American Journal of Sports Science
2023; 11(3): 59-67
http://www.sciencepublishinggroup.com/j/ajss
doi: 10.11648/j.ajss.20231103.11
ISSN: 2330-8559 (Print); ISSN: 2330-8540 (Online)

Pressure and Choking in Darts of College Athletes: The Interplay of Self-Enhancement

Jinhua Liu[1], Zhicai Gao[2], Ya Zhou[1], Zhi Qiao[3, *], Sumaira Kayani[4, *]

[1]School of Rehabilitation, Kunming Medical University, Kunming, China

[2]School of Electrical and Mechanical Engineering, Kunming Metallurgy College, Kunming, China

[3]School of Sports Science, China University of Mining and Technology, Xuzhou, China

[4]Department of Education, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Punjab, Pakistan

Email address:

liujinhua@kmmu.edu.cn (Jinhua Liu), 821402711@qq.com (Zhicai Gao), george_0120@163.com (Zhi Qiao), 1073714155@qq.com (Ya Zhou), sumairakayani@zju.edu.cn (Sumaira Kayani)

[*]Corresponding author

To cite this article:

Jinhua Liu, Zhicai Gao, Ya Zhou, Zhi Qiao, Sumaira Kayani. Pressure and Choking in Darts of College Athletes: The Interplay of Self-Enhancement. *American Journal of Sports Science*. Vol. 11, No. 3, 2023, pp. 59-67. doi: 10.11648/j.ajss.20231103.11

Received: June 12, 2023; **Accepted**: June 27, 2023; **Published**: July 6, 2023

Abstract: The problem of diminished performance under stress, often referred to as 'choking under pressure,' is a significant issue in the realm of sports psychology, especially during high-stakes competitions. Researchers have thoroughly explored various factors contributing to this issue, yet the role of self-enhancement in sporting competition scenarios hasn't received the same level of scrutiny. Characterized by an individual's inclination to emphasize positive outcomes for self-esteem protection and setting lofty personal standards, self-enhancement is increasingly becoming a focal point in the study of choking. Our research draws from the self-focus theory and related studies, probing the mediating influence of self-enhancement on the relationship between high-pressure environments and choking tendencies. In our study, we used an experimental design based on dart-throwing as a representative model for sports performance under stress, aiming to elucidate the role of self-enhancement as a mediating variable in such settings. Involving fifty collegiate athletes, the study required participants to first complete a self-enhancement personality measure. They then engaged in dart-throwing tasks under two different conditions: one with low pressure and another with high pressure. Using statistical analysis tools SPSS 27.0 and Process 4.2, we discovered a link between high levels of self-enhancement, increased self-perceived cognitive pressure (β=.43, $p<.01$), and a higher chance of choking (β=.39, $p<.01$). The findings reveal that self-enhancement partially mediates the relationship between perceived pressure and performance, accounting for a variance of 30% in sports settings. It suggests that self-enhancement serves as a connecting factor between pressure perception and choking. These insights into self-enhancement tendencies provide valuable perspectives for designing future interventions to help mitigate choking. Such efforts could, in turn, potentially boost the competitiveness and longevity of collegiate athletes' performances.

Keywords: Pressure, Self-Enhancement, Choking, Mediating Effect

1. Introduction

In the realm of competitive sports, 'choking under pressure' denotes an unexpected decrease in performance when an athlete's self-set standards are within reach [2, 36]. The complexity of the choking phenomenon arises from numerous factors, among which endogenous elements of the self-system have become a focal point. These elements are intrinsic motivational resources that influence choking behavior [19, 35]. Merced argued that self-related dispositional factors provide a more suitable explanation for choking, a self-defeating event [27]. These factors incite self-oriented psychological activities that can drastically reduce performance efficiency, particularly under pressure.

The self-focus theory highlights that heightened self-awareness can exacerbate choking [32]. Specifically, individuals with a strong predisposition towards self-consciousness tend to exhibit amplified self-related cognition,

making them more prone to choking under pressure [39]. While the literature has identified numerous personality factors like trait anxiety, self-consciousness, perfectionism, and fear of negative evaluation as linked to choking, the role of self-enhancement has been relatively overlooked [12, 30, 39].

Self-enhancement, as a psychological trait, serves to augment positive self-perceptions, thereby fostering self-improvement [18]. It influences cognitive processes that shape linguistic utilization and behavioral patterns. As Sedikides and colleagues elucidated, self-enhancement can manifest in four distinct forms: motivation, trait, state, and explicit expression [34]. Individuals with a disposition towards self-enhancement tend to use strategies such as "better-than-average," "self-serving attribution," "unrealistic expectation," and "exaggerated perception of control and mastery" for self-promotion. Moreover, self-enhancement, acting as an intrinsic factor for self-esteem preservation, can moderate emotions and behaviors by promoting excessive self-positivity. Previous studies, such as that by Heck et al., indicate that individuals with a high predisposition towards self-enhancement not only anticipate better outcomes but also show a heightened sensitivity to the accuracy of self-perception [16]. Empirical evidence further underscores the association between self-enhancement and task performance [37], suggesting that self-enhancement could potentially modulate sports performance under high-pressure conditions. However, the impact of self-enhancement-induced introspection on sports performance remains to be explored.

This study aims to explore the association between self-enhancement and 'choking' under high-pressure conditions using a choking experimental paradigm. A hypothetical model was proposed, informed by existing research, and data were collected through a dart-throwing task. We performed a mediation analysis using Hayes' methodologies to derive statistical outcomes [14-15]. The findings of the study contribute to understanding the influence of self-enhancement on choking under pressure.

