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Research Paper

# A Correlational Study of Cognitive Flexibility, Imagery Ability, and Self-Efficacy among Individual Athletes

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## ABSTRACT

The present study aimed to examine the relation between the cognitive flexibility, imagery ability, self-efficacy among individual athletes. A sample of 175 aged between 18 to 24 years, representing various sports like shooting, badminton, tennis, gymnastics, swimming, table tennis, athletics, was selected for the study. Standardized instruments including the cognitive flexibility inventory (CFI), sports imagery ability questionnaire (SIAQ), general self-efficacy scale (GSE), were used to assess the variables. The data were analyzed using descriptive statistics, Pearson product moment correlation, and linear regression analysis. The results revealed that cognitive flexibility had a strong positive correlation with imagery ability and self-efficacy. Also, imagery ability was found to be significantly and positively related to self-efficacy. Regression analysis indicated that cognitive flexibility significantly predicted both imagery ability and self-efficacy, while imagery also significant predictor of self efficacy. These findings suggest that cognitive flexibility plays foundational role in enhancing imagery processes and confidence among athletes, while imagery ability further strengthens self-efficacy. The study highlights the importance of psychological skills in sports performance and suggests that interventions focusing on cognitive flexibility and imagery training can enhance athletes' confidence, adaptability, performance overall. The findings contribute to the field of sports psychology by providing empirical evidence on the interrelationship among key psychological variables influencing athletic performance.

***Keywords:*** *Cognitive Flexibility, Imagery Ability, Self-Efficacy, Individual Athletes, Sports Psychology, Psychological Skills*

In competitive sports, particularly individual events performance is influenced not only by physical preparation and technical expertise but also by psychological strength. Unlike team sports, individual athletes bear full responsibility for success and failure. Increasing cognitive and emotional demands. In this overall thing, psychological constructs such as cognitive flexibility, imagery ability, and self-efficacy play role on shaping performance and confidence.

Cognitive flexibility refers to the ability to adapt thinking, shift strategies and respond effectively to changes situations. In dynamic sport environments, athletes must constantly

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adjust to factors such as opponent behaviour, environmental conditions, and performance flections. Imagery ability involves creating vivid and controllable mental images of performance situations, enabling athletes to mentally rehearse skills, strategies and emotional responses. This process makes neural pathways, enhance skill acquisition and improves focus and preparedness. Self-efficacy, defined as an individual belief to perform task, influence motivation, persistence and emotional control. Athletes with higher self-efficacy approach challenges confidently and recover quickly after setbacks.

The relationship among there variables is theoretically significant. Cognitive flexibility may enhance self-efficacy by promoting adaptive thinking, while imagery ability strengthens confidence through mental rehearsal of success. Their interaction may create a synergistic effect on performance. Understating their relations is essential in individual sports, where athletes rely on internal psychological process, and can inform integrated mental skills training for improved performance and well-being.

Success in high-stakes sport isn't just about how fast you run or how strong you are; it's also about the mental games that go on in an athlete's head. In solo sports, because the player is the only one responsible for winning or losing, these mental pressures are usually much higher. This makes things like self-regulation and how someone thinks inside even more important for getting the job done.

One of the biggest parts of this is self-efficacy, which comes from Albert Banduras social cognitive theory. Basically, it's how much a person believes they can actually succeed. This belief is what keeps them motivated and helps them stay tough when things get hard. Athletes with a lot of self-efficacy tend to face challenges with more bravery and don't give up after a bad game. At the same, imagery ability—or the skill to imagine yourself playing—is a great tool for practice. It helps athletes practice their moves in their mind, control their feelings, and get ready for the real match.

Another factor is cognitive flexibility, which is the ability to change your thinking or try a new plan when things aren't going right. Even though its super important in fast-moving sports, people haven't studied it as much. In a crazy competition, being flexible mentally helps an athlete switch their strategy on the fly and keep their cool under stress.

Even though we know a lot about self-efficacy and imagery, we don't really know how they work together with cognitive flexibility, especially for individual athletes. Most of the time, these things are studied by themselves, so there is a big gap in knowing how they help each other out. Fixing this gap is key because being mentally flexible might make imagery work better and boost a person's confidence. Looking at these together will help us understand sports psychology better and make better training plans for athletes.

