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A Study on Spatial and Depth Perception Ability of Adolescents in Relation to Participation in Sports

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Abstract

Since the adolescence period determines the future direction of our generation, this study was conducted to compare the spatial and depth perception ability of adolescent players and non-players. To conduct the study, 100 adolescent 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, 100 adolescents 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. The Applied Test described by Terzi and standardized by Cesaroni (2007) was used to assess the spatial ability of adolescent subjects. To evaluate the depth perception of selected adolescent players and non-players, Johnson and Nelson's depth perception test was used. Results reveal that the spatial ability of adolescent players (M=13.78) was significantly higher as compared to non-player adolescents (M=10.58). The t value of 9.56 gives this result a statistical significance at 0.01 level. Results also reveal that depth perception in adolescent players (M=0.91) was significantly superior as compared to non-player adolescents (M=3.67). The t value of 14.31 gives this result a statistical significance at 0.01 level. Based on the results it can be concluded that adolescent players possess superior spatial ability and depth perception as compared to adolescent non-players thereby confirming the benefits offered by sports to enhance cognitive and perceptual abilities in adolescents. Hence educational institutions need to encourage adolescent students to actively take part in sports so that overall development as envisaged in new education policy can be attained.

Keywords: Spatial ability, depth perception, adolescence, participation in sports

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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 in respect to the position of our own body.

Just like spatial ability another important form of perceptual ability is depth perception. Perception refers to the process of taking in, organizing and interpreting sensory information. Perception is multi-model, with multiple sensory inputs contributing to motor responses (Bertenthal 1996). It is the ability to judge the distance in 3D i.e. length, width and depth respectively. Depth perception requires the brain to process a single image by processing two types of information. It is the ability to tell us about the distance of objects from our position. Not only in sports depth perception has numerous benefits in our day-to-day life. It allows us to react to an incoming object with precise movement i.e. we can judge the speed of an object approaching us. Depth perception in some cases can be improved by certain specific exercises.

It has also been noticed that there is no clear-cut evidence about the difference in spatial and depth perception ability of the general population and athletes. Although it was found that athletes possess superior spatial and depth perception abilities as compared to non-athletes the results are not consistent and contrary. Since

the adolescence period determines the future direction of our generation, hence this study was conducted to compare the spatial and depth perception ability of adolescent players and non-players.

REVIEW OF LITERATURE

Zwierko (2007) compared the peripheral perception of handball players and non-athletes of the same age. 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 with handball players had a significantly shorter response time to stimuli appearing in the peripheral field of vision compared to non-athletes. **Huys et al. (2009)** found that the information pickup of skilled athletes was more holistic than that of low-skilled athletes when covering different parts of opponents' bodies during studies of the anticipation ability of tennis athletes at different professional levels relating to the placement of the shot. **Ahmed M. Abd El-Kader (2010)** investigated the efficacy of static and dynamic distance perception on Kumite performance in Karate. The results revealed that the dynamic experimental group had a better result in distance perception and Kumite performance than the experimental static group. **Chaddock et al. (2011)** in their study found that cognitive transfer skills required for better spatial ability were found to be higher in athletes as compared to non-athletes. **Jansen and Lehmann (2013)** reported that mental rotation performance was not influenced by participation in competitive sports. **Alves et al. (2015)** reported that the visual skills, more specifically visual tracking, of more developed and experienced elite football players (U20 and main squad), are greater than the visual skills of younger and less experienced elite football players (U15 and U17). **Gao et al. (2015)** in their study reported that athletes have significantly better predictive ability in terms of analysing the depth of moving objects as compared to non-athletes. **Cynthia et al. (2016)** compared the spatial ability of athletes and non-athletes but doing regular physical exercise. 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)** compared the spatial ability of athletes and non-athletes. They found significant differences in the spatial ability of athletes and non-athletes with the former having superior spatial ability than the later group. **Deka and Ajay Kumar (2017)** in their study reported that there was no significant difference in depth perception of male and female interuniversity softball players. **Iehisa et al. (2020)** in their study reported that factors such as direction of movement, efficiency of both eyes and distance are key factors that affect depth perception. **Meneghetti et al. (2021)** reported that participation in judo is a good medium to improve spatial ability and those who participated in judo regularly showed better spatial ability than non-sports participants. **Mathe et al. (2023)** in their study reported superior visuo-spatial intelligence in female handball players and non-players thereby establishing the benefits of competitive sports in the enhancement of spatial ability. **Singh and Choudhary (2024)** in their study reported a non-significant difference in depth perception of intervarsity and intercollegiate male soccer players. **Bartseva et al. (2024)** compared spatial ability between athletes (hockey players) and non-players. They found a very small advantage to athletes in spatial ability as compared to non-players.

Objective of the Study

The objective of the present study is to compare the spatial and depth perception ability of adolescent players and non-players.

Hypothesis

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

H_2 Adolescent players will show significantly superior depth perception as compared to non-player adolescents.

Methodology

Sample :

To conduct the study, 100 adolescent 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, 100 adolescent 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.

Depth Perception Test:

To evaluate the depth perception of selected adolescent players and non-players, Johnson and Nelson's depth perception test was used.

Procedure

100 adolescent players and 100 non-players adolescents were selected. The performance of these subjects was evaluated on spatial ability test and depth perception apparatus. 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 Adolescent Players and Non-Players

Groups	Mean	S.D.	Mean Difference	't'
Adolescent Players (N=100)	13.78	2.39	3.20	9.56**
Adolescent Non-players (N=100)	10.58	2.33		

** Significant at 0.01 level

A perusal of Table 1 reveals that the spatial ability of adolescent players (M=13.78) was significantly higher as compared to non-player adolescents (M=10.58). The t value of 9.56 gives this result a statistical significance at 0.01 level.

Table 2

Comparison of Depth Perception between Adolescent Players and Non-Players

Groups	Mean	S.D.	Mean Difference	't'
Adolescent Players (N=100)	0.91	1.12	2.75	14.31**
Adolescent Non-players (N=100)	3.67	1.56		

** Significant at 0.01 level

A perusal of Table 2 reveals that depth perception in adolescent players (M=0.91) was significantly superior as compared to non-players adolescents (M=3.67). The t value of 14.31 gives this result a statistical significance at 0.01 level.

Results reveal superior spatial ability in adolescent athletes than in non-athletes. It shows the importance of participation in sports for improvement in cognitive skills which helps to visualize spatial orientation. Spatial ability is imagination about predicting the movement of objects relative to their position. Sports offers improvement in these abilities which can be explained through motor learning theory. In sports, a player needs to track the flight of the object or positioning of the opponents and through practice, these spatial abilities develop.

In the present study, it was also found that depth perception in adolescent athletes was significantly superior to that of adolescent non-athletes. The result can be explained through perceptual learning theory. Judging the speed/distance or flight of a moving object and then position accordingly requires depth perception and through regular practice, it develops more in athletes than non-athletes. The findings of the present study are similar to those of studies conducted by Bartseva et al. (2024), Mathe et al. (2023) and Alves et al. (2015).

Conclusion

Based on the results it can be concluded that adolescent players possess superior spatial ability and depth perception as compared to adolescent non-players thereby confirming the benefits offered by sports to enhance cognitive and perceptual abilities in adolescents. Hence educational institutions need to encourage adolescent students to actively take part in sports so that overall development as envisaged in new education policy can be attained.

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