Hypothetical Framework

'Choking' in sports competition is intrinsically linked to pressure, which often results in suboptimal performance. Therefore, any investigation of choking performance that fails to consider the factor of pressure would not hold much practical relevance. Notably, social psychologist Baumeister pioneered the study of choking behavior through pressure manipulation in a lab environment, defining 'pressure' as any stimulus that leads to diminished task performance [2]. Daou and colleagues substantiated this by illustrating a significant negative correlation between cognitive and somatic anxiety in high-pressure situations and behavioral performance [8]. This establishes a tangible cause-and-effect relationship between pressure and choking. Accordingly, the first hypothesis this study aims to examine is the predictive reliability of pressure in determining choking behavior within a sports context.

Existing research and theoretical perspectives support the proposition of a positive correlation between perceived pressure and self-enhancement under specific circumstances [3, 17-18]. Under high-pressure conditions, individuals may feel a greater need to demonstrate their abilities, which can lead to an increase in self-enhancement behaviors such as emphasizing achievements or minimizing weaknesses. Moreover, pressure can also stimulate concerns about self-presentation, leading to an enhanced desire to project a favorable self-image. This correlation is corroborated by numerous studies across different contexts, including academic settings, sports competitions, and job interviews. To illustrate, Roberts et al. conducted experiments with dart throwing and endurance tasks. They found that in self-enhancement contexts, individuals with high narcissistic traits tend to exert more effort when they perceive higher levels of pressure [33]. Based on these findings, it's reasonable to hypothesize that perceived pressure can positively trigger cognitive processing related to self-enhancement under stressful conditions.

Relevant research suggests that individuals with a propensity for self-enhancement may exert more effort, enhance their self-reflection, and increase their control, stemming from their high standards of positive self-cognition [25, 31, 37]. Van Der Kam et al., for example, examined team leaders demonstrating high levels of self-enhancement and their task performance. They found that those with strong self-enhancement cognition exhibited positive beliefs and a heightened awareness of the significance of outcomes [37]. This heightened focus on self-promotion resulted in a perceived increase in control, but interestingly, it corresponded with a decrease in performance. Likewise, Pulfrey and Butera's study involving 470 university students found that those with high self-enhancement tendencies were more likely to cheat in exams due to an excessive concern for social status and recognition [31]. This drive to maintain high self-esteem via cognitive control led to an increase in cheating behavior. Consequently, drawing from the existing literature, the cognitive processing of self-enhancement during sports skills execution might also involve increased effort and self-control. Based on the self-focus attentional control theory [32], we hypothesize that a stronger cognitive process of self-enhancement may disrupt the automatic execution of skills, leading to 'choking' behavior.

In line with Hayes's suggestion [15], this study employs the structural equation modeling framework to investigate the mediating effect of self-enhancement in the pressure-choking relationship, as illustrated in Figure 1. In this figure, the dotted line represents the indirect route from pressure to choking, with self-enhancement acting as the mediator.

This study is fundamentally guided by the aim to examine the effect of pressure on choking, considering self-enhancement as an intermediary factor. Drawing from a thorough review of existing literature, the following hypotheses are proposed:

Hypothesis 1 (H1): There exists a positive correlation between pressure and choking.

Hypothesis 2 (H2): In sports competition settings, perceived pressure positively correlates with self-

enhancement cognition.

Hypothesis 3 (H3): In sports competition settings, self-enhancement cognition is positively associated with choking.

Hypothesis 4 (H4): The cognitive processing of self-enhancement mediates the relationship between pressure and choking within sports competition environments.

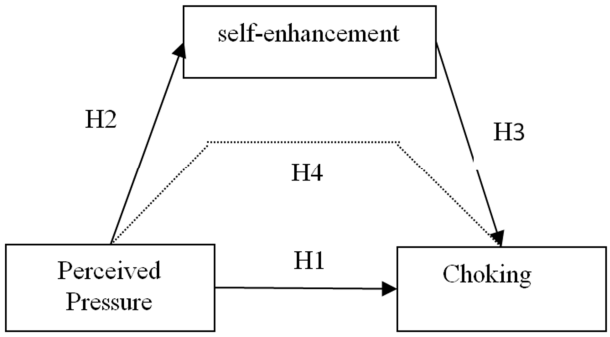

Figure 1. *Mediation Model of Self-enhancement for Choking under Pressure.*

2. Method

2.1. Design

This study utilized an experimental design, integrating a dart-throwing task as a choke-inducing paradigm due to its effectiveness in replicating performance-related pressure [36, 38]. The setup was in alignment with international darts competition standards, featuring an 18-inch dartboard and 25-gram straight darts, with the board's center mounted 1.73 meters above the ground and a throwing line set at 2.37 meters. Taking cues from prior choking research [8], we introduced two conditions: low-pressure and high-pressure, while employing a repeated measures within-subjects design to monitor any variations in performance. In the low-pressure scenario, participants performed a set number of dart-throwing tasks under the supervision of a single experimental assistant documenting results. In contrast, the high-pressure condition involved the additional elements of an audience presence, video recording, and social evaluation [29]. To heighten the sense of competition, we provided performance feedback, potential rewards, and implemented time constraints [9, 40].

