Self-talk Overcomes Choking under Pressure: An Intervention Study in Competition Based on Experimental and Mathematical Statistics Analysis

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Abstract
Self-talk has been proved to be effective in improving sports performance. However, it is unclear whether self-talk overcomes choking under pressure and promotes performance in real competitions. Furthermore, it needs to be investigated that which type of self-talk should be used in real competitions. We conducted a field study using a 2 (intervention: pre- vs. post-, within-subject) × 3 (type: motivational, instructional, vs. decisive, between-subject) design which explored self-talk in a real competitive situation. 24 players (12 males, M_{age} = 28.67 years) from three teams in the fierce knockout badminton competition, used motivational self-talk, instructional self-talk, and decisive self-talk, respectively. Repeated measures of analysis of variance (ANOVA) revealed a significant group interaction effect in the unforced errors among three groups between pre- and post-interventions. Results showed that the group with decisive self-talk decreased significantly in both unforced errors and anxiety, indicating that decisive self-talk without hesitation would overcome chocking under pressure. Correlation analysis revealed a positive correlation between unforced errors and anxiety. However, both the groups with the motivational and instructional self-talk did not show this positive effect. We suggest self-talk should be dynamically adopted according to different situations

Keywords: *Sport; Self-talk; Badminton; Competition*

1. INTRODUCTION

1.1. Choking under pressure

"Choking under pressure" refers to the phenomenon that performing more poorly than expected one's level of skill under pressure [5]. It is an obstacle concerned by many sports players, coaches, and researchers. Two types of theories have been proposed to account for "choking". Distraction theories propose that pressure creates a distracting situation that shifts attention to task-irrelevant cues [22]. Explicit monitoring theories suggest that pressure raises self-consciousness and anxiety about performance, which increases the attention paid to skill processes and their step-by-step control. However, attention to execution at this step-by-step level would disrupt well-learned performances [3].

1.2. Self-talk

Self-talk is a multidimensional phenomenon concerned with athletes' verbalization that addressed to themselves, which can serve different functions [9]. Previous studies revealed self-talk can enhance performance among varied sports. The functions of different types of self-talk vary, and they are strongly influenced by types and characteristics of participants [11]. According to different functions, there are two types of self-talk, including motivational self-talk and instructional self-talk[10]. Matching hypothesis suggests that instructional self-talk can strengthen the accurate execution, thus more effective to improve fine skills; while motivational self-talk can improve the effort and awakening levels and promote gross skills[19]. Additionally, it was demonstrated that skilled players prefer to use motivational self-talk in the competition situation. While instructional self-talk may be more

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effective at early stages of learning [1]. Self-talk can also be divided into strategic and organic self-talk according to whether controlled or not. Strategic self-talk often imposed by coaches and interventions which aim to enhance performance.

Although self-talk has been proved effective in enhancing performance, few intervention studies to date have taken place outside the laboratory. Thus, most prior studies on self-talk limited the ecological validity of the findings. Specifically, what types of self-talk should be used in certain situations needs to be further investigated.

1.3. Coping

Coping style is a substantial factor to avoid choking. In general, coping styles in sport research include approach and avoidant styles [1]. Approach coping style refers to the typical use of coping strategies that direct cognitive and behavioral efforts toward reducing the intensity of stress. Conversely, avoidant coping style refers to the typical use of coping strategies that direct the activity away from the threat-related stimulus. It is proposed that instructional coping style is more appropriate when situations are perceived as attainable and controllable. Avoidant coping style proposed predominating in situations perceived as beyond the control of the individuals [8]. It was found that approach coping style was significant related to choking and anxiety under pressure [20]. This seems consistent with explicit monitoring theories, implying attention to execution harm performance under pressure among high-level players. Approach coping is similar to instructional self-talk since they both emphasis-specific guidance.

1.4. Associative processes

Dual process theories propose that associative and rule-based processes support performance in reasoning and decision-making tasks [7]. Associative processes consist of similarity-based associations built up over repeated exposure to concurrent events, which operate relatively spontaneously and make few demands on working memory resources [17]. While rule-based processes rely on symbolically represented explicit knowledge as conventions to guide processing that place heavy demands on working memory [18]. When under pressure, simpler strategies which depend little on working memory would be more effective[5]. Beilock et al., (2004) [6] revealed that expert golfers putted more accurate under speed instructions than accuracy instruction. The speed instruction intended to reduce the time available to monitor and explicitly adjust execution parameters. We were interested in the effect of combining avoidant coping style, associative processes and self-talk. We called it decisive self-talk (classify to strategic self-talk) since it emphasizes decisive execution without hesitation.

