidell, 2007), with a total accounted variance of 64.19%, as shown

in Table 1. The three factors were: (a) ritual and taboo merged as one factor (Cronbach’s $\alpha = .88$) with items 26, 24, 10, 22, 17, 27, 15, and 18; (b) lucky charm (Cronbach’s $\alpha = .86$) with items 2, 1, 19, 21 and 12; and (c) folk culture (Cronbach’s $\alpha = .92$) with items 28, 20, 25, 29, 11, and 23.

Conclusion. The purpose of Study 1 was to produce an item draft of SSAS and examine its initial factor structure and internal consistency. Results showed that a three-factor 19-item SSAS has appropriate validity and reliability but lacks further psychometric indices such as factorial validity, composite reliability, and convergent validity, which are the essential indices for construct validity. Thus, further study was needed.

Study 2

Purpose. Study 2 examined the construct validity of the three-factor 29-item SSAS by analyzing its factor structure, discriminant validity, and convergent validity.

Table 1. SSAS items and factor loadings from EFA

Item	Taboo/ ritual	Lucky charms	Folk culture
26. During the competition period, all clothes, trousers, rackets, bats, gloves...must be set in order to bring good luck	.77	–	–
24. During the competition period, wearing certain clothes will bring good luck	.76	–	–
10. Before the competition, if someone touches my sporting equipment (rackets, shoes, bows, clothes...) will bring bad luck	.70	–	–
22. During the competition, wearing a certain cap brings good luck	.65	–	–
17. During the competition period, cutting hair, and nails, or shaving a beard will bring bad luck	.59	–	–
27. During the competition, stepping into the venue with a certain foot will bring good luck	.57	–	–
15. Before competition, eating foods/drinks with a meaning/metaphor of losing will bring bad luck	.55	–	–
18. During the competition, if someone steps across your sporting equipment will bring bad luck	.54	–	–
2. Before the competition, touching/possessing lucky items will bring good luck	–	.82	–
1. If wearing a lucky item/accessory (i.e. pin, doll, leather craft...) on the cloth, will bring good luck	–	.74	–
19. During the competition, wearing religious items such as a Taoism amulet, Christian cross, Buddhist beads, or Muslim kiswa will bring good luck	–	.68	–
21. Before the competition, contact sacred figures/persons will bring good luck	–	.61	–
12. Before competition, praying in temples, churches, or mosques will bring good luck	–	.56	–
28. Hanging around places where people suicide (hanging, poisoning...) will bring bad luck	–	–	.78
20. Before the competition, visiting funeral families/parlors will bring bad luck	–	–	.75
25. Before competition, visiting graveyards or haunted houses will bring bad luck	–	–	.74
29. Eating something worshiped for ghosts/spirits will bring bad luck	–	–	.74
11. Before the competition, attending funeral ceremonies will bring bad luck	–	–	.65
23. During the competition, competition items placed on malevolent influenced or evil spots will bring bad luck	–	–	.61
Eigenvalues	45.33	11.47	7.39
Cumulative % of variance	45.33	56.80	64.19
Cronbach’s α	.90	.67	.82

Methods.

Participants. There were 627 college student-athletes (males=380; females=247 with $M_{age}=20.16+S.D.=3$) engaged in diverse sports, including archery, baseball, basketball, judo, volleyball, table tennis, badminton, tennis, swimming, golf, track and field, and taekwondo.

Measurements and procedures. The procedures and measurements were the same as in Study 1.

Statistical analyses. To examine the factorial structure, we used AMOS version 22 to perform a CFA analysis by the following criteria: (a) χ^2/df between 1~3; (b) the root mean square error of approximation (RMSEA) smaller than .08; (c) the standardized root mean square residual (SRMR) smaller than .05; and (d) the incremental fit index (IFI) greater than .90; (e) comparative fit index (CFI) greater than .90; and (f) the non-normed fit index (NFI) greater than .90 (McDonald & Ho, 2002). We analyzed the average variance extracted (AVE) to examine convergent validity for indices between .46 ~ and .59 (Hair et al., 1998). As discriminant validity, we adopted Torkezadeh, Koufteros, & Pflughoeft's (2003) suggestion by examining confidence intervals (CI) between factors' correlation coefficients.