2.2. Participants

We enlisted a total of 52 right-handed collegiate athletes who had no prior training in standard dart-throwing for our study, ensuring their participation was voluntary. Due to certain deviations from our research focus—absence of pressure sensation and performance improvement under high-pressure conditions—we had to exclude the data of two participants from our analysis. Thus, our final analysis took into account data from 50 participants (29 males, 21 females, with a mean age of 19.42±1.91). A sample size of 32, calculated with G*Power at a power set of 0.80 and an alpha level of 0.05, was deemed adequate [10]. Considering the tendency of choking-related studies to accommodate relatively small sample sizes—as evidenced by previous studies with samples of 45, 48, 33, and 46—our study's sample size of 50 participants is both representative and well-suited for experimental research in the context of choking [2, 4, 28-29].

2.3. Measures

2.3.1. Measurement of Pressure Perception

In this study, we measured perceived pressure using the revised cognitive and somatic anxiety subscales from the Competitive State Anxiety Inventory-2 (CSAI-2) [8, 28, 39]. The instrument comprises nine items in total, which were used to assess the participants' stress response during the experiment. Specifically, the cognitive anxiety subscale, consisting of five items, was adapted to evaluate the participants' apprehensions in high-stress situations. An example of these items includes, "I worry about not being able to demonstrate my true abilities in front of others."

Similarly, the four-item somatic anxiety subscale was adjusted to assess emotional experiences and cognitive responses triggered by the autonomic nervous system in discomforting situations. This subscale includes items such as, "I feel nervous due to others' evaluation of my performance." The respondents rated each item on a 4-point Likert scale, with higher scores indicating a stronger perception of pressure and lower scores denoting less experienced pressure in specific scenarios. Thus, the total score on the questionnaire could range from 9 to 36.

This instrument has been widely used as a pressure measurement tool in choking-related studies [8, 12]. The validity and reliability of the questionnaire were verified in this study, yielding satisfactory Cronbach's alphas of 0.89 and 0.86 for cognitive anxiety and somatic anxiety subscales, respectively. Additionally, it demonstrated acceptable construct validity with indices: $\chi 2=29.82$, df=26, GFI=0.94, AGFI=0.89, CFI=0.99, RMSEA=0.04.

2.3.2. Self-Report for Task Performance

In this research, we incorporated a self-report performance perception scale to provide a deeper insight into participants' perceived satisfaction regarding their sports performance. The scale is a single-item tool where participants are asked to rate their satisfaction with their immediately preceding performance. The ratings span from 0 to 10, with higher scores indicating a greater degree of satisfaction with their performance. This scale has been validated as a reliable measure of task performance in previous studies [21].

2.3.3. Measurement of Choking Performance

The present study utilized task performance measurements to evaluate the occurrence of choking. In alignment with Wallace and Baumeister's recommendations [38], we computed dart scores using the formula: D=21 - S (1), where '21' corresponds to the radius of a standard dartboard (in centimeters), and 'S' denotes the distance from the dart's point to the board's center. If a dart missed the target board, 'S' was assigned a value of 21. This computation yielded a range of

values between 0 and 21, with higher scores reflecting better performance.

Choking, as per the widely accepted definition within the experimental paradigm, is characterized by a decline in sports performance scores in high-pressure situations relative to low-pressure conditions [20]. To quantitatively evaluate this phenomenon, we applied the following formula for choking:

Task performance score=(high-pressure dart score + self-report evaluation in high-pressure) - (low-pressure dart score + self-report evaluation in low-pressure) (2).

2.3.4. Measurement of Self-Enhancement

In line with the definition provided by Hepper et al., our research employed the Chinese version of the "self-enhancement strategy scale" to gauge self-enhancement [18]. This questionnaire is structured around three dimensions: positive embracement, favorable construal, and self-affirming reflections, with a total of 15 items. Examples of these items include "when you achieve success, attribute it to your ability" and "perceive yourself as having more positive personality traits or abilities than most people".

The questionnaire employs a 6-point Likert scale, leading to a total score range of 15 to 90 points. Given that the original version of this tool was in English and had not been previously utilized within the context of sports culture, we decided to undertake a comprehensive revision. This was done to ascertain its reliability and validity in this new context. Further details on the process undertaken for this revision are presented in the upcoming section on tool revision.

2.4. Analyses Performed

We imported the data into SPSS version 27 for a comprehensive analysis. The validity and reliability of the research instruments were assessed using AMOS graphics version 25, and we used Hayes' Process 4.2 for hypothesis testing. Our preliminary data analysis included an outlier screening followed by calculating descriptive statistics, encompassing means, standard deviations, and correlations among variables.

To confirm the experiment's effectiveness, we employed paired t-tests to determine the operational pressure and the size of the choking effect. Our objective was to test the first three hypotheses; thus, we conducted a linear regression analysis to explore relationships between choking, the cognitive processing of self-enhancement, and pressure, as well as to assess the predictive capabilities of the tools.

In line with Hayes' recommendations [14], we used bootstrap analysis in Process 4.2 to examine the mediating effect of self-enhancement on choking under pressure. The results of this analysis served to build a structural model for mediation analysis using Process Model 4.

3. Procedure of the Whole Study

Our research commenced upon obtaining institutional approval (IRB: KMMU2022MEC118). After securing this authorization and following the recommendations by Liu et al., we invited athletes to participate in a dart-throwing experiment [23]. Each athlete voluntarily filled out a consent form after receiving a comprehensive explanation of the research objective. The study was conducted using validated and reliable tools, and we collected the data confidentially. The purpose of this process was to delve into the potential mediating role of self-enhancement in the occurrence of choking under high-pressure circumstances.

Our study was structured into two primary stages, aimed at investigating the mediation model of self-enhancement between pressure and choking. In the first stage, we evaluated the availability, reliability, and validity of the questionnaire measuring self-enhancement, aiming to refine our assessment tools. Following this preliminary stage, we conducted the formal study.

