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Supporting mental health: pre-post four-week psychological capacity building program for Indian target sport athletes

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ABSTRACT
Purpose. Mental training, widely recognised in sports psychology, has not been fully utilised to address broader mental health concerns among athletes, especially in India. This study examines the Psychological Capacity Building Program (PCBP) for Indian shooters and archers, focusing on key psychological variables such as motivation, grit, emotions, and well-being. The four-phase program includes sports analyses, individual assessments, motivational tasks, a one-week psychoeducational phase on mental skills, and two weeks of applying these skills in the athlete's daily training routines.
Methods. Psychometric tools such as the Sports Motivation Scale-II (SMS-II), Mental Health Continuum-Short Form (MHC-SF), Sports Emotion Questionnaire (SEQ), and Grit Scale were used to measure pre- and post-intervention scores of 122 athletes, divided into experimental (n = 60) and control (n = 62) groups. Within-group and between-group analyses were conducted, along with effect size calculations.
Results. The experimental group showed significant improvements in happiness ($p < 0.001$), emotional well-being ($p = 0.017$), intrinsic motivation ($p = 0.006$), and grit ($p = 0.004$), alongside reductions in dejection ($p = 0.001$) and non-regulation ($p < 0.001$). In contrast, the control group experienced increased anger ($p = 0.005$) but no other significant changes. Between-group comparisons revealed greater reductions in anxiety ($p < 0.001$) and significant improvements in happiness ($p < 0.001$), emotional well-being ($p < 0.001$), social well-being ($p < 0.001$), and grit ($p = 0.004$) in the experimental group.
Conclusions. PCBP shows promise for enhancing the athlete's mental health, but further research with larger samples is needed to confirm its effectiveness and long-term adaptability across diverse sports.
Key words: well-being, sport, archery, mental health, motivation, shooting

Introduction

Mental training (MT) has been a significant advancement in sports psychology. It has been widely researched and applied in various contexts, including the use of assistive technologies [1, 2], coping with injuries [3], and handling high-pressure sporting environments [4, 5]. Vealey highlights MT's role in developing mental skills such as imagery, self-talk, and relaxation, as well as improving cognitive and behavioural outcomes with support from sports psychology professionals [6]. These techniques help athletes enhance stress management and performance. Recently, positive psychology-based programs, such as Mindfulness Acceptance-Commitment Therapy (MACT), Mindfulness-Acceptance-Commitment (MAC), and Mindful Sport Performance Enhancement (MSPE), have gained attention. Psychological Skills Training (PST) remains a widely used intervention package and is the most commonly implemented intervention package in the field of sports [7–11].

Despite these advancements, research on MT's application for mental health is limited, with only a recent shift towards enhancing well-being through interventions [12, 13]. It is only recently that there has been a shift toward exploring the athlete's well-being and quality of life through MT interventions to foster psychological resilience along with understanding the influence of cultural and social support systems on mental health outcomes, as emphasised by Ryba's cultural praxis approach and Lundqvist's work on athlete well-being (see, Lundqvist [14], Trainor [15], Ryba [16]. Moreover, organisations like ISSP, FEPSAC, AASP, and ASPASP emphasise integrating mental health support into training [17, 18]. Thus, it is rational to assume that

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psychological aspects are a key determinant of positive mental health and interventions. Further, given the athlete's diverse psychological pressures, sport-specific MT interventions may help address their unique challenges. Thus, the current study evaluates the Psychological Capacity Building Program (PCBP) for Indian shooters and archers. It explores how customised MT programs improve key psychological factors such as motivation, grit, well-being, and emotions, providing valuable insights into the athlete's overall development.

Psychological and physiological dynamics in target sports

In a study conducted by Heller and Baca [19] in the context of target sports, various target sports disciplines such as shotgun, pistol, rifle, archery, biathlon require precise shooting and aiming techniques. These sports rely on intricate physical and sensorimotor processes for tactical skill execution, presenting similar physiological and technical challenges. For example, shooting demands exceptional physiological control, such as minimal body sway, postural stability, and cognitive regulation to maintain focus and attention. Similarly, archery requires precise aiming, proper anchorage, smooth release, hand-eye coordination, and controlled breathing [20, 21]. Research in target sports has primarily explored the influence of physiological factors, including blood pressure, respiration, heart rate, gaze, and quiet eye movement, on pre- and post-shot performance in both shooters and archers [19, 22]. Additionally, non-invasive methods such as electroencephalography (EEG), electromyography (EMG), 3D motion capture, and image-processing algorithms have been used to study neurological functions, such as brain activity, and to analyse shot execution and body movement patterns [19, 23]. Recent studies have also emphasised the psychological challenges in these sports, including conditions like yips, target panic, performance anxiety, and pressure-induced choking, which significantly impact athletic performance [3, 24]. Although abundant research has focused on the physiological and motor aspects of target sports globally, the application of psychological interventions remains underexplored. Barriers such as limited training time, lack of awareness about MT, and difficulties integrating psychological techniques into daily routines have been identified as key obstacles to implementing psychological interventions.

Furthermore, the lack of systematic MT programs aimed at managing psychosomatic conditions in target sports worldwide highlights the need for structured interventions. In India, research on archery and shooting has examined factors such as anxiety [25], self-esteem, heart rate [26, 27], and injury. However, there is a noticeable lack of studies addressing the broader psychological concerns of athletes in these sports; for instance, aspects such as self-confidence [28] and motor learning are explored in Indian shooters. However, to the best of the author's knowledge, only one study in shooting sport explicitly addressed the psychophysiological demands and impacts of emotions on shooters [29]. While these studies contribute valuable insights, they often neglect critical psychological determinants necessary for long-term athlete development, such as grit, motivation, well-being, and emotions essential for success in high-precision sports. Globally, sports science research consistently demonstrates that motivation is a significant factor in athletic success, with studies showing a strong correlation between intrinsic motivation and greater engagement, persistence, and performance [6, 30]. Emotions are also crucial in sports performance, particularly in precision sports like shooting and archery, where athletes face emotionally intense environments characterised by fear of failure, performance anxiety, and pressure to execute technical skills with precision [30].

Moreover, grit and well-being are fundamental to an athlete's overall success. According to Duckworth et al. [32], grit – a combination of perseverance and long-term goal commitment – enables athletes to overcome obstacles, maintain composure in difficult situations, and persist in their pursuits, all contributing to career success. On the other hand, well-being is associated with an athlete's ability to cope with challenges, maintain mental resilience, and draw strength from a strong social support system [14, 33]. Thus, based on empirical evidence as stated above, further investigation into the psychological aspects of the athlete's development and mental health within target sports can result in deeper insight into the psychological concerns of athletes in India.

Importance of mental health intervention support: Indian and global perspectives

The formal recognition of sports psychology as a profession and research field in India began in the 1960s with the establishment of key institutions such as the Indian Association of Sports Medicine (IASM), the National Institute of Sports (NIS), Patiala, and the Sports Authority of India (SAI). This development-initiated research focused on areas like psycho-physical arousal, personality traits, anxiety, and stress. Globally, sports

psychology research has evolved to include the development and testing of mental health interventions, such as mental health literacy and resilience programs [33], evidence-based behavioural treatments and sport-specific cognitive-behavioural interventions like The Optimum Performance Program in Sports (TOPPS) [34], all of which aim to address the athlete's mental health directly. However, the Indian context still lags in building a robust evidence-based research ecosystem, which is critical for establishing a mental health support framework for athletes. Despite recent Olympic success stories of athletes such as Neeraj Chopra in the javelin [35]; Abhinav Bindra, Gagan Narang, and Rajyavardhan Singh Rathore in shooting [36, 37]; and Deepika Kumari and Atanu Das in archery [38], mental health application and testing of scientifically rigorous mental health programs is limited in India [39]. As highlighted, the Indian sporting ecosystem has faced significant challenges in integrating psychology with other domains of sports science [40]. This gap is apparent in both research and practice, with mental health concerns often being neglected as a crucial component for the overall development of athletes.

