Structured Self-Talk Training and Competitive Outcomes in Adolescent Handball: Effects on Anxiety, Self-Efficacy, and Performance in a Quasi-Experimental Study

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Abstract

Competitive handball can be mentally and emotionally intense for adolescents, and the pressure to perform often increases anxiety and disrupts decision-making during matches. Although self-talk training is widely discussed as a practical way to improve focus and emotional control, there is still limited evidence of its impact in team-based youth sports such as handball. This study investigated whether a structured self-talk program could reduce competitive anxiety, boost self-efficacy, and improve performance in adolescent handball players. Using a quasi-experimental design, 48 male and female athletes aged 13–17 years were placed in either an intervention group or a comparison group that continued normal training. Over eight weeks, the intervention group practiced structured self-talk that blended instructional cues (to guide technique and tactical choices) with motivational cues (to sustain confidence and effort). These self-talk strategies were built directly into technical drills and match-like simulations so athletes could apply them under realistic competitive conditions. Competitive anxiety and self-efficacy were measured with validated sport psychology scales, while performance was evaluated using match statistics and coach-rated performance indices. Pre- and post-intervention outcomes were compared using mixed-design ANOVA, alongside effect sizes to judge practical impact. The self-talk group showed clear benefits compared with the comparison group. Both cognitive anxiety (worry and negative thoughts) and somatic anxiety (physical tension) decreased significantly, while self-efficacy increased, reflecting stronger belief in skill execution and coping under pressure. Performance also improved, including better pass success, more effective defensive actions, and higher overall coach ratings. Effects ranged from moderate to large. The program fit smoothly into regular practice with no reported adverse effects. Overall, structured self-talk appears to be a low-cost, workable strategy for improving psychological readiness and match performance in adolescent handball.

1. Introduction

Competitive adolescent handball places intense psychological demands on young athletes. Players are expected to make quick decisions, maintain concentration, regulate emotions, and cope effectively with performance pressure, often within seconds. The fast-paced and physical nature of the game, marked by frequent body contact and constant transitions between attack and defence, increases both cognitive load and emotional arousal during competition. For adolescents, these sport-specific demands are further shaped by developmental processes such as identity formation, sensitivity to social evaluation, and fluctuating self-confidence, all of which can amplify stress responses in competitive settings (Freeman, 2020; Latella & Haff, 2020). Consequently, young handball players are particularly vulnerable to elevated competitive anxiety, which may disrupt motor coordination, impair tactical decisions, and reduce overall performance if not well managed.

Within sport psychology, self-talk has long been recognised as a powerful tool for regulating thoughts, emotions, and behaviours during performance. Self-talk refers to the internal dialogue athletes use to interpret events, guide actions, and respond emotionally before, during, and after competition. Structured self-talk training typically involves the intentional use of instructional statements to support skill execution and decision-making, alongside motivational statements designed to build confidence and persistence (Akpan, Awe & Idowu, 2019; Ogundipe *et al.*, 2019).

For adolescent athletes, self-talk is especially important because cognitive regulation skills are still developing and external feedback from coaches, peers, and spectators can easily be internalised in unhelpful ways. When used effectively, self-talk can act as a psychological anchor, strengthening self-efficacy emotional control, and resilience under competitive pressure (Newland, Gitelson & Legg, 2020; Uphill, 2015).

Research has consistently shown that self-talk interventions improve both psychological and performance outcomes in individual sports such as athletics, tennis, and gymnastics. These studies report reductions in anxiety, increased confidence, and better task execution following structured self-talk training (Muwonge, Zavuga & Kabenge, 2015; Wilhelmsen & Sørensen, 2017). However, evidence from team sports remains comparatively limited, particularly in high-tempo games like handball that involve complex interactions, shared responsibility, and constant situational changes. Such environments may shape how athletes apply and experience self-talk strategies (Razon & Sachs, 2019; SU, 2020). Moreover, most existing studies focus on adult or elite athletes, leaving adolescent team sport populations underrepresented.

In adolescent handball specifically, quasi-experimental research examining the combined effects of structured self-talk on anxiety, self-efficacy, and competitive performance is scarce. Many interventions lack ecological validity due to short durations or laboratory-based designs that do not fully reflect match conditions (Corbally, Wilkinson & Fothergill, 2020; Olmedilla *et al*., 2019). In response, the present study investigates the effects of a structured self-talk training programme on competitive anxiety, self-efficacy, and performance among adolescent handball players. It is expected that athletes receiving the intervention will show reduced anxiety, stronger self-belief, and improved performance compared with controls, contributing practical and developmentally relevant insights into psychological preparation in youth team sports (Kunnuji *et al*., 2017; Mukoro, 2017).

2. Methodology

This study used a quasi-experimental pretest–posttest control group design to find out whether structured self-talk training could improve competitive anxiety, self-efficacy, and performance in adolescent handball players. This approach was chosen because, in real sport settings, it is often difficult to randomly assign athletes to groups without disrupting team arrangements, coaching plans, and training schedules. The study was conducted in an applied, real-world environment that reflects how youth handball is typically organized.

Participants were recruited from secondary school and community handball teams and included both male and female athletes aged 13 to 18 years who were actively training and competing. At the start, 68 athletes indicated interest in taking part. They were then screened to ensure they met the study requirements and could participate safely. To be included, athletes needed at least one year of playing experience, consistent training attendance, and no injury or medical condition that could affect training or competition. After screening, 60 athletes met these criteria and were enrolled in the study. Ethical approval was obtained from the appropriate institutional body, and written consent was secured from both the athletes and their guardians.

Baseline assessment took place one week before the intervention began. Athletes completed standardized sport psychology questionnaires measuring competitive anxiety and self-efficacy. Performance at baseline was captured using match statistics and coach-rated performance evaluations, providing both objective and applied indicators of handball performance. These tools were selected because they are widely used, have acceptable validity and reliability for adolescent athletes, and reflect the technical and psychological demands of competitive handball. Baseline comparisons were also conducted to check that the two groups were broadly similar before the training started.