Thus, current theories of "choking" suggested that reducing distraction through performance will probably save choking. Our study explored whether self-talk avoids choking in fierce competition. Inspiring by coping style, we explored whether decisive self-talk which asks them to avoid thinking too much helps save errors under enormous pressure as decisive coping aids when perceived as beyond their control. Badminton is one of the most popular sports in the world. It is characterized by high-intensity, intermittent actions, requiring specific preparation in terms of technique, control, and physical fitness [16]. Complex, proceduralized sensorimotor skill is thought to be vulnerable to choking. Meanwhile, badminton players have little time to decide where and what kind of shot they should play thus cause great pressure. Recent research compared self-talk across sport types and exploring how skill-level is related to performance found that, badminton players' self-talk was more characterized by self-regulated anxiety [15]. In the present study, we aimed to test whether self-talk could be effective in overcoming choking, and whether decisive self-talk will be more effective than other types of self-talk under such high pressure in the real competition situations.

2. RESEARCH METHODS

An official badminton final competition was organized by Shenzhen Municipal Federation of Trade Unions and the Badminton Association. Each of the top 5 teams from preliminary competition in different districts participated. The top 8 teams in the finals will receive a corresponding bonus, and the top 3 teams will receive trophies and medals as well as privileges for the next tournament. The competition represented the highest level of badminton in Shenzhen. It had five events: men' s and women' s singles, men' s and women' s doubles, and mixed doubles. We choose 3 teams from the final (24 in total) that qualified from the group stage in first place. All players of the three teams have received professional training for more than 5 years (non-national registered players) and trained for at least 8 hours per week. The first match played in knockout stage chose as pre-intervention (play against the second place team from the group stage). The nest match chose as post-intervention. The teams in the knockout matches had passed the group stage and their skill level was higher which put the participants in a situation that incentives for optimal performance are at their highest.

2.1. Measures

Referring to previous studies [14], we developed a self-efficacy scale for badminton competition.

Participants were asked to answer the following 5 items on 10-point Likert scale (from 1 not at all to 10 absolutely certain): How confident are you in your service? How confident are you in your smash? How confident are you in your defense? How confident are you of winning the important points? How confident are you of winning the match?

Anxiety was obtained through scales devised by Warr (1990) [21]. Participants were presented with 6 expressions. For each expression, participants were asked to choose the response that best described their present state on a 7-point Likert scale (from 1= not at all to 7= extremely). The 6 items were about tense, uneasy, worried, calm, content, coping under pressure and relaxed, the last three being recorded as they were reversing scored.

We collected and analyzed data by watching the video of each match. Chocking was measured by unforced errors, which are errors committed by the player in a situation where an error is not expected [13]. It's similar to the description of choking under high pressure: people make errors which aren't expected. Unforced errors could affect the final result and therefore be used to predict the outcome of the match and a player's performance level [13]. The unforced error rate = unforced errors ×100/total won and lost points [12].

2.2. Participants

There are 8 members of each group, including motivational self-talk(29.25±1.04), instructional self-talk(28.75±1.28), and decisive self-talk(28±2). The coaches told the players they had participated in an activity about the performance improvement, in which they would be videotaped and were asked to do their best.

- Pre-intervention

Videotape the first match. After the first match, all members fill in the self-efficacy questionnaire, and the anxiety scale.

- Post-intervention

At the beginning of the second match, each coach of groups gave the corresponding self-talk cues to the members. The decisive group received self-talk cues, which suggested them “please make a decision as soon as possible, and don't think too much”. The motivational group received cheer up cues: “I can; I am the best”. The instructional group receives specific technical instruction from coaches, for example, intending to target the opponent's weaknesses. Then match began, and videotape the match. During the interval, each coach of the group repeated the instructions. After the second match, participants in the three groups filled in the self-efficacy questionnaire and the anxiety scale.

3. RESULTS

In the pre-intervention, one-way ANOVA showed non-significant difference in age, F (2, 21) =0.44, p = 0.655, and non-significant difference in unforced errors between the three groups, F (2, 21) = 0.14, p = 0.87.