Additionally, the system struggles with persistent issues, such as the stigma associated with mental health and the lack of awareness among coaches and athletes regarding psychological interventions, which limits the widespread adoption of MT within the community. Despite some recent efforts to address the athlete's mental health, such as the use of yoga and mindfulness to enhance sports performance [41], the introduction of the sport model for contemporary cricketers to manage emotions and performance through mythologically-based psychological frameworks [42] and Sood and Puri's attempt to validate the Psychological Capital Questionnaire (PCQ-24) for student-athletes in India [43], there remains a critical need to explore the psychological needs of athletes across various sports calling for establishment of mental health intervention programs to support athletes both professionally and personally [40]. Thus, this field in India demands extensive attention to establish protocols and psychological frameworks for supporting the athlete's mental health and advocating global collaborations to enhance research standards and bridge the gap between knowledge and practice.

Current study

Considering existing empirical evidence, significant research gaps exist in the psychological dimensions of target sports like shooting and archery, particularly in India. These sports require athletes to balance technical skills, physiological stability, and mental resilience. Although research has largely focused on technical and physiological performance [44, 45], little attention has been paid to the psychological factors underpinning the mental health of these athletes. It is well noted in previous studies that precision-based sports such as shooting and archery demand exceptional focus and cognitive skills [26, 44], making them ideal for exploring how long-term participation in these sports affects their mental health, as well as how the psychological interventions designed to improve their mental health can create impact in their sports performance. Further, in India, these sports have gained much popularity [27, 43]. They are well-represented internationally, including in the Olympics, underscoring the importance of understanding the mental dynamics behind successful performance in these sports [19, 46]. While psychological challenges, such as performance anxiety, target panic, and lack of focus, are known obstacles for athletes in these sports [47, 48], further highlighting the psychological aspects of these sports can provide a more thorough understanding of the wider psychological concerns that influence not only mental health but also the overall development of athletes. Globally, factors like motivation, emotions, well-being, and grit have been studied across various sports [14, 15, 31], but research on Indian shooters and archers remains scarce. Addressing this gap could offer valuable insights into the athlete's mental determination to play (grit), inspiration to compete (motivation), recognition of dominant emotions (emotions), and overall psychosocial health (well-being). Finally, while psychological interventions have been documented in other sports, sport-specific and context-tailored programs for Indian athletes are still underdeveloped, presenting an opportunity to advance the research in testifying the impact of these interventions in Indian settings.

This pilot study aims to bridge these gaps by assessing key psychological factors in Indian shooters and archers through the PCBP. The study will explore how PCBPs impact an athlete's mental health, providing coaches, researchers, and practitioners with strategies to enhance an athlete's well-being and performance in both training and competition.

About the Psychological Capacity Building Program (PCBP)

The PCBP is based on Boutcher and Rotella's [49] framework designed for Closed Skill Sports (CSS). Its primary goal is to familiarise athletes with essential

mental skills that play a significant role during their early years of sporting experience [50]. The four-week duration of the PCBP (a mesocycle) follows the principles of mental periodisation [51, 52]. The program is structured into four phases as follows:

Phase 1, 2, and 3

The first three phases are the initial steps of the PCBP and are completed over a week with two days of break. Phase 1, known as the sport analysis phase, occurs on the first day. In this phase, basic information like the participant's name, age, years of experience in their sport, and formal consent is collected through paper-pencil-based forms. Phase 2, known as the individual assessment phase, spans two days (day 2 for the experimental group and day 3 for the control group) and is administered separately to the experimental and control groups. As part of the pre-intervention assessment, participants undergo psychometric assessments that evaluate psychological factors such as grit, motivation, emotions, and well-being. For the experimental group, an additional activity titled 'strength exploration' is conducted on their designated day. This paper-pencil activity encouraged athletes to reflect on their strengths in various life domains, such as work, relationships, and personal fulfilment.

The fourth day was a break for participants, followed by phase 3 on the fifth day, termed the conceptual/motivation phase. This phase involved only the experimental group and introduced a 'goal setting' activity (paper-pencil-based) where athletes outline their sport-related goals for the upcoming week, month, and year. The activity was designed to help athletes brainstorm their goals for their sporting careers. After the third phase, the experimental group and coaches engaged in an informal discussion on the sixth day to share their experiences. The week concluded with a rest day on the seventh day.

Phase 4

Phase 4 of the PCBP began in the second week and spanned three weeks. It was divided into two key sub-phases: the general mental skill development phase (GMSDP) and the specific mental skill development phase (SMSDP). Each sub-phase has been described in detail as follows:

General mental skill development phase (*GMSDP*)

The first sub-phase, the GMSDP, is a one-week psychoeducational segment where athletes participate in instructional sessions to enhance their understanding of mental skills. These sessions, delivered through PowerPoint presentations and lectures by the first author, covered five essential mental skills: relaxation, self-talk, concentration, energisation, and imagery, as proposed by Bacon [52]. The program began with a rapport-building session on the first day, followed by one mental skill being taught each day for the next five days, with a break on day seven. Each session lasted one hour and was conducted in a classroom exclusively for the experimental group.

Specific mental skill development phase (SMSDP)

The GMSDP phase, a second sub-phase of phase 4, began in week 3 and continued through week 4. During this phase, athletes applied and integrated the mental skills they had learned during the GMSDP into their daily training routines by practising exercises linked to each skill. This sub-phase lasted two weeks, with five training sessions each week, varying in duration. A discussion day was scheduled on the sixth day, followed by a rest day on the seventh. The five mental skills introduced in the GMSDP – relaxation, self-talk, concentration, imagery, and energisation – were practised during this sub-phase through exercises such as deep breathing, thought logging, de-catastrophising, cueing, PETTLEP exercises, and mindful body scanning [53]. Each skill was practised in sequence: for instance, relaxation was practised on the first day, followed by self-talk on day 2, concentration on day 3, imagery on day 4, and energisation on day 5. The sixth day was dedicated to a group discussion, while the seventh day served as a rest day. This same sequence was repeated during the fourth week. Detailed descriptions of phase 1, phase 2, phase 3, and phase 4 (including the GMSDP and each exercise associated with the mental skills in the GMSDP phase) are provided in the Procedure section.

Material and methods

Study design

The present study aims to investigate the impact of four weeks of a PCBP on emotions (anxiety, dejection, anger, excitement, and happiness), motivation level (intrinsic regulation, integrated regulation, identified regulation, introjected regulation, external regulation, and non-regulation), well-being (emotional well-being (EWB), social well-being (SWB), and psychological well-being (PWB), and grit of target sports athletes. For this, a quantitative research approach was employed. The study focused on the following objectives: assessing the effect of the PCBP intervention on emotional

variables, including anxiety, dejection, anger, excitement, and happiness; examining the impact on motivational sub-variables, including intrinsic regulation, integrated regulation, identified regulation, introjected regulation, external regulation, and non-regulation; and evaluating its effect on well-being sub-variables, specifically EWB, SWB, and PWB. Additionally, the research aimed to compare the pre- and post-intervention scores of the experimental and control groups and investigate the differences between these groups at the post-intervention stage. The study hypothesised that the experimental group would significantly improve grit, emotional states, motivation levels, and well-being after the intervention. It was expected that no significant changes would occur in the control group over time. Furthermore, the study anticipated significant differences between the experimental and control groups at the post-intervention stage, with larger effect sizes in the experimental group, indicating the practical significance of the intervention's impact. Also, the study followed the TREND checklist [54], which was designed for non-randomised research designs for quality assurance of the research study.

