

# Cognitive-Behavioural Intervention, Competitive Anxiety and Shooting Performance: A Pre-Test and Post-Test Study of Shooters

<sup>1</sup>Valke Aarti Balchandra

<sup>1</sup>Scholar, Department of Psychology

Maharaja Agrasen Himalayan Garhwal University, Uttarakhand, India

<sup>2</sup>Dr. Rajkumari Meena

<sup>2</sup>Assistant Professor, Department of Psychology

Maharaja Agrasen Himalayan Garhwal University, Uttarakhand, India

## ABSTRACT

Shooting is a precision sport in which technical stability can be disrupted by anxiety, negative self-talk and poor recovery after an unsuccessful shot. This paper examines the effect of a cognitive-behavioural intervention on competitive anxiety, irrational performance beliefs, sport confidence and shooting performance among competitive shooters. The study used a pre-test and post-test design with an intervention group and a comparison group. The intervention was organised around cognitive restructuring, rational self-talk, breathing regulation, imagery, mindfulness, performance journalling and post-shot reset routines. The statistical results showed clear improvement in the intervention group. Competitive anxiety decreased from 70.09 to 57.09, irrational performance beliefs decreased from 64.34 to 49.19, sport confidence increased from 62.97 to 73.83, and shooting performance increased from 503.20 to 522.95. Paired t-tests indicated significant improvements across all major indicators, and the comparison of change scores showed that the intervention group improved more strongly than the comparison group. ANCOVA further indicated a significant group effect on post-test performance after controlling for pre-test performance, anxiety and experience. The findings support the use of structured cognitive-behavioural work in shooting academies and suggest that psychological preparation should be treated as a normal part of

shooter training rather than as a corrective measure used only after failure.

**Keywords:** cognitive-behavioural intervention; competitive anxiety; shooting performance; irrational beliefs; sport confidence; REBT; sport psychology.

## I INTRODUCTION

Shooting demands an unusual combination of calmness, attentional control, technical accuracy and emotional recovery. Unlike many open-skill sports, where players can compensate for one error through movement, pace or tactical change, a shooter must remain composed while the outcome of each shot is visible and measurable. A small disturbance in breathing, finger pressure, visual focus or postural steadiness can affect performance. For this reason, the mental side of shooting is not secondary to physical training; it is part of the performance act itself. Competitive anxiety can become especially damaging when the shooter interprets a poor shot as evidence of personal failure, loss of selection chance or loss of family confidence. The present paper therefore examines cognitive-behavioural intervention as a practical method for reducing anxiety and improving performance in shooters.

The theoretical logic of the paper is that emotional disturbance is not produced only by the event itself but also by the meaning attached to the event. This idea is central to cognitive-behavioural therapy and rational emotive behaviour therapy. In shooting, a low-scoring shot may become psychologically harmful when the athlete thinks, 'I must not fail',

'this proves I am weak' or 'my next shot will also be poor'. Such thoughts can increase tension and shift attention away from the immediate task. The intervention examined in this paper was designed to interrupt that sequence. It trained shooters to recognise irrational beliefs, replace them with rational coping statements, practise controlled breathing, rehearse successful routines through imagery and use a post-shot reset after mistakes. The paper contributes to applied sport psychology by connecting these psychological techniques with statistical performance outcomes.

## II LITERATURE REVIEW

The literature on sport performance has long recognised that psychological readiness influences competitive results. Martens, Vealey and Burton conceptualised competitive anxiety as a multidimensional state involving cognitive worry, somatic arousal and confidence. Woodman and Hardy later showed through meta-analysis that self-confidence has a stronger positive relationship with performance than the negative relationship between cognitive anxiety and performance. Bandura's theory of self-efficacy explains why athletes who believe they can handle pressure are more likely to persist after errors. Vealey's work on sport confidence similarly shows that confidence is a performance resource, not merely a personality trait. Lazarus and Folkman added an appraisal-based view, arguing that stress depends on whether the individual evaluates a situation as threat, challenge or harm. This is highly relevant to shooting because a poor shot may be read either as a correctable technical event or as a threat to identity.

