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A Comparative Study On Spatial Ability In Adolescents Based On Participation In Sports

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ABSTRACT

Spatial ability is a process for understanding the space surrounding us by processing the information provided by our sensory organs with the help of the brain. The role of spatial ability in allied fields namely sports, and basic sciences such as physics, chemistry and mathematics along with certain engineering courses etc. have been documented scientifically. The present study aims to compare spatial ability between adolescent male players and non-players as well as adolescent female players and non-players. To conduct the study, 50 adolescent male players and 50 adolescent female players were selected. The adolescent players were selected based on their participation in state/district-level sports competitions for various team and individual sports. To fulfil the objectives of the present study, 50 adolescent males and 50 adolescent females with no active involvement in competitive sports were also selected. The age range of the selected adolescent subjects was between 15 to 18 years. Purposive sampling was used for the selection of subjects. A test validated by Terzi and standardized by Cesaroni (2007) was used to assess the spatial ability of adolescent subjects. It was found that spatial ability in adolescent male players was significantly superior as compared to non-player male adolescents. ($t=8.07$, $p<.01$). It was also observed that spatial ability in adolescent female players was significantly superior as compared to non-player female adolescents ($t=5.69$, $p<.01$). It was concluded that sports participation has a significant positive effect on the spatial ability of adolescents thereby suggesting that participation in competitive sports enhances the cognitive transfer skills such as spatial ability in adolescents.

Keywords: Spatial ability, adolescents, participation in sports

INTRODUCTION:

For ages, we have been interested in understanding spatial perception. According to the Greek version, it is a continuous series of images concerning space which are then imagined as pictures. To establish and understand the spatial relationship between objects or space one needs to possess the spatial ability. We use spatial abilities not only in sports but also in our day-to-day lives. Navigating a road or approximately calculating the distance or repairing equipment requires spatial ability. The role of spatial ability in allied fields namely sports, and basic sciences such as physics, chemistry and mathematics along with certain engineering courses etc. have been documented scientifically. Spatial ability is a process for understanding the space surrounding us by processing the information provided by our sensory organs with the help of the brain. Spatial ability is also a subcategory of cognitive processes. There are four common spatial abilities namely visual perception, mental folding and rotation as well as spatial visualization. All these abilities form the basis of spatial capacity and it consists of unique qualities for the accomplishment of a certain task or motor movement. All the abilities are required to perceive the spatial perception of other objects with respect to the position of our own body.

Spatial ability has a great significance in our lives. Manoeuvring high-speed traffic, orienting in a new environment like a new building etc. also require spatial ability. Spatial ability is also important in certain fields of study such as architecture, meteorology, natural science etc. Spatial skills are important in restoring that information when more detailed mental models of the molecules are needed. More formal evidence on the importance of spatial ability in math and science education has been compiled by many researchers like Humphreys et al. (1993). Hence the role of spatial ability in adolescents is crucial because excellence in some specific professional fields such as engineering, physical science and for that matter day-to-day work depends on it. Keeping the importance of spatial perception in adolescents' future development, this study was planned to assess the impact of sports participation on the spatial ability of adolescents.

REVIEW OF LITERATURE

Zwierko (2007) compared the peripheral perception of handball players and non-athletes of the same age. A comparative analysis involves abilities connected with general visual functions - such as the field of vision (hardware system) and reaction time to visual stimuli (software system). The peripheral perception was examined using the peripheral perception test included in the Vienna Test System (Schuhfried, Austria). The results show that the examined groups did not differ in regards to visual functions connected with the peripheral field of vision and the correctness of stimuli recognition. Handball players had a significantly shorter response time to stimuli appearing in the peripheral field of vision compared to non-athletes.

Chaddock et al. (2011) in their study reported that athletes were better in crossing the roads as compared to non-athletes thereby denoting the better cognitive transfer skills in athletes as compared to non-athletes.

Jansen and Lehmann (2013) in their study between athletes and non-athletes on mental rotation performance. They found statistically non-significant differences in the mental rotation performance of athletes and non-athletes.

Cynthia et al. (2016) compared the spatial ability of athletes and non-athletes but doing regular physical exercise. This study was conducted on 21 athletes and 21 non-athletes from Indonesia. It was found that spatial scores of athletes and non-athletes did not differ from each other to a significant extent. It was concluded that cognitive skills as assessed by spatial ability were not affected by sports participation.