Initially, the study received approval from the Department of Science and Technology (DST), Government of India (File no.SE/CSRI-PDF/2021/47), followed by ethical approval from the University Ethical Committee to ensure the information's confidentiality and adherence to the tenets of the Helsinki Declaration to preserve the integrity of the research process (IITRPR/IEC/2023/014). Further, the study was also registered in the ISRCTN Registry (ISRCTN12265928) (following the recommendations of the International Committee of Medical Journal Editors (ICMJE) and the World Organization's (WHO) requirements for registering clinical studies). All the details regarding the study's framework were further shared with the potential institutions, and permissions were obtained via email from their administrators/coaches for participation. Moreover, the first author visited participating institutions several times to conduct rapport-building sessions under the supervision of coaches with athletes and supporting staff. In the case of minors, the parents of the athletes were informed about the study telephonically by the coach and first author. The PCBP's author administered the first intervention, whose prior experience with shooters and archers offered valuable contextual insights. Several robust measures were implemented to ensure this familiarity did not compromise the study's integrity. First, the study was thoroughly reviewed by the university's ethical committee and co-authors to safeguard against personal bias. Second, standardised protocols and well-defined inclusion and exclusion criteria were applied uniformly across the experiment and control groups, ensuring participant treatment and assessment consistency. Third, blinded data analysis, conducted by the second author with anonymised participant identities, ensured that prior knowledge of individual athletes did not influence the results. External evaluators, such as coaches and sports staff, were actively involved in participant screening and data collection to uphold objectivity. These comprehensive steps were essential in mitigating potential bias from the first author, thereby preserving the study's scientific rigour and credibility.

Sample

In the present study, sample size estimates were conducted before data collection using an a priori power analysis with G*Power software (version 3.1.9.6; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) [55]. This approach allowed for the determination of a sufficient sample size to detect meaningful effects while considering the [56] exploratory nature of the research and various constraints, including the geographical limitations to the Punjab and Haryana regions, logistical challenges, study timeline, and strict inclusion/exclusion criteria (e.g., athletes with no recent competition history or prior MT experience). The study conservatively chose a medium effect size (f = 0.25) based on Cohen's f values criterion [57, 58] due to the variability in psychological and performance outcomes across different sports, as well as findings from prior meta-analyses in sports sciences [59, 60]. While large effects have been observed in some studies – such as in study conducted by Mon-Lopez [61] to compare the visual acuity of shooters with non-athletes, it was found that shooters had higher visual acuity than non-athletes with large effect size between 1.01 and 2.35. Similarly, Scharfen and Memmert [62] stated moderate to large effect sizes (SMD = 0.72) for psychological performance outcomes in elite athletes, supporting the decision to use a medium effect size for this study. Further, in the G*Power analysis, a correlation among repeated measures, within-between interactions (r = 0.5) were applied, following recommendations from studies in sports science, particularly Hopkins et al. [63] and Atkinson and Nevill [64], where moderate correlations between pre- and post-intervention measurements were expected. Additionally, a non-sphericity correction (ε = 1) was applied, assuming ideal sphericity [65], when no significant violations of sphericity are expected. The analysis indicated a total sample size of 54 partici-

pants was required, with a critical *F*-value of 4.026 and degrees of freedom of 1 (numerator) and 52 (denominator). The a priori power analysis confirmed that the chosen sample size would provide sufficient power (0.95) to detect moderate effects in this study.

Selection process

Pooling and initial screening

Two hundred sixty target sports athletes expressed interest in participating in the study. These athletes were drawn from five academies across the Punjab state (Mohali district) and Haryana state (Sonipat city, Panchkula city, Ambala district), with the focus on shooting (10-meter air rifle and air pistol events) and archery (recurve and compound events). The sampling was purposive, adhering to the specific inclusion and exclusion criteria.

Initial screening criteria

During the initial screening, participants were evaluated based on the following criteria:

No recent participation in national or international competitions the previous month.

No previous exposure to formal MT under a coach or sports psychologist.

No heavy involvement in intensive training or preparation for competitions scheduled within the next one to six months.

No recent injury or recovery from injury.

No significant academic commitments, such as exams or major assignments.

Of 260 interested athletes, 240 met these criteria and proceeded to group allocation. These steps were crucial for controlling confounding variables and ensuring reliable experimental and control group results.

Group allocation

After screening, participants were assigned to either the experimental or control group based on their training objectives. Employing purposive sampling, athletes who planned regular training were placed in the experimental group (which received the PCBP intervention). In contrast, those with more sporadic training commitments were placed in the control group. Finally, 160 athletes qualified for the experimental group, and 80 were placed in the control group.

Final screening: inclusion and exclusion criteria

The final screening ensured that all participants complied with official sports regulations. In shooting, participants in the 10-metre air rifle and air pistol events were selected according to the National Rifle Association of India (NRAI) guidelines, which mandate a minimum age of 10 years for air gun events and recognised competitions. Similarly, archery participants were selected based on the Archery Association of India (AAI) [66] criteria, requiring involvement in the Under-9 and Under-14 National Archery Championships. In addition to these federation-specific guidelines, athletes must have participated in at least one recognised competition or have a minimum of one year of experience recognised by the Ministry of Sports. Basic English proficiency was also required for clear communication throughout the study. Initially, 80 participants were included in the experimental group. However, 10 participants withdrew, and another 10 were excluded due to incomplete forms during phase 1 of the PCBP, leaving a final count of 60 participants in the experimental group.

Similarly, after applying the inclusion and exclusion criteria, the control group was reduced to 71 participants. Before phase 1 of the PCBP commenced, 9 athletes dropped out, resulting in a final control group of 62 athletes. This thorough screening ensured adherence to the study's practical and ethical standards. The PCBP intervention was administered over four weeks at the participant's academies. The study preparations and initial groundwork (sorting permissions from organisations/academies) commenced in April 2022, and active recruitment and participation were conducted in July 2023. The study concluded in January 2024.

Measures

The measurements in this study were selected for their relevance to the broader aspects of mental health in athletes. The Mental Health Continuum-Short Form (MHC-SF) assesses well-being across emotional, social, and psychological dimensions, offering insights into potential mental health concerns [67]. The Sports Emotion Questionnaire (SEQ) captures key emotions such as anxiety, anger, and excitement that shape the athlete's experiences in sports [68]. The Sports Motivation Scale-2 (SMS-2), grounded in Self-Determination Theory (SDT), measures intrinsic and extrinsic motivation and amotivation, reflecting the athlete's basic needs for autonomy, competence, and relatedness to flourish in their sporting careers [69]. Lastly, the Grit Scale (Grit-S)

evaluates perseverance, a critical factor in overcoming challenges and achieving long-term goals [70]. The scales and their characteristics are outlined in detail as follows:

1. Mental Health Continuum-Short Form (MHC-SF): The MHC-SF was chosen to assess well-being and consists of 14 items available for youths under 18 and adults. It evaluates three components of well-being: EWB (items 1–3), SWB (items 4–8), and PWB (items 9–14) on a 5-point Likert scale from"never" to"every day" The MHC-SF has been widely used in countries like China [71] and the Netherlands [72]. In India, Singh et al. [73] reported a reliability of α = 0.8. In the current study, the internal consistency was 0.77, which aligns with previous research.

2. Sports Emotion Questionnaire (SEQ): The SEQ, developed by Jones et al. (2005), is a five-point Likert scale that measures an athlete's emotions across five categories: anxiety, dejection, anger, excitement, and happiness, before and after competitions or training. Responses range from 0 (not at all) to 4 (extremely), assessing the intensity of emotions [67, 74]. The SEQ has been adopted in countries like Germany and Turkey, where Cronbach's alpha ranges from 0.75 to 0.90 [73]. In India, Sathvik [75] reported alpha values of 0.77 to 0.87, while the present study showed α = 0.85.

3. Sports Motivation Scale-2 (SMS-2): The SMS-2 (SMS-2; [68]) consists of 18 items assessing athletes' motivation levels using a 7-point Likert scale, from 1 (does not correspond at all) to 7 (corresponds completely). It measures intrinsic regulation, integrated regulation, identified regulation, introjected regulation, external regulation, and non-regulation. The SMS-2 has been validated in countries like China, Malaysia, and Hungary, with reliability ranging from 0.70 to 0.85. The 28-item SMS scale in India has been adapted with Cronbach alpha values between 0.76 and 0.85 [76]. The SMS-2 offers better psychometric properties due to its efficiency and foundation in prior theoretical use in India. In this study, the scale's reliability was α = 0.84.