The main study utilized a within-subject random experimental design for data collection. Participants were engaged in dart-throwing tasks that aligned with the choking experimental paradigm. We then analyzed the collected data using a triangulation strategy for statistical observation [29]. This process allowed us to evaluate the mediating effect of self-enhancement on choking under pressure.

Hence, this research comprised two key components: 1) Refining the self-enhancement measurement tools, and 2) The main study.

3.1. Revision of Self-Enhancement Measurement Tools

Given that the original questionnaire was developed in English, a back-translation process is generally adopted. Yet, within academia, the use of this method is debated due to the potential cultural discrepancies that could emerge during the translation process. For instance, Barger et al. have noted that translating questionnaires frequently introduces alterations to the conceptual structures due to language-specific expressions [1].

This issue is particularly prominent in social psychology measurements, where a strict adherence to verbatim translation may result in phrasing problems. Moreover, Case et al. have emphasized that back-translation can often compromise functional, conceptual, measurement, and instrument equivalence, thereby potentially introducing bias into the research findings [6].

Additionally, the issue of cognitive bias sensitivity to text representation in cross-cultural personality tests was raised by Blanch & Aluja. They argued that this sensitivity can negatively impact the validity of the translated questionnaire [5].

To address these concerns, Blanch & Aluja suggested a three-stage questionnaire translation process aimed at mitigating potential errors, comprising descriptive analyses, dissimilarity assessment, and item assessment. Following their recommendations, we implemented this three-stage revision method for our questionnaire translation.

(1) Descriptive analyses: In this preliminary stage, we engaged two native English speakers and three native

Chinese speakers to examine the cultural context of the questionnaire items and phrasing. The goal was to ensure that the concepts and expressions in the translation aligned with the original version.

(2) Dissimilarity assessment: The next stage involved assessing participants' understanding and responses to the translated questionnaire. We regarded difficulties in comprehending specific items as indications of significant dissimilarity in the expressions used, suggesting a requirement for modification or removal of these items. Consequently, six items from the original questionnaire were identified as inappropriate for our participants and were subsequently removed, resulting in a three-dimensional, 9-item questionnaire.

(3) Item assessment: During the final stage, we conducted an evaluation of the statistical validity of the translated items.

We conducted a two-wave questionnaire survey among college athletes. In both waves, participants completed the questionnaire on-site under the guidance of the researchers, and it was carried out both before and after their training.

In the first wave, we distributed 120 questionnaires, and managed to collect 110 responses, yielding a response rate of 91.6%. After excluding four questionnaires due to incomplete answers, we were left with 106 valid questionnaires for analysis (61 males, 45 females; age: M=20.20, SD=2.91). The data from this round was subjected to exploratory factor analysis (EFA).

In the second wave, we handed out 100 questionnaires and received them all back. However, nine questionnaires were disqualified due to improper completion, leaving us with 91 valid responses (51 males, 40 females; age: M=19.33, SD=1.71). Thus, the valid response rate stood at 91%. We used the data from this wave for confirmatory factor analysis (CFA).

The exploratory factor analysis (EFA) performed on data from the first wave retained eight items. The explained variances by positive embracement, favorable construal, and self-affirming reflections were 27.92%, 18.62%, and 9.86% respectively, cumulatively accounting for 56.45% of the total variance. This indicated that the shared variance fell within acceptable bounds. Internal consistency reliability coefficients (Cronbach's alphas) for these constructs were confirmed to be 0.88, 0.80, and 0.78, respectively, which attested to the reliability of the questionnaire. Considering these results, data from the eight-item questionnaire from the second wave was used for confirmatory factor analysis (CFA). The structure of the questionnaire showed an acceptable fit, with $\chi 2=18.00$, df=17, GFI=0.95, AGFI=0.90, CFI=0.99, RMSEA=0.03.

The finalized self-enhancement questionnaire was composed of three dimensions. The first, Positivity Embracement, comprised three items reflecting the expectation of receiving positive feedback regarding behavior or cognition. An example item is, "When I succeed, I attribute it to my own abilities." The second dimension, Favorable Construal, consisted of three items depicting self-serving cognitive construction and the better-than-average effect. An item example is, "Compared to others, I believe I possess more positive personality traits and abilities." The third and final dimension, Self-Affirming Reflections, embodied the ability to maintain self-consistency when faced with self-threats from the past or present. This dimension contained two items, one of which was, "I remind myself of the obstacles I've overcome to truly appreciate my success." Utilizing a 6-point Likert scale, the questionnaire's total score ranged from 8 to 48 on the eight items, with higher scores signifying increased self-enhancement.

After the revision process, the refined self-enhancement questionnaire was integrated into the formal experiment. With a sample size of 50 participants, the questionnaire's reliability, as measured using Cronbach's alpha, was found to be 0.86, demonstrating acceptable internal consistency.

3.2. Formal Study

Building on the foundation of Liu et al.'s prior research and our refined instrument, we conducted a formal experiment to test our primary hypotheses [23]. Our aim was to uncover the internal mechanism of how self-enhancement influences choking under pressure. Upon arrival, participants first completed the self-enhancement questionnaire. We then implemented an additional stressor, following Baumeister's recommendation [2], to amplify perceived self-pressure. We placed a 170 cm by 50 cm mirror in the experimental space, enabling participants to observe their own actions during the task and thus emphasizing self-awareness in a high-pressure environment.

