

Relationship between Intelligence Quotient (Dimension-Wise) and Sports Performance of Shuttlers and Academics

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Abstract

This study investigates the relationship between Intelligence Quotient (IQ) dimensions and performance outcomes in two domains—sports (specifically badminton) and academics—among adolescents aged 14 to 17 years in Haryana, India. A total of 400 male subjects were randomly selected, comprising 200 shuttlers and 200 academic performers. The primary objective of the research was to assess the influence of specific IQ dimensions—namely Vocabulary, Classification, Number Series, Analogies, and Reasoning—on sports performance and academic achievement. The Group Test of General Mental Ability by S. Jalota was administered to evaluate the cognitive abilities of all participants across the five IQ dimensions. Sports performance was assessed through official records and competitive match outcomes, while academic performance was based on school-reported academic scores. The collected data were analyzed using Pearson's correlation coefficient to examine the relationship between IQ and performance indicators in both groups. The findings revealed a positive and statistically significant correlation between all IQ dimensions and performance outcomes in both domains. In the shuttler group, reasoning and numerical ability emerged as the most influential cognitive factors contributing to sports performance. Similarly, in the academic group, strong performance in number series and reasoning dimensions was associated with higher academic success. The study concludes that higher cognitive abilities across various dimensions of IQ contribute meaningfully to both athletic and academic performance. These findings emphasize the importance of cognitive profiling for effective talent identification, athlete training, and academic guidance. The results carry practical implications for coaches, educators, and psychologists, encouraging a more holistic approach to developing youth potential in both educational and athletic settings.

Keywords: Intelligence Quotient, Cognitive Abilities, Sports Performance, Academic Achievement, Badminton Players

Introduction

Intelligence has fascinated psychologists, educators, and performance analysts for centuries – a construct that is believed to have far-reaching applications to human potential, learning and adjustment. Among them, Intelligence Quotient (IQ) testing is one of the most popular measurements for cognitive function; it is designed to measure human intelligence in different cognitive domains. Not just a one-dimensional score, IQ includes several distinct types of intelligence, for example, verbal reasoning, numerical ability, spatial awareness, memory and processing speed that add up to a complex and nuanced profile of an individual's cognitive landscape. With more and more focus on cognitive profiling, more recent research questions how IQ relates not just to educational attainment but athletic outcomes, especially in cognitively demanding sports such as badminton.

The IQ's original conceptual development in the early 20th century, by Alfred Binet and subsequently refined by Lewis Terman, was pivotal in institutionalising the IQ as a cognitive measure in both educational and psychological diagnostics. Contemporary perspectives, on the other hand, see intellect/emotion as a multidimensional phenomenon. Howard Gardner's multiple intelligences theory and Robert Sternberg's triarchic theory mark the transition from linear models of intelligence to interactive models involving analytical, practical, and creative dimensions of intelligence (Sternberg, 2019). Although the conventional IQ model survives in psychometric testing, it is being complemented with tests that investigate how the dimensions of intelligence relate to people's performance in the real world.

Verbal reasoning and numerical aptitude were the dimensions found to be strongly related with the performance of examination and logical thinking, problem solving as these are related with knowledge comprehension and application (Sharma & Singh, 2018). Similar findings have also been found in international settings. For instance, Verbal IQ was shown to be the strongest predictor of literacy through its effect on reading comprehension in American high school students (Gottfredson, 2019). But intelligence is no longer seen as only in the realm of scholastic ability. In the recent years, the link of IQ and sports performances has been in focus especially when you are looking at games that require strategy, quick decision making and ability to predict the movements, a slight pull away from Kaadle because Shuttle badminton is played at competitive level at several tournaments across Karnataka. Badminton players are required to deal with visual stimuli and must make fine motor responses and change strategies during the game. Studies such as Balakumar and Rajeswaran (2021) demonstrate that performers with high spatial and logical reasoning scores demonstrate a high degree of court awareness, better shot selection and kinesthetic prediction in fast-paced badminton play. Further, European neurocognition studies suggest that executive functions—correlated with dimensions of general intelligence—are crucial for elite sports performance (Vestberg, Gustafson, Maurex, Ingvar, & Petrovic, 2018). Specifically, in badminton, a sport known for requiring a blend of physical agility and mental acuity, the interplay between intelligence dimensions and performance is increasingly evident. Studies have found that shuttlers with higher problem-solving abilities and faster cognitive processing speeds

outperform their counterparts in tactical gameplay and anticipatory responses (Kumar & Dey, 2020). Additionally, spatial visualization, often a sub-domain of IQ, contributes significantly to rally construction, positioning, and shot variation, especially in high-level matches (Chowdhury & Mallick, 2019).

