Mahapatra and Abhinandan
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Correlation between speed and agility with an influence of gender in adolescent Kho-Kho players—an observational study

Charuhasini Mahapatra[1*] and Abhishek Abhinandan[1]

Abstract

Background Adolescent girls who participate in sports have injuries 4–6 times greater as compared to boys. Several factors are responsible for the injuries are as anatomical, biomechanical, hormonal, and some extrinsic factors. The ideal level of motor characteristics, including speed, endurance, agility, and flexibility, determines how well a player performs in Kho-Kho. Speed and agility are two major components for better Kho-Kho performance. This study aimed to evaluate the correlation between speed and agility with an influence on gender in Kho-Kho players.

Method A total of 75 participants (boys 34 and girls 41) Kho-Kho players in the age groups 11–17 years were included in the study based on selection criteria. For the agility-modified *T* test for speed, a 50-m Dash test was done.

Results Pearson's correlation was used to analyze the collected data. The results indicated a moderate correlation between agility and speed in both genders ($r=0.404$, $p=0.001$), but in boys specifically, it showed a moderate correlation($r=0.586$, $p=0.001$) and in girls, it showed a weak correlation ($r=0.267$, $p=0.095$).

Conclusion It can be concluded from the results of this study that there is a moderate correlation between speed and agility in Kho-Kho players, but boys have a moderate and girls have a weak correlation this indicates combining both genders and a particular gender also shows a weak to moderate correlation between speed and agility in adolescent Kho-Kho players.

Introduction

Adolescent girls who participate in sports have injuries 4–6 times greater as compared to boys. Several factors are responsible for the injuries such as anatomical, biomechanical, hormonal, and some extrinsic factors. Anatomical like broad Q angle, narrower femoral notch, and increased laxity in girls where hormonal fluctuation and neuromuscular control which responsible for the activation of dynamic motion in response to sensory stimuli is make a difference in both genders [1]. Kho-Kho is a game that is more popular among adolescent players. A Kho-Kho team has 12 players and is played on a rectangular court with two poles at each end and a central lane running through it. The court is 27 by 16 m (89×52 ft), the distance between the two poles is 24 m (79 ft), and the width of the center lane is 30 cm (12 in). A match consists of two innings with each consisting of 9 min each. Three runners from the defensive team race around the court and try to avoid being touched while nine players from the chasing team (attacking team) are on the pitch, from which in the central lane eight of them are sitting (crouched). Each crouched player on the attacking team faces the opposite direction of their teammates. In Kho-Kho's, there are some fundamental moves including sitting in square formations, diving, running, pole dives, chain formation, making circles, giving Chou, twisting around the pole, sudden changes in direction, and

*Correspondence:
Charuhasini Mahapatra
charuhasinimahapatra@gmail.com
[1] Department of Physiotherapy, Abhinav Bindra Sports Medicine and Research Institute, Bhubaneswar, India

dodging. The ideal level of motor characteristics, including speed, endurance, agility, and flexibility, determines how well a player performs in Kho-Kho. The most crucial traits for a Kho-Kho player's performance are speed and agility [2, 3]. Agility, which depends on strength, response time, movement speed, and muscle coordination, is the capacity to quickly alter the direction of the body or its parts. Fast starts, pauses, and direction changes are essential for successful sports performance [4]. To get away from the chaser in Kho-Kho, the runner must move quickly and unexpectedly. To avoid being touched runner needs to change direction suddenly. Because chasers cannot change direction once they start running toward the pole. Agility is an important factor for Kho-Kho players [5]. Running speed is not only a sport in itself, but it also plays a significant role in practically all court and field games. In Kho-Kho, the chaser sprints across the court to tag the runner as quickly as possible, while the runners also move rapidly to avoid being touched by the chaser. So In Kho-Kho, players need to have quick reactions. When we discuss the correlation between agility and speed, it includes perceptual components defined by complicated reactions to unexpected, variable stimuli happening during a sporting event in addition to simple reaction speed, acceleration, and deceleration accompanied by the change of direction of movement [6]. Several studies show a correlation between speed and agility in Kabaddi [3], basketball [7], and other sports, but there is a lack of studies that show the correlation between speed and agility in young Kho-Kho players and there are several studies showed gender differentiation in between sprint and agility [8–10], but there is a lack of studies which correlates speed and agility of adolescent individuals for specific sports which have more demand of speed and agility. Hence, the purpose of this study was to evaluate the correlation between speed and agility with an influence on gender in Kho-Kho players. This helps to find which factor we have to focus on during training to improve performance in both genders.

