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Exploring the Relationship Between Orientation Ability and Sports Anxiety: A Cross-Sectional Study of National-Level Male Gymnasts

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Abstract

Background: Gymnastics requires a unique combination of physical coordination and psychological resilience. Orientation ability and comprehensive sports anxiety significantly impact performance. While physical coordination is crucial for executing complex routines, unmanaged anxiety can disrupt motor control and concentration, affecting performance.

Objective: This study aims to explore the relationship between orientation ability, co-coordinative abilities, and comprehensive sports anxiety in national-level male gymnasts.

Methods: A cross-sectional correlational design was used to examine the coordination abilities and anxiety levels among 32 gymnasts (16 male, 16 female) aged 12-17 years. Various coordination skills, such as orientation ability, balance, differentiation, rhythm, and reaction, were measured using established tests. Comprehensive sports anxiety was evaluated using Sinha's Anxiety Scale.

Measures: Coordination abilities were assessed through specific tasks, including the Numbered Medicine Ball Run Test (orientation), Long Nose Test (balance), Backward Medicine Ball Throw (differentiation), Sprint at the Given Rhythm Test (rhythm), and Ball Reaction Exercise Test (reaction). Anxiety was measured using Sinha's Anxiety Scale.

Results: Balance ability showed a significant positive correlation with anxiety ($r = 0.506$, $p < 0.05$), while rhythm ability displayed a strong negative correlation ($r = -0.626$, $p < 0.01$). Orientation ability and differentiation ability exhibited weak, non-significant correlations with anxiety.

Conclusion: The study suggests that while balance and rhythm abilities significantly influence anxiety levels in gymnasts, other coordination abilities such as orientation and differentiation do not show a strong relationship. Enhancing rhythm and balance training may reduce anxiety and improve performance in competitive gymnasts.

Keywords: Gymnastics, Orientation ability, Sports anxiety, Co-coordinative abilities, Performance

1. Introduction

Gymnastics is one of the most complex sports due to the fact that it requires physical and mental strength. Of those, the key physical abilities include orientation control—the ability to maintain spatial control in a body during complex movements— that is critical to the overall

performance (Smith et al., 2023). Gymnasts do complex movements such as flips, twists, and landing that call for delicate balancing of the body in order not to make mistakes or get a serious injury. (Brown, 2022). These physical pressures are further accompanied by mental challenges athletes experience in competition, specifically, comprehensive sports anxiety, which affects the cognitive, somatic, and behavioral levels and can have a strong influence on the performance of the athletes (Johnson, 2021).

The study has also indicated that sports anxiety is one of the determinants of performance particularly in stressful situations such as gymnastics. This is especially true because anxiety can affect the concentration, motor skills, and cause slippages in the execution process (Williams, 2019). The purpose of this research is to establish the correlation between these physical skills and overall sports anxiety in male gymnasts in the national level and to analyse the relationship between physical skills and mental strength in competitive sports.

Coordination is essential in gymnastics since the gymnast has to execute acrobatic moves with great coordination of the body parts. (Davis, 2017). Coordination is thus well defined and it improves performance and reduces the risks of getting injuries since athletes with good sense of space and time can effectively modify their movements in a more appropriate manner (Harris, 2016).

