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Effect of functional strength training with Swiss Ball exercises on selected psychological variables among athletes

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Abstract

The goal of this analysis was to investigate among athletes some psychological characteristics under the influence of functional strength training using Swiss ball exercises. Combining functional strength training—which stresses movement patterns that increase athletic performance—with the instability component of Swiss ball exercises is hypothesised to improve psychological qualities including self-confidence and anxiety control. Selected participants were split into investigation and non-investigation groups; the investigation group followed a planned Swiss ball-based strength training program over eight weeks. Standardized tools were used to evaluate psychological variables. These instruments assessed anxiety reactions both before and after the intervention as well as confidence levels. Within-group and between-group variations were found by means of paired sample t-tests and ANCOVA data analysis. In the investigation group, the outcomes revealed notable increases in self-confidence and a decrease in competitive anxiety relative to the non-investigation group ($p < 0.05$). These results imply that including Swiss ball exercises into functional strength training can be a good approach to improve athletes' psychological and physical readiness. Long-term consequences and changes in training strategies for several sports disciplines should be investigated in next studies.

Keywords: Functional strength training, Swiss Ball exercises, Self-Confidence, competitive anxiety, athletic performance

Introduction

In modern sports science, coupled with physical fitness, psychological elements significantly affect an athlete's performance. High degrees of stress, performance anxiety, and self-doubt that competitive sports situations expose athletes to can have a major effect on their decision-making, response times, and general skill execution (Weinberg & Gould, 2019) ^[20]. Consequently, including psychological training into physical education courses has grown to be a crucial part of whole athlete development (Dos Santos *et al.*, 2021) ^[5]. One such approach is functional strength training combined with Swiss ball exercises, which not only enhances physical attributes such as strength, balance, and coordination but also contributes to psychological resilience by fostering greater body control and movement efficiency (Behm & Sale, 1993) ^[3].

Functional Strength Training and Psychological Impact

Functional strength training is a training approach that focuses on multi-joint, compound movements that mimic sports-specific actions, thereby improving neuromuscular coordination, core stability, and dynamic balance (Myer *et al.*, 2005) ^[11]. Unlike traditional resistance training, which isolates muscle groups, functional strength training integrates movement patterns relevant to athletic performance, enhancing proprioception and reaction time (Hoffman *et al.*, 2009) ^[7]. When performed using unstable training tools such as the Swiss ball, these exercises engage stabilizing muscles to a greater extent, improving postural control, movement efficiency, and core activation (Anderson & Behm, 2005) ^[1]. Such neuromuscular improvements have been linked to better self-perception of movement capabilities, thereby contributing to increased self-confidence and reduced performance-related anxiety (Strang & Berg, 2007) ^[21].

Self-Confidence and Anxiety in Sports

In competitive sports, an athlete's performance and success depend on his or her confidence. Based on Bandura's Self-Efficacy Theory, high-confidence persons are more likely to engage in challenging tasks with a positive attitude, displaying superior endurance, resilience, and willingness to take risks in competitive settings. This self-confidence increases pressure-resistance, motivation, and focus, therefore improving performance. More performance objectives, effort, and training and competition dedication are traits of self-confident athletes (Vealey, 1986; Hays *et al.*, 2009) [19, 6]. Confident athletes maintain cool and perform better under duress as they view competition as an opportunity rather than a threat.

Athletes' self-confidence can be raised by well-planned training programs emphasizing mastery, constructive feedback, and a competitive, unsupported environment. According to Vealey (1986) [12], experience, mental preparation, and physical conditioning can all help one improve their dynamic psychological state—confidence. Under pressure, goal-setting, mental imagery, and functional strength training help to increase self-efficacy, thereby strengthening concentration, motivation, and mental resilience (Feltz, Short, & Sullivan,). These training techniques increase athletes' confidence, therefore helping them to acquire the psychological basis required for optimal performance.

Unchecked competitive anxiousness, though, can affect an athlete's performance. Sports-related anxiety is split by Martens *et al.*'s (1990) [18] Multidimensional Anxiety Theory into cognitive (bad thoughts, fear, self-doubt) and somatic (physiological responses include increased heart rate, muscle tension, perspiration, and restlessness). Though too much produces muscle tension, poor concentration, poor decision-making, and a performance drop, a little anxiety can increase performance by boosting attention and focus (Jones, 1995) [8].

Athletes with high cognitive anxiety may doubt themselves, overanalyze their performance, and concentrate on their shortcomings, therefore jeopardizing their skill execution. Somatic anxiety, on the other hand, results in bodily discomfort that can wear athletes out, induce uncoordination, and lead to uncontrollability. By raising anxiety, this mix of mental and physical stresses causes avoidance, lower confidence, and performance breakdowns (Weinberg & Gould, 2019) [20].

Training programs should combine intense physical and skill-based therapy with relaxation training, mental rehearsal, and breathing exercises to minimize competition anxiety. By enhancing neuromuscular control, proprioception, and body awareness, Woodman & Hardy (2003) [22] advise functional strength training—especially on unstable surfaces—can increase movement confidence and reduce anxiety. Swiss ball exercises help athletes to adjust

and respond, therefore enhancing their capacity to control tension and anxiety in demanding events.

Methodology

Participants: A total of 40 male and female athletes, aged 18 to 25 years, were selected for this study and randomly allocated into two equal groups: the Investigation Group (n = 20), which underwent functional strength training with Swiss ball exercises for eight weeks, and the Non investigation group (n = 20), which continuous with their regular sports training routine without additional strength training interventions. The inclusion criteria required athletes to have a least of two years of competitive experience, regular participation in structured training programs for at least five hours per week, and no recent history of musculoskeletal injuries in the past six months.