It is also crucial to appreciate that student-athletes have academic and sports obligations, especially in countries such as India, where academic goals are perceived to be equally important, if not more so, even for elite athletes. Since most shuttle players are involved in intense training during their careers and are expected to meet the academic requirements, an analysis of how different aspects of intelligence may support or inhibit this balance is important. Theories such as the dual-pathway model of cognitive load propose that increased working memory and fluid reasoning capacity results in better time management and cognitive flexibility, qualities critical at academic studies and in the competitive sport (Fuchs & Fuchs, 2021).

Moreover there is growing interest in dimension-wise IQ analysis. Rather than looking at intelligence as one piece of the puzzle, experts now disassemble it, segmenting its subskills like verbal reasoning, classification, analogical reasoning, number series, and studying how each influences different performance areas. For instance, Patel and Sharma (2022) found verbal intelligence to be a stronger predictor of academic essay performance, and logical reasoning to be more related to decision making in sports. These results support the value in deconstructing IQ into actionable dimensions that may be separately, though simultaneously, studied.

Neurocognitively IQ is highly biologically based. It is known from neuroimaging studies that intelligence is related to the efficiency (global information transfer) of neural networks, especially in the prefrontal cortex. For athletes, especially for reactive sports such as badminton, increased integration in the parts of the brain responsible for spatial reasoning and executive control have been demonstrated (Vestberg et al., 2018). These convergences of IQ regions and motor planning jurisdiction centers signal a biological origin for elite performances in both sports and school.

Culture however is also an important consideration when assessing IQ. Social markers such as education and access to resources as well as linguistic diversity may influence the formation and measuring of IQ in Indian society. Narayan and Mukherjee (2021) highlighted the appropriateness of culturally informed assessment as transcultural psychological practice which recognizes the cultural versions of contemporary Indian students, and athletes' conceptualizations of intellectualism by Western-constructed IQ tests and measures, and downplays the expression or understanding of Indian's cultural bearing.

So, the IQ number is not just a number, but a multidimensional measure with wide-ranging applications in education and sport. The dimension-by-dimension analysis of IQ can therefore help shuttlecock players, for whom histrionic and kinesthetic capabilities are necessary, to predict players' behaviors and outcomes in the game. Similarly, for the student-athlete juggling two livelihoods, understanding which cognitive attributes contribute to academic and

sporting success, can influence designing training programme's, educational interventions, and psychological support structures.

Review of Related Literature

Chatterjee and Roy (2018) also found out that game planning and competitive reliability was significantly better in those Indian athletes who were classified higher in reasoning and classification scores. These dimensions of IQ support athletes as they anticipate moves and plan adjustments during matches.

Vestberg, Gustafson, Maurex, Ingvar, & Petrovic, (2018) identified that executive function, working memory, and problem-solving, predicted significant variation in performance in elite soccer. High-scoring athletes adjusted more quickly to changes in gameplay and demonstrated better short-term decision-making under pressure.

Kumar and Singh (2019) underlined that volleyball players with above-average verbal and spatial intelligence demonstrated a higher capacity to understand tactical situations and communicate on the court. The emphasis was knowledge of game mechanics and adaptability to coach feedback through IQ.

Mallick and Chowdhury (2019) studied spatial intelligence in junior badminton players and discovered that better achievement in visual-spatial IQ led to better shot placement, movement effectiveness and anticipation of athletes. Their footwork a little less scrappy when playing a hard game.

Gonzalez, Torres, and Rios (2020) studied dual-career athletes and reported that verbal and numerical intelligence quotient (IQ) positively predicted academic grades and tactical knowledge in sports. These students were better able to cope with academic and sport-related demands, as a result of enhanced cognitive flexibility in this variable.

Additionally, Reddy and Dey (2020) demonstrated that Indian university-level badminton players with higher logical reasoning and analogical thinking abilities performed better during match play. Their choices were faster and more accurate, indicating an effect of IQ on decision-making performance in the task.

Patel and Sharma (2022) found logical reasoning and numerical ability as significant predictors of winning rallies, positioning on court and success of the match among Indian collegiate players, specially shuttlers. They stressed the necessity of examining the IQ dimensionally with regard to both academic and athletic training results.

Sandroff, Motl, & Hernandez, (2022), which found that improvements in cognitive speed were associated with better motor coordination and reactive variables. This also highlights the importance of integrating cognitive training in training regimens to maximize physical and cognitive performance in sport.