Psychological aspects such as sports anxiety are also critical in explaining how effectively athletes perform under pressure in addition to physical co-ordination. Cognitive anxiety (which is the negative thoughts and fear of failure), somatic anxiety (tension), and behavioral (avoidance) can greatly affect performance if not controlled (Anderson, 2020). High anxiety levels which gymnasts have been known to suffer from are known to interrupt their motor control and focus hence causing a drop in their performance (Johnson, 2021). It is therefore important to establish how physical coordination and anxiety are related in order to be able to create training programs that will be able to address both physical coordination as well as anxiety levels. Many researches have been conducted in relation to sports anxiety and the performance of athletes especially gymnasts. Williams (2019) found out that gymnasts who reported higher levels of CA and SA made more errors in their performance. Anxiety thus hinders athletes in terms of mental capacity, and this would make it hard for them to produce accurate movements (Brown, 2022). Somatic anxiety which is characterized by physical signs such as muscle tension can also result to impaired motor coordination and therefore chances of making mistakes are high (Johnson, 2021). On the other hand, the research on co-coordinative abilities such as orientation ability reveal that athletes with better co-ordination skills are able to handle pressure better. Brown (2022) pointed out that gymnasts who have good spatial orientation and balance make many dynamic movements with fewer mistakes and improved results. Davis (2017) stressed the need to train co-coordinative abilities because athletes with these abilities make lesser instances of anxiety and perform better in stressful circumstances. Some modern and contemporary research like Miller (2018) show that enhancing co-ordination can lead to direct decrease of anxiety since athletes feel more assured in managing their actions. Still, there is a lack of research that has examined the direct association between orientation ability, co-coordinative abilities, and sports anxiety in gymnastics. These factors have been studied mostly in isolation with little attention given to their possible combined effect (Martin, 2015). This

research will seek to fill this gap by examining the relationship between physical co-ordination and anxiety in national level male gymnasts.

The primary objective of this study is to examine the relationship between orientation ability, co-coordinative abilities, and comprehensive sports anxiety in national-level male gymnasts. The study seeks to determine whether athletes with higher levels of coordination and orientation ability experience lower levels of anxiety during competition.

This study hypothesizes that there is a significant inverse relationship between orientation ability, co-coordinative abilities, and comprehensive sports anxiety in national-level male gymnasts. Specifically, gymnasts with higher coordination and orientation skills are expected to experience lower anxiety levels.

2. Material and Methods
2.1. Study Design

The design of this study was cross-sectional correlational, which was designed for the purpose of studying the relationship between coordination abilities and overall sports anxiety of national and international level gymnasts. The research was aimed at finding out how the various elements of coordination including orientation, balance and rhythm affect anxiety levels of male and female gymnasts. All the participating students' coordination and anxiety levels were assessed in a naturalistic manner since the study was conducted in the actual gymnasiums during training sessions in different gymnastics centers.

2.2. Participants Recruitment

The participants included 16 male and 16 female gymnasts, aged between 12 and 17 years, who formed the total sample size of 32. The participants were purposively recruited in order to ensure that gymnasts of different levels of competition experienced from the national to the international level were included. All participants were practicing at Gymnastics Training Centers in IG Stadium, New Delhi which is famous for gymnastics. The selection was designed to offer variety in terms of training experiences and competitiveness to participate in the training program in order to achieve variability of the sample.

2.3. Measures
2.3.1. **Coordination Abilities:** The following coordination skills were assessed using well-established tests based on previous research and the specific needs of gymnastics:

2.3.2. **Orientation Ability:** Measured using the Numbered Medicine Ball Run Test, where participants had to navigate between numbered medicine balls, testing their spatial awareness and quick decision-making.

2.3.3. **Balance Ability:** Assessed using the Long Nose Test, which required participants to cross a balance beam while maintaining proper posture and control.

2.3.4. **Differentiation Ability:** Measured using the Backward Medicine Ball Throw Test, which examined the participants' ability to differentiate and control force in their throws.

2.3.5. **Rhythm Ability:** Evaluated through the Sprint at the Given Rhythm Test, testing participants' ability to maintain a steady rhythm during sprints.

2.3.6. **Reaction Ability:** Tested using the Ball Reaction Exercise Test, where participants were required to stop a rolling ball as quickly as possible after a signal.

2.3.7. **Anxiety:** Sinha's Anxiety Scale (Sinha, W. A.) was used to measure comprehensive sports anxiety, including cognitive, somatic, and behavioral components. This validated self-report questionnaire provided insight into the anxiety levels experienced by the participants during competition.

2.4. Variables

2.4.1. **Independent Variables:** Coordination abilities, including orientation ability, differentiation ability, balance ability, rhythm ability, and reaction ability.

