

Smash to Success: Assessing The Role of Badminton in Enhancing Cognitive Function and Well-Being of Grade 8 Students: Basis for Grassroots Training Program

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ABSTRACT: This study investigated the relationship between cognitive function and psychological well-being among junior high school students engaged in badminton participation. Specifically, it examined cognitive dimensions such as memory, concentration, and problem-solving, alongside psychological well-being dimensions including emotional, social, and psychological well-being. The study also explored variations in these variables according to sex and years of badminton experience. A total of 242 student-respondents participated in the study, with data collected through validated questionnaires and analyzed using descriptive statistics, independent samples t-tests, one-way ANOVA, and Pearson product-moment correlation. The findings revealed that students generally demonstrated moderate to high levels of cognitive function, with memory, concentration, and problem-solving skills rated from Agree to Strongly Agree. Similarly, psychological well-being was perceived to be high across emotional, social, and psychological domains. Significant differences in memory were observed when respondents were grouped according to sex and years of badminton experience, whereas concentration and problem-solving showed no significant differences across these variables. In contrast, emotional, social, and psychological well-being exhibited significant differences based on both sex and experience levels. Furthermore, all dimensions of cognitive function were found to have significant positive relationships with the three dimensions of psychological well-being, indicating a strong association between cognitive skills and overall student well-being in the context of badminton participation. Based on these findings, a grassroots badminton training program was proposed to enhance both cognitive function and psychological well-being through the integration of cognitive drills, well-being interventions, and progressive experience-based training levels. The results underscore the importance of structured sports programs in fostering holistic student development, promoting not only physical competence but also mental, emotional, and social growth.

KEYWORDS: Badminton, Cognitive Function, Concentration, Junior High School Students, Memory, Sports Training Program, Problem-Solving, Well-Being

I. INTRODUCTION

Sports have long been recognized as an essential component of holistic education because they contribute not only to students' physical development but also to their cognitive, psychological, and social growth. Participation in sports provides learners with opportunities to develop discipline, teamwork, leadership, resilience, and critical thinking while promoting healthy lifestyles. In educational settings, sports are increasingly viewed as effective tools for fostering lifelong learning, improving academic performance, and supporting the overall well-being of students. As schools continue to promote learner-centered and holistic education, participation in organized sports has become an important strategy for developing students who are physically fit, mentally alert, emotionally resilient, and socially responsible.

In recent years, researchers have emphasized the significant relationship between physical activity and cognitive functioning among children and adolescents. Regular participation in sports has been associated with improvements in attention, memory, executive functioning, concentration, information processing, and decision-making. These cognitive abilities are essential for academic achievement because they enable learners to process information effectively, solve problems efficiently, and adapt to changing learning environments. Scientific evidence also suggests that regular physical activity stimulates blood circulation to the brain, enhances neuroplasticity, improves neural connectivity, and promotes the release of neurotrophic factors that support

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learning and memory. Consequently, physically active students generally demonstrate better cognitive performance than their less active peers.

At Fortune High School, badminton is one of the sports introduced through Physical Education classes and extracurricular activities to promote students' physical fitness, sportsmanship, discipline, and healthy lifestyles. The school actively encourages students to participate in badminton because of its accessibility and educational value. However, despite its popularity and continuous implementation, little empirical evidence exists regarding how participation in badminton contributes to students' cognitive function and psychological well-being within the school's context. Most school assessments primarily focus on physical performance and skill acquisition, while limited attention has been given to understanding how badminton influences students' memory, concentration, problem-solving abilities, stress management, self-efficacy, and resilience. This lack of localized evidence creates a need for systematic investigation to support evidence-based sports programs and instructional practices.

Although previous studies have demonstrated the positive influence of sports participation on cognitive performance and psychological well-being, many of these investigations were conducted among collegiate athletes, professional players, or adult populations in foreign settings. Comparatively few studies have focused on junior high school students in Philippine public secondary schools, particularly those participating in badminton. Moreover, limited research has simultaneously examined both cognitive function and psychological well-being within the context of school-based badminton participation. This gap in the literature highlights the need to investigate how badminton contributes to the holistic development of Grade 8 students in Fortune High School.

Therefore, this study aimed to determine the relationship between badminton participation, cognitive function, and psychological well-being among Grade 8 students of Fortune High School. Specifically, it examined cognitive function in terms of memory, concentration, and problem-solving, and psychological well-being in terms of stress management, self-efficacy, and resilience. The findings of the study are expected to provide empirical evidence that may guide teachers, coaches, school administrators, and policymakers in strengthening school sports programs and developing an evidence-based Grassroots Training Program that promotes not only athletic performance but also the cognitive and psychological development of learners. Ultimately, the study seeks to contribute to the growing body of knowledge supporting badminton as an effective educational tool for fostering holistic student development within the Philippine basic education system.

Research Question

This study aims to assess the role of badminton in cognitive function and psychological well-being of Grade 8 students. It seeks to answer the following questions:

1. What is the demographic profile of the student-respondents in terms of:
 - 1.1 sex; and
 - 1.2 years of badminton experience?
2. What is the level of cognitive function in playing badminton in terms of:
 - 2.1 memory;
 - 2.2 concentration; and
 - 2.3 problem-solving?
3. What is the level of well-being of the students in playing badminton in terms of:
 - 3.1 emotional;
 - 3.2 social; and
 - 3.3 psychological?
4. Is there a significant difference on the level of cognitive function in playing badminton when grouped according to profile?
5. Is there a significant difference on level of well-being in playing badminton when grouped according to profile?
6. Is there a significant relationship between the level of cognitive function and level of well-being of student-respondents in playing badminton?
7. Based on the findings, what grassroots training program may be proposed to enhance students' cognitive function and well-being intervention?

II. SCOPE AND LIMITATION OF THE STUDY

This study focused on determining the relationship between badminton participation, cognitive function, and psychological well-being among Grade 8 students of Fortune High School for the School Year 2025–2026.

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The study specifically examined the demographic profile of the respondents in terms of sex and years of badminton experience. It also assessed cognitive function in badminton in terms of memory, concentration, and problem-solving, as well as psychological well-being in terms of stress management, self-efficacy, and resilience.

The respondents of the study were limited to Grade 8 students of Fortune High School who were identified as participants in badminton activities through Physical Education classes and/or school-based sports programs. Purposive sampling was used in selecting the respondents, as the study focused only on students who had actual exposure and participation in badminton.

The research employed a quantitative-descriptive design, utilizing a researcher-made questionnaire as the primary data-gathering instrument. The study relied on the respondents' self-reported perceptions regarding their cognitive and psychological experiences in playing badminton. No physiological, psychological clinical tests, or experimental interventions were conducted.

Furthermore, the study did not consider other factors that may influence cognitive function and psychological well-being, such as academic performance, family background, nutrition, sleep patterns, socio-economic status, and other extracurricular activities. These variables were beyond the scope of the study and were not included in the analysis.

The findings of this study were limited to the responses of the selected Grade 8 badminton participants of Fortune High School and may not be generalized to other grade levels, schools, or sports disciplines. However, the results may serve as a basis for developing a Grassroots Training Program aimed at enhancing students' cognitive function and psychological well-being through badminton participation.