Methods

This observational correlation study was conducted in the athletic ground of a teaching institute, to evaluate the correlation between agility and running performance in Kho-Kho players. Kho-Kho players were selected for the study based on the following selection criteria: Age between 11 and 17 years, boys and girls were included, at least 1 year of experience in Kho-Kho, and consent and willingness to participate in the study. Anyone with musculoskeletal injury within the past 4 months, any history of systemic disease, or vestibular disorders was excluded from the study. The participants ($n=75$, boys 34 and girls 41) were selected using nonprobability purposive sampling. Informed consent was obtained before the assessments from all the participants who were included in the study. Ethical clearance was obtained from the IEC of the institute. Materials used for this study were 7 agility cones and a stopwatch to measure agility and sprint time. All participants wore comfortable clothing that did not interfere with the evaluation of the tests. Before the evaluation, the height and weight of the participants were recorded.

Modified T test measurement

Four cones were used in this test. During the test the participants run to the front cone which will be at a distance of 5 m, moving laterally to the left covering a distance of 2.5 m (by shuffling) later returning to the center and moving to the right for another 2.5 m (by shuffling), returning to the center, and running backward to the finish line. The stopwatch was started at the time when the participant started and stopped when the crossed the last cone. Time was calculated. The test has an intra-class reliability of 0.90 [11] (Fig. 1).

Fig. 1 Modified *T* test

Fig. 2 50-m Dash test

Table 1 Descriptive statistics

Variables	Mean	Standard deviation
Age	13.3	1.14
Height in cms	146	8.11
Weight in kgs	36.3	4.49
BMI	17	1.91
Modified *T* test	8.80	0.64
50-m dash test	7.52	0.65

50-m dash test measurement

Run a single maximal distance of 50 m, starting from a stationary standing position one foot in front of the other. The front foot must be behind the starting point. Instruct the player to start when the instructor says go and he should run in the forward direction and finish when the chest crosses the finish line. The stopwatch starts when the instructor says go and stops when the player crosses the finish line. Tests were measured two times and the less time trials were recorded. The test has an intra-class reliability of 0.90 [12] (Fig. 2).

Statistical analysis

The collected data were analyzed using the statistical package SPSS 29.0 (SPSS Inc., Chicago, IL). Kolmogorov Smirnov test was used to check normality. As the data were normally distributed, Pearson's correlation test was used to correlate agility and speed in boy and girl Kho-Kho players. The tests were applied at a power of 80% and confidence interval of 95% and a level of significance, and the p value was set as < 0.05.

Results

Descriptive statistics of all independent and dependent variables are explained in Table 1. The results indicated a moderate correlation between agility and speed in both genders ($r = 0.404$, $p = 0.001$), but in boys specifically, it showed a moderate correlation ($r = 0.586$, $p = 0.001$), and in girls, it showed a weak correlation ($r = 0.267$, $p = 0.095$).

Table 2 Correlation between MTT and a 50-m dash test in both genders combine

Variables	*r* value	*p* value
MTT and 50-m dash	0.404	0.001

MTT and 50-m DASH test analysis with Pearson correlation test indicated a moderate correlation between them

The analyzed data were tabulated, and the results were interpreted as follows (Table 2):

Figure 3 the figure shows that there was a moderate correlation between speed and agility in combined gender (Table 3).

Figure 4 the figure shows that there was a weak correlation between speed and agility in girl Kho-Kho players (Table 4).

Figure 5 the figure shows that there was a moderate correlation between speed and agility in boy Kho-Kho players.