Research on cognitive flexibility has consistently highlighted its role in adaptability and decision-making among athletes. Studies suggest that athletes involved in team sports often display greater cognitive flexibility compared to those participating in individual sports, possibly because team environments demand constant adaptation to changing situations and teammates' actions (Aslan, 2018). Başoğlu et al. (2025) also observed that cognitive flexibility contributes to effective decision-making, although the level of contribution was moderate in nature. Beyond sports settings, Dalkılıç (2017) connected cognitive flexibility

with adaptation in organizational and work-related contexts, showing that this psychological construct has importance in different life domains too.

Imagery ability is considered one of the most important psychological skills in sports psychology. Research by MacIntyre and Moran (2007) suggested that elite athletes are more capable of regulating and controlling imagery processes, including the use of negative imagery in a productive way. A meta-analysis conducted by Liu et al. (2023) further showed that imagery practice can improve athletic performance, especially when it is combined with other psychological techniques. Similarly, Hall et al. (1990) and Munroe-Chandler et al. (2007) reported that imagery usage tends to increase with higher competitive experience and age, becoming more systematic and structured over time.

Self-efficacy has also been strongly linked with motivation, emotional regulation, and sports performance. Anjali and Mathews (2020) found that athletes generally report higher self-efficacy compared to non-athletes. Nicholls et al. (2010) indicated that greater self-efficacy positively affects performance while also helping athletes reduce anxiety levels during competition. Moreover, intervention-based findings by Zagórska and Guszkowska (2014) demonstrated that self-efficacy can be improved through structured psychological training programs.

Several studies have explored the relationship among cognitive flexibility, imagery ability, and self-efficacy. Roberts et al. (2017) discussed the neurological relationship between imagery processes and cognitive flexibility. In addition, studies by Short et al. (2005) and Munroe-Chandler et al. (2008) suggested that athletes with stronger imagery ability often experience higher levels of self-efficacy. Research conducted by Pepe (2021) and Laçin and Yalçın (2019) also identified positive associations between cognitive flexibility and self-efficacy, indicating that these variables may collectively contribute towards athletic adaptation and performance.

## METHODOLOGY

### *Sample*

The sample for the study consisted of individual athletes aged between 18 and 24 years, including both male and female participants. These athletes were state-level players representing various sports such as badminton, swimming, athletics, table tennis, tennis, shooting, and gymnastics. A purposive sampling technique was used to select participants who met specific criteria. Inclusion criteria required athletes to have a minimum of one year of experience and to be engaged in regular training. Exclusion criteria included athletes who were injured, those participating in team sports, and individuals who were not competing at the state level.

### *Instrument*

Standardized and widely accepted tools were used for data collection. The Cognitive Flexibility Inventory (CFI) consists of 20 items rated on a 7-point Likert scale. The Sport Imagery Ability Questionnaire (SIAQ) includes 15 items designed to measure different aspects of sport imagery ability. The General Self-Efficacy Scale (GSE) comprises 10 items rated on a 4-point Likert scale. All three instruments have established reliability and validity and are commonly used in psychological and sports research.

***Procedure***

Participants were approached through various sports academies and clubs. Prior to data collection, informed consent was obtained from all participants to ensure ethical compliance. The questionnaires were administered in person to maintain consistency and clarity. Participants were assured that their responses would remain confidential and anonymous. After collection, the data were systematically coded to facilitate accurate analysis.

***Plan for Statistical Analysis***

The collected data were analysed using SPSS software. Descriptive statistics, including mean, median, skewness, and kurtosis, were computed to summarize the data. A normality test was conducted to ensure that the data followed a normal distribution. Since the data met the assumptions of normality, Pearson's correlation was used to examine the relationships between the variables. Additionally, regression analysis was applied to determine the predictive relationships among cognitive flexibility, imagery ability, and self-efficacy.

## RESULTS

***Table 1: descriptive statistics***

| **Descriptive Statistics** | | | |
|---|---|---|---|
| | **Cognitive flexibility** | **Imagery ability** | **Self -efficacy** |
| **Mean** | 100.05 | 96.57 | 25.14 |
| **Std. Deviation** | 14.871 | 16.001 | 6.019 |
| **Skewness** | -.091 | -.147 | -.066 |
| **Std. Error of Skewness** | .184 | .184 | .184 |
| **Kurtosis** | -.177 | -.069 | -.285 |
| **Std. Error of Kurtosis** | .365 | .365 | .365 |

| **Variable** | **Kolmogorov-Smirnov** | | | **Shapiro-Wilk** | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| **Cognitive Flexibility (CFI)** | .057 | 175 | .200* | .991 | 175 | .334 |
| **Imagery Ability (IMG)** | .035 | 175 | .200* | .996 | 175 | .926 |
| **Self-Efficacy (GSE)** | .038 | 175 | .200* | .994 | 175 | .750 |