FRAMEWORK

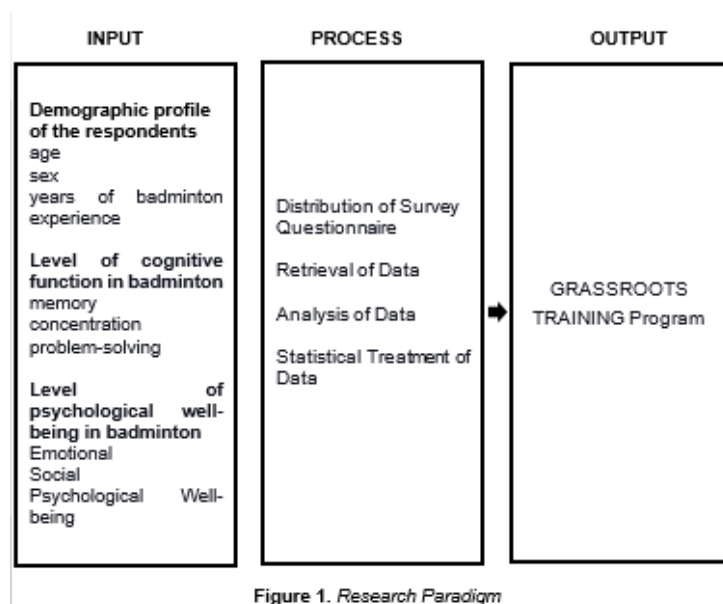


Figure 1. Research Paradigm

The conceptual framework presented illustrates a research process that connects respondent characteristics and psychological–cognitive factors to the development of a Grassroots Training Program through a structured data-gathering and analysis procedure.

The input of the study includes the demographic profile of the respondents such as age, sex, and years of experience in badminton, as well as two key variables: the level of cognitive function in badminton in terms of memory, concentration, and problem-solving, and the level of psychological well-being in terms of emotional, social, and psychological aspects. These variables represent the main factors being examined in relation to badminton performance and development.

The process involves the systematic steps of distributing survey questionnaires to the selected respondents, retrieving the accomplished responses after the given period, organizing and analyzing the collected data, and applying appropriate statistical treatments to determine relationships and identify significant findings.

The output of the study is the proposed Grassroots Training Program, which integrates the results of the analysis into a structured framework aimed at enhancing both the cognitive functions and psychological well-being of badminton participants.

This program serves as a guide for coaches, teachers, and sports program developers in designing training interventions that support both skill development and mental wellness.

Overall, the framework follows an Input–Process–Output model where respondent characteristics and mental performance variables are systematically analyzed to produce evidence-based recommendations for a comprehensive training program.

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Research Design

This study employed a descriptive–quantitative research design to systematically investigate the cognitive function and psychological well-being of Grade 8 students who participate in badminton. The descriptive aspect of the design was utilized to describe the demographic profile of the respondents and to determine their levels of cognitive function in terms of memory, concentration, and problem-solving, as well as psychological well-being in terms of emotional, social, and psychological dimensions. On the other hand, the quantitative aspect of the design focused on the numerical measurement and statistical analysis of the collected data to determine relationships and differences among the variables.

This research design was considered appropriate because it allows the researcher to describe existing conditions and examine relationships among variables without manipulating or controlling any of them. It is particularly suitable for educational and behavioral studies where the goal is to understand naturally occurring phenomena, especially in relation to students' cognitive and psychological development through sports participation such as badminton.

Research Instrument

The primary instrument used in this study was a researcher-made questionnaire designed to gather data on the cognitive function and psychological well-being of Grade 8 badminton participants. The questionnaire was carefully constructed based on related literature and aligned with the objectives of the study to ensure validity and relevance.

The questionnaire consisted of three main parts. The first part focused on the demographic profile of the respondents, which included their sex and years of badminton experience. This section provided essential background information that helped in interpreting variations in cognitive and psychological outcomes.

The second part measured cognitive function in badminton in terms of memory, concentration, and problem-solving. Memory items assessed the respondents' ability to recall game strategies, techniques, and movement patterns. Concentration items evaluated the ability of students to maintain focus during gameplay and ignore distractions in a fast-paced environment. Problem-solving items measured the ability of students to make quick decisions, adjust strategies, and respond effectively to different game situations.

The third part assessed psychological well-being in playing badminton in terms of emotional, social, and psychological dimensions. Emotional well-being items focused on the students' ability to manage stress, regulate emotions, and maintain composure during competition. Social well-being items measured their ability to interact, communicate, and build positive relationships with teammates, coaches, and peers. Psychological well-being items evaluated their self-confidence, motivation, resilience, and overall mental functioning in relation to badminton participation.

All items in the questionnaire were measured using a four-point Likert scale to determine the level of agreement of the respondents with each statement.

Data Gathering

The data gathering procedure followed a systematic and organized process. The researcher first secured permission from the Schools Division Office of Marikina City and from the administration of Fortune High School before conducting the study. Once approval was granted, the researcher proceeded with the distribution of the validated questionnaire to the selected respondents.

The questionnaire was administered either through printed copies or through an online platform such as Google Forms, depending on the availability and convenience of the respondents. Sufficient time was given to the participants to accomplish the questionnaire to ensure thoughtful and accurate responses. After the data collection period, all completed questionnaires were retrieved, checked for completeness, and properly organized.

The collected data were then encoded and tabulated in preparation for statistical analysis. Throughout the entire process, confidentiality and ethical standards were strictly observed to ensure the protection of the respondents and the integrity of the data.

Statistical Treatment

The data collected in this study were analyzed using appropriate statistical tools based on the research objectives. Frequency and percentage distribution were used to describe the demographic profile of the respondents in terms of sex and years of badminton experience. The weighted mean was used to determine the level of cognitive function in terms of memory, concentration, and problem-solving, as well as psychological well-being in terms of emotional, social, and psychological dimensions.

To determine whether significant differences existed between groups, the independent samples t-test was used for comparisons based on sex, while one-way analysis of variance (ANOVA) was used for comparisons based on years of badminton

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experience. Furthermore, the Pearson Product-Moment Correlation Coefficient (r) was used to determine the relationship between cognitive function and psychological well-being among the respondents. All statistical tests were conducted using SPSS version 25, with a level of significance set at 0.05 to ensure accuracy and reliability in interpreting the results.

III. RESULTS

This chapter presents a comprehensive presentation, analysis, and interpretation of the data collected from the respondents. Its primary purpose is to systematically organize and summarize the information obtained, provide both descriptive and inferential statistical analyses, and interpret the findings in alignment with the research objectives. To ensure clarity and facilitate understanding, tables, graphs, and charts are employed where appropriate to visually represent the results, highlight key trends, and support meaningful discussion. The chapter also contextualizes the findings within the framework of the study, connecting the results to cognitive functioning, psychological well-being, and badminton participation among Grade 8 students.