Voyer and Jansen (2017) in their study found that on an average athletes reported significantly higher spatial ability as compared to non-athletes.

Meneghetti et al. (2021) in their study reported that regular participation in Judo improves spatial ability and those who practice judo regularly have significantly better spatial ability than the general population.

Mathe et al. (2023) studied the difference in visio-spatial intelligence between female netball players and non-players. They found that there exists a significant difference in visio-spatial intelligence between players and non-players with players excelling in visual skills such as eye-hand coordination and peripheral awareness but no significant difference was observed in the visual memory of players and non-players.

Bartseva et al. (2024) in their study reported a small advantage for hockey players in terms of spatial ability as compared to non-athletes.

OBJECTIVE OF THE STUDY

The first objective of the present study is to compare the spatial ability of adolescent male players and non-players. The second objective of the present study is to compare the spatial ability of adolescent female players and non-players.

HYPOTHESIS

H_1 Adolescent male players will show more magnitude of spatial ability as compared to male non-player adolescents.

H_2 Adolescent female players will show more magnitude of spatial ability as compared to female non-player adolescents.

METHODOLOGY

Sample: To conduct the study, 50 adolescent male players and 50 adolescent female players were selected. The adolescent players were selected based on their participation in state/district-level sports competitions for various team and individual sports. To fulfil the objectives of the present study, 50 adolescent males and 50 adolescent females with no active involvement in competitive sports were also selected. The age range of the selected adolescent subjects was between 15 to 18 years. Purposive sampling was used for the selection of subjects.

Tools

Spatial Ability Test

The Applied Test described by Terzi and standardized by Cesaroni (2007) was used to assess the spatial ability of adolescent subjects. The test is composed of two parts. In both phases of the test during the execution and production, a point system was assigned for each right command. During the 1st part, execution, the blindfolded subject has to carry out a command given by an examiner, memorize it and imagine the route taken to get back to the starting point. The route is square. The last command, to go back to the starting point, tests orientation skills. During the 2nd part, reproduction, the subject has to reproduce on paper the route taken.

PROCEDURE

50 male adolescent players, 50 female adolescent players, 50 male adolescent non-players and 50 female adolescent female non-players were selected. The performance of these subjects was evaluated on a spatial ability test. After tabulation, an independent sample 't' test was used and the results are presented in Tables 1 and 2.

RESULT AND DISCUSSION

Table 1
Comparison of Spatial Ability between
Male Adolescent Players and Non-Players

Groups	Mean	S.D.	Mean Difference	't'
Male Adolescent Players (N=50)	14.24	1.61	3.56	8.07**
Male Non-players Adolescent (N=50)	10.68	2.53		

** Significant at 0.01 level

A perusal of Table 1 reveals that the spatial ability of male adolescent players (M=14.24) was significantly higher as compared to non-players male adolescents (M=10.68). The t value of 8.07 gives this result a statistical significance at 0.01 level.

Table 2
Comparison of Spatial Ability between
Female Adolescent Players and Non-Players

Groups	Mean	S.D.	Mean Difference	't'
Female Adolescent Players (N=50)	13.32	2.80	2.84	5.69**
Female Non-players Adolescent (N=50)	10.48	2.13		

** Significant at 0.01 level

A perusal of Table 2 reveals that the spatial ability of female adolescent players (M=13.32) was significantly higher as compared to non-players female adolescents (M=10.48). The t value of 5.69 gives this result a statistical significance at 0.01 level.

In the present study, a significant effect of participation in sports was observed on the spatial ability of adolescents. Spatial ability is base for physical movements and executing sports skills. Sports involve dynamic spatial reasoning for tracking moving objects or predicting the trajectories of objects in the air. This is necessary to apply appropriate bodily movements. This comes under motor learning and cognitive development theory. Hence there is no surprise that spatial ability in adolescent players was significantly higher than adolescent non-players with results are consistent for both male and female adolescent group. The result of the present study is the same as reported by Chaddock et al. (2011) in their study.

CONCLUSION

Based on the results it can be concluded that sports participation has a significant effect on the spatial ability of adolescents by suggesting that participation in competitive sports enhances cognitive skills such as spatial ability in adolescents. It can also be concluded that encouraging participation in sports during adolescence is necessary for their holistic development.

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