4. Results

4.1. Descriptive Statistics

We initially computed the descriptive statistics, which included means, standard deviations, and bivariate correlations among variables, and presented these in Table 1. The table demonstrated statistically significant correlations among variables, specifically between pressure perception, self-enhancement, and choking. The presence of these significant relationships justified the inclusion of these variables in a regression model for further hypotheses testing.

Table 1. *Result of descriptive statistics and correlation analysis.*

	M	SD	1	2	3
1 Pressure	26.10	6.88	1		
2 SE	33.92	4.78	0.43**	1	
3 Choking	5.43	2.85	0.57**	0.56**	1

Note: *p<.05,**p<.01

4.2. Test of Pressure Operation Effect and Choking

To evaluate the participants' perception of the imposed pressure, we employed a paired t-test, treating pressure situations as the independent variable. This approach allowed us to observe variations in the effect sizes for cognitive

anxiety, somatic anxiety, and task score performance, as presented in Table 2. This table shows that changes in effect sizes ranged from medium to large, notably characterized by a decline in performance under high-pressure conditions. Such a marked decrease in performance under high-pressure situations underscores the successful implementation of pressure application in our choking experiment.

Table 2. *Paired t test for pressure and task performance.*

Variable	Low-pressure		High-pressure		*t*	*p*	95% CI		Cohen's *d*
	M	SD	M	SD			*LL*	*UL*	
CSA	13.10	4.69	15.64	3.91	-4.64	***	-3.64	-1.44	-0.59
SSA	7.48	3.03	10.46	3.62	-6.59	***	-3.89	-2.07	-0.89
Task perf	15.06	1.24	11.99	2.32	10.48	***	2.48	3.66	1.65

Note: ***p<.001

4.3. Major Analyses

Following the successful validation of our choking experiment's effectiveness, we moved forward with the hypotheses testing and examination of the mediation model. We conducted an initial stepwise regression model analysis to investigate the possible mediating role of self-enhancement on choking under pressure (see Table 3). As shown in Table 3, all three regression models achieved statistical significance. Pressure predicted 31% of the variation in choking, as indicated by a beta value of 0.57, thereby supporting Hypothesis 1. Moreover, pressure explained 17% of the variance in self-enhancement, marked by a beta value of 0.43, which affirmed Hypothesis 2. The observed positive relationship between self-enhancement and choking (B=0.39) substantiated Hypothesis 3. In conclusion, pressure and self-enhancement together accounted for 42% of the variation in choking. The large effect sizes across all models provided further evidence for the hypotheses. The empirical data thus offered robust support for all our study's proposed hypotheses.

Table 3. *The results of stepwise regression analysis of mediation hypothesis model.*

Indep.	Dep.	R^2	R^2 change	Coeff	se	*B*	*t*	*p*	LLCI	ULCI
Pressure	Choking	0.33	0.31	0.23	0.05	0.57	4.77	***	0.14	0.33
Pressure	SE	0.19	0.17	0.30	0.09	0.43	3.31	**	0.12	0.48
Pressure	Choking	0.45	0.42	0.17	0.05	0.40	3.32	**	0.07	0.27
SE				0.23	0.07	0.39	3.23	**	0.09	0.38

Note: **p<.01,***p<.001, SE=self-enhancement.

To further estimate the value of the mediation path, we utilized a Bootstrap analysis to calculate the effect size of self-enhancement, following Hayes' recommendation [14, 15] and selecting model 4. The analysis revealed that self-enhancement accounted for 30% of the variation, signifying a substantial effect size (see Table 4). This result validated Hypothesis 4, thereby confirming our proposed research mechanism involving self-enhancement.

Table 4. *Results of Bootstrap analysis of self-enhancement mediation.*

	Effect	BootSE	BootLLCI	BootULCI	ab/c
SE	0.07	0.02	0.02	0.13	0.30

Finally, to demonstrate the mediation effect, we constructed a standard path effects model, visualizing the impact of self-enhancement on choking under pressure (see Figure 2). This model reveals that the total standard effect of pressure on choking was 0.57, whereas the indirect effect of pressure on choking via self-enhancement was 0.17. Therefore, self-enhancement served as a partial mediator for choking under pressure, further validating the fourth hypothesis of our study.

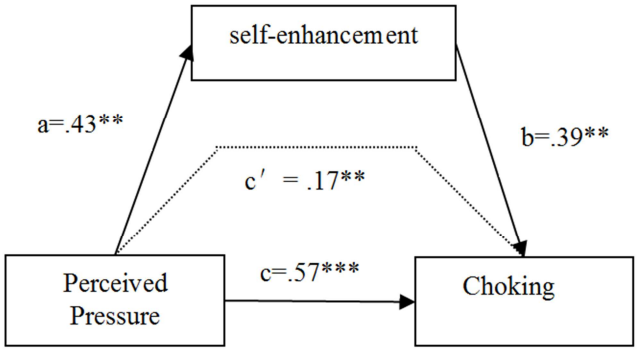

Figure 2. *The Standard Mediation Model of Self-enhancement for Choking under Pressure.*

5. Discussion

This study aims to examine if self-enhancement cognitive processing serves as a mediator between perceived pressure and choking. By collecting and analyzing experimental data, we established that self-enhancement cognition provides a partial mediation in the relationship between perceived pressure and choking. Hence, this model supports the notion

that self-enhancement cognition only partially explains the link between perceived pressure and choking.