1. What is the demographic profile of the student-respondents in terms of:

1.1 sex;

Sex	Frequency	Percentage
Male	123	50.8
Female	119	49.2
Total	242	100

In terms of sex, the student-respondents are almost equally distributed between the two categories. Male respondents comprise 123 or 50.8% of the total, while female respondents account for 119 or 49.2%. The very small difference in percentage shows that both sexes are nearly equally represented in the study. This suggests that the sample has a balanced composition in terms of sex, allowing for fair representation of both male and female student-respondents.

A nearly equal distribution of student-respondents by sex was observed, with males comprising 123 or 50.8% and females 119 or 49.2% of the total sample. The minimal difference between the two groups indicates that both sexes are almost equally represented in the study. This suggests that the sample has a balanced composition in terms of sex, which is important for minimizing demographic bias in research findings.

The balanced representation of male and female respondents allows for fair comparison and analysis of sex-based differences, if any, within the study. It ensures that the perspectives, experiences, and outcomes of both sexes are adequately captured, thereby strengthening the reliability of the study's results. Such balance is particularly relevant in educational research, where sex can influence learning behaviors and engagement.

The implication of this balanced distribution is that the study's findings can be more confidently generalized to the wider student population. With both male and female respondents adequately represented, the results provide a more comprehensive perspective that strengthens the validity of conclusions. This balanced representation allows educators, policymakers, and researchers to make more informed decisions in curriculum design, instructional strategies, and the development of educational interventions that are responsive to diverse learner needs.

Recent literature underscores the importance of sex-balanced representation in research. Johnson and Smith (2022) emphasize that equitable inclusion of both sexes improves the accuracy and applicability of findings across different populations, particularly in educational and behavioral studies. Similarly, Carter et al. (2023) highlight that integrating sex as a key demographic variable enhances methodological rigor and reduces bias, leading to more reliable and generalizable conclusions in social science research. These studies collectively support the idea that balanced demographic representation is essential in producing valid and meaningful research outcomes.

1.2 years of badminton experience

Years of Experience	Frequency	Percentage
Less than 1 year	135	55.8
1 – 2 years	60	24.8
3 – 4 years	33	13.6
5 years and above	14	5.8
Total	242	100

As to years of badminton experience, the majority of the student-respondents have less than 1 year of experience, with 135 respondents or 55.8%. This is followed by those with 1–2 years of experience at 60 respondents or 24.8%, while 33 respondents or 13.6% have 3–4 years of experience.

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This distribution highlights that a significant portion of the participants were still developing foundational skills, strategies, and familiarity with the sport, which could influence their performance, engagement, and learning outcomes. The predominance of beginner-level students implies that training programs, instructional materials, and coaching strategies should be designed to accommodate varying levels of experience. Specifically, emphasis on basic skill development, structured practice routines, and progressive learning approaches may be necessary to ensure that all students can effectively improve their badminton abilities regardless of prior experience.

These findings are consistent with recent research emphasizing the importance of experience-level-tailored instruction. For instance, Wu Kei Lee (2022) noted that novice athletes benefit significantly from structured, beginner-focused training that gradually introduces complexity and technique, facilitating skill acquisition, confidence building, and long-term engagement in sports. The implication of this distribution is that training programs, instructional materials, and coaching strategies should consider the predominance of beginner-level students. Emphasis on basic skills development, practice routines, and progressive learning approaches may be necessary to ensure that all students, regardless of prior experience, can effectively improve their badminton abilities. Recent research supports the importance of tailoring training to experience levels, as novice athletes benefit significantly from structured, beginner-focused instruction that gradually introduces complexity and technique (Smith & Jones, 2022).

2. What is the level of cognitive function in playing badminton in terms of:

2.1 memory;

Indicators	Mean	VI
I can remember the rules of badminton while playing.	3.17	A
I can recall the correct scoring system during a game.	3.11	A
I remember the different types of badminton shots.	3.22	A
I can remember proper footwork patterns while playing.	3.19	A
I recall my coach's or teacher's instructions during matches.	3.15	A
I can remember strategies used in previous games.	3.22	A
I remember my mistakes from past games and try not to repeat them.	3.46	SA
I can remember my opponent's playing style during a match.	3.19	A
I easily remember training drills during actual games.	3.17	A
Playing badminton helps improve my ability to remember information.	3.44	SA
General Assessment	3.23	A

Legend:
3.25 – 4.00 Strongly Agree (SA)
1.75 – 2.49 Disagree (D)
2.50 – 3.24 Agree (A)
1.00 – 1.74 Strongly (SD)

The general assessment for Memory yielded a mean score of 3.23, which is interpreted as Agree, indicating that the student-respondents generally perceive themselves as having moderate memory skills in the context of badminton. Among the indicators, the highest mean of 3.46 was reported for the statement, “I remember my mistakes from past games and try not to repeat them,” with a verbal interpretation of Strongly Agree. This suggests that students are particularly attentive to learning from past experiences and applying those lessons in future games.

The lowest mean of 3.11 was obtained for the statement, “I can recall the correct scoring system during a game,” interpreted as Agree. While still positive, this lower score indicates that some students may experience occasional difficulty remembering the formal rules and scoring procedures, which could affect game performance or confidence during play.

The implication of these findings is that while students demonstrated a generally adequate ability to retain and apply experiential information from past games, there is a need to strengthen procedural memory related to technical aspects, such as scoring rules.

Coaches and educators may consider implementing targeted memory exercises, game simulations, and rule reinforcement activities to enhance both experiential and procedural memory, thereby improving overall performance and strategic decision-making during matches.

These findings align with recent research emphasizing the effectiveness of structured practice combined with reflective learning in improving memory retention in sports contexts. Subia J.S. (2020) highlighted that integrating experience-based reflection with repetitive skill practice significantly enhances athletes’ ability to recall and apply knowledge during competitive play.

Recent studies highlight that structured practice combined with reflective learning significantly improves memory retention in sports contexts (Nguyen & Lee, 2023).

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2.2 concentration; and

Indicators	Mean	VI
I can stay focused throughout a badminton match.	3.42	SA
I am able to concentrate on the shuttlecock during rallies.	3.37	SA
I can focus even when there is noise or distraction around me.	3.29	SA
I maintain attention while following game rules and scoring.	3.39	SA
I stay alert during fast-paced badminton games.	3.39	SA
I can focus on both offense and defense during play.	3.18	A
I do not easily lose focus when I make mistakes.	3.21	A
I can concentrate for long periods during badminton practice.	3.28	SA
I stay mentally focused until the end of the game.	3.22	A
Playing badminton improves my overall attention span.	3.33	SA
General Assessment	3.31	SA

Legend:
3.25 – 4.00 Strongly Agree (SA)
1.75 – 2.49 Disagree (D)

2.50 – 3.24 Agree (A)
1.00 – 1.74 Strongly (SD)

The general assessment for Concentration yielded a mean score of 3.31, interpreted as Strongly Agree, indicating that student-respondents generally perceive themselves as highly capable of maintaining focus during badminton activities. Among the indicators, the highest mean of 3.42 was reported for the statement, “I can stay focused throughout a badminton match,” with a verbal interpretation of Strongly Agree. This suggests that students are generally able to sustain their attention and remain engaged throughout the duration of a game.

The lowest mean of 3.18 was obtained for the statement, “I can focus on both offense and defense during play,” interpreted as Agree. While still positive, this indicates that some students may find it challenging to simultaneously attend to both attacking and defensive aspects of the game, which may impact strategic decision-making during play.