Discussion

The purpose of this study was to find the correlation between speed and agility among adolescent boy and girl Kho-Kho players. The results of this study demonstrate that there is a moderate correlation between speed and agility in combined gender, but when investigated separately, boys have a moderate correlation whereas girls have a weak correlation. Speed should be considered a good predictor of agility [8, 13]. In Kho-Kho player, agility and speed are measured to improve performance [2]. Kabaddi players show less agility and speed as compared to Kho-Kho [14]. There is a relationship between agility and linear speed [15]. Previous studies also showed agility training improves running speed in the athletic population [16]. As we are taking the adolescent previous study suggests that there is a correlation between 11 m, 22 m, and 33 m with agility in hockey players [17], but to achieve a Kho-Kho performance at least 50 m is

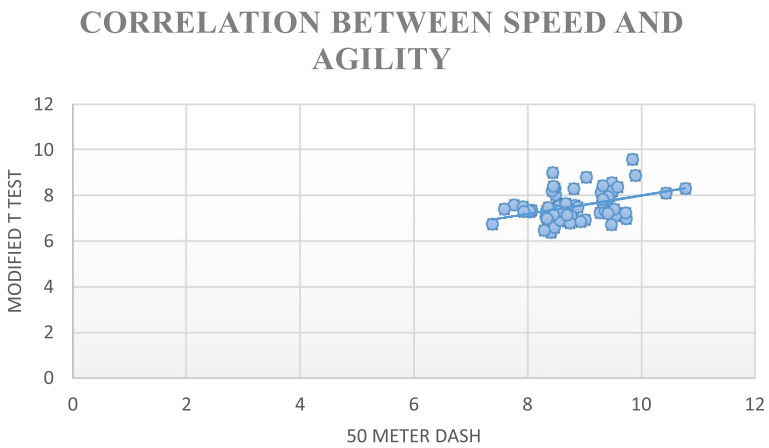

Fig. 3 Correlation between agility and speed in combined gender

Table 3 Correlation between MTT and 50-m dash test in girl Kho-Kho players

Variables	*r* value	*p* value
MTT and 50-m dash	0.267	0.095

MTT and 50-m DASH test analysis with Pearson correlation test indicated a weak correlation between girl Kho-Kho players

required to complete the whole Kho-Kho ground [18]. Young tennis players also showed that there is a moderate correlation between speed and agility [19]. Running characteristics are different in different gender. In running adolescent girls, use more eccentric contraction of the hip adductor as compared to boys, and in cutting manoeuvers, girls have more knee abduction angle as compared to boys. Girls during the cutting maneuver produce less flexion angle in the supporting leg as compared to boys which produces a neuromuscular delay in the neuromuscular firing of the protective muscle and girls experience more ground reaction force as compared to boys [20].

Table 4 Correlation between MTT and 50-m dash test in boy Kho-Kho players

Variables	*r* value	*p* value
MTT and 50-m dash	0.586	0.001

MTT and 50-m DASH test analysis with Pearson correlation test indicated a moderate correlation between boy Kho-Kho players

It has also been noted that there was a weak to moderate correlation in the statistics between boys and girls participants. As a previous study showed there is a change in physical performance according to gender which showed girls having less agility as compared to boys [8]. Agility is not only a component of speed it is combined with acceleration, deceleration, change in direction, and perceptual components, so only agility is not a predictor for speed [6]. There was a moderate correlation between speed and agility in boys basketball

