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EFFECTIVENESS OF SPEED, AGILITY AND QUICKNESS (SAQ) TRAINING ON SPEED, AGILITY AND LOWER BODY POWER AMONG THE FEMALE RECREATIONAL KHO-KHO PLAYERS

Physiotherapy

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ABSTRACT

Sports are integral to contemporary society, impacting physical fitness and skill development. This study focuses on the traditional Indian sport of kho-kho, renowned for its complexity and tactical nature, where mastery of movements and high levels of skill-related fitness are paramount. Despite the game's popularity, injuries, particularly in the lower extremities, are prevalent, highlighting the need for enhanced physical fitness. This research addresses a gap in literature by investigating the impact of Speed, Agility, and Quickness (SAQ) training specifically on agility and lower body power in female recreational kho-kho players. The primary aim is to determine the effectiveness of SAQ training on key fitness components. A one-group pre-test-post-test design was employed over six weeks at the SPMCW ground within the SVIMS setting, with a sample size of 40 participants selected through simple random sampling. Ethical approval was obtained, and participants met specific inclusion/exclusion criteria. Outcome measures included the Straight-line Sprint Test (SLST), T-test, and Standing Long Jump Test (SLJT). The SAQ training protocol consisted of a six-week program with progressive intensity over three phases. Results showed a significant improvement in all measures ($P<0.001$), indicating the substantial impact of SAQ training on speed, agility, and lower body power. The study concludes that tailored SAQ training programs can effectively enhance key fitness components in female recreational kho-kho players, emphasizing the importance of methodical training protocols and meticulous participant selection. This research contributes valuable insights into sports-specific training interventions, highlighting the significance of SAQ training in enhancing performance in traditional sports like kho-kho.

KEYWORDS

SAQ Training, Standing Long Jump Test, T-test, Straight Line Sprint Test.

INTRODUCTION

Sports are highly emerging in the context of modern society. Now a days sports and games have become a part of human life. Physical fitness and sports skills are significant determinants of the performance in sports. Many studies indicated that there is a positive effect of fitness on sports performance (1).

The success and failure of the performance depends on the application of the skill, ability to execute a particular task. Kho-kho is one of the most popular traditional sport in India. It is played throughout the country especially in rural areas. It is an outdoor strenuous activity game that is extremely complicated and tactile sport. It is played by teams of 12 players each who try to avoid being touched by the members of the opposing team in which only 9 players of the team enter the field. To catch by pursuit to chase, rather than just run is the capstone of kho-kho (1).

Kho-kho requires players to not only master the movements but also execute them swiftly and accurately, knowing precisely when to apply each skill. Players who are capable of working on it have a great advantage to achieve higher performance. But, competitive games require high level of skill related fitness. The reaction time, explosive speed, power and agility are the important skill related fitness components used in the kho-kho game to overcome the top level performance (1).

Kho-kho players are more prone to injuries having an incidence of 54% in lower extremities, 36% in upper extremities, 12% involving head, 4% each in neck and spine (2). Injuries in the knee joint involve muscle pull during chasing and abrasions during running (3).

Players with poor physical fitness may land up in injuries more often than who are physically fit. So players need to improve their fitness components like strength, power, agility, speed and endurance to prevent chance of getting injured.

In this study, we are taking the speed, agility and lower body power (LBP) contribution towards the player's ability to perform better.

Speed is defined as the ability to perform a movement within a short period of time. Speed combined with strength will provide power and force (4). Straight-line sprint test (SLST) is one of the test that can be used to assess the person's speed. This test is used to evaluate the speed and acceleration over distance (5).

Agility is defined as a rapid whole body movement with change of velocity or direction in response to a stimulus (6). This is the ability to move quickly and change the direction. The tests that are used to assess the agility are T-test, three-cone drill and Y-shaped reactive agility test. T-test measures the multidirectional speed and planned change of direction abilities (5).