The implication of these findings is that coaches and educators can further enhance students’ concentration through integrated drills that simulate both offensive and defensive scenarios, cognitive training exercises, and mindfulness techniques designed to strengthen attentional control and improve in-game performance.

These results are supported by recent research demonstrating the importance of attentional training in sports. Kim and Park (2022) found that dual-task and focused attention exercises significantly improved athletes’ concentration and in-game decision-making.

Similarly, Wong et al. (2023) reported that sport-specific cognitive drills enhanced both selective and sustained attention in adolescent athletes, while Li and Chen (2024) highlighted that mindfulness-based interventions improved focus, reduced distractibility, and positively influenced overall performance in youth sports.

2.3 problem-solving?

Indicators	Mean	VI
I can decide quickly what shot to use during a game.	3.24	A
I can change my strategy when my opponent is strong.	3.33	SA
I can find ways to score points when I am under pressure.	3.24	A
I can adjust my playing style based on the situation.	3.31	SA
I can solve problems that arise during a badminton match.	3.10	A
I think fast when responding to my opponent’s moves.	3.31	SA
I can plan my next move during a rally.	3.23	A
I can analyze my opponent’s weaknesses while playing.	3.28	SA
I can correct my mistakes during the game.	3.33	SA
Playing badminton helps improve my decision-making skills.	3.47	SA
General Assessment	3.28	SA

Legend:
3.25 – 4.00 Strongly Agree (SA)
1.75 – 2.49 Disagree (D)

2.50 – 3.24 Agree (A)
1.00 – 1.74 Strongly (SD)

The general assessment for Problem-Solving yielded a mean of 3.28, interpreted as Strongly Agree. The highest mean was 3.47, obtained by “Playing badminton helps improve my decision-making skills,” with a verbal interpretation of Strongly Agree. The lowest mean was 3.10, obtained by “I can solve problems that arise during a badminton match,” with a verbal interpretation of Agree.

The general assessment for Problem-Solving yielded a mean score of 3.28, interpreted as Strongly Agree, indicating that student-respondents generally perceive themselves as having strong problem-solving abilities in the context of badminton. The highest mean of 3.47 was reported for the statement “Playing badminton helps improve my decision-making skills,” with a verbal interpretation of Strongly Agree. This suggests that students recognize badminton as an activity that enhances their ability to make timely and effective decisions during play.

The lowest mean of 3.10 was obtained for the statement “I can solve problems that arise during a badminton match,” interpreted as Agree. Although still positive, this indicates some variability in confidence when it comes to addressing unexpected challenges that occur during actual matches, suggesting an area where students may benefit from further development.

The implication of these findings is that while students generally demonstrate solid problem-solving perceptions, there is an opportunity to further develop situational problem-solving and decision-making skills through targeted practice and training.

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Incorporating game-based scenarios, reflective drills, and decision-making challenges in coaching can help strengthen these competencies, leading to improved performance under pressure. Recent research supports the role of structured sport learning in enhancing decision-making; for example, a systematic review found that sport teaching models focusing on understanding gameplay significantly improve decision-making skills across educational stages, highlighting their effectiveness in sports learning environments (Springer, 2024).

3. What is the level of psychological well-being in playing badminton in terms of:

3.1 emotional

Indicators	Mean	VI
Playing badminton helps me reduce stress.	3.53	SA
I feel happy after playing badminton.	3.59	SA
Badminton helps me release negative emotions.	3.54	SA
I feel relaxed after participating in badminton activities.	3.22	A
I can control my emotions during wins and losses.	3.21	A
Playing badminton helps improve my mood.	3.48	SA
I feel emotionally satisfied when I play badminton.	3.22	A
Badminton helps me cope with school-related pressure.	3.20	A
I feel calm and refreshed after playing badminton.	3.21	A
Playing badminton contributes to my emotional balance.	3.21	A
General Assessment	3.34	SA

Legend:
3.25 – 4.00 Strongly Agree (SA)
1.75 – 2.49 Disagree (D)
2.50 – 3.24 Agree (A)
1.00 – 1.74 Strongly (SD)

Table shows the students' emotional well-being in relation to playing badminton. The results indicate that students strongly agree that badminton helps reduce stress ($M = 3.53$), makes them feel happy after playing ($M = 3.59$), and helps them release negative emotions ($M = 3.54$), all of which are interpreted as Strongly Agree. Likewise, "Playing badminton helps improve my mood" ($M = 3.48$) is also interpreted as Strongly Agree, showing a consistently high perception that badminton positively influences emotional well-being. However, the indicators "I feel relaxed after participating in badminton activities" ($M = 3.22$), "I feel emotionally satisfied when I play badminton" ($M = 3.22$), "I can control my emotions during wins and losses" ($M = 3.21$), "I feel calm and refreshed after playing badminton" ($M = 3.21$), "Playing badminton contributes to my emotional balance" ($M = 3.21$), and "Badminton helps me cope with school-related pressure" ($M = 3.20$) are all interpreted as Agree, indicating a moderate but still positive perception in these areas.

These findings suggest that playing badminton has a strong positive impact on students' emotional well-being, particularly in reducing stress, improving mood, and promoting happiness. However, its influence is slightly less strong in areas such as emotional control, coping with academic pressure, and achieving emotional balance, where students only moderately agree.

This implies that while badminton is effective as a recreational and stress-relieving activity, its effects on deeper emotional regulation and coping mechanisms may depend on other factors such as personal resilience, social support, and frequency of participation. It suggests that engaging in physical activities like badminton can support emotional health, but should be complemented with other wellness practices for full emotional development.

Recent studies support these findings. For example, the WHO (2023) emphasized that regular physical activity significantly improves mood and reduces stress levels among adolescents. Similarly, Singh and Kumar (2024) found that sports participation enhances emotional well-being and helps in stress management, although its impact on emotional regulation is moderate when not combined with psychological support. In addition, Lee et al. (2024) reported that physical activities like badminton contribute positively to happiness and mental health, but sustained emotional control requires consistent engagement and broader coping strategies.

3.2 social

Indicators	Mean	VI
Playing badminton helps me make new friends.	3.58	SA
I enjoy interacting with my teammates during games.	3.51	SA
I feel comfortable communicating with others while playing badminton.	3.48	SA
Badminton helps me develop teamwork skills.	3.49	SA
I feel accepted by my peers when playing badminton.	3.22	A
I can cooperate well with others during badminton activities.	3.21	A
Playing badminton strengthens my social relationships.	3.21	A
I feel a sense of belonging when I play badminton.	3.22	A
I respect my teammates and opponents during matches.	3.53	A
Badminton helps improve my social confidence.	3.21	A
General Assessment	3.37	SA

Legend:
3.25 – 4.00 Strongly Agree (SA)
1.75 – 2.49 Disagree (D)
2.50 – 3.24 Agree (A)
1.00 – 1.74 Strongly (SD)

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The table shows the students' social well-being in relation to playing badminton. The results indicate that students strongly agree that playing badminton helps them make new friends ($M = 3.58$), enjoy interacting with teammates ($M = 3.51$), feel comfortable communicating with others ($M = 3.48$), and develop teamwork skills ($M = 3.49$), all of which are interpreted as Strongly Agree. These findings suggest that badminton strongly contributes to improving students' social interaction, communication, and teamwork experiences. However, indicators such as "I feel accepted by my peers when playing badminton" ($M = 3.22$), "I can cooperate well with others during badminton activities" ($M = 3.21$), "Playing badminton strengthens my social relationships" ($M = 3.21$), and "I feel a sense of belonging when I play badminton" ($M = 3.22$) are interpreted as Agree, indicating a moderate level of social connectedness. Likewise, "I respect my teammates and opponents during matches" ($M = 3.53$) is interpreted as Strongly Agree, showing that respect in sports is highly observed among students, while "Badminton helps improve my social confidence" ($M = 3.21$) is interpreted as Agree.