In order to test the differences in unforced errors between the pre and post intervention in 3 groups, 2 (intervention: pre- vs. post-) × 3 (type: motivational, instructional, vs. decisive) repeated measures ANOVA was conducted (see Figure 1). Although there was no main effect of intervention (p = 0.06), there was a significant interaction effect between the intervention and self-talk types, F (2, 21) =75.93, p < 0.001, η^2 = 0. 88. Analyses of the pairwise comparisons revealed that, in the post intervention, the unforced errors of the decisive group ($M \pm SD$ = 14.75 ± 1.75) significantly lower than the motivational group ($M \pm SD$ = 19.8 ± 4.09) and instructional group ($M \pm SD$ = 20.54 ± 4.42), F= (1, 14) = 5.43, p = 0.03, η^2 = 0.63, F= (1, 14) = 6.35, p = 0.013, η^2= 0.65. Meanwhile, the unforced errors of the decisive group significantly decreased from pre-intervention ($M \pm SD$ = 18.26 ± 3.06) to post-intervention ($M \pm SD$ = 14.75 ± 1.75), F (1, 14) = 75.1, p < 0.001, η^2 = 0.78. The motivational group and instructional group increased significantly from pre ($M \pm SD$ = 18.03 ± 3.57) ($M \pm SD$ = 17.4 ± 3.58) to post ($M \pm SD$ = 19.8± 4.09) ($M \pm SD$ =20.54 ± 4.42) intervention, F= (1, 14) = 19.39, p < 0.001, η^2 = 0.48, F= (1, 14) = 60.57, p < 0.001, η^2= 0.74. These results indicated that decisive self-talk was effective in saving choking under pressure.

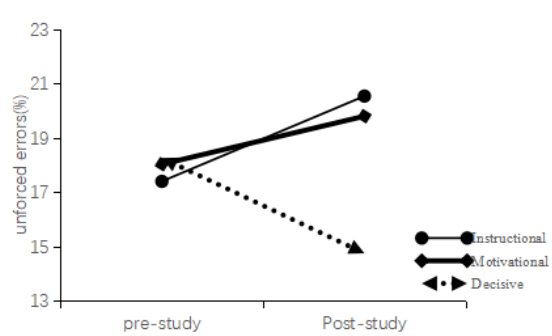

Figure 1 Change of unforced errors between 3 groups

In the pre-intervention, one-way ANOVA showed non-significant difference in self-efficacy between the three groups in the pre-intervention, F(2, 21) = 0.033, p = 0.97. However, repeated measures ANOVA was used to test for differences in self-efficacy between the pre ($M \pm SD$ = 29.83 ± 2.84) and post ($M \pm SD$ = 30.79 ± 2.38) interventions in the three groups. The analysis revealed a significant main effect, F (2, 21) = 19.8, p < 0.001, η^2= 0.49. Pairwise comparisons revealed that motivational group increased significantly from pre (M

± *SD* = 29.63 ± 2.07) to post (*M* ± *SD* = 31.25 ± 1.39), *F* (1, 14) = 18.98, *p* < 0.001, η2= 0.48. Meanwhile decisive group revealed a difference from the pre (*M* ± *SD* = 30.06 ± 2.07) to post (*M* ± *SD* = 30.75 ± 1.58), *p* = 0.057; Instructional group increased faintly from pre (*M* ± *SD* = 29.88 ± 4.22) to post (*M* ± *SD* = 30.38 ± 3.71) (Figure 2), *p* = 0.19. But both of them didn't reveal significant difference. These results indicated that motivational self-talk enhanced self-efficacy.