4. Grit Scale (Grit-S) by Duckworth [31]: The Grit-S measures an individual's level of passion and perseverance. It includes 12 items, with negative items (2, 3, 5, 7, 8, 11) scored from 1 "very much like m") to 5 "not like m"), and positive items (1, 4, 6, 9, 10, 12) reversed. The scale has been applied to academic performance, health, and physical fitness, demonstrating strong reliability and validity. In India, the scale was translated and adapted into Hindi, showing good convergent validity with well-being and resilience [31, 69, 73]. The present study reported a Cronbach's alpha of 0.67.

5. PCBP Booklet: It is a reference manual/booklet that includes detailed explanations of MT exercises such as relaxation, concentration, positive self-talk, energisation, and Imagery. These exercises are meant to be practised during the general and GMSDP phases, typically in weeks 3 and 4 of the PCBP intervention. The booklet is designed to guide athletes to perform these skills correctly, but it is purely informational and does not assess their mental health.

Procedure

The study received approval from the DST, Government of India (File no. SE/CSRI-PDF/2021/47) in February 2022, and the project officially started in April 2022. The first author began identifying and shortlisting potential academies in the Punjab and Haryana regions. In April 2022, the first author contacted coaches and authorities of private archery and shooting academies in Punjab and Haryana via phone. Concurrently, during this period, both the first and second authors submitted applications for ethical clearance to the Institutional Ethics Committee-Humans (IEC-Humans, Application no. IITRPR/IEC/2023/014, approved on 02/05/2023), obtaining the necessary permissions to begin the study in 2023. By December 2022, seven academies had initially agreed to participate, but only four consented to join the study. After receiving verbal consent from academy heads and coaches, the first author visited the academies to explain the details of the PCBP. Final participation confirmation was obtained via email from each academy. In July 2023, the active recruitment process commenced, and there were 260 athlete registrations, with 158 from Haryana and 102 from Punjab. The screening procedures were carried out during subsequent visits to the academies (see details in the participants section). A strict protocol was established with academy officials and coaches to control confounding variables and enhance study validity. It was agreed that the control and experimental groups would be assigned distinct training times, with pre-post assessments conducted under identical but separate conditions. To prevent psychological burnout in the experimental group, PCBP sessions were scheduled in the mornings before technical training. The second author accompanied the first author during the screening and final sample selection to prevent potential bias. These protocols were uniformly applied across all participating academies, ensuring clear administrative procedures and minimising bias before the study commenced.

Further, the study was registered with the IRCTN Registry (IRCTN12265928; https://www.isrctn.com/ISRCTN12265928).

Following the screening process, 240 participants were initially selected. In consultation with the coaches, participants were allocated to the experimental or control group based on their training consistency. Participants committed to regular training were assigned to the experimental group (n = 160), while those with sporadic training schedules were placed in the control group (n = 80). During this stage, verbal consent was obtained from all participants. In the case of minors, coaches provided consent on behalf of the parents, who were informed about the study via telephone by both the coaches and the first author. The final stage of participant selection involved applying inclusion and exclusion criteria, ensuring eligibility based on age and years of experience according to the guidelines provided by the NRAI and AAI. This process resulted in 80 participants being selected for the experimental group and 71 for the control group. However, ten athletes from the experimental group withdrew due to personal reasons and an additional 10 submitted incomplete pre-intervention assessments (phase 1 of the PCBP). In the control group, 9 participants also withdrew due to personal reasons before the commencement of the PCBP. Consequently, the final sample was comprised of 60 participants in the experimental group and 62 in the control group.

Implementation of Psychological Capacity Building Program (PCBP)

Following the final sample selection, the first author implemented the intervention with one academy per month, adhering to an identical PCBP implementation procedure at each location. A roster/calendar was prepared by the first author based on the permissions received from the participating academies. The PCBP commenced the first week, covering phases 1, 2, and 3 of the intervention detailed as follows:

Week 1: phase 1, 2, and 3

The purpose of this week was to collect baseline data, obtain official consent from participants, and offer the experimental group insights into their strengths while guiding them in goal setting (see Table 1). The details of each phase are as follows:

1. Phase 1 (sports analysis) – Day 1: This phase marked the beginning of the PCBP, where athletes were verbally introduced to the objectives and purpose of the study. The session also involved administering a self-reporting form to collect data on the participants' age, experience, education, employment, training routines, sporting background, and obtaining their official consent. For instance, questions such as "Does your coach provide mental training support?" and "How do you feel after each training session?" were included to assess the athlete's current sporting environment. The session was conducted in the morning before the athlete's regular training sessions. To implement this, the first author briefed both the experimental and control groups about the purpose and objectives of the study, including instructions for completing the self-reporting form and giving written consent. Each briefing lasted 15 min. After the briefing, a 10-minute break was provided to both groups to prevent boredom and cognitive fatigue. After the break, the self-reporting form was distributed – administered by the first author to the experimental group and the coach to the control group. Both groups were given 15 min to complete the form, with the entire phase lasting around 45 min for each group.

2. Phase 2 (individual assessment) – Days 2 and 3: The individual assessment phase was conducted on days two and three before the athlete's morning training sessions. This phase involved pre-assessment using standardised, paper-and-pencil-based scales to measure well-being (MHC-SF for both children and adults), motivation (SMS-II), Grit (Grit-S), and emotions (SEQ) among the target sport athletes. On day two, the experimental group received a briefing regarding the nature of the assessments and detailed instructions for completing them. The assessments were conducted in a briefing hall under the supervision of the first author, junior coach, and senior coach. Each assessment lasted 15 min, with a 5-minute break between tests to mitigate cognitive fatigue and maintain participant engagement. The session lasted approximately 90 min, after which the first author collected the pre-assessment forms. Before the evening of day two, the experimental group participated in a 20-minute paper-and-pencil-based "Strength Exploration" exercise before the evening training session. This exercise aimed to engage athletes in reflecting on their strengths across different domains, including work/school, family/relationships, and personal fulfilment. The exercise was conducted under the supervision of the coach and the first author. The first part of the activity required athletes to identify personal strengths from a list of positive traits (e.g., wisdom, honesty, persistence, leadership).

In contrast, the second part described situations where these strengths had benefited them and outlined

new ways to apply them in their current context. Following the 20-minute session, the first author engaged in a brief informal discussion with the athletes to gather their reflections and conclude the day's activities. On day three, the control group underwent the same pre-assessment procedure as the experimental group, utilising the same standardised measures and under similar conditions. The assessments were conducted before the morning training session, supervised by the first author and senior coach. The control group was briefed on the nature of the tests and provided instructions before the assessments, which also lasted 90 min. The first author collected the pre-assessment forms upon completion, concluding the session. The control group did not participate in the "Strength Exploration" exercise during the evening session. Both groups were given a rest day on day four, with Phase Three scheduled to begin on day five.

3. Phase 3 (conceptual/motivation phase) – Day 5: Only the experimental group continued with the PCBP from day five onwards. The "conceptual/motivation" phase aimed to help athletes reflect on their current and future career goals and gain clarity on their aspirations. Before their morning training session, the experimental group participated in a paper-pencil goal-planning exercise. The session began with the first author explaining the importance of goal setting. In the first part of the activity, participants set goals for the next week, month, year, and five years. In the second part, they answered questions regarding potential challenges, resources needed, and immediate steps to begin working towards their goals (e.g., "Actions I need to take to achieve my goal"). The activity lasted 30 min, after which the athletes began training. On day six, athletes and coaches could discuss one-on-one with the first author before their morning training. This informal two-hour session at the archery/shooting range allowed those interested to ask questions about sports psychology or share thoughts on their experiences. Participants were given a rest day on day seven.