Cognitive-behavioural theory gives a direct route for intervention. Ellis argued that irrational beliefs, particularly demandingness, awfulising, low frustration tolerance and self-downing, produce unhealthy emotional responses. Beck's cognitive approach also emphasised the role of automatic thoughts in emotional disturbance. David, Lynn and Ellis developed the evidence base around rational and irrational beliefs, while Dryden

provided a practical account of rational emotive behaviour therapy. Turner and Barker showed how REBT can be used with athletes to reduce irrational beliefs in sport settings, and Turner later argued that rational beliefs can protect athlete mental health. Tóth, Soós, Szabo and Berki found REBT useful for regulating competitive anxiety, perfectionism and irrational beliefs among athletes. Li, Yang and Wang's recent meta-analysis also reported that psychological interventions, including cognitive-behavioural methods, reduce athlete anxiety with large effects.

Several sport psychology authors support the same direction from different perspectives. Eysenck, Derakshan, Santos and Calvo proposed attentional control theory, explaining how anxiety can reduce processing efficiency by shifting attention towards threat-related information. Orlick and Partington, through research on excellence in elite performers, highlighted commitment, focus and mental readiness. Gould and Maynard emphasised psychological preparation for major competitions, while Birrer and Morgan reviewed psychological skills training as a method for improving performance in high-intensity sport. Gardner and Moore introduced mindfulness and acceptance-based work as a way to manage internal experience without becoming controlled by it. Park, Lim and Lim found that self-talk was related to motivation among shooting athletes, which directly supports the use of structured self-talk in the present study. Together, these authors show that anxiety reduction, cognitive restructuring, confidence building, imagery and attentional control are not separate concerns; they form a connected performance system.

## III RESEARCH METHODOLOGY

The study followed a quantitative pre-test and post-test comparison design. The population consisted of competitive shooters who were involved in regular practice and were exposed to evaluative shooting conditions. The design compared an intervention group with a comparison group. The intervention group received a structured cognitive-

behavioural programme, while the comparison group continued normal training. The major variables were competitive anxiety, irrational performance beliefs, sport confidence, socio-cultural support and shooting performance. Anxiety, irrational beliefs, sport confidence and support were measured through Likert-scale tools, while performance was measured through shooting scores recorded before and after the intervention period.

The intervention was delivered through eight sessions. The first session introduced the anxiety-performance link and performance journalling. The second focused on identifying irrational beliefs connected with poor shots, selection fear and self-downing. The third session developed rational coping beliefs through disputation. The fourth focused on breathing and arousal regulation. The fifth introduced imagery and task-focused self-talk. The sixth developed a post-shot reset routine. The seventh used competition simulation, and the final session consolidated maintenance strategies.

The objectives were: (1) to assess the level of competitive anxiety among shooters before and after cognitive-behavioural intervention; (2) to examine whether the intervention reduces irrational performance beliefs; (3) to assess whether the intervention improves sport confidence; and (4) to evaluate whether psychological improvement is reflected in shooting performance. The hypotheses were: H1, cognitive-behavioural intervention significantly reduces competitive anxiety; H2, cognitive-behavioural intervention significantly reduces irrational performance beliefs; H3, cognitive-behavioural intervention significantly improves sport confidence; and H4, cognitive-behavioural intervention significantly improves shooting performance. Statistical analysis included descriptive statistics, paired sample t-tests, comparison of change scores and ANCOVA.

#### IV RESULTS AND FINDINGS

The results indicate that the intervention group improved more substantially than the comparison group across psychological and performance

indicators. The pre-test scores were reasonably close across the two groups, which supports the suitability of the comparison. The strongest improvement was observed in irrational performance beliefs and shooting performance, followed by sport confidence and competitive anxiety. The results are presented below.