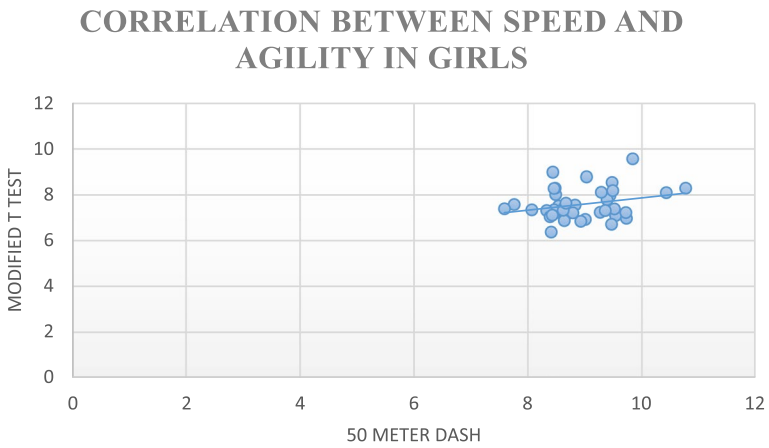

Fig. 4 Correlation between agility and speed in girl Kho-Kho players

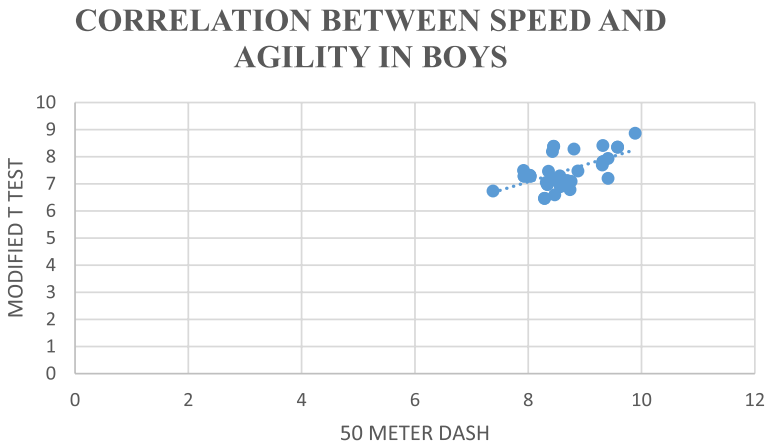

Fig. 5 Correlation between agility and speed in boy Kho-Kho players

players which specifies that boys have a moderate correlation between speed and agility [7]. In Kho-Kho, agility is not only influenced by speed but also by other factors are also responsible. In our study, we are considering only adolescent individuals. Studies also suggest that depending on age motor performance also differs so because of that players may not show a good correlation between speed and agility [21]. Adolescent boys show higher physical activity and motor coordination as compared to adolescent girls which might be a reason behind boys having a moderate correlation and girls having a weak correlation [9].

There is some limitation to the current study such as the sample size being insufficient which is unable to act as a predictor for gender differentiations in adolescent Kho-Kho players, and the age group of the study comprised from early adolescent to late adolescence study was limited to predicting a specific adolescent age group because their fitness levels are also different. As the study comprises of different genders, during measurement, the normative values of outcomes are not taken into consideration so the accuracy of measurement may be flawed. Further study with other fitness parameters could be performed in adult Kho-Kho players with gender differentiation. A study could be done to compare the correlation among adolescents and adults with both boys and girls in different sports with a larger sample size.

Conclusion

It can be concluded from the results of this study that there is a moderate correlation between speed and agility in Kho-Kho players, but boys have a moderate and girls have a weak correlation which indicate combined both gender and a particular gender also show a weak to moderate correlation between speed and agility in adolescent Kho-Kho player. These studies showed if agility improves speed may or may not be improved, so for better performance, we have to focus on both speed and agility. When it comes to girls, we have to consider all the factors that are responsible for their performance during training sessions, and more neuromuscular training should be advised for girls as compared to boys.

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Authors' contributions
We affirm that the submission represents an original work that has not been published previously and is not currently being considered by another journal. Also, we confirm that each author has seen and approved the contents of the submitted manuscript. This work was carried out in collaboration with all authors. CM and AA designed the study and wrote the protocol, and CM wrote the first draft of the manuscript. AA managed the data collection for the study. All authors read and approved the final manuscript.

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Availability of data and materials
The data collected and/or analyzed during the study are available with the corresponding author.

Declarations

Ethics approval and consent to participate
The study was done at Abhinav Bindra Sports Medicine and Research Institute, Bhubaneswar, Odisha, India. Ethical clearance was taken from the ethical committee of the institute, and informed consent was taken from all the participants. The study is not a clinical trial, so no clinical trial registration was done. The participants were aware of all procedures involved in the study, and written consent was taken for the same.

Competing interests
The authors declare that they have no competing interests.

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