Participants were then placed into either an intervention group or a control group using team-based allocation rather than random assignment, to maintain training flow and team cohesion. Each group included 30 athletes. Over eight weeks, the intervention group completed a structured self-talk program embedded into their normal handball training sessions. The program combined instructional self-talk aimed at improving technique and tactical decisions, with motivational self-talk designed to build confidence, support emotional control, and sustain effort under pressure. Athletes were guided to become more aware of their internal dialogue, develop personalized cue words and short phrases, and apply them during drills and competitive simulations. The control group continued with standard training and did not receive any structured psychological skills training.

Post-intervention assessment was completed within one week after the program ended, using the same measures and procedures applied at baseline. Data were analyzed using descriptive statistics and mixed-design ANOVA to evaluate changes over time within groups and differences between groups. Effect sizes were calculated to show the practical importance of observed changes. Statistical assumptions were checked before running inferential tests, and the level of significance was set at $p < .05$. This approach allowed the study to evaluate the impact of structured self-talk training in a way that was both methodologically sound and realistic for youth sport settings.

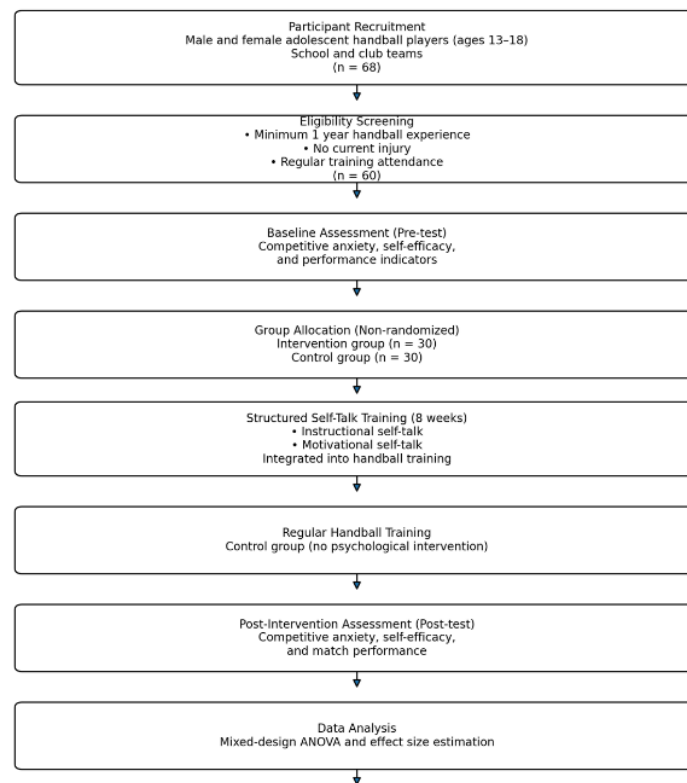**Methodological Flowchart: Structured Self-Talk Training in Adolescent Handball (Quasi-Experimental Study)**

Participant Recruitment
Male and female adolescent handball players (ages 13–18)
School and club teams
(n = 68)

Eligibility Screening
• Minimum 1 year handball experience
• No current injury
• Regular training attendance
(n = 60)

Baseline Assessment (Pre-test)
Competitive anxiety, self-efficacy,
and performance indicators

Group Allocation (Non-randomized)
Intervention group (n = 30)
Control group (n = 30)

Structured Self-Talk Training (8 weeks)
• Instructional self-talk
• Motivational self-talk
Integrated into handball training

Regular Handball Training
Control group (no psychological intervention)

Post-Intervention Assessment (Post-test)
Competitive anxiety, self-efficacy,
and match performance

Data Analysis
Mixed-design ANOVA and effect size estimation

Fig 1: Flowchart of the study methodology

2.1. Theoretical and Empirical Background

Structured self-talk training is supported by a strong base of psychological theory and research showing that an athlete's inner dialogue is one of the main ways they manage thoughts, emotions, and actions in high-pressure situations. In youth sport, this matters even more because psychological skills are still forming and emotional reactions to competition can be intense and unpredictable. Adolescent handball, in particular, creates a demanding mental environment. It is fast, physical, and constantly changing, with players needing to switch quickly between attacking and defending while also coordinating decisions with teammates. In this kind of setting, self-talk can play an important role in helping athletes manage anxiety, sustain confidence, and perform more consistently (O'Brien, et al., 2020, Vaz, et al., 2015).

Much of the thinking behind self-talk comes from cognitive-behavioral theory, which argues that thoughts shape emotions and guide behavior. From this perspective, self-talk acts as a "middle link" between what an athlete faces in competition and how they respond. When self-talk becomes negative through self-doubt, fear of failure, or catastrophic thinking it can increase anxiety and disrupt attention. When it is constructive and purposeful, it can support calmness, sharpen focus, and improve execution of skills (Bühlmayer, et al., 2017, Hill, Mallinson-Howard & Jowett, 2018). In sport, this framework helps explain why athletes who learn to challenge unhelpful thoughts and replace them with useful cues often perform better under pressure. For adolescents, whose attention and emotional control systems are still maturing, structured self-talk offers a simple and practical way to manage what is happening internally during competition.

Self-talk is commonly described as either instructional or motivational, and each type supports performance in different ways. Instructional self-talk helps athletes concentrate on task-specific cues how to position the body, execute a technique, or make a tactical decision which is essential in a sport as complex and rapidly changing as handball. Motivational self-talk is more about effort, confidence, and emotional control, helping athletes stay composed, bounce back after mistakes, and persist when the game becomes difficult (Hutzler, et al., 2019, Nketsia, 2017). The dual-process view adds that self-talk can work through both automatic and deliberate pathways, shaping performance by improving attentional focus and managing arousal levels. For invasion sports, where athletes must continuously balance thinking and movement, combining instructional and motivational self-talk may be especially helpful (Boellstorff, et al., 2012, Lukaszewicz, 2020).