4. Phase 4: weeks 2, 3, and 4

In the second week of the PCBP, the GMSDP (GMSDP), a sub-phase of phase 4, was conducted in the experimental group. This sub-phase aimed to educate athletes on various mental skills, emphasising their importance in enhancing performance and PWB. Each session lasted one hour and was held daily over a week. These sessions were scheduled in the morning, with a two-hour gap before the athletes' technical training, as this timing was optimal for information retention given that the athletes had fresh minds and could focus more effectively. Delivered through the first author's lectures and paper pencil-based exercises, the sessions covered five core mental skills: relaxation, self-talk, concentration, energisation, and imagery. All sessions took place in a classroom setting. The day-by-day details of each session are as follows:

1) Day 1 (rapport building): The program commenced with a rapport-building session on the first day, exclusively for the experimental group. Athletes were seated by the senior coach, and the session aimed to foster interaction and break the ice. The first author initiated the session with a brief introduction, followed by each athlete introducing themselves, sharing basic personal information, details about their sporting journey, and expectations from the PCBP. After the introductions, the first author provided an overview of the benefits of psychological training, emphasising its positive impact on athletic performance and long-term well-being. The session concluded with a questions and answers segment, addressing the athlete's myths and doubts regarding MT.

2) Day 2 (introduction to relaxation): Athletes were introduced to relaxation on the second day. The session covered basic information about the nature and importance of relaxation, followed by an explanation of the mind-body relationship outlined by Westphal and Schulze [77]. Athletes were then taught deep breathing techniques based on the work of Heil [78], which highlighted the role of controlled breathing in fostering relaxation and improving mental and physical well-being. The session concluded with a questions and answers segment, where athletes raised questions and clarified their understanding of relaxation techniques.

3) Day 3 (introduction to self-talk): On the third day, the topic of discussion was self-talk. The athletes were first introduced to the concept of rumination [79] and how it affects thought patterns. Further, athletes were introduced to self-talk and its benefit in regulating our negative thoughts and emotions, especially during high-pressure conditions. They were given a mini drill of 5 min during the session to track their thoughts and write them on paper. The session concluded with questions and answers segment, where athletes raised questions and clarified their understanding of self-talk.

4) Day 4 (introduction to concentration): On the fourth day, the topic of concentration was discussed. Athletes were introduced to the concept of concentration and its role in improving their ability to focus. The session also explained the distinction between concentration and flow, clarifying that while both are related, they are distinct psychological states. Athletes were then introduced to the exercise of 'cueing', a technique commonly used in pre-training or pre-competition rou-

tines. Athletes were introduced to how to utilise specific verbal cues, such as performance-related commands like "ready, see", along with auditory cues, such as humming a familiar song, to enhance their technical execution and sharpen their concentration for performance before training or competition and during critical moments. The session was concluded for the experimental group with a question and answers segment, where athletes raised questions and clarified their understanding of concentration.

5) Day 5 (introduction to motivation guided imagery): On the fifth day, the focus was on imagery. Athletes were introduced to imagery, which involves creating a mental representation of a complete experience or scenario using multiple senses, including visual, auditory, kinaesthetic, tactile, and emotional. The session concluded by introducing the PETTLEP model [80], highlighting its benefits in boosting morale and improving clarity around sporting technique and performance execution. A questions and answers segment followed to address the athlete's questions regarding imagery.

6) Day 6 (introduction to energisation): On the sixth day, athletes were introduced to energisation, [81] which involved activating the body for optimal performance. The session aimed to help athletes understand how energisation can assist in managing low energy levels or overcoming adverse conditions. Additionally, athletes were introduced to the mindful body scanning technique, which focuses on bringing awareness to bodily sensations from head to toe [82]. The session concluded with a light activity where each athlete was given a balloon to practice breathing exercises, blowing in and out of the balloon for five minutes as a form of activation. A questions and answers discussion followed this.

7) Day 7 (rest day): Day 7 was a rest day for all the athletes from sessions and technical training.

Week 3 and 4

Weeks 3 and 4 (see Table 1) constituted the GMSDP phase (SMSDP). This sub-phase aimed to implement the mental skills learned during the GMSDP by practising exercises associated with each skill. This phase occurred on the sports field two hours before the athlete's training session. The implementation guidelines for each exercise were provided by the first author to the entire experimental group and were conducted under the supervision of the senior coach. After a detailed explanation of each exercise, athletes engaged in trial practice sessions, supervised by the first author, to ensure the correct acquisition of the MT techniques. The first author also demonstrated the techniques when necessary. Following the third week of regular practice of mental techniques, athletes were instructed to continue practising the exercises in the same sequence during the fourth week. This process helped develop a consistent training routine for the athletes, encouraging them to practice MT techniques regularly before their technical training sessions. The specific MT exercises are described briefly below:

1) Day 1 (relaxation skill): On the first day of the third week, all athletes from the experimental group gathered on the field for a deep breathing exercise focused on relaxation skills. Athletes were advised to be well-hydrated and wear appropriate gear to ensure comfort. They stood in a line and were instructed to focus on their breathing. Athletes were then asked to observe the pace of their breaths, noting whether they were fast or slow, shallow or deep, rough or smooth, irregular or regular. Gradually, they were guided to focus on relaxing their muscles. The exercise began by directing the athlete's attention to their abdomen. They were instructed to take a long, deep breath, silently count to one, hold the breath briefly, and then exhale, allowing their bodies to relax. The same procedure was followed for other body areas, with athletes silently counting to 3 for the chest, 4 for the back, 5 for the upper legs, 6 for the lower legs, 7 for the upper arms, 8 for the lower arms, 9 for the neck and shoulders, and 10 for the face and forehead. The focus was brought to the entire body to feel the sensations. The session lasted 20 min, with instructions provided by the first author. Athletes were instructed to keep their eyes closed throughout the exercise. The session concluded with guidance to slowly open their eyes and continue breathing deeply, smoothly, and regularly.

2) Day 2 (self-talk): On the second day, the athletes gathered in a classroom under the supervision of the senior coach before their morning training session for a 45-minute total de-catastrophising exercise, part of the self-talk skill. Each athlete sat separately and received exercise handouts. The first author explained that the exercise addresses irrational thoughts that influence emotions. Athletes were guided to reflect on and answer questions like "What are you worried about?" and "If your worries come true, what's the worst that could happen?" The second part involved a thought log with sections for events, related thoughts, emotional and behavioural consequences, and an alternative response. This helped athletes document their self-talk and develop positive responses. Athletes were encouraged to

Table 1. Showing the detailed Specific Mental Skill Development Phase (SMSDP) of the program for two weeks based on Bacon's [52] mental skills model and Boutcher and Rotella's [49] framework for Closed Skill Sports (CSS)

Days	Mental skill	Exercises/ intervention	Duration	Delivery mode	Objectives	Target psychological variables
Day 1	Relaxation	Deep breathing Heil [78]	20 min	Instruction-based	To relax the mind and learn to regulate bodily sensations.	Well-being
Day 2	Self-Talk	De-catastrophising Thought record logging	45 min	Paper-pencil-based	To learn to reframe negative thoughts into positive thoughts and evaluate oneself realistically. To journal one's thoughts and acknowledge one current mindset and bodily sensations.	Motivation
Day 3	Concentration	Cueing	45 min	Paper-pencil and instructions-based	Learn to develop a quick pre-performance routine using words as 'prompts' to remind oneself to be focused and gain momentum in performance in a distracted environment.	Motivation
Day 4	Imagery	PETTLEP model-based exercise Holmes and Collins [80]	45 min	Instruction-based	To create a clear image of the training process in the mind and learn to reimagine oneself confidently in different scenarios.	Grit
Day 5	Energisation	Mindful Body Scan Carmody and Baer [81]	45 min	Instruction-based	To release any tension in the body and be aware of one's emotions during or post-performance and energise oneself with body awareness in case of performance fatigue and monotony.	Emotions
Day 6	Discussion					
Day 7	Day off					

For more details regarding the complete intervention program and activities, kindly contact the first author.

integrate the thought log into their daily sporting journals. The session ended after 45 min, and the forms were collected for use again in the fourth week of the GMSDP phase.