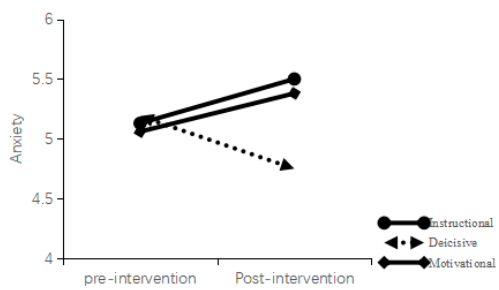

Figure 3 Change in anxiety between 3 groups

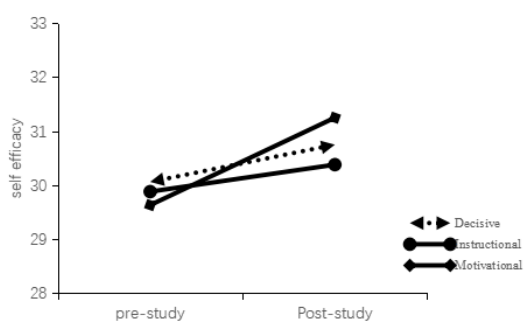

Figure 2 Change of self-efficacy between 3 groups

In the pre-intervention, one-way ANOVA showed non-significant difference in anxiety between the three groups, with *F* (2, 21) = 0.52, *p* = 0.6. Repeated measures ANOVA was used to test for differences in anxiety between the pre (*M* ± *SD* = 5.13 ± 0.49) and post (*M* ± *SD* = 5.21 ± 0.57) studies in 3 groups. The analysis revealed a significant trial by group interaction *F* (2, 21) = 16.65, *p* < 0.01, η^2= 0.61. Pairwise comparisons revealed that decisive group decreased significantly from pre (*M* ± *SD* = 5.19 ± 0.65) to post (*M* ± *SD* = 4.75± 0.38), *F* (1, 14) =10.5, *p* = 0.004, η^2 = 0.33, while instructional and motivational groups increased significantly, *F* (1, 14) = 7.71, *p* = 0.011, η^2 = 0.27, *F* (1, 14) = 5.36, *p* = 0.031, η^2 = 0.2. Meanwhile, in the post intervention, anxiety in the decisive group (*M* ± *SD* = 4.75 ± 0.38) was significantly lower than the instructional group (*M* ± *SD* = 5.5± 0.71) (Figure 3), *F* (1, 14) = 6.3, *p* = 0.02, η^2 = 0.55. These results indicated that only decisive self-talk reduces anxiety. To examine the association between the decrease in anxiety and unforced errors, the correlation between changes in anxiety and unforced errors (scores in the post intervention minus scores in the previous intervention) was calculated for the total sample. The analysis revealed a positive moderate relationship (r = 0.49, *p* = 0.01), suggesting that changes in unforced errors were positively related to anxiety. This revealed that anxiety reduction could promote performance.

4. DISCUSSION

Our field study provides empirical evidence in real competition that decisive self-talk could reduce unforced errors from the badminton player thus preventing them from choking. From the pre-intervention to post-intervention, the competition intensified as the knock out rounds of the competition progressed which caused more pressure. The motivational group and instructional group increased significantly in both unforced errors and anxiety. However, decisive group presented the most obvious effect in reducing unforced errors and anxiety. Additionally, we found that the change in unforced errors was positively associated with anxiety. These were in accordance with early research, the approach coping was positively related to anxiety and is negatively related to avoidant coping under high pressure conditions.

The negative relationship between instructional self-talk and performance as well as anxiety may be attributed to the inhibition of automatic execution caused by conscious attempts to control the performance process under pressure. Using working memory can lead to choke in stressful situations [4]. The cognitive resources available for self-regulation under high pressure may be limited compared to less intense situation, for example, training situation. As for relations between errors and anxiety, it's in accordance with that emotion regulation prevents choking under pressure [2]. Decisive self-talk leads players to focus on the key point. Consuming little working memory, reducing anxiety and enhancing the sense of control, decisive self-talk is effective in competition situations.

Finally, all the groups improved in self-efficacy, whereas the motivational group enhanced the most. This was consistent with past research that self-talk improves self-efficacy. However, present study found the enhancement in self-efficacy didn't reduce unforced errors in fierce badminton competition. For one hand, "Matching hypothesis" suggests motivational self-talk benefits gross skill more than fine skill. For the other, high levels of arousal can lead to poorer performance on fine skills by increasing muscular tension [23]. Badminton is characterized by high-intensity and fine control. Worry and anxiety are the main concerns of the players. These findings suggested that motivational self-talk alone was not enough to save choking in competition situation of fine skills. We suggested that self-talk should vary with different skills and different stage of competitions. Future studies can use self-talk dynamically to find out which type of self-talk is more appropriate for the different stages of competition.

5. CONCLUSION

The present study extended existing findings of self-talk in the competition situation. Our findings indicated that 1) that decisive self-talk save choking in competition situation and 2) that different self-talk should be dynamically apply according to different situations.

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