Boone, Zambrotta, Manocchio, & Helling (2023) discovered that NFL quarterbacks with more well-developed Athletic Intelligence Quotient (AIQ) values greatly garnered improved situational strategy decisions, reaction times, and game prediction. Cognitive factors such as

spatial awareness and decision-options flexibility were associated to on-field performance and play-calling efficiency.

Scanlan, Conte, and Ferioli (2023) who observed that basketball players with high indices of intelligence performed better in terms of off-the-ball movement, defensive anticipation and tactical flexibility. They were also closely linked with pattern recognition and cognitive processing speed subsets of IQ.

Throughout the literature included in this review, there is a unanimous agreement that objective measures of intelligence quotient are positively but modestly related to sport performance, especially in the context of complex skill sports including badminton. Sportspeople with higher IQs were found to exhibit better strategic play and better ability to adapt, anticipate and remember events and were also generally better performing in academia. The IQ has been proven both in India and across the world as a significant factor not just in academics, but in sports too. This would again point to the need to look at behavioural profiling as part of an athlete development and dual-career training programme.

Need and Significance of the Study

The increasing emphasis on high performance both academically and in sport has created an increased interest in the cognitive determinants of performance, particularly among young individuals engaging in dual careers. Intelligence quotient (IQ), including its dimensions of classification, reasoning, and spatial intelligence, may also have an impact with the highly strategic demands of badminton as well as fast reflexes, spatial awareness, and real-time decision-making. At the same time academic success deeply relies on these cognitive functions too. Nevertheless, research remains scant on the dimension wise correlation of IQ with sports and academic success, particularly in the Indian scenario. This relationship is important as it helps to identify what cognitive abilities are important for success in shuttle sports, as well as in education. Ideally, such findings would be used to develop more effective training programs, academic interventions and psychological support tailored to an athlete's cognitive profile, coaches, educators and policy makers said. As such, the present study is theoretically and practically significant, as it connects sports science, psychology and education together and provides an all-round perspective on athlete development and academic prospect. It also adds to the current debate of the possibility that cognitive intelligence is a cognitive predictive as well as compensatory factor in human performance in different areas of expertise.

Objectives of the Study

1. To find out the impact of intelligence quotient on the performance of badminton players.
2. To find out the impact of intelligence quotient on the academic performance of academics.

Hypotheses

3. There will be significant impact of intelligence quotient on the performance of badminton players.

4. There will be significant impact of intelligence quotient on the academic performance of academics.

Research Methodology Used

The present study employed a descriptive and correlational research design to examine the relationship between the dimensions of intelligence quotient and performance in both sports and academics. The focus was to assess the direction and strength of association between specific IQ domains and achievement indicators in two different performance fields.

Population

The population for this study comprised male adolescents aged 14 to 17 years residing in Haryana, India. The study targeted both academic high-performers and shuttlers participating at school and district levels in badminton.

Sample

The study included a total of 400 male subjects, selected randomly from Haryana, India. The participants were divided equally into two groups. The first group consisted of 200 shuttlers, actively participating in badminton training and competitions. The second group comprised 200 students, selected based on their consistent academic performance in schools. All participants were aged between 14 and 17 years. Prior to the data collection, each subject was informed about the purpose of the study and consented to participate voluntarily.

Tools Used

To assess intelligence, the Group Test of General Mental Ability developed by S. Jalota was used. This test is widely accepted and measures five key dimensions of intelligence. These dimensions include: Vocabulary, Classification, Number, Series, Analogies, Reasoning. Sports performance was measured based on match outcomes and official rankings of shuttlers. Academic performance was assessed using school-reported scores or grades.

Statistical Techniques Used

Data were analyzed using both descriptive and inferential statistics. Mean and Standard Deviation were used to describe IQ and performance scores. To test relationships, Pearson's product-moment correlation coefficient (r-value) was applied.

Analysis of Data

Table 1: Relationship between intelligence quotient (dimension-wise) and sports performance of shuttlers

Dimensions of Intelligence quotient	N	Mean	Std. Deviation	"r" value
Vocabulary	200	25.63	2.55	0.291**
Sports Performance	200	2.60	1.97	
Classification	200	17.33	1.93	0.321**
Sports Performances	200	2.60	1.97	
Number Series	200	24.34	2.81	0.424**
Sports Performance	200	2.60	1.97	
Analogies	200	18.00	4.78	0.371**
Sports Performances	200	2.60	1.97	
Reasoning	200	15.27	4.33	0.546**
Sports Performances	200	2.60	1.97	