The descriptive statistics indicate that cognitive flexibility had the highest mean (100.05) with moderate variability (SD = 14.871). Imagery ability showed a slightly lower mean (96.57) but greater variability (SD = 16.001), while self-efficacy had the lowest mean (25.14) and least variability (SD = 6.019). Table no.2:

***Table No.2: correlation and regression between cognitive flexibility and imagery ability among individual athletes***

| **Variable** | **Kolmogorov-Smirnov** | | | **Shapiro-Wilk** | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| **Cognitive Flexibility (CFI)** | .057 | 175 | .200* | .991 | 175 | .334 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Imagery Ability (IMG)** | .035 | 175 | .200* | .996 | 175 | .926 |
| **Self-Efficacy (GSE)** | .038 | 175 | .200* | .994 | 175 | .750 |

| **Variables** | **1** | **2** |
|---|---|---|
| **1. Cognitive Flexibility** | — | .803*** |
| **2. Imagery Ability** | .803*** | — |

| **Predictor** | **β** | **$R^2$** | **F** |
|---|---|---|---|
| **Cognitive Flexibility** | .803*** | .643 | 314.094*** |

N = 175. ***p < .001.

The findings support the first hypothesis, showing a strong positive relationship between cognitive flexibility and imagery ability (r = .803, p < .001). This indicates that athletes with higher cognitive flexibility can create more vivid and effective mental images.

Regression analysis further confirmed that cognitive flexibility significantly predicts imagery ability (F = 314.094, p < .001), explaining 64.3% of the variance (Adjusted $R^2$ = .643). The strong beta value (β = .803) highlights its important role.

These results align with previous studies, suggesting that flexible thinking enhances athletes' ability to mentally simulate performance, making it a key psychological skill in sports.

***Table no.3: correlation and regression between cognitive flexibility and self-efficacy among individual athletes.***

| **Variables** | **1** | **2** |
|---|---|---|
| **1. Cognitive Flexibility** | — | .876*** |
| **2. Self-Efficacy** | .876*** | — |

N = 175. ***p < .001.

| **Predictor** | **β** | **$R^2$** | **F** |
|---|---|---|---|
| **Cognitive Flexibility** | .876*** | .765 | 568.483*** |

N = 175. ***p < .001.

The second hypothesis was supported, showing a very strong positive relationship between cognitive flexibility and self-efficacy (r = .876, p < .001). This suggests that athletes who think more flexibly have higher confidence in their abilities.

Regression analysis confirmed that cognitive flexibility strongly predicts self-efficacy (F = 568.483, p < .001), explaining 76.5% of the variance (Adjusted $R^2$ = .765). The high beta value (β = .876) highlights its strong influence.

These findings are consistent with previous research, indicating that flexible thinking enhances confidence and plays a key role in athletes' psychological performance.

***Table no.4: correlation and regression between imagery ability and self-efficacy among individual athlete***

| Variables | 1 | 2 |
|---|---|---|
| **1. Imagery Ability** | — | .836*** |
| **2. Self-Efficacy** | .836*** | — |

N = 175. ***p < .001.

| Predictor | β | $R^2$ | F |
|---|---|---|---|
| **Imagery Ability** | .836*** | .697 | 401.772*** |

N = 175. ***p < .001.

The results show a strong positive relationship between imagery ability and self-efficacy (r = .836, p < .001), indicating that athletes with better imagery skills have higher confidence. Regression analysis confirmed that imagery ability significantly predicts self-efficacy (F = 401.772, p < .001), explaining 69.7% of the variance (Adjusted $R^2$ = .697), with a strong beta value (β = .836).

Overall, the findings suggest that imagery ability plays a key role in building confidence, and along with cognitive flexibility, contributes significantly to athletes' performance and psychological development.

## DISCUSSION

The present study examined the relationship among cognitive flexibility, imagery ability, and self-efficacy in individual athletes. The findings showed significant positive relationships among all the three variables, with cognitive flexibility emerging as a strong predictor of both imagery ability and self-efficacy. Imagery ability was also found to significantly predict self-efficacy. These findings support the proposed hypotheses and give a more integrated understanding of psychological processes in sports.