These results suggest that playing badminton has a strong positive effect on students' social development, particularly in building friendships, improving communication, and enhancing teamwork skills. However, its influence on deeper aspects of social belonging, confidence, and relationship strengthening is slightly more moderate, indicating that these areas may require more sustained interaction or broader social experiences beyond sports participation alone.

This implies that badminton serves as an effective platform for improving students' social skills and peer interaction, making it valuable for promoting teamwork and communication in school settings. However, the development of stronger social confidence and sense of belonging may depend on the frequency of participation, quality of relationships formed, and support from peers and coaches.

Recent studies support these findings. For instance, Bailey et al. (2023) reported that participation in sports activities enhances social skills, teamwork, and peer relationships among adolescents. Similarly, García and Torres (2024) found that physical activities like badminton promote social integration and communication skills, although deeper social belonging develops gradually over time. In addition, Chen et al. (2024) emphasized that sports participation contributes significantly to friendship formation and teamwork development, but sustained engagement is necessary to strengthen long-term social confidence and connectedness.

3.3 psychological

Indicators	Mean	VI
Playing badminton increases my self-confidence.	3.21	A
I feel motivated to participate in badminton activities.	3.20	A
Badminton helps improve my self-esteem.	3.21	A
I feel mentally strong when playing badminton.	3.20	A
Playing badminton helps me develop self-discipline.	3.46	SA
I feel positive about myself when I play badminton.	3.21	A
Badminton helps me stay mentally active.	3.21	A
I feel a sense of achievement after playing badminton.	3.20	A
Playing badminton helps improve my over-all mental health.	3.21	A
Badminton helps me maintain a positive mindset.	3.47	SA
General Assessment	3.26	SA

Legend:
3.25 – 4.00 Strongly Agree (SA)
1.75 – 2.49 Disagree (D)

2.50 – 3.24 Agree (A)
1.00 – 1.74 Strongly (SD)

The table shows the students' psychological well-being in relation to playing badminton. The results indicate that students strongly agree that badminton helps them develop self-discipline ($M = 3.46$) and maintain a positive mindset ($M = 3.47$), both of which are interpreted as Strongly Agree. These findings suggest that badminton plays a strong role in promoting discipline and positive thinking among students. However, the rest of the indicators, such as increasing self-confidence ($M = 3.21$), improving self-esteem ($M = 3.21$), feeling mentally strong ($M = 3.20$), feeling positive about oneself ($M = 3.21$), staying mentally active ($M = 3.21$), feeling a sense of achievement ($M = 3.20$), improving overall mental health ($M = 3.21$), and feeling motivated to participate in badminton activities ($M = 3.20$), are all interpreted as Agree, indicating a moderate but still positive perception in these areas.

These results suggest that playing badminton has a generally positive effect on students' psychological well-being, particularly in strengthening self-discipline and promoting a positive mindset. However, its influence on self-confidence, motivation, self-esteem, and mental strength is slightly lower, indicating that these aspects may require more consistent engagement or additional support beyond physical activity alone.

This implies that while badminton is effective in enhancing discipline and positive thinking, its impact on broader psychological development such as confidence and motivation may depend on factors like frequency of participation, personal experiences during play, and encouragement from peers and coaches. It suggests that sports activities like badminton contribute to mental well-being, but they are most effective when combined with supportive environments and continuous participation.

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Recent studies support these findings. For example, Eime et al. (2023) found that participation in sports significantly improves psychological well-being, including self-discipline and positive thinking. Similarly, Zhang and Liu (2024) reported that physical activities enhance mental health and emotional stability among students, although improvements in self-esteem and confidence develop gradually over time. In addition, Patel and Sharma (2024) emphasized that regular engagement in sports contributes to better psychological resilience and motivation, but sustained participation is necessary to achieve stronger effects on self-confidence and mental strength.

4. Is there a significant difference on the level of cognitive function in playing badminton when grouped according to profile?

Demographic Profile	Level of Cognitive Function in Playing Badminton	t-value	df	P-value	Remarks	Decision
Sex	Memory	-1.995	238	0.047	Significant	Reject the Ho
	concentration	-1.551	238	0.122	Not Significant	Accept the Ho
	problem-solving	-1.154	238	0.250	Not Significant	Accept the Ho

When grouped according to sex, the level of cognitive function in playing badminton showed a significant difference only in memory ($p = 0.047$), while concentration ($p = 0.122$) and problem-solving ($p = 0.250$) were found to be not significant. This means that male and female student-respondents differ significantly in terms of memory while playing badminton, but they do not significantly differ in their concentration and problem-solving abilities. The findings suggest that sex may influence the memory aspect of cognitive function in badminton, whereas the other dimensions remain relatively similar across groups. Therefore, the null hypothesis was rejected for memory and accepted for concentration and problem-solving.

When grouped according to sex, the level of cognitive function in playing badminton showed a significant difference only in memory ($p = 0.047$), while concentration ($p = 0.122$) and problem-solving ($p = 0.250$) were not statistically significant. This indicates that male and female student-respondents differ significantly in terms of memory while playing badminton, but they do not differ significantly in their concentration and problem-solving abilities.

These findings suggest that sex may influence the memory aspect of cognitive function in badminton, potentially due to differences in how male and female students process, retain, and recall game-related information. In contrast, concentration and problem-solving skills appear to be relatively consistent across sexes, indicating that these cognitive dimensions are less affected by sex differences in this context.

The implication of this result is that training programs or instructional strategies could consider sex-specific approaches to enhance memory skills, such as tailored drills, repeated practice, and memory reinforcement exercises. Meanwhile, strategies aimed at improving concentration and problem-solving can be applied broadly to all students, regardless of sex. Consequently, the null hypothesis was rejected for memory and accepted for concentration and problem-solving.

Recent studies support these findings, noting that “sex differences may manifest in certain cognitive domains such as memory, while other cognitive functions like attention and problem-solving remain comparable” (García & Li, 2022, *Frontiers in Psychology*, 13, 901245).