Results. After deleting four items of the SSAS in Study 1, we found the three-factor, 15-item SSAS has appropriate indices in CFA as follows: (a) $\chi^2/df=4.04$, smaller than ≤ 5 ; (b) RMSEA =.07, smaller than $\leq .08$; (c) SRMR =.04, smaller than $\leq .05$; (d) GFI =.93, greater than $\geq .9$; (e) AGFI = .90, greater than $\geq .9$; (f) NFI =.92, greater than $\geq .9$; (g) RFI =.91, greater than $\geq .9$; (h) IFI =.94, greater than $\geq .9$; and (i) CFI =.94, greater than $\geq .90$ (Figure 2). The examination of convergent validity by analyzing AVE found the following results: (a) ritual and taboo AVE =.46; (b) lucky charm AVE =.51; and (c) folk culture AVE =.66. Except ritual and taboo, all indices were greater than .5, which indicated appropriate convergent validity. Further, the confidence intervals between three factors were as follows: (a) folk culture vs. ritual/taboo was .80; (b) lucky charm vs. ritual/taboo was .69, and (c) folk culture vs. ritual/taboo was .63; all less than one.

Conclusion. Study 2 provided evidence of the construct validity of SSAS by examining the factorial structure, convergent validity, and discriminant validity. However, because Study 1 and Study 2 only examined the psychometric properties of the SSAS, whether it is correlated with theoretical variables needs further examination.

Study 3

Purpose. The purpose of Study 3 was to examine a hypothetical model of the relationships among athletic identity, locus of control, sports superstition, and fear of failure.

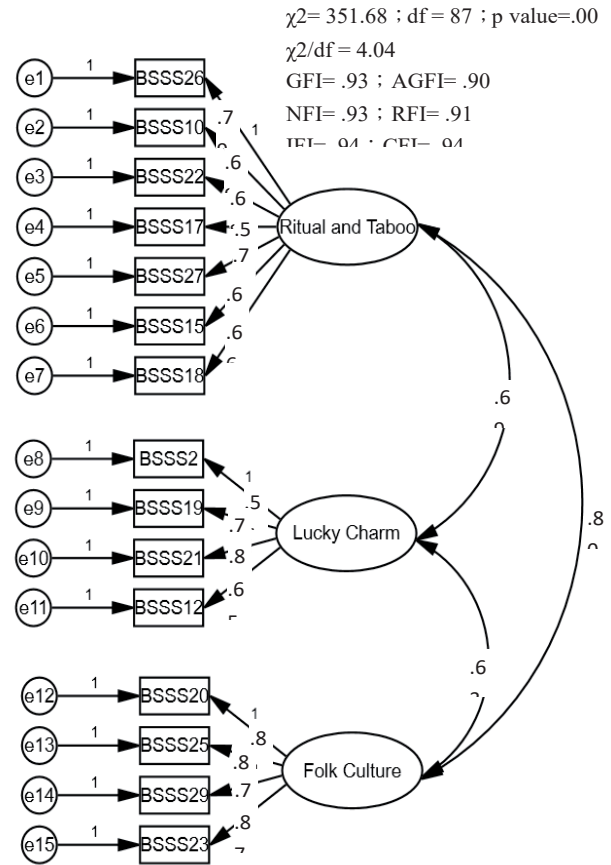


Figure 2. CFA solution of SSAS.

Methods

Participants. We sampled 215 college student-athletes (males=167; females=48 with $M_{age}=19.95\pm 1.49$) as participants who engaged in diverse sports as in Study 2.

Measurements. There were four measures as follows:

Sports Superstition Attitude Scale (SSAS). The 15-item SSAS derived from Study 2 was used for Study 3.

Locus of Control in Sport Scale (LCSS). We referred to Spector's (1988) Work Locus of Control Scale by replacing items with sports-related contents. The LCSS uses a 6-point Likert scale ranging from "1=strongly disagree" to "6=strongly agree" to measure participants' locus of control toward daily events. A sample question of the internal control of LCSS is "I believe that things will go better if making plans earlier in sports". The sample question for external control of LCSS is "I believe luck is more important than ability for my sports performance". We sampled 215 participants from diverse sports and administered LCSS to test its validity and reliability. Initial exploratory factor analysis (EFA) found that LCSS has two factors with 15 items that explained 58.17% of the total variance. The internal consistency coefficient of Cronbach's α for internal control was .90, and for external control was .87.