The positive relationship between cognitive flexibility and self-efficacy suggests that athletes who are able to adapt their thinking and shift cognitive strategies more effectively may also have stronger beliefs in their own performance abilities. This finding is consistent with social cognitive perspectives by Albert Bandura, which emphasize the role of cognitive processes in shaping efficacy beliefs. Athletes who can reinterpret difficult situations and generate alternative strategies may experience greater perceived control, therefore increasing their confidence.

Similarly, the significant association between imagery ability and self-efficacy is in line with previous research which suggests that mentally simulating successful performances can strengthen confidence. Imagery allows athletes to rehearse skills and prepare for different performance situations, which may reinforce mastery experiences, considered as one of the major sources of self-efficacy. The current findings further extend this research by showing that imagery ability is not only related to self-efficacy but also acts as a significant predictor of it.

The strong relationship observed between cognitive flexibility and imagery ability suggests that flexible cognitive processing may help athletes use imagery more effectively. Athletes with higher cognitive flexibility may be better at generating, manipulating, and adapting

mental images according to situational demands. This supports the idea that underlying cognitive abilities can influence the effectiveness of psychological skills commonly used in sports settings.

Importantly, the findings highlight the possible interdependence of these constructs instead of their isolated effects. Cognitive flexibility may contribute to athletes' ability to use imagery effectively, which in turn may improve self-efficacy. This integrated perspective provides a broader understanding of psychological functioning in individual sports, where athletes heavily rely on internal cognitive and self-regulatory processes.

From an applied perspective, these results suggest that psychological skills training programs may benefit from including strategies aimed at improving cognitive flexibility along with traditional imagery training. Developing athletes' ability to adapt their thinking patterns may improve their engagement with imagery techniques and strengthen confidence during performance situations. Such integrated interventions may be especially useful in individual sports, where athletes often independently manage performance pressure and demands.

However, some limitations should also be acknowledged. First, the cross-sectional design of the study limits the ability to establish causal relationships among the variables. Future studies using longitudinal or experimental designs would be more useful in determining directionality. Second, the use of self-report measures may introduce common method bias, which could partly explain the relatively high correlations observed among the variables. Third, the sample consisted only of state-level athletes within a specific age range, which may limit the generalizability of the findings to other groups, such as elite athletes or younger populations.

Future research should explore these relationships using more diverse samples and include intervention-based approaches to examine whether improving cognitive flexibility and imagery ability leads to measurable changes in self-efficacy and performance outcomes. Additionally, examining possible mediating or moderating variables may further clarify how these constructs interact within sports environments.

In conclusion, the present study contributes to the sports psychology literature by providing empirical evidence for the relationship among cognitive flexibility, imagery ability, and self-efficacy in individual athletes. The findings highlight the importance of considering multiple psychological factors together and suggests the potential value of integrated mental skills training approaches.

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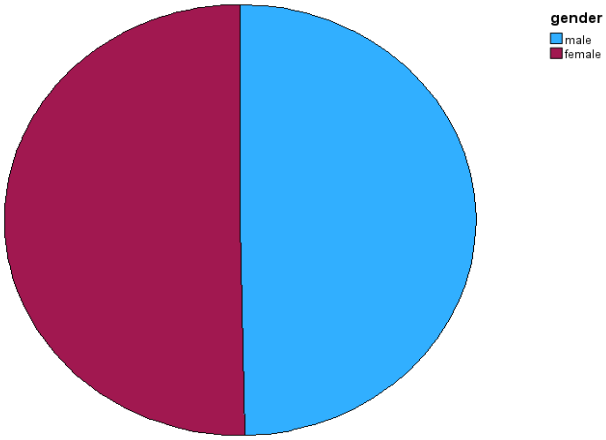
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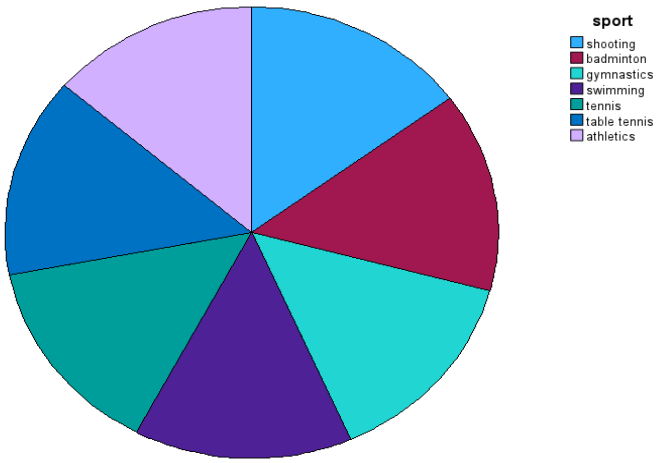
***Conflict of Interest***
The author(s) declared no conflict of interest.