Anxiety regulation theory also provides a useful lens for understanding why self-talk can be effective in competitive sport. Competitive anxiety in young athletes is often described as having two parts: cognitive anxiety (worry, negative expectations, distraction) and somatic anxiety (physical symptoms of arousal). The multidimensional anxiety theory and processing efficiency theory suggest that when cognitive anxiety becomes too high, it reduces performance because it uses up working memory and interferes with attentional control (Brogden & Kennedy, 2018, Zwangobani, 2016). In this context, self-talk is believed to help by changing how athletes interpret pressure, shifting attention back to controllable actions, and strengthening feelings of control. In adolescent handball, where decisions must be made quickly under time pressure and defensive challenge, this kind of mental reset can be the difference between confident execution and hesitation, technical mistakes, or poor tactical choices.
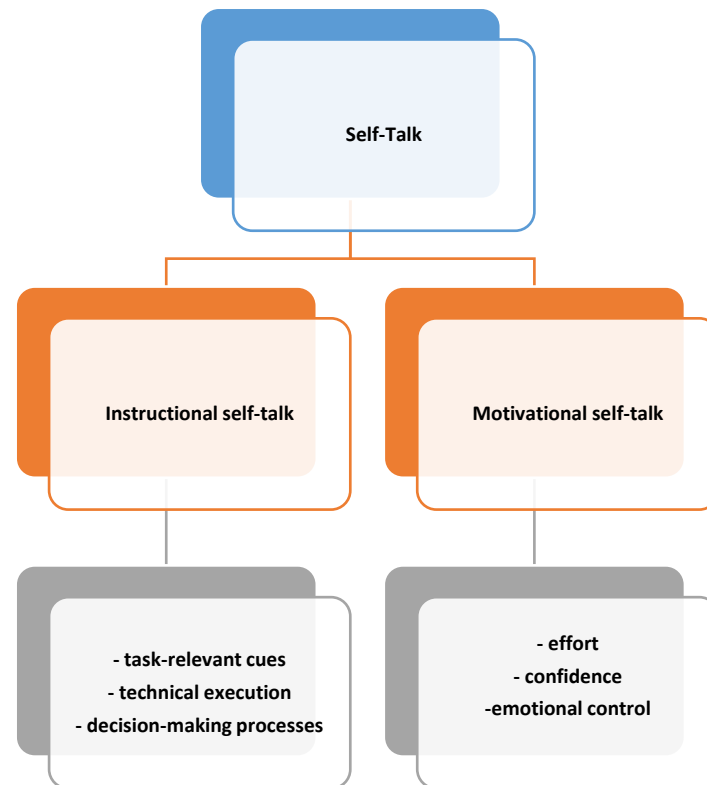
Fig 2: Categories of Self Talk

Empirical studies in youth sport consistently show that self-talk interventions can help young athletes manage pressure more effectively, especially by reducing cognitive anxiety and improving emotional regulation. When athletes are taught to notice negative inner dialogue and replace it with positive or task-focused statements, they often report feeling less nervous before competition and more composed during performance. These benefits may be even stronger for adolescents, who commonly experience intense worry about being judged, making mistakes, or letting others down (Onukwugha, *et al*., 2020, van Zijl Drive & Cape, 2017). In team sports, anxiety is not only an individual experience it can spread through team interactions, coaching feedback, and collective reactions to errors. That is why internal regulation strategies like self-talk can be especially valuable. Even so, despite the broader evidence, research that specifically tests self-talk as an anxiety-management tool in handball particularly using controlled or quasi-experimental designs remains limited (Jones, 2017, Kansanga, 2020).

Self-efficacy theory offers another useful lens for understanding why self-talk can influence competitive outcomes. Social cognitive theory describes self-efficacy as a person's belief in their ability to organize and carry out the actions needed to achieve a goal. In sport, this belief strongly shapes effort, persistence, emotional reactions, and performance under pressure. Self-talk can influence self-efficacy by shaping how athletes interpret their competence, reinforcing feelings of mastery, and helping them respond more constructively to success or failure (Hill-Herndon, *et al*., 2019, Kennedy & Lee, 2018). This is particularly relevant for adolescent athletes, who are still building confidence and are often highly influenced by feedback, comparisons with peers, and social approval.

Across youth sport settings, structured self-talk interventions have been shown to strengthen self-efficacy. Athletes who learn to use affirming, mastery-oriented statements often report greater confidence in their skills and decision-making, which then supports more decisive and adaptive performance. In invasion games, self-efficacy is not just about personal skill it also includes confidence in understanding tactics, fulfilling a role, and contributing to team success. Handball players, for example, must believe they can execute under pressure, communicate clearly, and adjust quickly to changing situations. Self-talk that reinforces role clarity, readiness, and situational confidence may therefore be especially helpful in this setting (Despres-Bedward, 2019, Silk, Andrews & Thorpe, 2017).

Ultimately, performance outcomes are where the combined effects of self-talk, anxiety regulation, and self-efficacy become most visible. Models of performance regulation suggest that athletes perform best when attention, emotional arousal, and confidence are well matched to the demands of the moment. Self-talk helps maintain that balance, especially after mistakes or during high-pressure phases of a match. In a sport like handball, performance is multidimensional it involves technical execution, tactical decision-making, and effective teamwork making it an ideal context for understanding how cognitive strategies like self-talk operate in real competitive environments (Adogu, 2015, Oluwaseyi, 2019).