Athletic Identity Measurement Scale (AIMS; Brewer, et al., 1993). The AIMS is a 10-item sport-specific measure to assess athletic self-perception (Brewer, et al., 1993). The AIMS uses a 7-point Likert-type scale ranging from “1 = strongly disagree” to “7 = strongly agree” to measure one’s athletic self-perception. A sample question of the AIMS is “I need to participate in sports to feel good about myself”. Higher scores on AIMS are associated with greater athletic self-perception, while low scores on AIMS are associated with a weaker athletic self-schema. The EFA analysis found that AIMS is a one-factor measure that explained 60.93% of the total variance, and the internal consistency coefficient Cronbach’s α was .92.

Chinese version of the Performance Failure Appraisal Inventory (PFAI-C, Cho & Lu, 2005). The PFAI-C is an 18-item multidimensional measure of cognitive-motivational-relational appraisals associated with fear of failure. The PFAI-C uses 6-point scale ranging from “1 = strongly disagree” to “6 = strongly agree” to measure participants’ fear of failure in sports settings. The EFA factor analysis found that the PFAI-C has two factors—namely “fear of shame and embarrassment” (Cronbach’s α =.94) and “fear of being criticized by others and losing other’s interest” (Cronbach’s α =.91), which explained 75.04% of the total variance. A sample question for “fear of being criticized by others and losing others’ interest” is: “When I am failing, I expect to be criticized by others”. The sample question for “fear of shame and embarrassment” is: “When I am failing, it is embarrassing if others are there to see it”.

Procedures. The procedures were the same as Study 1 and Study 2.

Results. We employed structural equation modeling (SEM) to examine the hypothetical

model proposed in this study. Results found the χ^2 (759)=1428.675, $p < .001$, Normed χ^2 =1.88, GFI =.76, AGFI =.73, RMSEA=0.06, CFI=.89, PCFI=.82—all are shown in an acceptable range. Figure 3 depicts the direct and indirect relationships among athletic identity, locus of control, sports superstition, and fear of failure. For direct relationships, there were significant relationships between athletic identity and ritual and taboo with regression coefficient=.27 (β = .27, t =3.04, $p < .001$); athletic identity and lucky charm with regression coefficient=.32, (β =.32, t =3.4, $p < .001$); athletic identity and folk culture with regression coefficient =.28 (β =.28, t =3.18, $p < .001$); external control and ritual and taboo with regression coefficient =.17 (β =.17, t =2.26, $p < .01$); external control and folk culture with regression coefficient=.16 (β =.16, t =2.22, $p < .01$); and between ritual and taboo and fear of failure with regression coefficient β =.27 (t =2.02, $p < .05$). For indirect relationships, (a) athletic identity predicted fear of failure via ritual and taboo with predictive value =.07; (b) external control predicted fear of failure via ritual and taboo with predictive value =.05. The combined value of these two indirect effects=.12. The combined direct and indirect effects of athletic identity and external control was =.68, which was greater than .5. Thus, the interactions of athletic identity, external control and ritual and taboo have significant impact on fear of failure.

Conclusion. The purpose of Study 3 was to examine a hypothetical model of the relationships among athletic identity, locus of control, sports superstition, and fear of failure. Results found that athletic identity and external control predicted fear of failure via superstition as a mediator. The results advance our knowledge of sports superstition, which interacts with athletic identity and external control on athletes’ fear of failure.