First, the results from stress manipulation and changes in athletic performance confirm the successful induction of choking behavior in the participants under stress conditions. Distinct variations in cognitive and somatic anxiety, which serve as indicators of perceived pressure under different stress conditions, were both characterized by substantial effect sizes (changes in effect sizes were d=0.59 and d=0.89, respectively). Additionally, marked differences were observed in the changes in athletic performance, as evidenced by a large effect size (changes in effect sizes were d=1.65 and d=1.77, respectively). This demonstrates a significant decrease in the participants' performance in the dart task under laboratory stress conditions. Therefore, the choking experimental paradigm implemented in this study effectively operationalized the phenomenon.

Second, in terms of effect size from the regression analysis of the research data, perception of pressure accounts for 31% of variation in choking, a result largely in line with prior research [22]. This suggests that higher perceived stress increases the likelihood of choking. As explained in previous studies [28-29, 39], when participants perform the dart task under laboratory-induced stress, heightened self-awareness can result in a heightened perception of the importance of outcomes. For example, the presence of factors like a close-up camera, reminders of the participants' self-introductions, competition, and evaluation, all potentially amplify the likelihood of the participants exerting self-control, which can subsequently lead to choking.

Additionally, pressure perception demonstrated a substantial effect size in its ability to predict self-enhancement cognition, suggesting that a heightened sensitivity to stress cognition is linked with elevated levels of self-enhancement cognitive processing. Experimental observations imply that pressure perception triggers the self-enhancement psychological tendency within the individual's self-system, leading to high-standard self-evaluation and positive self-improvement expectations, aiming to surpass others. Colvin et al. have previously argued that an increase in anxiety due to stress stimuli could spark an upsurge in self-enhancement cognitive processing [7]. In addition, when self-enhancement cognition is triggered by everyday stressors, it can form a highly positive psychological drive characterized by high self-standards, directing attention towards positive self-promotion or portrayal [11, 34]. Consistent with this, Gebauer et al. found that individuals with high self-enhancement cognition under stress situations tend to present highly positive self-evaluations and reinforce self-control cognitive styles [11]. This notion is very much in line with the current study's findings that pressure perception in stressful scenarios prompts self-enhancement cognition to focus attention on high-standard interpretations.

Furthermore, as a crucial component in elucidating the mechanism of the model, the mediation role of self-enhancement cognitive processing in choking under stress proved statistically significant. Specifically, while self-enhancement cognitive processing only served as a partial mediator in this explanatory model, it nonetheless accounted for 30% of the variance in the explanation for choking arising from pressure perception. The results of our Bootstrap analysis echoed prior studies. This finding appears to support the notion that under stress conditions, the cognitive style of self-enhancement propels attention towards the high-standard processing of self-performance information, deploying additional psychological resources, which subsequently leads to variations in behavioral execution outcomes [13, 18, 33].

Theoretically speaking, examining self-enhancement as a personality factor in relation to shifts in pressure perception and choking enriches our comprehension of the choking mechanism in sports performance. Self-enhancement, characterized as a personality trait within the self-system, elucidates how individuals manage their perceptions under stress to enhance task performance and aspire to outperform others through effort. This gives rise to a positively oriented cognitive processing. The present study reveals that under stress stimuli, pressure perception escalates, magnifying the significance of performance outcomes. Consequently, the self-enhancement cognitive style is activated, drawing more attention resources to the execution process. This increase leads to the deployment of more effort control resources to the dart throwing task. With regards to the self-control skills involved in dart throwing [24], the effort control explanation of self-focus in choking theory suggests that when attention is directed towards the action process and more psychological resources are channeled to manage skill execution, a paradoxical effect may transpire. This can disrupt the automation of action execution, ultimately resulting in changes in the "choking" performance of dart throwing.

6. Strengths and Limitations

Our study's findings shed light on the self-focus aspect of the choking process model, demonstrating a correlation between self-enhancement and choking performance. Lohse et al.'s interpretation suggests that internalized attention hinders the execution of automatic tasks such as sports performance [24]. Thus, our experimental choking performance aligns with the self-focus theory outlined in the choking process model. This theory argues that increased pressure intensifies self-related sensitivity, escalating the importance of task performance outcomes and overemphasizing control or mastery, which may impede automatic execution's fluency [2, 4, 26].

To stimulate the self-system, we introduced stressors like video cameras, self-introduction, a mirror facing participants, and audience participation for social evaluation [28-29]. These factors might have enhanced self-focus, thereby emphasizing the significance of task performance outcomes. Viewing this through a self-enhancement lens, individuals inclined towards self-enhancement might overestimate their

mastery or control, potentially leading to over-control in task execution. The self-focus theory of choking suggests that such over-control could disrupt automaticity during motor skill execution, resulting in performance deterioration. To foster automaticity, the experimental design asked participants to achieve a 70% hit rate, which might have reduced self-monitoring to some extent [36].

Despite these insights, our research has its limitations. Primarily, we did not examine the distraction theory. To provide a comprehensive understanding of self-enhancement's impact on choking under pressure, future research, as per the choking process model's suggestion, could design experiments emphasizing distraction's role in information-processing tasks. This could also help ascertain the correlation between self-enhancement and performance under pressure.

7. Conclusion

In conclusion, our study employed a dart-throwing task as a component of an experimental design purposed to induce choking. We examined the mediation model of self-enhancement's effect on choking under pressure among collegiate athletes. Our findings showed that pressure, especially when it highlighted self-importance, could precipitate a decrease in performance. Furthermore, individuals predisposed to self-enhancement cognitive processing demonstrated an increased sensitivity to self-related pressure. Intriguingly, the disposition towards self-enhancement accounted for 30% of the effect on choking performance, hence establishing a partial mediation mechanism for choking under pressure. This research enhances the theoretical comprehension of personality traits prone to choking. Future studies focusing on the modification of internal self-related factors could provide a valuable perspective for choking interventions. Specifically, the interplay between personality traits such as self-enhancement and the competitive environments of collegiate athletes warrants a closer look.