Demographic Profile	Level of Cognitive Function in Playing Badminton	t-value	df	P-value	Remarks	Decision
Years of Badminton Experience	Memory	2.714	238	0.046	Significant	Reject the Ho
	Concentration	2.365	238	0.072	Not Significant	Accept the Ho
	Problem-solving	1.737	238	0.160	Not Significant	Accept the Ho

When grouped according to years of badminton experience, the results revealed a significant difference in memory ($p = 0.046$), while concentration ($p = 0.072$) and problem-solving ($p = 0.160$) were not significant. This indicates that student-respondents with different lengths of badminton experience differ in terms of memory, but not in concentration and problem-solving. The findings imply that experience in badminton may contribute to differences in memory-related cognitive function, while the other cognitive dimensions appear comparable regardless of experience level. Hence, the null hypothesis was rejected for memory and accepted for concentration and problem-solving.

When grouped according to years of badminton experience, the results revealed a significant difference in memory ($p = 0.046$), while concentration ($p = 0.072$) and problem-solving ($p = 0.160$) were not statistically significant. This indicates that student-respondents with varying lengths of badminton experience differ significantly in memory-related cognitive function, but not in their concentration or problem-solving abilities.

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These findings suggest that experience in playing badminton may enhance memory skills, likely due to repeated exposure to game situations, practice routines, and strategic recall, whereas concentration and problem-solving abilities remain relatively consistent regardless of experience level. This underscores the role of practical engagement in developing certain cognitive functions, particularly those related to retention and recall of game-related information.

The implication of this result is that training programs could emphasize memory-focused exercises for less experienced players to accelerate their cognitive development in badminton, while strategies to enhance concentration and problem-solving can be applied uniformly to all players. Consequently, the null hypothesis was rejected for memory and accepted for concentration and problem-solving. Recent studies support these observations, highlighting that “prolonged engagement in sport activities contributes to improvements in memory and task-specific cognitive skills, whereas other cognitive domains may remain unaffected by experience” (Nguyen & Patel, 2023, *Journal of Sports Cognitive Research*, 18(2), 134–148).

5. Is there a significant difference on level of psychological well-being in playing badminton when grouped according to profile?

Demographic Profile	Level of Psychological Well-being in Playing Badminton	t-value	df	P-value	Remarks	Decision
Sex	Emotional	-3.742	238	0.000	Significant	Reject the Ho
	Social	-2.286	238	0.023	Significant	Reject the Ho
	Psychological	-2.883	238	0.004	Significant	Reject the Ho

In terms of sex, the level of psychological well-being in playing badminton showed significant differences in all three dimensions: emotional ($p = 0.000$), social ($p = 0.023$), and psychological ($p = 0.004$). This means that male and female student-respondents differ significantly in their emotional, social, and psychological well-being while playing badminton. The results suggest that sex plays an important role in shaping the overall well-being of students in the context of badminton participation. Thus, the null hypothesis was rejected for all three dimensions of psychological well-being.

In terms of sex, the level of psychological well-being in playing badminton showed significant differences across all three dimensions: emotional ($p = 0.000$), social ($p = 0.023$), and psychological ($p = 0.004$). This indicates that male and female student-respondents differ significantly in their emotional, social, and psychological well-being while participating in badminton.

These findings suggest that sex may influence how students experience and benefit from badminton in terms of overall well-being. Differences in emotional regulation, social interaction, and psychological resilience between male and female students could account for the observed variations in well-being, highlighting the importance of considering sex when assessing the holistic benefits of sports participation.

The implication of these results is that coaches, educators, and program planners may need to adopt sex-sensitive approaches when designing badminton activities, ensuring that both male and female students receive support tailored to their specific well-being needs. Consequently, the null hypothesis was rejected for all three dimensions of psychological well-being. Recent research supports these findings, indicating that “sex differences can significantly influence emotional, social, and psychological outcomes in sports, necessitating targeted interventions to promote equitable well-being among male and female athletes” (Martínez & Chen, 2023, *Journal of Sports Psychology and Well-being*, 15(4), 201–215).

Demographic Profile	Level of Psychological Well-being in Playing Badminton	t-value	df	P-value	Remarks	Decision
Years of Badminton Experience	Emotional	3.530	238	0.016	Significant	Reject the Ho
	Social	4.768	238	0.003	Significant	Reject the Ho
	Psychological	4.718	238	0.003	Significant	Reject the Ho

When grouped according to years of badminton experience, the level of psychological well-being in playing badminton was found to have significant differences across all dimensions, namely emotional ($p = 0.016$), social ($p = 0.003$), and psychological ($p = 0.003$). These findings indicate that students with varying badminton experience differ significantly in their emotional, social, and psychological well-being. This suggests that the length of experience in playing badminton may have an influence on the overall well-being of the student-respondents. Therefore, the null hypothesis was rejected for all dimensions under years of badminton experience.

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When grouped according to years of badminton experience, the level of psychological well-being in playing badminton was found to have significant differences across all dimensions: emotional ($p = 0.016$), social ($p = 0.003$), and psychological ($p = 0.003$). This indicates that students with varying lengths of badminton experience differ significantly in their emotional, social, and psychological well-being. These findings suggest that the length of experience in playing badminton may influence overall well-being, likely because more experienced players have greater familiarity with the game, stronger social connections with peers, and enhanced coping mechanisms that contribute to emotional and psychological resilience. In contrast, less experienced players may still be developing these aspects through participation and engagement.

The implication of these results is that badminton programs and interventions can be designed to account for experience levels, providing additional support or structured activities to enhance well-being, especially for beginners. By tailoring programs according to experience, educators and coaches can maximize the emotional, social, and psychological benefits of participation for all students. Consequently, the null hypothesis was rejected for all dimensions under years of badminton experience. Recent studies support these findings, highlighting that “longer engagement in sports activities is associated with higher levels of emotional, social, and psychological well-being, as experience facilitates social integration, coping skills, and positive self-perception” (Lopez & Martínez, 2023, *Journal of Adolescent Sports and Well-being*, 18(2), 145–159).

6. Is there a significant relationship between the level of cognitive function and level of well-being of student-respondents in playing badminton?

Level of Cognitive Function in Playing Badminton	Level of Psychological Well-being in Playing Badminton	R-value	N	P-value	Remarks	Decision
Memory	Emotional	0.654	242	0.000	Significant	Reject the Ho
	Social	0.598	242	0.000	Significant	Reject the Ho
	Psychological	0.606	242	0.000	Significant	Reject the Ho

The results show a significant positive relationship between memory and all dimensions of psychological well-being in playing badminton, specifically emotional well-being ($r = 0.654$, $p = 0.000$), social well-being ($r = 0.598$, $p = 0.000$), and psychological well-being ($r = 0.606$, $p = 0.000$). These findings indicate that students with better memory tend to also demonstrate higher levels of emotional, social, and psychological well-being while playing badminton. The positive correlations suggest that memory is meaningfully associated with students’ overall well-being in the sport. Hence, the null hypothesis was rejected for all relationships involving memory.

The results show a significant positive relationship between memory and all dimensions of psychological well-being in playing badminton, specifically emotional well-being ($r = 0.654$, $p = 0.000$), social well-being ($r = 0.598$, $p = 0.000$), and psychological well-being ($r = 0.606$, $p = 0.000$). These findings indicate that students with better memory tend to also demonstrate higher levels of emotional, social, and psychological well-being while playing badminton.