3) Day 3 (concentration skill): On the third day, athletes gathered on the field with their journals for a cueing exercise before their morning training session. They were instructed to write down cue words related to the movements involved in executing their technical skills. For example, shooters noted cues for each step of their routine, from standing at the shooting line to positioning their guns and body. This 15-minute exercise was followed by a 30-minute session where athletes applied these cues during their practice at the shooting lanes, aiming to enhance muscle memory and concentration by associating specific cues with performance rituals. The session concluded with a brief rest.

4) Day 4 (imagery skill): On day four, athletes participated in amotivation-guided imagery exercise conducted on the field under the supervision of the coach. The 45-minute session, led by the first author, involved seven key elements of imagery: physical, environment, task, timing, learning, emotion, and perspective. Athletes sat comfortably with their eyes closed and followed guided instructions, starting with imagining physical elements like equipment and gear and then visualising their competitive environment. They moved through each element, such as task (imagining specific actions like aiming), timing (envisioning pre-competition moments), and learning (reflecting on how they want to feel and motivate themselves). Athletes were also guided through emotional imagery with rhythmic breathing and were asked to observe their sensations. Finally, in the perspective element, they imagined themselves in

their sports setting and then as if watching a video of their performance. The session concluded with athletes slowly opening their eyes and resting for 10 min.

5) Day 5 (energisation skill): On day five, the athletes practised the energisation skill before their morning training sessions, supervised by the coach. The 45-minute session was conducted on the field, where the athletes stood in a large circle, with the first author delivering instructions from the centre. The session focused on the mindful body scan technique. Athletes were instructed to concentrate on physical sensations throughout their bodies, such as the feeling of their clothes, muscle tension, temperature, and any tingling sensations, without reacting to them. They began by taking slow, deep breaths while scanning their body from head to toe. Starting with the head, they progressively focused on the forehead, face, chest, back, arms, legs, and feet, paying attention to each area. The athletes then did a quick body scan to identify any discomfort. The session concluded with a gentle movement and a 10-minute rest period.

6) Day 6 (general discussion): On day six, a general discussion session for an hour was held before the morning training to gather feedback from the athletes and discuss their experiences with the MT exercises. On day seven, the athletes were given a rest day from both mental and technical training. The GMSDP phase process conducted during week 3 was repeated in the same sequence, with identical time durations and locations, during the fourth week. This was followed by post-assessments using the same scales administered for the pre-assessment.

Statistical analysis

The present study utilised within-group and between-group comparisons to assess the impact of the PCBP. Participants in the experimental group who received the PCBP intervention were compared to those in the control group who did not receive any intervention. All statistical analyses were conducted using SPSS software [55]. Initially, descriptive statistics were calculated to provide an overview of baseline demographics, including age, gender, and years of experience, with the means and standard deviations reported for both groups. The Shapiro–Wilk test was applied to assess the normality of the data and guide the selection of appropriate statistical methods for each variable [83]. Variables normally distributed were analysed using parametric tests, while non-parametric tests were employed for variables that deviated from normality. Within-group comparisons were conducted using paired *t*-tests for normally distributed variables such as excitement and intrinsic regulation. For non-normally distributed variables, such as dejection, anger, and non-regulation (amotivation), the Wilcoxon signed-rank test [83, 84] was employed to examine changes in pre- and post-intervention scores within each group.

Further, independent *t*-tests were used for between-group comparisons to assess differences in post-intervention scores between the experimental and control groups for variables that followed a normal distribution, such as PWB, excitement, and grit. Mann–Whitney *U* tests [85] were used to compare the two groups' post-intervention scores for variables with non-normal distributions, including dejection, anger, and external regulation. Effect sizes were calculated to determine the practical significance of the findings. Cohen's *d* [85] was used to calculate effect sizes for parametric data, while the rank-biserial correlation was computed for non-parametric data. Employing these multi-step statistical analysis approaches provided the study with a rigorous foundation for examining both within-group changes and between-group differences. Lastly, including effect sizes further improved the interpretation of the findings, highlighting the practical relevance of the observed changes in various sub-variables.

Results

Descriptive statistics

The study sample consisted of 60 participants in the experimental group and 62 participants in the control group. In the experimental group, the mean age was 19.7 years (SD = 5.88), and participants had an average of 3.05 years of experience (SD = 1.71). The control group had a mean age of 18.69 years (SD = 3.54), with an average of 2.75 years of experience (SD = 1.84). Gender distribution was balanced across both groups, ensuring comparability of demographic factors.

Normality check

The Shapiro–Wilk test for normality was conducted on the pre-intervention scores of all variables to determine the appropriate statistical tests for within-group and between-group comparisons. In the experimental group, pre-intervention scores of variables such as anxiety (p = 0.42) and excitement (p = 0.41) showed no significant deviation from normality, allowing for parametric tests. However, in pre-scores of variables such as dejection (p < 0.001) and anger (p < 0.001), significant deviations from normality were exhibited, neces-

sitating the use of non-parametric tests. In the control group, similar results were found, with pre-intervention scores of the control group in variables such as anger (p = 0.006) and PWB showing non-normal distributions. In contrast, pre-intervention scores of anxiety (p = 0.59) met the normality assumption.

Within-group comparisons

Both parametric (paired t-tests) and non-parametric (Wilcoxon Signed-Rank tests) analyses were used to examine changes in sub-variables of emotions, motivation, well-being, and grit within the experimental group. The intervention led to significant improvements in several sub-variables. Happiness showed a substantial increase post-intervention, as reflected in the paired t-test results ($t(59) = -4.086$, $p < 0.001$), indicating that the intervention positively impacted participants' state of happiness. SWB also improved significantly ($t(59) = -2.585$, p = 0.012), suggesting enhanced social bonding, interactions, and relationships. EWB followed a similar trend, with the Wilcoxon signed-rank test revealing a positive shift ($Z = -2.382$, p = 0.017). However, no significant changes were observed in excitement (t(59) = –1.697, p = 0.095), anxiety ($Z = -1.631$, p = 0.103), or anger ($Z = -0.005$, p = 0.996), indicating that the intervention did not affect these variables. Regarding motivation, intrinsic regulation increased significantly after the intervention (Z = –2.753, p = 0.006), highlighting a stronger internal drive and enthusiasm derived from personal satisfaction. Integrated regulation also showed a notable improvement (Z = –4.672, p < 0.001), suggesting a deeper alignment between personal values and sporting behaviours. Identified regulation improved significantly ($Z = -2.837$, p = 0.005), reflecting participant's greater recognition and conscious choice of their personal goals and giving importance to their daily activities. On the other hand, external regulation showed no significant change ($Z = -1.679$, p = 0.093), indicating that external motivators such as rewards or external pressures remained unaffected. A significant reduction was observed in non-regulation ($Z = -4.704$, $p < 0.001$), suggesting a decrease in amotivation among participants. Dejection also decreased significantly following the intervention ($Z = -3.252$, p = 0.001), indicating improved EWB. Although PWB showed a trend towards improvement, the change was not statistically significant ($Z = -1.717$, p = 0.086). Overall, the intervention successfully enhanced EWB and intrinsic motivation, although its effects on excitement, anxiety, anger, and external motivation were limited.

In the control group, fewer significant changes over time were observed, reflecting the natural stability in the absence of structured interventions. A significant decrease in anxiety was observed post-intervention ($Z = -2.131$, p = 0.033); however, no significant changes were found in dejection ($Z = -1.002$, p = 0.316) or excitement ($Z = -0.207$, p = 0.836), suggesting that the emotional states related to dejection and excitement remained unaffected. Further, in the context of anger, a significant increase was observed post-intervention (Z = –2.794, p = 0.005), indicating that anger levels rose throughout the study. Also, happiness did not show significant changes ($Z = -0.207$, p = 0.836), implying that the emotional tone related to joy and blissfulness in athletes in the control group remained largely stable. In the context of well-being, EWB ($Z = -0.505$, p = 0.614), SWB (Z = –0.564, p = 0.572), and PWB ($Z = -1.379$, p = 0.168) showed no significant changes within the control group, suggesting that well-being remained relatively consistent in this group.