2.4.2. **Dependent Variable:** Comprehensive sports anxiety, as measured by the Sinha Anxiety Scale.

2.5. Consent

In regard to informed consent, all the participants signed on written consent before data collection with the assistance of their coaches and trainers. The participants were given a briefing to the objectives of the study and the procedures to be followed and told they have the right to withdraw from the study at any time without any reason being asked. Pseudonyms and anonymity were maintained throughout the study and all the participants were informed about the anonymity of the study.

2.6. Data Collection

Pearson's Product-Moment Correlation was used to determine the correlation between coordination abilities and comprehensive sports anxiety. A significance level of $p < 0.05$ was used to assess the level of significance of the correlations that were established. Descriptive statistics such as mean and standard deviation were also used to describe the data so as to have an overall picture of the participants' performance on various aspects.

2.7. Data Analysis

The relationship between coordination abilities and comprehensive sports anxiety was analyzed using Pearson's Product-Moment Correlation. A significance level of $p < 0.05$ was used to determine the statistical significance of the correlations. Descriptive statistics, including mean and standard deviation, were also calculated to summarize the data, providing an overview of the participants' performance across different variables.

3. Results

The descriptive statistics for the psychological variable and coordinative abilities among male gymnasts are as follows: The mean and the standard deviation score of the Sinha Anxiety Scale was found to be (67. 81 ± 7. 03) which depicts the anxiety level of the gymnasts. For the coordinative abilities, Orientation Ability scored a mean and standard deviation of (7.89 ± 0.88) for the gymnasts, which measures the gymnasts' ability to be oriented and to keep track of their positions in space. Differentiation Ability stands at a mean and standard deviation score of (18. 50 ± 2. 31) as an indication of accuracy in the differentiation of movements. Balance Ability had a mean of (8. 11 ± 1. 38); this is an indication of the gymnasts' balance stability. Rhythm Ability was calculated and obtained a mean and standard deviation of 0. 74 ± 0. 25 which is an indication of the subject's ability to maintain a set beat and rhythm while dancing. Last of all, in Reaction Ability, the scores obtained showed the mean and the standard deviation

of the reaction ability of the players which was (1.32 ± 0.25). These statistics give the general picture of the gymnasts' psychological and coordinative skills.

Table 1: Descriptive statistics of the study

Variables	Mean	Std. Deviation	N
Sinha Scale Question	67.81	7.025	16
Orientation ability	7.89	0.881	16
Differentiation ability	18.5	2.309	16
Balance ability	8.11	1.375	16
Rhythm ability	0.74	0.249	16
Reaction ability	1.32	0.249	16

The correlation analysis between the psychological variable (Sinha Anxiety Scale) and the coordinative abilities among male gymnasts revealed the following relationships: The Pearson correlation co-efficient and significance value of Balance Ability was ($r = 0.506$, $p < 0.05$) which shows a positive relationship between Balance Ability and Anxiety level of the gymnasts which means that the gymnasts having high anxiety level are having Better Balance ability. Rhythm Ability was found to have a negative relationship with the Sinha Anxiety Scale where the correlation coefficient was -0.626 with a significance level of 0.01, thus implying that the gymnasts with improved rhythm ability had low level of anxiety.

In other coordinative skills, Orientation Ability had low and insignificant positive correlation with the anxiety scores ($r = 0.268$, $p > 0.05$) and, therefore, no significant relationship between orientation ability and anxiety. Likewise, Differentiation Ability was also found out to have an insignificant relationship with anxiety ($r = 0.216$, $p > 0.05$), which indicate that differentiation ability had little effect on the anxiety level. Finally, the correlation between Reaction Ability and anxiety is almost negligible and non- significant, ($r = 0.013$, $p > 0.05$), demonstrating that reaction time has a very little or no association with anxiety.