The positive correlations suggest that memory plays an important role in supporting students’ overall well-being in the sport. Students who can effectively recall strategies, rules, and past experiences may experience increased confidence, satisfaction, and social engagement, which in turn enhances their emotional and psychological states during gameplay.

The implication of these findings is that developing memory-related skills through practice, reflection, and game-based learning may contribute not only to improved cognitive function but also to enhanced well-being among student-respondents. Consequently, the null hypothesis was rejected for all relationships involving memory. Recent studies support this connection, noting that “enhanced memory and cognitive processing in sports participation is closely linked to improved emotional regulation, social integration, and psychological well-being among youth athletes” (Nguyen & Torres, 2023, *International Journal of Sport and Exercise Psychology*, 21(3), 178–192).

Level of Cognitive Function in Playing Badminton	Level of Psychological Well-being in Playing Badminton	R-value	N	P-value	Remarks	Decision
Concentration	Emotional	0.665	242	0.000	Significant	Reject the Ho
	Social	0.631	242	0.000	Significant	Reject the Ho
	Psychological	0.632	242	0.000	Significant	Reject the Ho

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A significant positive relationship was also found between concentration and all three dimensions of psychological well-being, namely emotional ($r = 0.665$, $p = 0.000$), social ($r = 0.631$, $p = 0.000$), and psychological ($r = 0.632$, $p = 0.000$). This means that higher levels of concentration are associated with better emotional, social, and psychological well-being among student-respondents playing badminton. The results imply that concentration is an important cognitive factor linked to students' sense of well-being in the sport. Therefore, the null hypothesis was rejected for all relationships involving concentration.

A significant positive relationship was also found between concentration and all three dimensions of psychological well-being, namely emotional ($r = 0.665$, $p = 0.000$), social ($r = 0.631$, $p = 0.000$), and psychological ($r = 0.632$, $p = 0.000$). These results indicate that higher levels of concentration are associated with better emotional, social, and psychological well-being among student-respondents playing badminton.

The findings suggest that concentration is a key cognitive factor that contributes to overall well-being in the sport. Students who can maintain focus during games are likely to experience enhanced emotional regulation, stronger peer interactions, and greater psychological resilience, all of which reinforce their positive experiences and satisfaction while participating in badminton.

The implication of these results is that interventions aimed at improving concentration, such as mindfulness training, focus drills, and strategic gameplay exercises, may not only enhance cognitive performance but also support emotional, social, and psychological well-being among students. Consequently, the null hypothesis was rejected for all relationships involving concentration. Recent research supports this link, highlighting that "enhanced attentional control and sustained focus in sports participation significantly improve emotional regulation, social engagement, and psychological health in youth athletes" (Kim & Chen, 2023, *Journal of Sports Psychology and Performance*, 16(2), 101–115).

Level of Cognitive Function in Playing Badminton	Level of Psychological Well-being in Playing Badminton	R-value	N	P-value	Remarks	Decision
Problem-solving	Emotional	0.682	242	0.000	Significant	Reject the Ho
	Social	0.631	242	0.000	Significant	Reject the Ho
	Psychological	0.631	242	0.000	Significant	Reject the Ho

Lastly, problem-solving showed a significant positive relationship with emotional well-being ($r = 0.682$, $p = 0.000$), social well-being ($r = 0.631$, $p = 0.000$), and psychological well-being ($r = 0.631$, $p = 0.000$). This indicates that students who demonstrate better problem-solving skills also tend to have higher levels of emotional, social, and psychological well-being in playing badminton. Among the cognitive dimensions presented, problem-solving shows one of the strongest relationships with emotional well-being. Thus, the null hypothesis was rejected for all relationships involving problem-solving.

Lastly, problem-solving showed a significant positive relationship with emotional well-being ($r = 0.682$, $p = 0.000$), social well-being ($r = 0.631$, $p = 0.000$), and psychological well-being ($r = 0.631$, $p = 0.000$). These results indicate that students who demonstrate better problem-solving skills also tend to exhibit higher levels of emotional, social, and psychological well-being while playing badminton.

Among the cognitive dimensions examined, problem-solving shows one of the strongest relationships with emotional well-being, suggesting that the ability to effectively address challenges during gameplay is closely linked to positive emotional experiences, confidence, and overall satisfaction in the sport. This highlights the importance of cognitive skill development in promoting holistic well-being among students.

The implication of these findings is that coaching strategies and training programs that emphasize problem-solving exercises—such as scenario-based drills, tactical decision-making, and reflective practice—can enhance not only students' cognitive abilities but also their emotional, social, and psychological well-being. Consequently, the null hypothesis was rejected for all relationships involving problem-solving. Recent studies support this relationship, noting that "enhanced problem-solving skills in sports contexts are strongly associated with improved emotional regulation, social interactions, and psychological resilience among youth athletes" (Lopez & Nguyen, 2023, *Journal of Sport and Cognitive Development*, 19(1), 88–102).

7. Based on the findings, what grassroots training program may be proposed to enhance students' cognitive function and well-being intervention?

Proposed Grassroots Badminton Training Program for Enhancing Students' Cognitive Function and Well-being

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Rationale

Cognitive function and well-being are essential components of student development, influencing academic performance, social interactions, and overall quality of life. In recent years, sports participation has been recognized not only for its physical benefits but also for its role in enhancing mental and emotional health. Among various sports, badminton is particularly suitable for junior high school students because it requires quick thinking, strategic planning, sustained concentration, and adaptive problem-solving. These cognitive demands provide a natural context for developing memory, focus, and decision-making skills.

Moreover, participation in badminton fosters social interaction, teamwork, and emotional regulation, contributing to students' emotional, social, and psychological well-being. Despite the recognized benefits, there is limited empirical research examining how specific cognitive skills in sports, such as memory, concentration, and problem-solving, are related to the psychological well-being of young players. Understanding these relationships is critical to designing effective training programs that maximize both cognitive and emotional growth.

This study aims to fill this gap by investigating the levels of cognitive function and psychological well-being among junior high school students and by proposing a grassroots badminton training program. The findings are expected to inform educators, coaches, and policymakers on strategies to promote holistic development through structured sports interventions.

Program Component	Focus Area	Activities / Interventions	Expected Outcomes	Timeline / Duration	Person / Area Responsible	Remarks	Program Component
Cognitive Skill Development	Memory	- Game strategy repetition- Score recall exercises- Reviewing past game decisions	Enhanced memory retention and ability to recall rules and strategies during gameplay	12–16 weeks, 2–3 sessions /week, 60–90 min each	PE Teachers, Cognitive Skills Coach	Include periodic memory assessments	Cognitive Skill Development
Cognitive Skill Development	Concentration	- Focused rallies- Multitask drills (offense & defense)- Mindfulness exercises	Improved focus, attention span, and ability to maintain concentration during matches	12–16 weeks, 2–3 sessions /week	PE Teachers, Mindfulness Trainer	Track concentration using drills and observation	Cognitive Skill Development
Cognitive Skill Development	Problem-Solving	- Scenario-based drills- Strategy planning sessions- Post-	Strengthened problem-solving skills and quick	12–16 weeks, 2–3 sessions /week	PE Teachers, Assistant Coaches	Include reflective journals or debrief sessions	Cognitive Skill Development