Studies that have looked at self-talk and performance in team sports are encouraging, but the results are not always consistent. Research across sports like soccer, basketball, and hockey suggests that structured self-talk can help athletes think and act faster, make more accurate decisions, and earn better overall performance ratings especially when the strategy is practiced regularly within normal training sessions and match routines. The challenge is that many of these studies focus on adult or elite athletes, run for a short period, or depend heavily on athletes' own ratings of how well they performed rather than objective indicators. As a result, there are still relatively few adolescent-focused, quasi-

experimental studies that examine both psychological outcomes and real performance outcomes at the same time in invasion games. Handball, despite being widely played and

highly demanding, appears far less often in the self-talk literature, leaving a clear gap in sport-specific evidence (Centeio, *et al*., 2020, Ozer, *et al*., 2020).
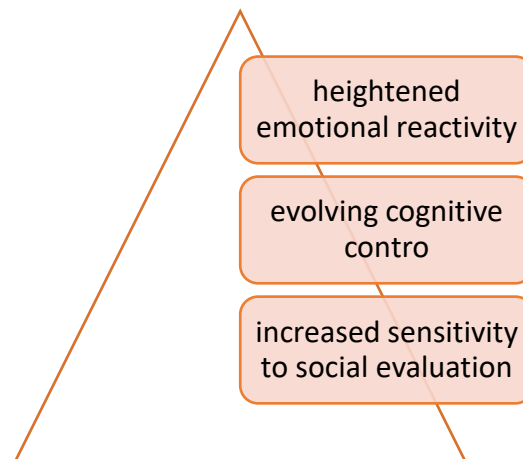

Fig 3: Factors can intensify competitive anxiety in adolescence

The adolescent context also deserves special attention. Adolescence is a transition stage where emotions can be intense, self-control skills are still developing, and young people are often highly sensitive to criticism, comparison, and public evaluation. These realities can make competition feel more stressful and can increase anxiety, particularly in fast-paced team sports where mistakes are visible and can affect the whole group. At the same time, this developmental period may be one of the best times to introduce psychological skills training. Structured self-talk at this stage may not only support better performance in the short term but also help athletes build stronger self-regulation habits skills they can carry into other areas of life such as school, relationships, and future work settings (Poitras, *et al*., 2016, Smedegaard, *et al*., 2016).

Overall, both theory and existing evidence point to structured self-talk as a practical way to improve anxiety control, strengthen self-efficacy, and support performance in youth sport. Yet the specific realities of invasion team sports like handball combined with the unique developmental features of adolescent athletes remain underexplored. A quasi-experimental study focused on adolescent handball players therefore offers a valuable opportunity to deepen understanding, fill important evidence gaps, and provide sport-specific guidance for coaches and practitioners working with young athletes (Adenrele, 2015, Kadijat, 2015).

2.2. Intervention: Structured Self-Talk Training Program

The structured self-talk training programme used in this quasi-experimental study was purposefully developed to help adolescent handball players manage competitive anxiety, build stronger self-efficacy, and perform more consistently under pressure. It was based on established sport psychology principles but also shaped around the real demands of adolescent handball fast decisions, emotional swings, physical contact, and constant shifts between attack and defence. A key goal was to keep the programme developmentally appropriate, easy to understand, and easy to use in real training, so it could fit naturally into normal practice routines and still feel realistic and meaningful for the athletes (Greenspan, *et al*., 2019, Vaquero-Solís, *et al*., 2020). The intervention focused on helping athletes become more

aware of their self-talk, understand how it affects performance, and learn how to use it deliberately during training and matches. In the early sessions, athletes were introduced to self-talk as the "inner voice" that influences emotions, confidence, attention, decision-making, and motor execution especially in high-pressure moments. They were encouraged to reflect on the negative or unhelpful statements they typically experienced, such as fear of making mistakes, self-doubt after an error, or worry before key match moments. These reflections were then used to guide cognitive restructuring, where athletes learned to replace maladaptive self-talk with more constructive, performance-supportive statements that matched their goals and the demands of the game (Rafferty, *et al*., 2016, Rose & Soundy, 2020). A clear distinction was maintained between instructional self-talk, which targets technical and tactical cues, and motivational self-talk, which supports confidence, effort, persistence, and emotional control.

Instructional self-talk was carefully adapted to handball-specific skills and decisions. Athletes created short cue words or phrases linked to performance targets such as footwork, shooting mechanics, defensive stance, passing accuracy, scanning for teammates, and transition speed. These cues were intentionally brief so they could be recalled quickly during intense play, and they were designed to direct attention to controllable actions rather than outcomes. Motivational self-talk was designed to strengthen self-belief, composure, and resilience, particularly after mistakes or during emotionally charged phases of play. Athletes practiced statements that reinforced confidence, calmness, and persistence, as well as phrases that reflected shared responsibility and teamwork an important feature of handball performance (Amholt, *et al*., 2020, Cilar, *et al*., 2020).

The programme lasted eight weeks, matching a typical competitive training cycle for adolescent handball teams. Athletes completed one structured self-talk session each week (about 30–40 minutes), supported by continued reinforcement during regular handball practices. This longer duration was intentional, allowing athletes time to learn the skill gradually, practise it repeatedly, and begin to internalize it rather than treating it as a short-term motivational boost. The programme was delivered in phases, guiding athletes from basic awareness to increasingly automatic and context-

specific use of self-talk during drills, simulations, and competition situations (Kunnuji, 2018, Shiffman, *et al*., 2018).

Delivery of the intervention was led by a researcher with sport psychology training, working closely with the coaching staff to keep the psychological messages consistent with the technical and tactical coaching goals. This partnership helped ensure that athletes were not receiving mixed signals for example, being coached to "stay composed and follow the cue" while technical feedback pushed them in a different direction. The early sessions were delivered in small groups to promote discussion, reflection, and shared learning, while later sessions shifted toward more individualized self-talk plans. Athletes were encouraged to tailor their statements to their positional demands, personal strengths, and common performance challenges. At the beginning, written self-talk scripts and cue cards served as practical learning tools, but these supports were gradually reduced so that athletes could internalize the strategy and use it more naturally in real time (Safieh, 2019, Sommer & Mmari, 2015).