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## PIE CHARTS

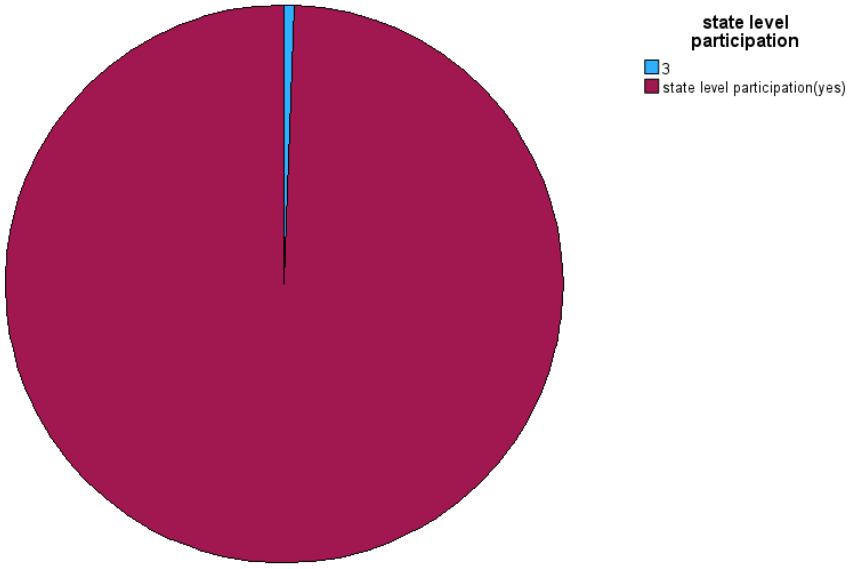



***Pie Chart 1: Gender Distribution***
This pie chart represents the gender distribution of participants. There are 87 male participants and 88 female participants.



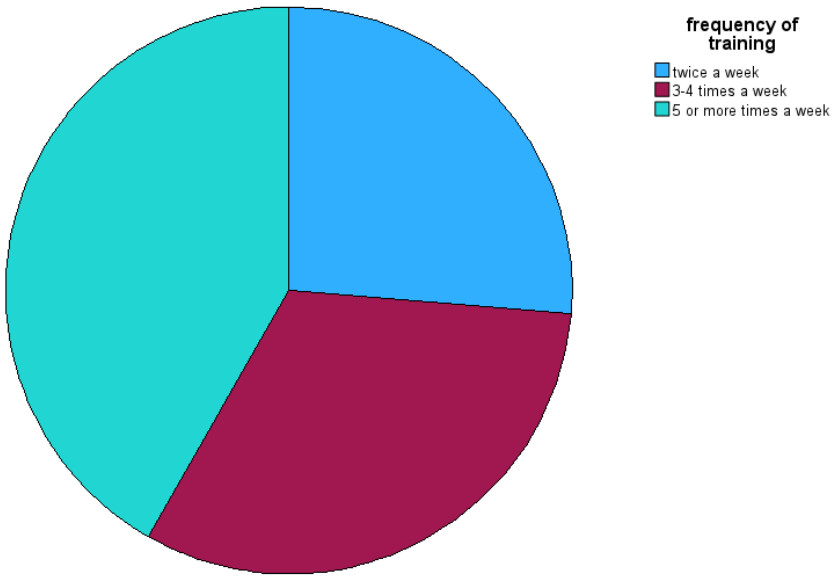

***Pie Chart 2: Type of Sport***

This pie chart shows the distribution of participants across different sports. Each sport has 25 participants, including shooting, badminton, gymnastics, swimming, tennis, table tennis, and athletics.