Acknowledgements

We are deeply appreciative of the financial support from the Yunnan Province Basic Research Project (202201AT070558). This generous contribution has been instrumental in facilitating the successful completion of our study.

References

[1] Barger, B., Nabi, R., & Hong, L. Y. (2010). Standard back-translation procedures may not capture proper emotion concepts: A case study of Chinese disgust terms. Emotion, 10 (5), 703-711. doi: 10.1037/a0021453.

[2] Baumeister, R. F. (1984). Choking under pressure: self-consciousness and paradoxical effects of incentives on skillful performance. Journal of personality and social psychology, 46 (3), 610-620. doi: 10.1037//0022-3514.46.3.610.

[3] Beer, J. S., Chester, D. S., & Hughes, B. L. (2013). Social threat and cognitive load magnify self-enhancement and attenuate self-deprecation. Journal of Experimental Social Psychology, 49 (4), 706-711. doi: 10.1016/j.jesp. 2013.02.017.

[4] Beilock, S. L., & Carr, T. H. (2001). On the fragility of skilled performance: what governs choking under pressure? Journal of experimental psychology. General, 130 (4), 701-725. doi: 10.1037//0096-3445.130.4.701.

[5] Blanch, A., & Aluja, A. (2016). Text mining a self-report back-translation. Psychological Assessment, 28 (6), 750-764. doi: 10.1037/pas0000213.

[6] Case, F. M., Ford, J. B., Markowski, E., & Honeycutt, E. D. (2013). An Experimental Examination of Equivalence Failures in Multicultural Comparative Research. Journal of Marketing Theory and Practice, 21 (1), 71-90. doi: 10.2753/MTP1069-6679210105.

[7] Colvin, C. R., Block, J., & Funder, D. C. (1995). Overly positive self-evaluations and personality: Negative implications for mental health. Journal of Personality and Social Psychology, 68 (6), 1152-1162. doi: 10.1037/0022-3514.68.6.1152.

[8] Daou, M., Hutchison, Z., Bacelar, M., Rhoads, J. A., Lohse, K. R.,... Miller, M. W. (2019). Learning a skill with the expectation of teaching it impairs the skill's execution under psychological pressure. Journal of Experimental Psychology: Applied, 25 (2), 219-229. doi: 10.1037/xap0000191.

[9] Essl, A., & Jaussi, S. (2017). Choking under time pressure: The influence of deadline-dependent bonus and malus incentive schemes on performance. Journal of Economic Behavior & Organization, 133, 127-137. doi: 10.1016/j.jebo.2016.11.001.

[10] Faul, F., Erdfelder, E., Lang, A., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39 (2), 175-191. doi: 10.3758/BF03193146.

[11] Gebauer, J. E., Sedikides, C., & Schrade, A. (2017). Christian self-enhancement. Journal of Personality and Social Psychology, 113 (5), 786-809. doi: 10.1037/pspp0000140.

[12] Gucciardi, D. F., Longbottom, J., Jackson, B., & Dimmock, J. A. (2010). Experienced Golfers' Perspectives on Choking Under Pressure. [Journal Article]. Journal of Sport & Exercise Psychology, 32 (1), 61-83. doi: 10.1123/jsep.32.1.61.

[13] Hart, W., Tortoriello, G. K., Richardson, K., & Breeden, C. J. (2020). Substantive vs. superficial self-enhancement: Differentiating narcissism constructs from self-esteem following failure. Personality and Individual Differences, 152, 109560. doi: 10.1016/j.paid.2019.109560.

[14] Hayes, A. F. (2015). An Index and Test of Linear Moderated Mediation. Multivariate Behavioral Research, 50 (1), 1-22. doi: 10.1080/00273171.2014.962683.

[15] Hayes, A. F., & Rockwood, N. J. (2017). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. Behaviour Research and Therapy, 98, 39-57. doi: 10.1016/j.brat.2016.11.001.

[16] Heck, P. R., & Krueger, J. I. (2016). Social Perception of Self-Enhancement Bias and Error. Social Psychology, 47 (6), 327-339. doi: 10.1027/1864-9335/a000287.

[17] Hepper, E. G., Gramzow, R. H., & Sedikides, C. (2010). Individual Differences in Self-Enhancement and Self-Protection Strategies: An Integrative Analysis. Journal of Personality, 78 (2), 781-814. doi: 10.1111/j.1467-6494.2010.00633.x..

[18] Hepper, E. G., Sedikides, C., & Cai, H. (2012). Self-Enhancement and Self-Protection Strategies in China: Cultural Expressions of a Fundamental Human Motive. Journal of Cross-Cultural Psychology, 44 (1), 5-23. doi: 10.1177/0022022111428515.

[19] Hill, D. M., Carvell, S., Matthews, N., Weston, N. J. V., & Thelwell, R. R. C. (2017). Exploring choking experiences in elite sport: The role of self-presentation. Psychology of Sport and Exercise, 33, 141-149. doi: 10.1016/j.psychsport.2017.09.001.

[20] Hill, D. M., Hanton, S., Matthews, N., & Fleming, S. (2010). Choking in sport: a review. International Review of Sport and Exercise Psychology, 3 (1), 24-39. doi: 10.1080/17509840903301199.

[21] Iwatsuki, T., Raalte, J. L. V., Brewer, B. W., Petitpas, A., & Takahashi, M. (2018). Relations Among Reinvestment, Self-Regulation, and Perception of Choking Under Pressure. Journal of Human Kinetics, 65 (1), 281-290. doi: 10.2478/hukin-2018-0042.