Fig 4: Athletes key performance elements

A major strength of the programme was the way self-talk training was built into normal handball practice rather than treated as a separate add-on. Self-talk cues were embedded within technical drills, tactical exercises, and conditioning routines. For instance, during shooting drills, athletes were prompted to apply brief instructional cues immediately before execution, while motivational self-talk was encouraged after missed shots or during high-fatigue sequences. Coaches reinforced the approach by using short reminders and prompting athletes to rehearse cues silently or out loud during training. This design supported transfer, helping self-talk move from a "training concept" to a usable skill within dynamic practice conditions (Walker-Stevenson, 2017, Xu, *et al*., 2020).

Competitive simulations were used to close the gap between practice and match demands. Sessions included modified game situations that reproduced real stressors such as time pressure, score deficits, and high-stakes decisions. Within these scenarios, athletes practiced applying self-talk in the moment and then took brief reflection breaks to evaluate what worked and what needed adjustment (Awe & Akpan, 2017, Isa, 2019). These simulated conditions allowed athletes to experience anxiety responses safely, rehearse coping strategies, and strengthen the practical value of self-talk for maintaining focus and confidence. Strong emphasis was placed on recovering quickly after mistakes and keeping internal dialogue constructive even when performance fluctuated (Chung, Kim & Lee, 2018, Keogh, *et al*., 2018).

Monitoring and reflection were used throughout the intervention to support learning and ongoing improvement. Athletes completed short reflection logs describing when they used self-talk, how it affected anxiety and confidence, and what difficulties they encountered. These logs guided adjustments to individual self-talk strategies and helped facilitators respond to common barriers. Group discussions also gave athletes a chance to share experiences and normalize the fact that psychological skills take time to develop, strengthening a supportive team climate where learning was encouraged rather than judged (Akpan, *et al*., 2017, Oni, *et al*., 2018, Isa, 2020).

The programme intentionally balanced instructional and motivational self-talk to match the full range of demands in adolescent handball. Instructional self-talk was emphasized during skill execution and tactical decision-making, where precision and attentional focus are critical. Motivational self-talk was prioritized during emotionally challenging moments such as intense pressure, physical fatigue, or performance setbacks when confidence can drop and anxiety can rise. Athletes were trained to shift flexibly between these two forms depending on what the situation required, supporting adaptive self-regulation rather than rigid repetition of scripted phrases (Pradhan, Wynter & Fisher, 2015, Yakubu & Salisu, 2018).

Overall, the structured self-talk intervention was designed to be realistic, sustainable, and easy to scale within adolescent handball programmes. By embedding psychological skills into existing training structures, emphasizing personalization and reflection, and using match-like simulations, the programme aimed to produce meaningful and transferable improvements in anxiety regulation, self-efficacy, and performance. This integrated approach aligns with contemporary recommendations in youth sport psychology, which emphasize contextually grounded and developmentally appropriate interventions that support both performance and psychological well-being in young athletes (Akomea-Agyin & Asante, 2019, Awe, 2017, Osabuohien, 2019).

2.3. Measures and Data Collection Procedures

The measures and data collection procedures for this quasi-experimental study were planned carefully to capture the full range of effects that structured self-talk training can have on adolescent handball players psychologically and competitively. Because sport performance is shaped by multiple factors at once, and because adolescents are still developing key psychological skills, the study prioritized instruments that are well established, reliable, and appropriate for youth participants. At the same time, the procedures were designed to be realistic within a team-sport setting, so data could be collected without disrupting training or competition routines. Importantly, all data collection steps were standardized for both the intervention and control groups to support fairness, reduce bias, and strengthen internal validity (Fantaye, *et al.*, 2020, Ivanova, *et al.*, 2020).

Competitive anxiety was assessed using a widely validated sport-specific self-report scale that captures both cognitive and somatic anxiety, alongside self-confidence as a closely related competitive construct. This multidimensional approach made it possible to measure worry, concentration disruption, and physiological arousal linked to competition. The instrument has been used extensively in youth sport settings and is known for strong psychometric performance, including acceptable internal consistency and sound construct validity across different sports. To support adolescent comprehension, the wording was age-appropriate, and athletes responded on a Likert-type scale indicating the intensity of their experiences. In this study, internal reliability values met or exceeded recommended thresholds, supporting its suitability for tracking anxiety changes over time (Forrester, *et al.*, 2018, Lall, *et al.*, 2019).

Self-efficacy was measured with a sport-specific scale designed for team-based performance contexts. It assessed athletes' confidence in executing technical skills, making tactical decisions, coping under pressure, and contributing meaningfully to team success during competition. The items reflected social cognitive theory and were aligned with the performance demands of handball. The scale has demonstrated strong content validity through expert review and has shown satisfactory reliability in youth sport research. Before administration, items were reviewed for handball relevance, and minor wording adjustments were made to improve contextual fit without changing the underlying constructs. Reliability analysis within the sample showed high internal consistency across assessment points (Mugendawala & Muijs, 2020, Salifu, *et al.*, 2019).

Performance was assessed using both objective and subjective indicators to reflect the complex nature of handball performance. Objective indicators included match statistics such as successful passes, shooting accuracy, turnovers, defensive actions, and playing time, drawn from official records and standardized observation sheets. These provided quantifiable evidence of competitive performance. To complement these data, coach-rated performance evaluations were used to capture tactical awareness, decision quality, and overall effectiveness dimensions that are not always fully represented by statistics alone. Coaches rated performance using a structured scale with clear criteria to reduce subjectivity and improve rating consistency. Coaches were trained on the tool before data collection to enhance reliability (Hayes & Bulat, 2017, Kiberu, Mars & Scott, 2017).

Validity was a central consideration throughout the measurement strategy. Psychological instruments were selected because they are widely accepted in sport psychology and have been validated in adolescent populations, supporting content validity. Construct validity was strengthened by the close alignment between the measured variables and the study's conceptual framework linking self-talk, anxiety regulation, self-efficacy, and performance. For performance assessment, combining match statistics with coach ratings provided triangulation, improving criterion-related validity and offering a more complete picture of competitive outcomes (Akuma, 2017, Nketsia, Saloviita & Gyimah, 2016).