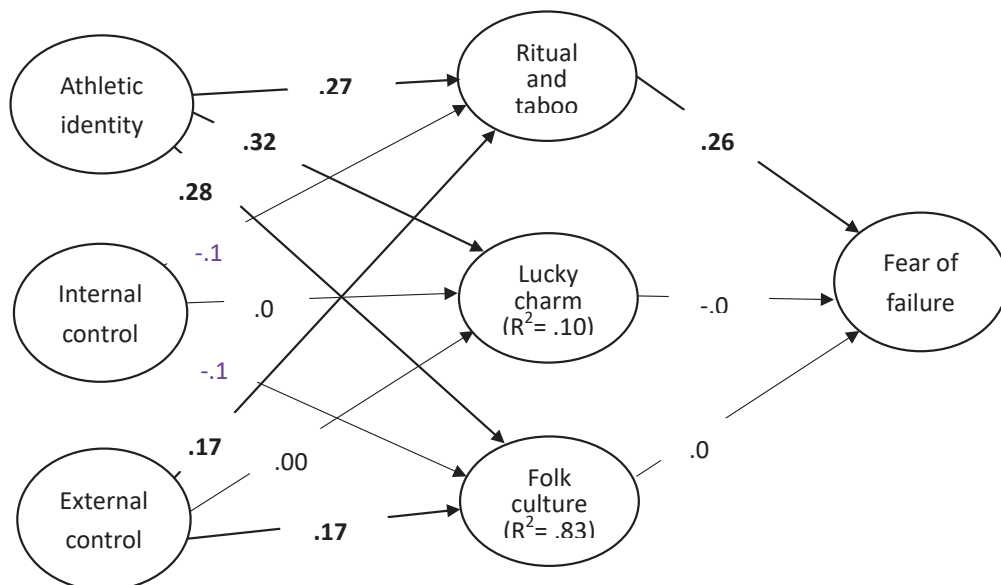


Figure 3. Theoretical model examination of sports superstition.

Discussion

Due to a lack of appropriate measures in sports, we followed the guidelines suggested by the Standards for Educational Psychological Testing (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014) to produce a sport-specific superstition scale entitled “Sports Superstition Attitude Scale” (SSAS) and test extant knowledge. Across three studies, we found that a three-factor, 15-item SSAS provides sufficient sources of construct validity, including content, factorial, convergent, and discriminant validity. Also, the examination of a hypothetical model examination not only offers the predictive validity of the SSAS but also advances our knowledge of the influences of superstition on athletes’ behavior. The initial results provide several implications for researchers.

Contributions/implications

The three-factor 15-item SSAS echoes theoretical components of superstition research and reflects sports culture. Much empirical research has found rituals and taboos (e.g., Allen, et al., 2020; Thacker, 2015). Athletes believe wearing a specific cap/cloth brings good luck, as Michael Jordon and Tiger Woods did (Murphy, 2018). Similarly, due to uncertainty in sports settings, athletes tend to forbid others from touching their clothes/shoes/equipment during competition to avoid bad luck (Allen, et al., 2020). Further, our study supports that athletes may use rituals not only to enhance athletic performance, level of athletic activity, and subjective sense of achievement but also to reduce anxiety, get a sense of control in tense and un-predictable situations when they are low in control and of poor emotion regulation skills (Dömötör, Ruíz-Barquín, & Szabo, 2016; Ofori, 2013; Sasvári, Harsányi, Dér, & Szemes, 2019).

The lucky charm has been popular in sports. For example, British BMX rider Shanaze Reade always carries a picture of her family when she competes around the world (Smith, 2012). Similarly, the famous Japanese figure skater Yuzuru Hanyu always touches a Pooh Bear before the competition to bring good luck (Gains, 2016). Hagan and Schack (2019) found that athletes wear lucky charms (e.g., amulets) on specific body parts before the competition to bring good luck and control external factors. Similarly, Allen et al.’s (2020) study found that athletes believed that eminent protects them during competition and makes them feel peaceful and calm. Further, Hanrahan and Tshube (2017) found that African athletes use sangoma (a spiritual healer) or a lucky charm (i.e. talisman) to enhance performance. All indicated that lucky charms psychologically affect athletes’ affect, cognition, and performance.

The third factor of SSAS is the folk culture, which reflects the sporting contexts in which athletes are situated and the environment in which they live. Folk culture is vital because culture influences one’s values and attitudes and plays an essential role in cognition, emotion, and motivation (Atkinson & Gim, 1989; Sun, Horn, & Merritt, 2004). The folk culture in SSAS contains those statements that athletes encounter in life, such as “before competition, visiting funeral families/parlors will bring bad luck” or “during competition, competition items placed on malevolent influenced or evil spots will bring bad luck” – all have theoretical and practical implications. Specifically, before the competition, athletes must be mentally and physically prepared (Gould, Flett, & Bean, 2009). Before the competition, athletes use cognitive, emotional, and behavioral strategies to achieve an ideal psychological state for peak performance. Under such a situation, involvement in non-sports events, such as visiting funeral ceremonies, is inappropriate to avoid emotional agitation.