[22] Jin, W., Zhi, Q., Jinhua, L., Junmei, Z., Mengjie, W.,... Yi, S. (2018). Pressure and "Choking" Phenomenon: A Systematic Analysis Based on the Choking Process Theory. China Sport Science, 38 (12), 19-34. doi: 10.16469/j.css.201812003.

[23] Jinhua, L., Zhi, Q., Jin, W., Junmei, Z., Yi, S.,... Xiaoyu, M. (2021). Intermediary Effect Validation of Self-criticism Based on the Choking Experimental Paradigm. China Sport Science and Technology, 57 (03), 10-18. doi: 10.16470/j.csst.2020111.

[24] Lohse, K. R., Sherwood, D. E., & Healy, A. F. (2010). How changing the focus of attention affects performance, kinematics, and electromyography in dart throwing. Human Movement Science, 29 (4), 542-555. doi: 10.1016/j.humov.2010.05.001.

[25] Lönnqvist, J., Paunonen, S., Nissinen, V., Ortju, K., & Verkasalo, M. (2011). Self-Enhancement in Military Leaders: Its Relevance to Officer Selection and Performance. Applied Psychology: An International Review, 60 (4), 670-695. doi: 10.1111/j.1464-0597.2011.00452.x.

[26] Masters, R. S. W. (1992). Knowledge, knerves and know-how: The role of explicit versus implicit knowledge in the breakdown of a complex motor skill under pressure. British Journal of Psychology, 83 (3), 343-358. doi: 10.1111/j.2044-8295.1992.tb02446.x.

[27] Merced, M. (2019). The psychodynamics of "choking" under performance pressure. Practice Innovations, 4 (1), 28-41. doi: 10.1037/pri0000080.

[28] Mesagno, C., Beckmann, J., Wergin, V. V., & Gröpel, P. (2019). Primed to perform: Comparing different pre-performance routine interventions to improve accuracy in closed, self-paced motor tasks. Psychology of Sport and Exercise, 43, 73-81. doi: 10.1016/j.psychsport.2019.01.001.

[29] Mesagno, C., Garvey, J., Tibbert, S. J., & Gropel, P. (2019). An Investigation Into Handedness and Choking Under Pressure in Sport. [Journal Article]. Research Quarterly for Exercise and Sport, 1-10. doi: 10.1080/02701367.2019.1588935.

[30] Mesagno, C., Harvey, J. T., & Janelle, C. M. (2012). Choking under Pressure and the Role of Fear of Negative Evaluation. Psychology of Sport and Exercise, 13 (1), 60-68. doi: 10.1016/j.psychsport.2011.07.007.

[31] Pulfrey, C., & Butera, F. (2013). Why Neoliberal Values of Self-Enhancement Lead to Cheating in Higher Education. Psychological Science, 24 (11), 2153-2162. doi: 10.1177/0956797613487221.

[32] Roberts, L. J., Jackson, M. S., & Grundy, I. H. (2019). Choking under pressure: Illuminating the role of distraction and self-focus. International Review of Sport and Exercise Psychology, 12 (1), 49-69. doi: 10.1080/1750984X.2017.1374432.

[33] Roberts, R., Cooke, A., Woodman, T., Hupfeld, H., Barwood, C.,... Manley, H. (2019). When the going gets tough, who gets going? An examination of the relationship between narcissism, effort, and performance. Sport, Exercise, and Performance Psychology, 8 (1), 93-105. doi: 10.1037/spy0000124.

[34] Sedikides, C., & Gregg, A. P. (2008). Self-Enhancement Food for Thought. Perspectives on Psychological Science, 3 (2), 102-116. doi: 10.1111/j.1745-6916.2008.00068.x.

[35] Takehiro, I., Raalte, J. L. V., Brewer, B. W., Petitpas, A., & Takahashi, M. (2018). Relations Among Reinvestment, Self-Regulation, and Perception of Choking Under Pressure. Journal of Human Kinetics, 65 (1), 281-290. doi: 10.2478/hukin-2018-0042.

[36] Teeselink, B. K., van Loon, R. J. D. P., van den Assem, M. J., & van Dolder, D. (2020). Incentives, performance and choking in darts. Journal of Economic Behavior & Organization, 169, 38-52. doi: 10.1016/j.jebo.2019.10.026.

[37] Van Der Kam, N. A., Janssen, O., van der Vegt, G. S., & Stoker, J. I. (2014). The role of vertical conflict in the relationship between leader self-enhancement and leader performance. The Leadership Quarterly, 25 (2), 267-281. doi: 10.1016/j.leaqua.2013.08.007.

[38] Wallace, H. M., & Baumeister, R. F. (2002). The performance of narcissists rises and falls with perceived opportunity for glory. Journal of Personality and Social Psychology, 82 (5), 819-834. doi: 10.1037//0022-3514.82.5.819.

[39] Wang, J., Marchant, D., Morris, T., & Gibbs, P. (2004). Self-consciousness and trait anxiety as predictors of choking in sport. Journal of Science and Medicine in Sport, 7 (2), 174-185. doi: https://doi.org/10.1016/S1440-2440(04)80007-0

[40] Wang, J., Marchant, D., & Morris, T. (2004). Coping style and susceptibility to choking. Journal of sport behavior, 27 (1), 75. doi: https://www.proquest.com/scholarly-journals/coping-style-susceptibility-choking/docview/215879328/se-2?accountid=15198