Data collection followed a structured timeline consistent with the intervention design. Baseline assessments were conducted one week before the structured self-talk program began. Athletes completed the anxiety and self-efficacy questionnaires in a quiet group setting under researcher supervision, with instructions delivered uniformly. Baseline performance data were taken from match records corresponding to fixtures within the same period, ensuring comparability between groups before training started.

Post-intervention assessments were conducted within one week of completing the eight-week program. The same psychological measures were re-administered using identical procedures to minimize measurement error. Performance data were collected from matches played during the final phase of the intervention to align competitive outcomes with the period when self-talk skills were being practiced most intensively. Where possible, performance indicators were aggregated across multiple matches to reduce the influence of one-off events or unusual match conditions (Burgers, 2017, Harerimana & Mtshali, 2018).

Ethical and procedural safeguards were observed throughout. Participants and guardians were informed about the study purpose, confidentiality, and the right to withdraw at any time. To reduce social desirability effects, athletes were told that coaches would not have access to identifiable questionnaire responses. Researchers supervised questionnaire administration to clarify instructions and ensure independent responding, but they did not provide feedback that could influence answers.

Reliability was supported through consistent administration protocols, standardized instructions, and use of the same tools at both time points. For coach ratings, consistency checks and periodic review of inter-rater agreement were used to maintain stable scoring. Data were checked for completeness and accuracy prior to analysis, and missing values were managed using established procedures appropriate for quasi-experimental studies (Gallicchio, Cooke & Ring, 2017, Jing, 2016).

Overall, the measurement and data collection approach was designed to provide a strong and balanced assessment of structured self-talk training in adolescent handball. By combining validated psychological instruments with objective match statistics and structured coach ratings, and by aligning data collection timing with the intervention schedule, the study aimed to generate reliable and meaningful evidence on how self-talk supports anxiety regulation, strengthens self-efficacy, and improves competitive performance in a realistic team-sport youth setting.

2.4. Data Analysis and Statistical Procedures

The data analysis and statistical procedures for this quasi-experimental study were designed to carefully and

transparently evaluate the effects of structured self-talk training on competitive anxiety, self-efficacy, and performance outcomes among adolescent handball players. Given the use of an intervention group and a control group assessed at two time points, the analytical strategy focused on methods capable of capturing both changes within individuals over time and differences between groups that could reasonably be attributed to the intervention. All analyses were conducted using standard statistical software commonly employed in sport science and behavioral research, with decisions guided by established analytical conventions and prior methodological recommendations (Alexander, 2018; Husband, 2018).

Before inferential testing, the dataset was screened to ensure accuracy, completeness, and suitability for parametric analysis. Descriptive statistics, including means, standard deviations, and ranges, were calculated for all variables at baseline and post-intervention to provide an overview of distributions and initial group comparability. Data were examined for missing values, outliers, and potential entry errors. Where missing data were identified, their patterns were assessed to determine whether they occurred at random, and appropriate handling procedures were applied to minimize bias while retaining statistical power. Outliers were evaluated in relation to theoretical plausibility and potential measurement error before decisions were made regarding their retention or exclusion (Baker, 2019; Predoiu *et al*., 2020).

The primary inferential analyses were conducted using mixed-design analysis of variance (ANOVA), also referred to as split-plot ANOVA. This technique was selected because it allows for simultaneous examination of a within-subject factor time (pre-intervention versus post-intervention) and a between-subject factor group (intervention versus control). Separate mixed-design ANOVAs were performed for each dependent variable: competitive anxiety, self-efficacy, and performance outcomes. The central focus of these analyses was the time × group interaction effect, as a significant interaction would indicate that changes over time differed between the intervention and control groups, consistent with the hypothesized effect of structured self-talk training (Hernández-Mendo *et al*., 2020; Maher, 2020).

For competitive anxiety, mixed-design ANOVAs were conducted on overall anxiety scores and on relevant subcomponents where applicable. Significant interaction effects were interpreted as evidence that self-talk training contributed to changes in anxiety regulation beyond those associated with regular training or the passage of time. Similar analytical procedures were applied to self-efficacy, examining whether confidence-related beliefs changed differently across groups following the intervention. Performance outcomes, derived from both objective match statistics and coach-rated evaluations, were analyzed using the same mixed-design framework, allowing psychological and behavioral outcomes to be interpreted within a unified analytical structure (Brinthaupt & Pennington, 2019; Vezzosi, 2017).

Where significant main or interaction effects were detected, post hoc analyses were conducted to clarify the direction and nature of these effects. Pairwise comparisons with appropriate adjustments for multiple testing were used to examine within-group changes from pre- to post-intervention and between-group differences at each time point. These analyses provided a more detailed understanding of how and

where the intervention exerted its influence.

Effect size estimation formed a core component of the analytical strategy, complementing traditional significance testing. Given the applied focus of youth sport research and the relatively modest sample sizes typical of team sport studies, effect sizes were essential for evaluating the practical importance of observed changes. Partial eta squared values were reported for ANOVA effects to indicate the proportion of variance explained by time, group, and their interaction. For pairwise comparisons, standardized mean difference indices were calculated to support interpretation of the magnitude of intervention effects (Fasina, 2019; Mekonnen *et al*., 2018). Effect sizes were interpreted using established benchmarks, while also considering their relevance in real competitive sport contexts.

Assumptions underlying mixed-design ANOVA were systematically examined prior to interpreting results. Normality of residuals was assessed using graphical methods and statistical tests, while homogeneity of variance between groups was evaluated to ensure comparable variability across conditions. With only two time points, the assumption of sphericity for the within-subject factor was inherently satisfied. Where minor deviations from assumptions were identified, the robustness of ANOVA to such violations was considered and findings were interpreted with appropriate caution (Abayomi *et al*., 2020; Ibrahim *et al*., 2019).

Reliability analyses were also incorporated into the analytical process. Internal consistency coefficients for psychological measures were calculated at each assessment point to confirm stability of the constructs over time. For performance measures involving coach ratings, inter-rater reliability was reviewed where applicable to strengthen confidence in subjective evaluations.