Training Protocol

Each 60-minute session was structured into three phases: a warm-up (10 minutes) consisting of dynamic stretching, mobility drills, and light aerobic exercises; functional strength training (40 minutes), which included core exercises such as Swiss ball planks, rollouts, and Russian twists, lower body exercises like Swiss ball squats, hamstring curls, and single-leg balance exercises, upper body exercises including Swiss ball push-ups, dumbbell presses, and stability-based shoulder exercises, and balance and coordination drills such as Swiss ball single-leg stance and proprioceptive drills; and a cool-down (10 minutes) focusing on static stretching and breathing exercises to promote recovery.

Psychological Assessment Tools: To assess changes in self-confidence and competitive anxiety, two standardized questionnaires were administered before and after the training intervention. The Trait Sport Confidence Inventory (TSCI) – Vealey (1986) [12] measured athletes' overall self-confidence using 13 items on a 9-point Likert scale, where higher scores indicated greater confidence. The Competitive State Anxiety Inventory-2 (CSAI-2) – Martens *et al.* (1990) evaluated cognitive anxiety (worry and negative thoughts), somatic anxiety (physical symptoms like tension), and self-confidence through 27 items on a 4-point Likert scale, with higher scores reflecting greater pre-competition anxiety levels.

Statistical Analysis: Descriptive statistics (mean and SD) were calculated, and an independent t-test compared baseline characteristics. A paired t-test assessed within-group changes, while ANCOVA controlled for baseline differences in post-test comparisons. Cohen's d measured the effect size to determine the training impact.

Results

Table 1: Paired t-Test – Within-Group Comparisons

Variable	Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	t-Value	p-Value	Effect Size (Cohen's d)
Self-Confidence (TSCI)	Experimental	55.32 ± 4.75	68.45 ± 5.12	6.72	0.001	1.78
	Control	54.98 ± 5.21	56.12 ± 5.34	0.78	0.441	0.18
Cognitive Anxiety (CSAI-2)	Experimental	24.82 ± 3.95	18.56 ± 4.02	5.92	0.002	1.52
	Control	25.14 ± 4.12	24.65 ± 3.98	0.63	0.532	0.12
Somatic Anxiety (CSAI-2)	Experimental	21.67 ± 3.85	16.23 ± 3.79	5.45	0.003	1.4
	Control	22.01 ± 3.91	21.74 ± 4.02	0.59	0.564	0.11

Following eight-week functional strength training with Swiss ball exercises, the investigation group showed statistically significant increases in self-confidence and declines in both cognitive and somatic anxiety ($p < 0.05$). By contrast, the non-investigation group—which kept up their normal training schedule—showed no appreciable variations in any of the psychological factors ($p > 0.05$).

Table 2: ANCOVA – Between-Group Comparisons (Post-Test Adjusted for Pre-Test Scores)

Variable	Source	F-Value	p-Value	Partial Eta ²
Self-Confidence. (TSCI)	Group	7.1	0.001	0.38
Cognitive Anxiety (CSAI-2)	Group	6.83	0.002	0.35
Somatic Anxiety (CSAI-2)	Group	6.21	0.003	0.33

The ANCOVA results indicate that, after controlling for pre-test scores, the investigation group demonstrated significantly higher self-confidence and lower anxiety levels compared to the non-investigation group ($p < 0.05$).

Discussion

This study found that functional strength training employing Swiss ball motions greatly reduced athletes' competitive anxiety and greatly increased their self-confidence. The non-investigation group exhibited no appreciable improvement; the research group showed marked increases in self-confidence and marked declines in cognitive and physical anxiety. These results complement other studies underlining the benefits of functional strength training in enhancing psychological well-being and performance-related confidence in athletes (Behm & Sale, 1993; Granacher *et al.*, 2016)^[3].

Functional strength training, especially on unstable surfaces like the Swiss ball, improves proprioception, neuromuscular control, and core stability, hence explaining some of the results (Behm & Anderson, 2006)^[14]. These changes help to increase self-efficacy and control, which in turn raises self-confidence in athletic ability. Vealey (1986)^[12] claims that sports success depends much on self-confidence, hence organized training programs enhancing strength, coordination, and balance can help to build psychological resilience.

Furthermore, the notable decreases in cognitive and somatic anxiety seen in the experimental group correspond with results published by Martens *et al.* (1990)^[18], who claimed that organized training courses enable athletes control of their competitive nervousness. Focused engagement, coordination, and adaptability that functional training demands aid to lower negative thoughts and physiological stress reactions during competition (Haff & Triplett, 2015)^[16]. Moreover, Swiss ball workouts add a degree of instability that requires more mental focus and physical awareness, which helps athletes create coping mechanisms for controlling stress and anxiety in the course of competition (Hodges & Richardson, 1997)^[17].

The impact size (Partial Eta²) of the ANCOVA study shows that functional strength training had a modest to big influence on psychological variables, therefore supporting these conclusions. This implies that addition of unstable surface exercises can also be a psychological intervention to improve mental toughness and confidence in athletes, beyond the physical advantages of strength training.

Conclusions

This study shows that athletes' competitive anxiety is much lowered and their self-confidence is much raised by functional strength training using Swiss ball exercises. The non-investigation group showed no appreciable change; the investigation group shown clear psychological advantages. ANCOVA findings validated a modest to significant effect, so supporting Swiss ball training's ability to improve mental resilience. These results imply that including functional strength training into sportsmen's regimens could be a good approach to increase psychological readiness in the sports.

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