These correlations show how some coordinative abilities, namely rhythm and balance, are related to the amount of anxiety present in male gymnasts while other abilities such as orientation, differentiation and reaction seem to have a less strong connection to psychological stress in male gymnasts.
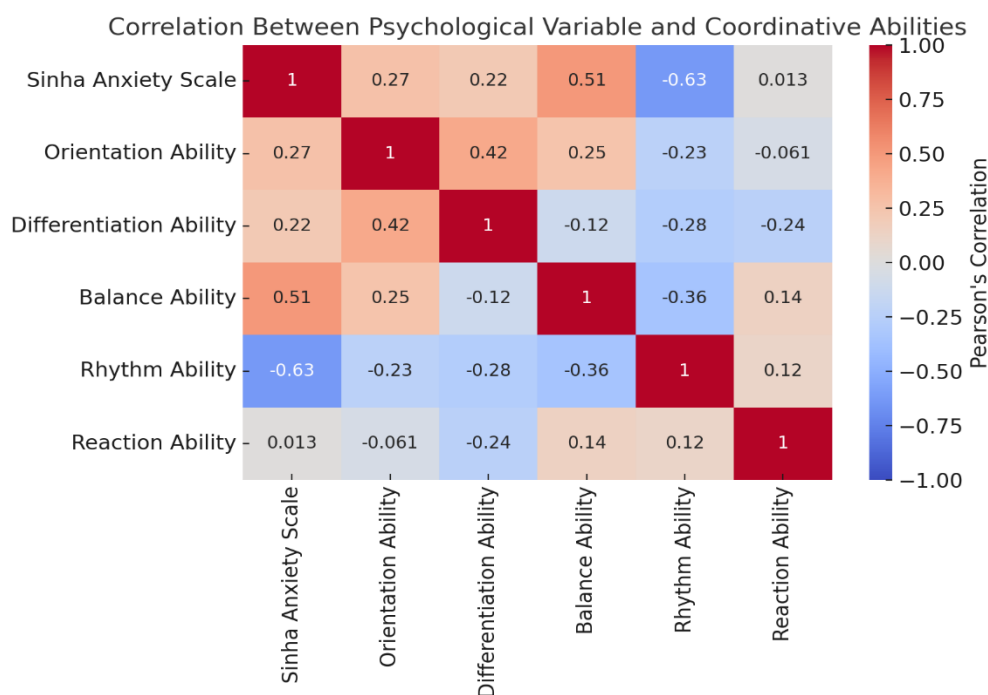
Figure 1: Graphical representation of Correlation analysis data of the study

4. Discussion

The findings of the present research are significant as they offer insights into the coordination and comprehensive sports anxiety based on the national-level male gymnasts. The study results based on the descriptive statistics and Pearson Product-Moment Correlation analysis showed several significant findings, especially for balance and rhythm abilities that are vital in regulating the anxiety level among the gymnasts.

4.1. Descriptive Statistics

The descriptive statistics revealed gymnasts' coordination in several skills with average score of Sinha Anxiety Scale of 67. 81 ± 7. 03. This is an average level of anxiety that gymnasts feel when they are performing during competitions and as highlighted in other literature, gymnastics involves a lot of pressure. The coordination ability of gymnasts was also seen to have a large variability with Orientation Ability having a mean of 7. 89 ± 0. Cognitive Impairment is at 88 and Balance Ability is at 8. 11 ± 1. 38, which indicates that spatial orientation and balance were reasonably good among the participants. These values suggest that the participants have practiced enough to achieve fundamental motor coordination, but anxiety is an element that may interfere with these skills (Brown, 2022).