**Significant at 0.01 level of significance

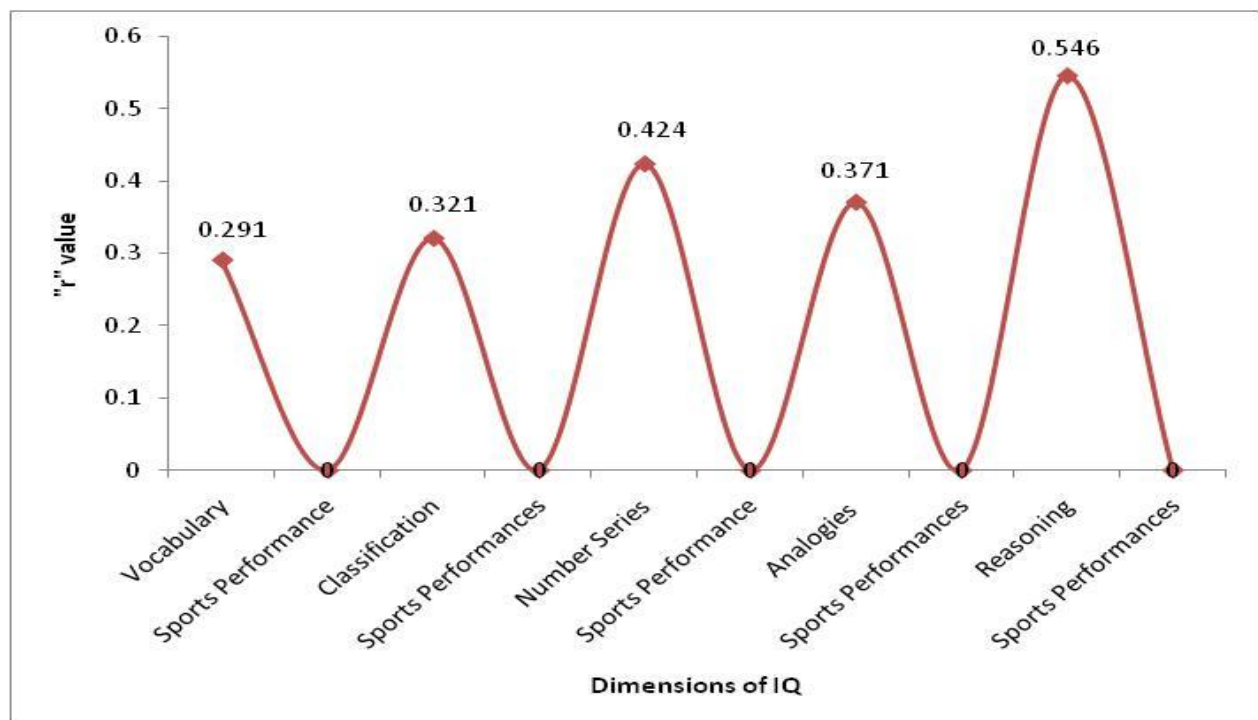


Figure 1: Relationship between intelligence quotient (dimension-wise) and sports performance of shuttlers

The table 1 shows the relationship between intelligence quotient and sports performance among shuttlers. The relationship with intelligence quotient with vocabulary is found 0.291, with classification is 0.321, with number series is 0.424,

with analogies is 0.371 and with reasoning it is 0.546. It shows that all the dimensions of Intelligence quotient is significant at 0.01 level of significance. Hence it is concluded that Intelligence quotient and sports performance are significantly and positively related with each other concluding that increase in the score of intelligence quotient, sports performance of shuttlers also increases and vice-versa.

Table 2

Relationship between intelligence quotient (dimension-wise) and academic performance of academics

Dimensions of Intelligence quotient	N	Mean	Std. Deviation	"r" value
Vocabulary	200	23.75	3.25	0.321**
Academics	200	71.25	13.69	
Classification	200	16.00	2.80	0.482**
Academics	200	71.25	13.69	
Number Series	200	23.96	3.33	0.562**
Academics	200	71.25	13.69	
Analogies	200	16.33	4.36	0.346**
Academics	200	71.25	13.69	
Reasoning	200	18.39	5.77	0.541**
Academics	200	71.25	13.69	