To enhance interpretive clarity, confidence intervals were reported alongside key estimates, providing information about the precision and practical range of observed effects. Confidence intervals that did not cross zero were interpreted as offering stronger evidence of meaningful change (Adedoyin, 2017; Pathak *et al*., 2017).

Given the quasi-experimental design, baseline equivalence between the intervention and control groups was examined prior to outcome analysis. Independent samples comparisons at pre-intervention confirmed that groups did not differ significantly on key variables, strengthening causal interpretation of post-intervention differences.

Overall, statistical findings were interpreted in relation to theoretical expectations and the broader empirical context, with emphasis placed on consistent patterns across anxiety, self-efficacy, and performance outcomes rather than isolated results. In summary, the data analysis strategy combined methodological rigor with applied relevance, enabling a robust evaluation of how structured self-talk training influences psychological regulation and competitive performance in adolescent handball (Munthali *et al*., 2018; Okolosi, 2020).

2.5. Results: Psychological and Performance Outcomes
The findings from this quasi-experimental study show that structured self-talk training produced meaningful psychological and performance benefits for adolescent handball players. When the intervention and control groups were compared across pre- and post-intervention assessments, the patterns of change were clearly different in competitive anxiety, self-efficacy, and competitive

performance. Overall, the results support the idea that deliberate cognitive regulation strategies can strengthen both mental readiness and on-court outcomes in team-based youth sport (Jimoh, 2016, Suleiman, *et al.*, 2018).

In relation to competitive anxiety, the intervention group recorded a statistically significant reduction in overall anxiety from pre- to post-intervention, while the control group showed no meaningful change during the same period. The reduction was driven mainly by decreases in cognitive anxiety worry, negative expectations, and concentration disruption during competition. Athletes who received the self-talk training described being better able to manage intrusive thoughts and remain focused during high-pressure moments such as fast breaks, penalty throws, and late-game situations. Somatic anxiety indicators, such as perceived physical tension and heightened arousal, also declined modestly in the intervention group, although the reduction was smaller than the change observed in cognitive anxiety (Chukwurah, Nwadiani & Ngwoke, 2018, Momoh, 2017). In contrast, the control group maintained largely stable anxiety patterns, suggesting that normal training alone did not deliver the same anxiety-regulation gains. Practically, the improvement is important because even moderate reductions in cognitive anxiety can support sharper attention and better decision-making in fast-paced invasion sports.

Self-efficacy results further confirmed the psychological value of structured self-talk training. Athletes in the intervention group showed a significant increase in sport-specific self-efficacy after the program, while the control group remained largely unchanged. After the intervention, trained athletes reported stronger confidence in executing technical skills under pressure, making sound tactical decisions, and contributing positively to team outcomes. These improvements were reflected across key dimensions such as confidence in shooting accuracy, defensive positioning, and communication with teammates (Adebayo, 2018, Deemuai & Nwankwo, 2018). This matters in real competition because self-efficacy is closely linked to effort, persistence, emotional control, and the willingness to engage fully even after mistakes. Athletes with stronger self-efficacy were more likely to attempt challenging plays, recover quickly from errors, and remain engaged throughout matches behaviours that are particularly critical in adolescent handball.

Notably, the pattern suggests that reduced anxiety and stronger self-efficacy worked together rather than operating separately. Athletes who felt more confident also described feeling more composed and in control under pressure, implying that structured self-talk supported a healthier psychological state marked by confidence-based regulation rather than anxiety-driven avoidance. This fits well with theoretical expectations that effective self-talk can reduce unhelpful thought patterns while strengthening positive performance beliefs.

Performance outcomes provided additional evidence of the intervention's practical value. Objective match indicators showed that the intervention group improved significantly in several key areas after self-talk training. Athletes demonstrated better shooting accuracy, higher successful pass completion, and stronger defensive actions, alongside fewer unforced errors and turnovers. Improvements were especially noticeable in areas that demand quick decision-making and sustained concentration, such as offensive transitions and defensive recovery (Abdulraheem &

Ibraheem, 2019, Okebukola, 2017). The control group, by contrast, showed relatively stable performance patterns, with small fluctuations that did not amount to statistically or practically meaningful change.

Coach-rated performance evaluations supported the match-statistics findings. Coaches rated the intervention group higher at post-intervention in tactical awareness, composure under pressure, and overall effectiveness compared with baseline. Coaches also observed improved emotional responses after mistakes, with trained athletes showing quicker recovery and sustained engagement. These observations align with the intended function of motivational self-talk in strengthening resilience and emotional control. In competitive handball, where games can be decided by a few key moments, even modest gains in decision quality and emotional steadiness can meaningfully influence outcomes (Abubakar, 2020, Ekuri & Akameze, 2016).

Importantly, the interaction effects between time and group across both psychological and performance variables indicate that the improvements were most likely due to the structured self-talk intervention rather than maturation, general training effects, or increased exposure to competition. Baseline equivalence between groups further strengthens this conclusion, suggesting that post-intervention differences were not simply reflections of pre-existing gaps. Effect size estimates reinforced the relevance of the results, with moderate to large effects for reductions in cognitive anxiety and improvements in self-efficacy, and small to moderate effects for performance variables. Within applied sport settings, these magnitudes are meaningful particularly because they were achieved through a low-cost, non-invasive intervention embedded into normal practice routines (Abayomi, *et al.*, 2020, Esan & Adewunmi, 2018).

The alignment between psychological gains and performance improvements highlights self-talk as a functional bridge between internal regulation and observable behaviour. Athletes using instructional self-talk reported stronger attentional focus on task-relevant cues, which likely contributed to more consistent technical execution. Motivational self-talk, in turn, supported emotional stability and persistence, helping athletes perform better under fatigue and pressure. These findings reinforce the argument that psychological skills training is most effective when it directly targets sport-specific demands and is practiced within realistic competitive contexts (Emmers, Baeyens & Petry, 2020, Reina, *et al.*, 2019).