The model examination fills a gap between current knowledge about sports superstition and athletes’ behavior. The direct relationships between athletic identity, external control, and superstition support past research that high athletic identity/external control is related to high superstition (e.g. Ciborowski, 1997; Ofori, et al., 2012). According to early conceptualization, external-control individuals generally believe that causes of outcomes lie in external reasons and attribute daily events to external reasons such as luck and opportunity (Rotter, 1966). Thus, it is natural that external control correlates with superstition. Further, high athletic identity athletes tend to identify as athletes and engage in vigorous training and competition. To reduce competition anxiety, they use superstition to cope and enhance confidence (Brevers, et al., 2011; Neil, Anderson, & Sheppard, 1981).

The direct relationship between superstition (i.e. ritual and taboo) and fear of failure is a novel finding. The reason underlying this relationship is unknown. Past research found that athletes use rituals to reduce anxiety and sports injuries (Watson & Czech, 2005). Whether athletes use superstition to reduce fear of failure needs further examination. Similarly, research also contends that following a group/culturally defined taboo is believed to avoid bad luck and disaster (Voigt, 1985). Whether this belief extends to sports settings and makes athletes use taboo to reduce fear of failure needs further examination.

The triangular relationships among athletic identity/external control, superstition, and fear of failure advance our knowledge of athletes’ superstitious behavior. Specifically, this study found that superstition mediates the relationship between athletic identity/external control and fear of failure.

However, mediation was not found for internal control. Internal-control individuals attribute outcomes to internal/personal ability, efforts, and strategies (Rotter, 1966). Our study found that internal control has no relationship to superstition and supports past research (Schippers & Van Lange, 2006). The mediation of superstition on the relationship between athletic identity/external control and fear of failure is insightful. According to Baron and Kenny (1986, p.1176), the mediator explains how the effects of stimuli (i.e. athletic identity and external control in this study) on behavior (i.e. fear of failure) are mediated by various transformational processes (i.e. sports superstition) internal to the organism. Athletes with high athletic identity are afraid to lose their competitions, so superstition may reduce their tension and build confidence.

Similarly, high external control athletes have low confidence in situational events, so they use sports superstition as a scapegoat and coping strategy. If they fail in the competition, they should not be blamed, or they are incompetent; it is something outside themselves, such as bad luck or encountering an evil event. The above theoretical explanations tell why the association of athletic identity/external control and failure of failure is the function of superstition. We suggest that researchers continue to examine the mediating role of superstition on athletes' sporting behavior, affect, and performance.

Strengths of the study

There are several strengths of this study. First, we adopted guidelines suggested by the Standards for Educational Psychological Testing (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 2014) to develop and validate the SSAS. This approach ensures the validity and reliability of the SSAS. Also, we examined a hypothetical model of superstition variables. Examining the hypothetical model offers predictive validity for the SSAS and extends our knowledge about the influences of superstition on athletes' behavior. Further, because the SSAS was developed

and validated in the sports domain, it reflects the ecological validity of the measure.

Limitations and future suggestions

There are several limitations to this study. First, we adopted a nomothetic approach to develop the SSAS. Because of the basic assumptions of the methodological paradigm, it cannot explain unique superstition cases in sports. We suggest future studies may adopt ethnographic or qualitative approaches to explore sports superstition in different cases. Further, the sources of the items of the SSAS are mostly referred to extant English and Chinese literature; it may only apply to some cultures. Future studies may adopt our approach to develop sports-specific superstition measures in other cultures.

Furthermore, our sample was mostly college student-athletes; results may not apply to professional or youth athletes. Moreover, though we examined the superstition model through a cross-sectional investigation, it does not warrant a cause-and-effect relationship between athletic identity, external control, superstition, and fear of failure. We suggest future studies adopt a longitudinal approach to examine the relationships among athletic identity, locus of control, superstition, and fear of failure. Finally, past studies on sports superstition have suggested that female athletes are more superstitious than male athletes (Brevers, et al., 2011; Wiseman & Watt, 2004), and young boys have a higher superstition score than old boys (Maller & Lundeen, 1933), future studies need to examine gender and age differences in sports superstition.

Conclusion

To obtain a reliable and valid measure of the sports-specific superstition scale and fill the current research gap, we conducted three studies to develop the three-factor, 15-item SSAS. We suggest that future studies adopt our framework to examine sports superstition phenomena by a longitudinal approach to examine the relationships among psychosocial factors, superstition, and athletes' behavior.

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