Table 1. Pre-test and post-test descriptive statistics

| Variable                       | Group        | Pre-test Mean (SD) | Post-test Mean (SD) |
|--------------------------------|--------------|--------------------|---------------------|
| Competitive anxiety            | Intervention | 70.09 (8.79)       | 57.09 (10.52)       |
| Competitive anxiety            | Comparison   | 68.24 (8.33)       | 65.78 (9.49)        |
| Irrational performance beliefs | Intervention | 64.34 (9.17)       | 49.19 (9.88)        |
| Irrational performance beliefs | Comparison   | 64.67 (8.86)       | 61.42 (10.14)       |
| Sport confidence               | Intervention | 62.97 (7.40)       | 73.83 (9.00)        |
| Sport confidence               | Comparison   | 64.74 (6.47)       | 67.32 (7.19)        |
| Shooting performance score     | Intervention | 503.20 (11.18)     | 522.95 (13.10)      |
| Shooting performance score     | Comparison   | 501.15 (10.68)     | 506.57 (14.98)      |

Table 1 shows that the intervention group recorded a sharp decline in anxiety and irrational performance beliefs and a strong increase in confidence and shooting score. The comparison group also showed small improvement, which may be linked to routine practice, but the size of change

was clearly lower than that of the intervention group.

Table 2. Paired sample t-test results

| Group        | Variable                       | Mean difference | SD difference | t      | p     | Effect size dz |
|--------------|--------------------------------|-----------------|---------------|--------|-------|----------------|
| Intervention | Competitive anxiety            | -13.00          | 5.75          | -17.50 | <.001 | -2.26          |
| Intervention | Irrational performance beliefs | -15.15          | 5.32          | -22.06 | <.001 | -2.85          |
| Intervention | Sport confidence               | 10.86           | 4.44          | 18.94  | <.001 | 2.44           |
| Intervention | Shooting performance score     | 19.75           | 6.36          | 24.05  | <.001 | 3.11           |
| Comparison   | Competitive anxiety            | -2.45           | 4.02          | -4.73  | <.001 | -0.61          |
| Comparison   | Irrational performance beliefs | -3.25           | 4.75          | -5.30  | <.001 | -0.68          |
| Comparison   | Sport confidence               | 2.58            | 3.75          | 5.33   | <.001 | 0.69           |

| Group      | Variable                   | Mean difference | SD difference | t    | p     | Effect size dz |
|------------|----------------------------|-----------------|---------------|------|-------|----------------|
| Comparison | Shooting performance score | 5.42            | 8.55          | 4.91 | <.001 | 0.63           |

Table 2 confirms that within-group changes were statistically significant. In the intervention group, the strongest effect was observed for shooting performance and irrational performance beliefs, indicating that cognitive change and score improvement moved together. The comparison group showed statistically significant but smaller changes.

Table 3. Group comparison of change scores

| Outcome                     | Intervention mean change | Comparison mean change | t     | p     |
|-----------------------------|--------------------------|------------------------|-------|-------|
| Anxiety reduction           | 13.00                    | 2.45                   | 11.64 | <.001 |
| Irrational belief reduction | 15.15                    | 3.25                   | 12.92 | <.001 |
| Confidence increase         | 10.86                    | 2.58                   | 11.02 | <.001 |
| Performance improvement     | 19.75                    | 5.42                   | 10.42 | <.001 |

Table 3 shows that change scores differed significantly between groups for all major

outcomes. The intervention group achieved greater anxiety reduction, irrational belief reduction, confidence increase and performance improvement, supporting the direct value of the cognitive-behavioural programme.

Table 4. ANCOVA for post-test performance

| Source          | Sum of squares | df  | F      | p      |
|-----------------|----------------|-----|--------|--------|
| Group           | 5545.43        | 1   | 97.24  | < .001 |
| Performance_Pre | 13050.85       | 1   | 228.86 | < .001 |
| Anxiety_Pre     | 23.82          | 1   | 0.42   | = .519 |
| Experience      | 0.32           | 1   | 0.01   | = .940 |
| Residual        | 6558.04        | 115 |        |        |

Table 4 indicates that the group effect on post-test performance remained significant after controlling for pre-test performance, pre-test anxiety and experience. This strengthens the interpretation that the intervention was associated with improvement beyond baseline performance differences.