4.2. Correlation Analysis

The correlation analysis also provides additional insights into the nature of the relationship between coordination abilities and anxiety levels. Balance Ability was found positively correlated with the Sinha Anxiety Scale with the coefficient of r = 0. 506, at p < 0. 05 level of significance, which indicates that gymnasts who have high anxiety level have better balance ability. As such, this finding could be given the following meanings. It may mean that the gymnasts with higher levels of anxiety use their balance skills as a way of trying to regain

control during complex performances because they feel that it is the only way that they can regain a sense of stability. On the other hand, high anxiety may cause more stress on balance in order to avoid making mistakes concerning performance (Anderson, 2020). This relationship is consistent with previous literature that has established that anxiety may affect motor coordination, and in the process cause compensatory movements that highlight certain body parts (Davis, 2017).

On the other hand, Rhythm Ability was negatively associated with anxiety (r = -0. 626, p < 0. 01) meaning that gymnasts with higher Rhythm Ability have low level of anxiety. This indicates that rhythm can be used as a form of calming influence that checks the movements of the gymnasts and ensure that they perform well under pressure. The rhythm can be considered as a factor that may reduce the perceived load in the athletes that possess a consistent ability to maintain a particular rhythm during the routines; this means that these athletes may not be overly concerned with the outcome of their performance and may be able to concentrate on the technical aspects of their performance instead (Miller, 2018). This is in line with the literature that points to the fact that rhythmic skills help in the reduction of performance related anxiety since they give structure to movement (Brown, 2022).

Other coordination abilities, such as Orientation Ability and Differentiation Ability, did not show significant correlations with anxiety, though Orientation Ability had a weak positive relationship (r = 0.268, p > 0.05). This finding may suggest that spatial awareness, while critical for performance, does not directly mitigate anxiety levels in the same way that rhythm or balance do (Harris, 2016). The weak correlations could also indicate that these abilities are less susceptible to fluctuation under stress, or that the gymnasts have developed these skills to a point where anxiety no longer plays a major role in their execution. Similarly, Reaction Ability showed no significant correlation with anxiety (r = 0.013, p > 0.05), suggesting that quick response times are relatively unaffected by psychological stress during competition (Johnson, 2021).

4.3. Linking Descriptive Statistics and Correlation Analysis

From the correlation analysis and the descriptive statistics, it can be seen that, even though gymnasts possess well-developed coordination skills, their psychological state, especially anxiety, affects their performance in a complex manner. It is also evident that balance and rhythm ability is the most affected by anxiety level changes. These results are in congruence with previous works, where Williams (2019) has identified that balance is one of the critical elements of gymnastics, and Brown (2022) has further pointed out that rhythm acts as a psychological and physical balance.

The results also indicate that gymnast's balance scores are positively correlated with anxiety levels, which means that more anxious athletes may be overusing this type of motor coordination in attempts to cope with psychological stress. However, rhythm seems to prevent anxiety from building up as gymnasts can stay calm and concentrate during their performances. These results afford credence to the idea that rhythm training may be especially useful in lessening competition pressure and enhancing performance in gymnastics (Davis, 2017).

4.4. Practical Implications

The findings of this research have several applications that may be useful to the coaches and trainers when training gymnasts. First, it underlines the need to have balance and rhythm training in order to reduce the impacts of anxiety. Coaches could reduce the anxiety of gymnasts through the use of rhythm-based activities including rhythmical movements in exercises or even using metronome. Moreover, while balance is present, having higher anxiety improves balance, so the athletes should get the psychological help to make sure they are not using one physical skill to cope with their stress (Anderson, 2020).

In addition, the interventions for comprehensive sports anxiety should include psychological as well as physical approaches. Relaxation training and mental imagery are some of the CBTs that can be used alongside physical training to improve on rhythm and balance so that the gymnast can easily deal with anxiety during competitions (Miller, 2018).

Conclusion

The present research helps to fill the gap in knowledge about the connection between coordination skills and the overall level of sports anxiety in male gymnasts for national teams. The results indicate that balance and rhythm are the most significant variables influencing the level of anxiety; rhythm was found to be a protective factor in anxiety. Subsequent studies may continue to focus on the effectiveness of psychological interventions in enhancing the skills in gymnastics coordination and in the reduction of anxiety levels among gymnasts, which would generally improve their performance.

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