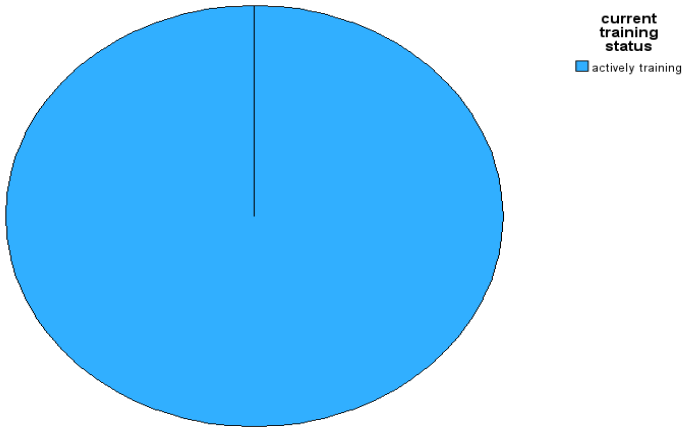

***Pie Chart 3: State-Level Participation***

This pie chart illustrates state-level participation. Out of a total sample size of 178, 175 participants included in the study are state-level athletes.



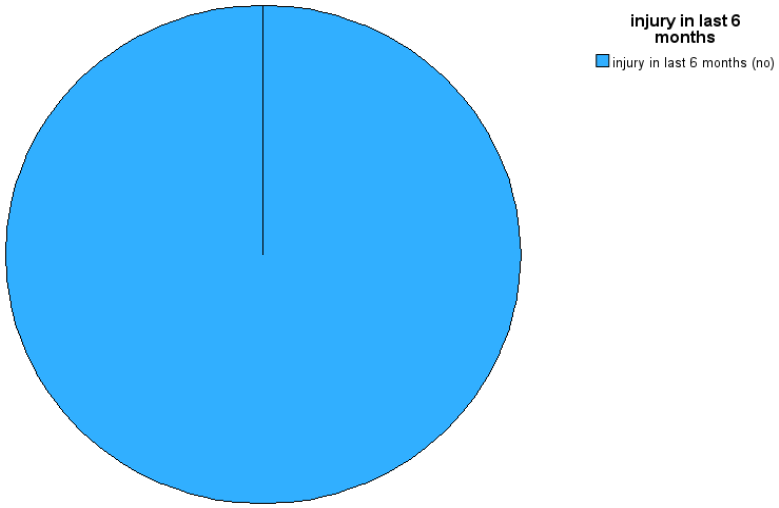

***Pie Chart 4: Frequency of Training***

This pie chart represents how frequently participants train. The categories include training twice a week, 3–4 times a week, and 5 or more times a week.



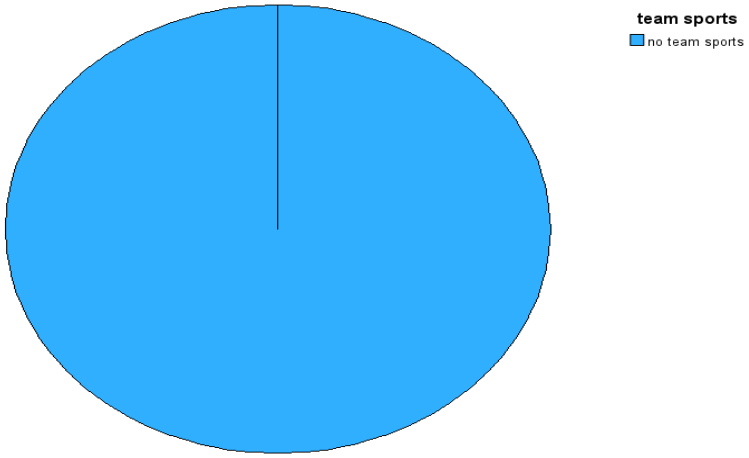

***Pie Chart 5: Current Training Status***

This pie chart shows the current training status of participants. All participants are actively training.



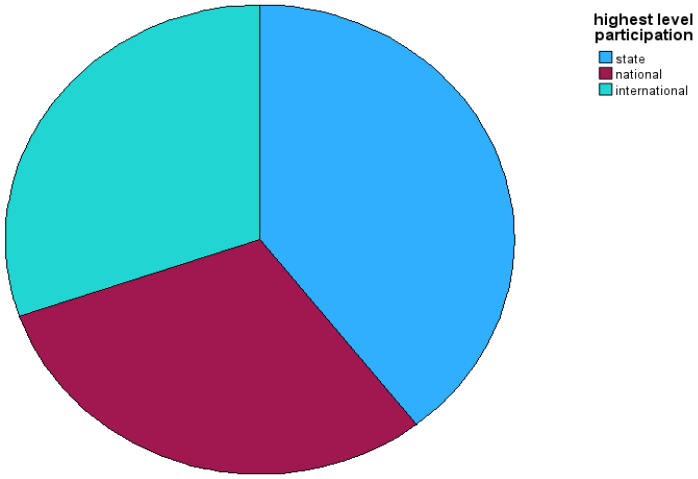

***Pie Chart 6: Injury in the Last 6 Months***

This pie chart represents injury status in the last six months. None of the participants have reported any injuries during this period.