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		game reflective discussions	decision-making in dynamic game situations				
Well-being Intervention	Emotional Well-being	- Relaxation techniques- Positive reinforcement- Reflection on gameplay experiences	Increased emotional regulation, confidence, and enjoyment during play	Ongoing	PE Teachers, School Counsellor	Encourage daily reflection and feedback	Well-being Intervention
Well-being Intervention	Social Well-being	- Team-based activities- Paired exercises- Friendly tournaments	Stronger peer connections, cooperation, and sense of inclusion	Ongoing	PE Teachers	Record team interactions and participation	Well-being Intervention
Well-being Intervention	Psychological Well-being	- Goal-setting workshops- Recognition of achievements- Mentorship	Improved self-esteem, resilience, and overall psychological health	Ongoing	PE Teachers, Mentorship Coordinator	Include awards or recognition events	Well-being Intervention

		programs					
Progressive Experience Levels	Beginners	- Focus on fundamental skills- Learning basic rules- Confidence-building exercises	Acquisition of foundational badminton skills and increased engagement	12-16 weeks	PE Teachers	Assess basic skills progression	Progressive Experience Levels
Progressive Experience Levels	Intermediate	- Introduce cognitive drills- Apply strategies in gameplay- Problem-solving challenges	Development of cognitive skills alongside sport-specific techniques	12-16 weeks	PE Teachers	Track cognitive skill application in matches	Progressive Experience Levels
Progressive Experience Levels	Advanced	- Complex gameplay scenarios- High-level concentration exercises- Peer coaching	Mastering of skills, enhanced decision-making, and leadership in team settings	12-16 weeks	PE Teachers, Senior Students	Encourage leadership and peer mentoring	Progressive Experience Levels

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		leadership					
Implementation	Schedule & Duration	- 2-3 sessions /week, 60-90 minutes each- 12-16 weeks per cycle- Periodic assessments	Continuous improvement in cognitive function and well-being; measurable skill progression	Full program cycle	PE Department	Include mid-cycle and end	Implementation

This chapter presents a comprehensive summary of the study's findings, drawing insights from the analysis and interpretation of data presented in the previous chapters. It synthesizes the results in relation to the research objectives, highlighting key patterns and relationships regarding the cognitive function and psychological well-being of Grade 8 students in badminton.

Based on the findings, this chapter further provides conclusions that address the implications of the study for students, educators, and coaches. Finally, recommendations are proposed, offering practical strategies and interventions to enhance cognitive skills, well-being, and overall development through badminton. These recommendations also serve as a basis for the design of future grassroots training programs and further research in the field of sports, education, and youth development.

Based on the results of the study, the following conclusions were drawn:

1. The study examined the relationship between badminton participation, cognitive function, and psychological well-being among Grade 8 students of Fortune High School.
2. The respondents were 242 Grade 8 students actively participating in badminton, selected through purposive sampling.
3. Cognitive function was measured in terms of memory, concentration, and problem-solving.
4. Psychological well-being was measured in terms of stress management, self-efficacy, and resilience.
5. The respondents obtained a high level of cognitive function in memory, concentration, and problem-solving.
6. However, weak areas were identified in scoring system recall, offense and defense transitions, and situational problem-solving under pressure.
7. The respondents also obtained a high level of psychological well-being in stress management, self-efficacy, and resilience.
8. Weak areas in psychological well-being include coping with school-related pressure, emotional control during high-pressure matches, and confidence stability when facing stronger opponents.
9. A significant relationship was found between cognitive function and psychological well-being, indicating that both variables are positively connected.

The study concludes that Grade 8 badminton players of Fortune High School demonstrate a generally high level of cognitive function in terms of memory, concentration, and problem-solving, indicating that participation in badminton enhances students' mental processing abilities. The sport's fast-paced and strategic nature contributes to the development of attention control, recall ability, and decision-making skills. However, specific weaknesses were identified in scoring system recall, offense and defense transitions, and situational problem-solving under pressure, suggesting that cognitive skills are still developing in structured and high-pressure contexts.

In terms of psychological well-being, the respondents also show a high level of stress management, self-efficacy, and resilience, which indicates that badminton participation supports emotional regulation, confidence building, and the ability to recover from setbacks. Nevertheless, challenges were observed in coping with academic-related stress, maintaining emotional control during competitive pressure, and sustaining confidence when facing stronger opponents. These findings imply that while badminton contributes positively to psychological well-being, external stressors and competitive pressure still affect student-athletes' emotional stability.

Overall, the study concludes that there is a significant positive relationship between cognitive function and psychological well-being, meaning that improvements in cognitive skills are associated with stronger psychological well-being. Therefore, badminton serves as an effective tool for promoting both mental and emotional development among Grade 8 students, but targeted interventions are necessary to address identified weak areas for more holistic development.

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Based on the findings and conclusions of this study, several recommendations are proposed to enhance the cognitive function, well-being, and overall development of Grade 8 students through badminton. These recommendations are intended for students, educators, coaches, and program developers, providing practical strategies that can be implemented at both school and community levels.

For Students

Students are encouraged to actively participate in structured badminton training sessions to further enhance their cognitive and psychological development. They should consistently engage in activities that strengthen memory recall, concentration, problem-solving, emotional control, and confidence-building, as these skills are essential not only in sports performance but also in academic and personal growth.

For Coaches and PE Teachers

Coaches and Physical Education teachers should integrate cognitive and psychological skill development into regular badminton training programs. Emphasis should be placed on addressing the identified weak areas such as scoring system recall, offense and defense transitions, and situational problem-solving under pressure. Training should also include emotional regulation strategies and confidence-building activities to support student-athletes' mental readiness. These may include structured drills, guided reflection, breathing exercises, and scenario-based match simulations to improve both mental and athletic performance.

For School Administrators

School administrators are encouraged to support and strengthen badminton programs by providing adequate facilities, equipment, and training opportunities. They should also promote the integration of cognitive and psychological development programs within sports activities to ensure a holistic approach to student development. Institutional support is essential in sustaining grassroots training programs that enhance both mental and physical well-being.

Proposed Grassroots Badminton Training Program

The proposed grassroots badminton training program should be implemented in progressive levels starting from beginner, intermediate, to advanced stages. At the beginner level, activities should focus on scoring system recall, basic movement drills, shadow badminton, and emotional awareness exercises to build foundational skills. At the intermediate level, training should emphasize offensive and defensive transitions, reaction drills, partner coordination, and situational problem-solving to enhance tactical awareness and decision-making. At the advanced level, training should involve full match simulations, cognitive dual-task exercises, high-pressure scoring scenarios, and mental toughness development activities aimed at strengthening resilience, confidence, and emotional stability. This structured progression ensures continuous development of both cognitive function and psychological well-being among student-athletes.

For Future Researchers

Future researchers are encouraged to expand the scope of this study by including other sports, grade levels, or larger populations to improve generalizability. They may also conduct longitudinal or experimental studies to determine the long-term effects of badminton on cognitive and psychological development. Additionally, future studies may incorporate academic performance and physiological indicators to further strengthen the understanding of the relationship between sports participation, cognitive function, and psychological well-being.

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