Although the group-level improvements were clear, individual differences were also evident. Some athletes showed especially strong gains often those who started with higher anxiety or lower confidence suggesting that structured self-talk may be particularly valuable for adolescents who are more vulnerable to competitive stress. At the same time, athletes with more stable baseline profiles still recorded smaller but meaningful improvements, indicating that the intervention can offer broad benefits across different psychological starting points (Addimando, 2019, Yada & Savolainen, 2017).

Taken together, the results provide strong empirical support for structured self-talk training in adolescent handball. The reductions in competitive anxiety, increases in self-efficacy, and improvements in competitive performance demonstrate both statistical and practical value. These findings suggest that structured self-talk can be integrated into youth handball training as a feasible and impactful strategy for improving

psychological readiness and performance consistency in demanding competitive environments (Awe, Akpan & Adekoya, 2017, Osabuohien, 2017).

2.6. Discussion and Conclusion

The findings from this quasi-experimental study show that structured self-talk training can be a highly effective psychological tool for improving both mental readiness and competitive performance in adolescent handball. The combined pattern of reduced competitive anxiety, stronger self-efficacy, and improved match performance supports key sport psychology theories that describe self-talk as a practical mechanism for controlling thoughts, emotions, and behavior in pressured situations. From a cognitive-behavioral perspective, the results suggest that when young athletes learn to shape their inner dialogue intentionally, they become better able to interpret competitive situations as challenges they can handle rather than threats they must fear. This shift matters because it reduces worry and mental distraction, strengthens attentional control, and supports more efficient decision-making and execution. In line with processing efficiency and self-regulation theories, structured self-talk appears to protect mental resources that might otherwise be consumed by anxiety, allowing athletes to focus more fully on what needs to be done in the moment.

The clear reduction in cognitive anxiety aligns with previous research showing that self-talk training can reduce worry, fear of failure, and concentration disruption in sport. What is particularly important here is that the current study demonstrates these benefits in a fast-paced, team-based invasion sport, where the psychological environment differs from individual sports. Handball includes rapid transitions, frequent physical contact, and constant decision-making under pressure, all while athletes remain accountable to teammates. The fact that self-talk reduced anxiety in this context suggests that cognitive regulation strategies can work across different sport structures, as long as they are adapted to the demands athletes actually face. The smaller improvement in somatic anxiety is also meaningful. It supports the idea that self-talk primarily changes the way athletes think about and appraise competitive stress, which can then influence physical arousal indirectly, rather than acting as a direct "relaxation" technique.

The observed gains in self-efficacy strengthen the relevance of social cognitive theory in adolescent team sport settings. As athletes practiced motivational and instructional self-talk, they seemed to build stronger beliefs in their competence, control, and readiness to compete under pressure. These findings echo earlier work linking self-talk to confidence and persistence, but they also highlight an important team-sport nuance. In handball, self-efficacy is not only about personal skill execution; it also includes tactical awareness, communication, role clarity, and the belief that one can contribute positively to team performance. The results suggest that structured self-talk can support both the individual and collective dimensions of confidence in adolescent players.

Performance improvements provide practical confirmation that the psychological changes were not merely "felt," but translated into observable competitive gains. Reduced anxiety and improved self-efficacy were accompanied by better match statistics and higher coach-rated effectiveness. This convergence strengthens the argument that self-talk is

not just a coping strategy it is a performance-regulation tool. The most noticeable gains occurred in areas requiring sustained focus, quick choices, and fast recovery from errors, such as shooting accuracy, defensive actions, and minimizing unforced mistakes. That is consistent with the demands of handball, where a single lapse in attention can create immediate scoring opportunities for an opponent and where athletes must reset quickly after errors.

In terms of practice, the results offer clear guidance for coaches and sport psychologists. They show that psychological skills training does not need to be expensive or separate from normal practice to be effective. Structured self-talk training is low-cost, time-efficient, and adaptable, making it realistic for youth sport environments where specialist support may be limited. Coaches can build instructional self-talk cues directly into technical drills and tactical exercises, and reinforce motivational self-talk during pressure-based simulations, fatigue drills, and competitive scenarios. Sport psychologists can strengthen these efforts by helping athletes develop age-appropriate self-talk routines, refining cue words, and ensuring strategies match players' developmental needs and positional demands. The strongest message is that mental skills work best when it is integrated into the sport context, not treated as an optional add-on.

At the same time, the study has limitations that should be acknowledged. The quasi-experimental design while appropriate for real-world team settings does not provide the same level of causal certainty as a fully randomized controlled trial. Group assignment based on team structures may have introduced contextual influences that were difficult to measure. The sample size, though typical for team sport research, may limit generalization to other age groups, competitive levels, or settings. Performance measures, even when objective and coach-rated, can still be influenced by game factors such as opponent strength, team dynamics, and match importance. Finally, the study focused on short- to medium-term outcomes, so the long-term durability of the benefits remains unknown.

Future research can build on these findings by using randomized designs where feasible, increasing sample diversity, and tracking athletes across longer periods, including full seasons and multiple competition cycles. Studies should also explore individual differences such as baseline anxiety levels, maturity, playing position, and role demands to identify which athletes benefit most and under what conditions. It would also be valuable to examine how self-talk interacts with other psychological skills such as imagery, goal-setting, or breathing routines, and to include qualitative athlete perspectives to better understand how young players internalize and adapt self-talk within the social reality of a team environment.

Overall, this study provides strong evidence that structured self-talk training is both powerful and practical for adolescent handball. By reducing anxiety, strengthening self-efficacy, and supporting more consistent performance under pressure, self-talk directly addresses key psychological challenges common in youth team sports. When delivered in a way that is developmentally appropriate and embedded into training and competition routines, structured self-talk has the potential to improve not only performance outcomes but also the broader self-regulation and psychological growth of adolescent athletes.

3. References

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