**Significant at 0.01 level

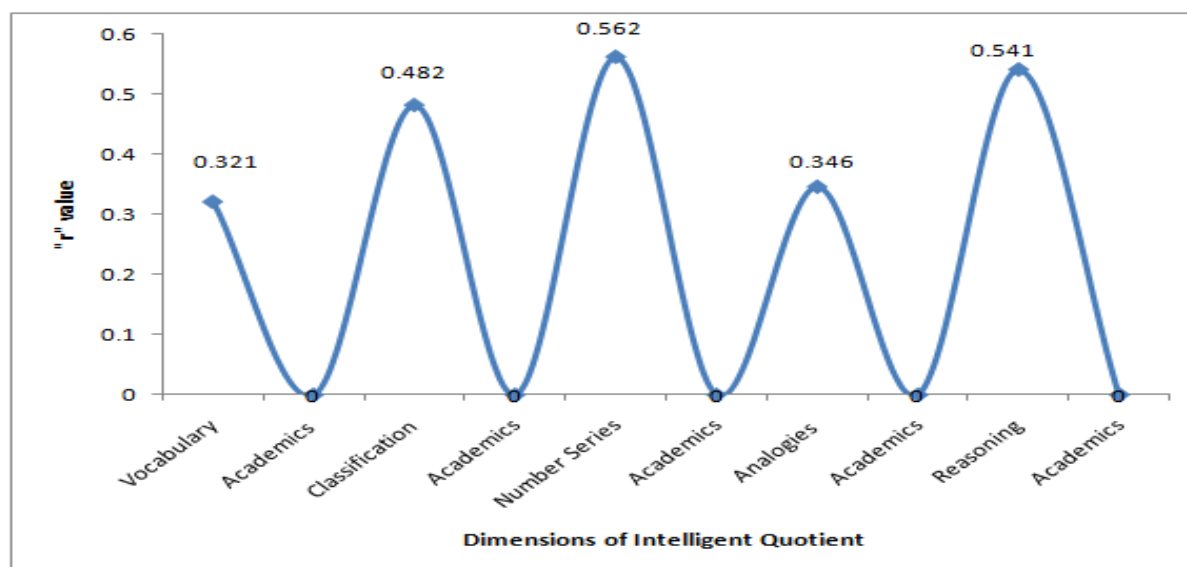


Figure 2: Relationship between intelligence quotient (dimension-wise) and academic performance of shuttlers

The table 2 shows the relationship between intelligence quotient and academics performance among academics. The relationship with vocabulary (dimension of IQ) with academic performance is found 0.321, with classification is 0.482, with number series is 0.562, with analogies is 0.346 and with reasoning it is 0.541. It shows that all the dimensions of Intelligence quotient is significant at 0.01 level of significance. Hence it is concluded that Intelligence quotient and academic performance are significantly and positively related with each other concluding that increase in the score of intelligence quotient, academic performance of academics also increases and vice-versa.

Findings of the Study

The results of the study were that each of the five scales of IQ (Vocabulary, Classification, Number Series, Analogies, Reasoning) had statistically significant positive relationships with both sport and academic performance. Reasoning had the highest correlation with sports performance among the shuttlers ($r = 0.546$), Number Series, Analogies, Classification and finally Vocabulary had the least, but still significant correlation ($r = 0.291$). This indicates that the better the reasoning ability of the athlete, the better he/she is likely to perform under competition conditions where quick thinking and decision-making are required.

Also, in the academically talented group, all dimensions of IQ were significantly related to academic achievement. The strongest association was found between Number Series and academic achievement ($r = 0.562$), thus, numerical reasoning and pattern recognition have great impact on students' performance. The weakest correlation value in this category was recorded between Analogies and academic success ($r = 0.346$, $p < 0.01$). Taken together, the findings showed that stronger cognitive abilities predict better performance on the court -- and accomplishing tasks at paces that might actually be feared in the classroom. These results suggest that intelligence is important for maximizing performance in academic and athletic settings.

Implications and Suggestions

The implications of the study are of significant value for coaches, teachers, sports psychologists and policymakers. For coaches, the results signify that cognitive training should form a core component of sports development. Extra focus on improving reasoning and pattern recognition skills, that can drastically improve an athlete's ability to make decisions on the field and understand tactics.

For teachers, the research highlights the importance of personalizing teaching approaches according to students' cognitive profiles. Identifying the particular IQ dimensions in which a student may be weak or strong can aid in developing more effective interventions for educational issues. It is suggested that sports psychologists design integrated training packages that include physical conditioning and mental skill evaluation. The games could

help athletes develop better physical coordination and the ability to process information, resulting in improved overall performance.

At the policy level, we suggest to add IQ-based cognitive development programs into the school and sport talent programs. Such programs can contribute to the overall development by training both mental and physical skills from a young age. Lastly, the current investigation may be expanded to include female athletes, similar analyses may be conducted with other sport disciplines or the effects of emotional and social intelligence on performance success may be investigated. These interventions will provide added dimensions with which to investigate the intricate relationship between cognition and performance.

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