In the context of motivation, intrinsic regulation showed a near-significant decrease ($Z = -1.872$, p = 0.061), while integrated regulation ($Z = -0.512$, p = 0.609) and external regulation ($Z = -1.521$, p = 0.128) did not change significantly. Identified regulation decreased significantly ($Z = -2.121$, p = 0.034), suggesting a reduction in the association and personal importance that participants placed on their sport and their involvement in sporting activities over time. No significant changes were observed in introjected regulation ($Z = -1.813$, p = 0.070) and non-regulation ($Z = -1.888$, p = 0.059), although these variables showed trends toward change that did not reach statistical significance. Finally, there was no significant change in grit level within the control group ($Z = -0.140$, p = 0.888), indicating that perseverance and passion for long-term goals remained consistent.

Between-group comparisons

To evaluate the overall effect of the intervention, between-group comparisons were conducted on post-intervention scores, using independent t-tests for normally distributed variables and Mann–Whitney U tests for non-normally distributed data. Significant differences were found between the two groups (see Figure 1) in all four normally distributed variables (excitement, SWB, PWB, and grit), highlighting the effect of the intervention on the experimental group (post-intervention scores). For excitement, the experimental group reported significantly higher scores compared to the control group ($t(120) = -4.435$, $p < 0.001$), with a mean

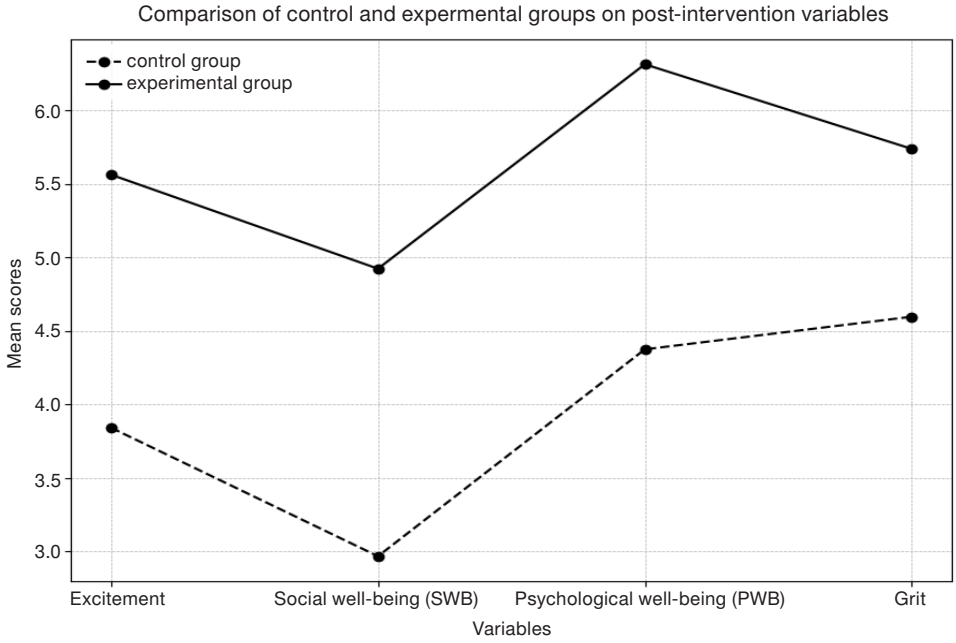

Figure 1. The following line graph illustrates the mean of post-scores of normally distributed variables of the experimental and control groups

difference of 1.72 (95% CI [0.95, 2.49]), indicating that the intervention led to increased excitement and eagerness in athletes. Further, a significant difference was also observed in SWB, with the experimental group showing higher SWB scores than the control group ($t(120) = -5.623$, $p < 0.001$), with a mean difference of 1.96 (95% CI [1.27, 2.65]). The findings suggest that the intervention positively impacted a participant's social relationships and interactions. Similarly, the experimental group reported significantly higher PWB scores compared to the control group ($t(120) = -5.807$, $p < 0.001$), with a mean difference of 1.94 (95% CI [1.28, 2.60]), reflecting an improvement in the overall psychological health of the participant. Lastly, grit scores were also significantly higher in the experimental group ($t(120) = -2.931$, $p = 0.004$), with a mean difference of 1.14 (95% CI [0.37, 1.92]), indicating that the intervention improved perseverance and passion for long-term goals among participants.

Further, the Mann–Whitney *U* test was conducted to compare the post-intervention scores between the experimental and control groups across well-being, emotions, and motivation sub-variables. The results showed significant differences between the groups in multiple areas. In the case of anxiety, the experimental group demonstrated significantly lower anxiety levels than the control group (Mann–Whitney $U = 1121.000$, $Z = -3.794$, $p < 0.001$) post-intervention, indicating that the intervention effectively reduced anxiety levels of athletes in the experimental group. Similarly, post-intervention dejection scores were significantly lower in the experimental group (Mann–Whitney $U = 1059.500$, $Z = -4.150$, $p < 0.001$), suggesting a reduction in dejection levels due to the intervention. Furthermore, post-intervention anger scores also showed a significant decrease in the experimental group compared to the control group (Mann–Whitney $U = 1017.500$, $Z = -4.349$, $p < 0.001$), reflecting better anger management and control post-intervention. Also, sub-variables such as happiness were reported to be significantly higher in post-intervention scores than in the control group (Mann–Whitney $U = 879.000$, $Z = -5.038$, $p < 0.001$), indicating that the intervention led to a noticeable increase in happiness levels and a sense of joy in athletes.

Additionally, a similar trend was observed in EWB, where the experimental group outperformed the control group (Mann–Whitney $U = 688.000$, $Z = -6.024$, $p < 0.001$), highlighting a significant positive shift in EWB post-intervention. In the case of motivation sub-variables, significant differences were found as intrinsic regulation was significantly higher in the experimental group (Mann-Whitney $U = 949.000$, $Z = -4.681$, $p < 0.001$), indicating that participants experienced an increase in internal motivation or zeal driven by personal enjoyment and satisfaction. Similarly, integrated regulation, which reflects alignment and balance between personal values and one's behaviour towards their tasks, was also significantly greater in the experimental group (Mann–Whitney $U = 944.000$, $Z = -4.707$, $p < 0.001$). Moreover, identified regulation, which involves recognising the importance of the task at hand, was notably higher in the experimental group (Mann–

Whitney $U = 808.500$, $Z = -5.402$, $p < 0.001$), reflecting a greater sense of personal importance attached to the activity athletes performed in their sporting scenario. In the case of introjected regulation, while the difference between the two groups was significant, it was relatively smaller (Mann–Whitney $U = 1437.000$, $Z = -2.175$, $p = 0.030$), suggesting a slight increase in motivation, driven by internal factors such as the desire to succeed or the sense of duty to perform at one's best, in the experimental group. However, there were no significant differences between the groups for external regulation (Mann–Whitney $U = 1707.500$, $Z = -0.783$, $p = 0.434$), suggesting that the intervention did not significantly affect motivation based on external rewards or pressures. Lastly, non-regulation (amotivation) showed a significant reduction in the experimental group (Mann–Whitney $U = 1207.500$, $Z = -3.388$, $p = 0.001$), highlighting a decrease in the lack of motivation post-intervention.

Effect sizes

The computation of effect sizes for the independent *t*-tests was conducted using Cohen's *d* to assess the magnitude of differences between the experimental and control groups. For post-intervention excitement scores, the effect size was $d = 0.8$, indicating a large impact of the intervention on excitement levels. Similarly, SWB showed a substantial positive effect, with $d = 1.02$. A large effect was also observed for PWB ($d = 1.05$), highlighting the intervention's strong influence on the athlete's psychological health. Similarly, grit moderately improved with a $d = 0.53$, reflecting enhanced perseverance and goal commitment. Additionally, Mann–Whitney *U* tests further revealed medium effects in reducing anxiety ($r = -0.34$), dejection ($r = -0.38$), and anger ($r = -0.39$) in the experimental group, while happiness ($r = -0.46$) and EWB ($r = -0.55$) showed significant increases. Motivation-related subvariables also showed meaningful changes, with intrinsic regulation ($r = -0.42$), integrated regulation ($r = -0.42$), and identified regulation ($r = -0.49$) being significantly higher in the experimental group. Non-regulation (amotivation) notably reduced ($r = -0.31$), although external regulation remained unchanged.