## V DISCUSSION

The findings support the central argument that cognitive-behavioural intervention is useful for shooters because it acts on the thought-emotion-performance sequence. The reduction in anxiety was not an isolated emotional change. It occurred alongside a decrease in irrational beliefs, an increase in confidence and a rise in shooting score. This pattern is consistent with Ellis's and Beck's view that emotional disturbance is shaped by interpretation, and with Eysenck and colleagues' view that anxiety affects attentional control. In practical terms, the shooter who no longer treats one poor shot as a personal disaster is more likely to return attention to sight alignment, breathing and trigger control.

The paired t-test findings also suggest that the intervention was not merely motivational. Large

changes were observed in core cognitive and performance variables. The intervention group improved its shooting score by 19.75 points, while the comparison group improved by 5.42 points. This difference matters in precision sport, where small score differences can affect ranking and selection. The ANCOVA result strengthens the interpretation because the group effect remained significant after controlling for pre-test performance, pre-test anxiety and experience. This suggests that the observed improvement was not simply due to initial ability differences.

The study also shows that psychological training can be made practical for shooters. Cognitive restructuring, rational self-talk, breathing regulation and post-shot reset routines are not abstract counselling techniques when adapted to the range. They can be practised before a shot, between shots and after a poor series. The results therefore support regular integration of sport psychology into shooting academies. Coaches should not wait until anxiety becomes severe; mental training should be included from the early training stage.

## VI CONCLUSION

The paper concludes that cognitive-behavioural intervention can reduce competitive anxiety and irrational performance beliefs while improving confidence and shooting performance. The results show that shooters benefited most when psychological skills were connected with actual shooting routines rather than delivered as general advice. The intervention helped athletes reinterpret mistakes, manage arousal, rebuild confidence and return attention to task-relevant cues. The study recommends that shooting centres include cognitive restructuring, rational self-talk, breathing regulation, imagery and post-shot reset as part of routine training. Future research may extend the design with larger samples, follow-up testing and discipline-wise comparison between pistol, rifle and other precision events.

Future research should include follow-up testing after three or six months to examine whether the

gains remain stable. It may also compare pistol and rifle shooters, male and female shooters, and athletes from different competitive levels. A mixed-method design with interviews could further explain why some shooters convert anxiety reduction into score improvement faster than others. The present findings provide a useful direction, but stronger evidence will emerge when psychological, technical and physiological data are studied together in a larger sample.

The findings also suggest that psychological support should be made available before major trials and selection events. A pre-competition mental routine may include breathing regulation, cue words, imagery of the shot sequence and a clear post-shot reset statement. Such a routine is especially useful in shooting because the athlete must recover quickly between shots. The intervention may be adapted for beginners, intermediate shooters and elite performers by changing the language and intensity of practice. Beginners may need awareness of anxiety and self-talk, while advanced shooters may benefit from pressure simulation and detailed cognitive restructuring.

The practical implication of the study is that cognitive-behavioural work should be built into routine shooter preparation rather than introduced only after repeated failure. The intervention can be delivered in short modules by trained sport psychologists or counsellors working with coaches. At the academy level, shooters may be asked to maintain a performance journal in which they record triggering thoughts after poor shots, emotional reactions and rational replacement statements. This can help athletes notice recurring patterns such as demandingness, fear of evaluation and self-downing. Coaches can then connect technical feedback with mental reset strategies instead of treating psychological difficulty as lack of discipline.

## **VII PRACTICAL IMPLICATIONS AND FUTURE SCOPE**

A further implication concerns assessment. Shooters should not be assessed only by final score during intervention work. Coaches and sport psychologists should also record post-shot recovery time, quality of self-talk, ability to return to routine and perceived control during pressure drills. These indicators can show psychological progress before score gains become fully visible. Such monitoring would make the intervention more precise and prevent premature judgement of an athlete who is improving mentally but still consolidating technical consistency.

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