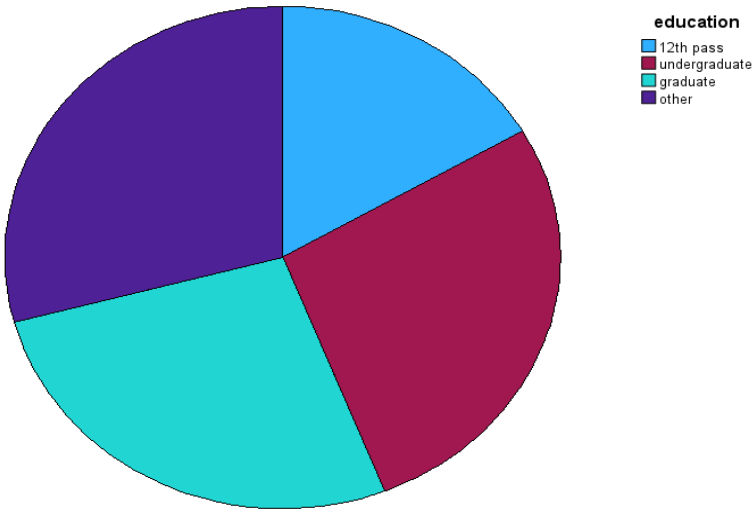

***Pie Chart 7: Team Sports Participation***

This pie chart shows participation in team sports. There are no team sport players included in the sample.



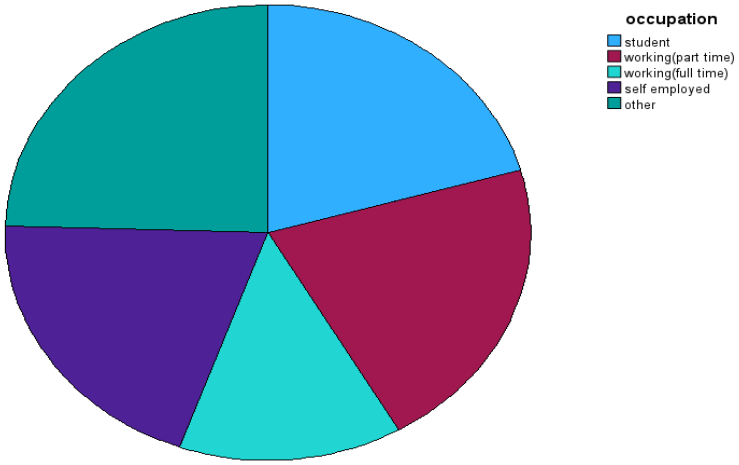

***Pie Chart 8: Highest Level of Participation***

This pie chart illustrates the highest level of participation achieved by participants, including state level, national level, and international level.



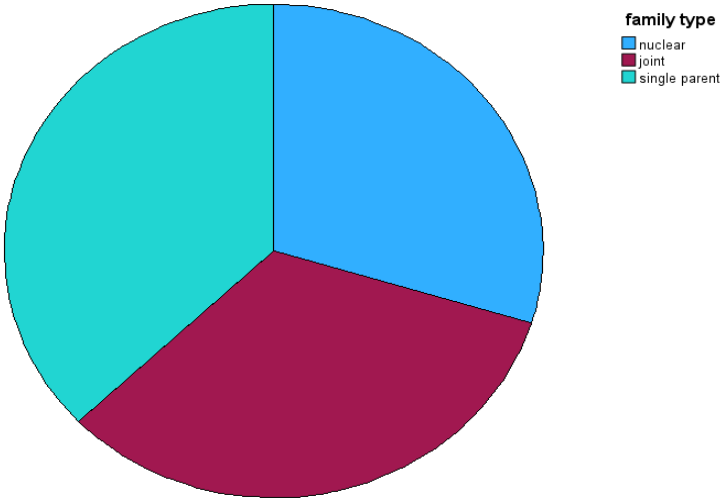

***Pie Chart 9: Education Level***

This pie chart represents the educational qualifications of participants. The categories include 12th pass, undergraduate, graduate, and other.