The overall results showed that the intervention greatly improved excitement, happiness, well-being, and grit while reducing negative emotions like anxiety and dejection. Increases in intrinsic motivation and decreases in amotivation highlight the program's effectiveness in fostering self-driven motivation and emotional strength. These results suggest that the PCBPs significantly enhanced grit, EWB, and motivational outcomes, providing clear benefits to the participant's mental health.

Discussion

Sports psychology experts have widely recognised the implementation of MT interventions as a critical practice for improving an athlete's performance and overall well-being. Such interventions facilitate self-regulatory practices, helping athletes enhance their sporting experience and adopt a competitive mindset. According to various studies, successful MT interventions are typically multimodal, integrating psychological techniques such as goal setting, relaxation, and imagination, which substantially impact the athlete's behaviour, performance, and well-being [10, 86]. In line with this research, the current study explored the effects of the PCBP intervention, aimed at enhancing the athlete's 'psychological capacity' where psychological capacity is "the potential of an individual to receive and retain information and knowledge or to function in mental or physical tasks" [87]. The PCBP intervention was designed to assess its impact on key psychological variables, including emotions, motivation, grit, and overall well-being. The findings of the present study reveal several significant insights into these variables.

1. Motivation: Motivation shapes athletic performance and drives the athlete's behaviours, thoughts, and emotions. According to SDT, motivation exists on a continuum from more autonomous forms to less autonomous ones, with more self-determined motivation leading to better performance and mental health outcomes [88]. The findings of this study demonstrate that the PCBP significantly influenced several forms of motivation, including intrinsic regulation, integrated regulation, identified regulation, and non-regulation. Intrinsic regulation improved, likely because the PCBP fostered internal satisfaction and a stronger sense of responsibility toward training, consistent with enhanced self-esteem and commitment [89]. Integrated regulation also showed significant improvement, indicating that athletes began aligning their personal goals with the demands of their sport, thus integrating their activities into their broader life goals. The increase in identified regulation suggests that athletes better understood the importance of their behaviours, recognising their relevance to their personal growth and performance outcomes. Moreover, the significant reduction in non-regulation highlights the intervention's ability to decrease amotivation, leading athletes to manage their efforts more purposefully. These results support

existing research, which underscores the role of motivation in shaping athletic behaviour and enhancing their enthusiasm to compete.

2. Emotions: Emotions play a critical role in the athlete's decision-making, performance, and overall functioning in personal and professional settings [90, 91]. They regulate responses to success and failure in competitive environments, making emotions a key factor in athletic success [92]. The present study found that the PCBP intervention significantly reduced dejection and increased happiness in the experimental group. The decrease in dejection, often linked to feelings of failure or disappointment, indicates a positive shift in the athlete's emotional state, supporting their motivation to compete. Moreover, the increase in happiness is significant, as happiness is closely associated with greater life satisfaction, which can enhance sports participation and foster stronger social connections [14].

Interestingly, a decrease in anxiety was also observed in the control group's post-intervention scores. Although the control group did not receive the intervention, this reduction may be attributed to self-reflection during participation, as completing the study questionnaires could have prompted athletes to reflect on their emotions and mental state. External factors such as personal life events or support from family and friends may also have contributed to the decrease in anxiety. Overall, the findings imply that implementing the intervention in the experimental group helped athletes recognise their self-worth and adopt a more optimistic outlook, contributing to a more positive and engaged training environment. A study by Vealey in 2007 [93] supports this by stating that MT programs are powerful tools for enhancing self-insight and emotional regulation, which are key to better decision-making, self-control, and emotional maturity in athletes [93, 94].

3. Well-being: The study also revealed significant improvements in EWB and SWB, demonstrating that athletes felt more connected to their peers and more satisfied with their environment. Enhanced EWB suggests that athletes developed greater emotional resilience and were better equipped to manage the emotional demands of their sport. Meanwhile, improvements in SWB reflect stronger integration within their athletic community and support networks, essential to mental health in sports. These findings are consistent with contemporary research, emphasising the importance of a holistic approach to an athlete's well-being, incorporating social, psychological, and physical dimensions [15, 86]. The present study reinforces the need for MT interventions beyond physical health and focuses on comprehensive athlete development.

4. Grit: Grit, defined as perseverance and passion toward long-term goals, is a critical attribute for success in sports, as it helps athletes overcome obstacles and maintain focus on their objectives [95]. The PCBP intervention significantly improved grit among participants, indicating that athletes developed greater resilience and determination to pursue their goals. This finding aligns with research suggesting that grit can be cultivated through structured training, goal-setting, and positive sporting experiences [31, 95]. The improvement in grit seen in this study underscores the potential for MT programs like the PCBP to foster long-term perseverance, a key factor in achieving success in competitive sports.

Thus, the study's findings indicate that the PCBP significantly improved the athlete's motivation, emotional regulation, well-being, and grit. By incorporating psychological techniques, the intervention helped athletes strengthen self-regulation and mental resilience, which are essential for both athletic performance and personal growth. These results support existing research on the importance of psychological interventions in promoting performance and holistic well-being in athletes.

Limitations

The present study had some methodological limitations that could impact the generalizability of the findings. First, the sample was restricted to athletes from Punjab and Haryana, specifically shooters and archers, limiting the applicability of the results to athletes from other regions or sports disciplines. The reliance on self-reported data also introduced the potential for bias, as participants may have underreported mental health concerns due to stigma, affecting the accuracy of the findings. Furthermore, the study lacked long-term follow-up, making it unclear whether the psychological improvements observed post-intervention are sustainable over time. Additionally, while the intervention focused on motivation and well-being, it did not address other important psychological strategies, such as self-esteem, resilience, or self-compassion, which could have broadened the scope of its impact. A notable limitation is a decrease in anxiety observed in the control group, which natural emotional fluctuations, the placebo effect of study participation, or external life factors may have influenced. Future studies should explore the placebo effect in control groups in greater detail to better isolate the true impact of interventions. Finally, although the sample size was sufficient for statistical analysis, it may not capture the full variability

within the broader athletic population. Future research with a larger, more diverse sample would enhance the reliability and applicability of these findings.

Conclusions

This study pioneers exploring psychological factors affecting target sports athletes in India. The PCBP intervention improved well-being, emotions, motivation, and grit but did not significantly impact anxiety, anger, excitement, or external regulation. Future research should expand on these findings to better understand and address the athlete's mental health in Indian sports, ultimately promoting well-being and reducing stigma.

Future recommendations

Given the stigma surrounding mental health in India [96–98], there is a growing need for licensed mental health professionals specialising in sports psychology. The findings of this study can contribute to the field by informing mental health policies, interventions, and support systems for athletes. Incorporating mental health support into training programs will be essential in addressing the athlete's psychological challenges and promoting their overall well-being. Recommendations for future research include:

Multimodal Interventions: It is important to design interventions tailored to the athlete's unique psychological and social environments to foster a more holistic understanding of their mental health [9].

Qualitative methods: Research in Indian sports should include self-report measures, observational studies, and action research to investigate each athlete's subjective experiences [14].

Psychoeducational interventions: Training programs that enhance an athlete's awareness using indigenous practices and psychoeducational approaches should be developed to address sports psychology challenges, particularly in regions where stigma is prevalent [45].

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Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Institutional Ethics Committee (IEC-Humans), Indian Institute of Technology (approval No.: IITRPR/IEC/2023/014) and was approved on 02/05/2023.

Informed consent

Informed consent has been obtained from all individuals included in this study.

Conflict of interest

The authors state no conflict of interest.

Disclosure statement

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