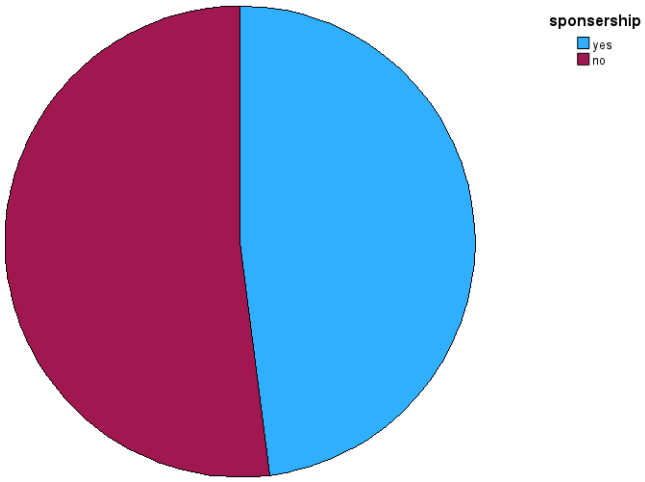

***Pie Chart 10: Occupation***

This pie chart shows the occupational status of participants. The categories include student, working part-time, working full-time, self-employed, and other.



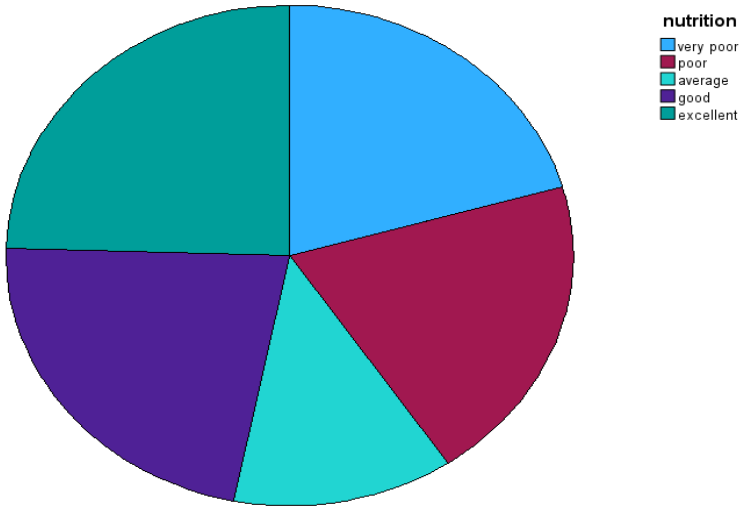

***Pie Chart 11: Family Type***

This pie chart represents the family structure of participants. The categories include nuclear family, joint family, and single-parent family.



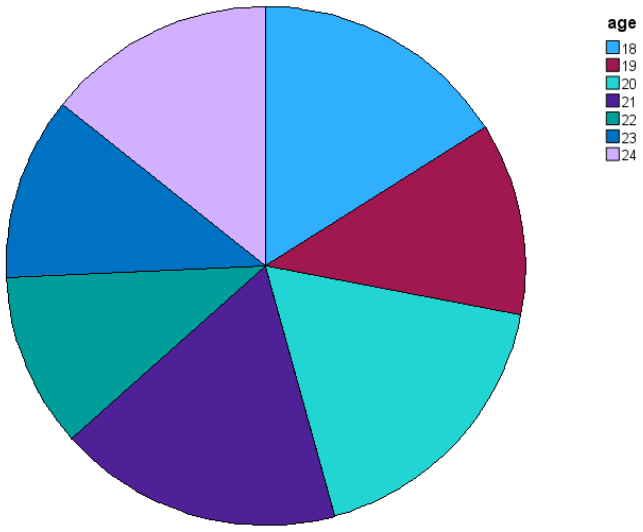

***Pie Chart 12: Sponsorship***

This pie chart shows whether participants have sponsorship. The responses are categorized as yes or no.




***Pie Chart 13: Nutrition Level***

This pie chart represents the nutritional status of participants. The categories include very poor, poor, average, good, and excellent.




***Pie Chart 14: Age Distribution***

This pie chart represents the age distribution of participants. The age categories include 18, 19, 20, 21, 22, 23, and 24 years.