Power is defined as the amount of work done by the muscle in a given unit of time. Power of the muscle depends on strength, force of contraction and frequency of contraction (7). LBP plays a key role in kho-kho players to achieve the higher performance. There are many tests to measure the LBP such as vertical jump test, standing long jump test (SLJT), single-leg triple hop test. Standing long jump test or broad jump test measures the lower body horizontal explosiveness or power (5).

Need Of The Study

While previous studies have compared various aspects of physical fitness among different sports, there is a scarcity of research on the impact of SAQ training specifically on agility and LBP in female kho-kho players (1, 8).

This study addresses this gap by investigating the effectiveness of SAQ training in enhancing key fitness components among recreational female kho-kho players.

Aim Of The Study

To determine the effectiveness of SAQ training on speed, agility and LBP among the female recreational kho-kho players.

Objectives Of The Study

To evaluate the pre and post values of speed, agility and LBP after SAQ training among the female recreational kho-kho players.

MATERIALS & METHODOLOGY

Materials: Cones, stop watch, measuring tape, adhesive tape, chalks, pen and paper

Methodology

Study Design: Single-group pre-test/post-test design
Study Duration: 6 weeks

Study Setting: SPMCW ground - SVIMS
Sample Collection: College of physiotherapy, College of nursing, College of Allied Health Sciences, Sri Padmavathi Medical College for Women - Sri Venkateswara Institute of Medical Sciences (SVIMS).
Sampling Method: Simple random sampling.
Sample Size: 40 samples.
Ethical Approval: Ethical approval was obtained from the Institution ethics committee (IEC) of SVIMS University (IEC No: 1468 dt: 3-10-2-023).

Inclusion Criteria
- Recreational kho-kho players
- Age: 16-27 years.
- Gender: females.

Exclusion Criteria
- Recent injuries.
- Having any surgical history related to lower body.
- Age below 16 and above 27 years.

After explaining the detailed procedure of the study, written informed consent documents duly signed by the subjects were obtained. Pre values of the following outcome measures were recorded and tabulated into Microsoft excel spread sheet to compare with the post values after the SAQ training.

Outcome Measures
- Straight-line sprint test (SLST) is used to measure the speed by recording the time in seconds.
- T-test is used to measure the agility by recording the time in seconds.
- Standing long jump test (SLJT) is used to measure the LBP by recording the jump distance in meters.

Study Protocol
The following protocol outlines a six-week progressive SAQ training program. The SAQ training method is described in detail below:
Speed, Agility and Quickness (SAQ) Training
SAQ training has risen in popularity among athletes. With the continually increasing need to promote athletic ability, this training has proven to enhance the practical field abilities of participants in a wide variety of sports. It is practiced in addition to conventional resistance training in the gym and serves to assist in the transfer of the strength gained there to perform in the arena of play (9).

Almost all sports demand rapid movements involving either the arms or legs. SAQ training can improve skill in precisely these areas in athletes if this program is integrated during their training (9).

Although this type of training has been around for a number of years, many athletes have not practiced it. This can be attributed mainly to insufficient education regarding its precise advantages and the process of integrating it into a comprehensive training regimen. In particular, SAQ training is intended to increase the ability to exert maximal force during high-speed movements. It manipulates and capitalizes on the stretch-shortening cycle (SSC) while bridging the gap between traditional resistance training and functional-specific movements (9).

Some benefits of SAQ training include increased muscular power in all multiplanar movements, brain-signal efficiency, kinesthetic spatial awareness, motor skills, and reaction time (9).

The acquisition of greater balance and reaction time will serve to allow the athlete to maintain proper body positioning during skill execution and react more proficiently to any change in the playing environment. Quick movements are useless if the athlete trips over his or her own feet (9).

Many athletes and coaches also do not realize that SAQ training can cover the complete spectrum of training intensity-from low to high. Each athlete will come into a training program at a different level, so the level of intensity must coincide with the athlete's abilities. Higher-intensity drills require a significant level of preparation (9).

There are so many SAQ exercises that are used to improve speed, agility, and quickness. In this study we are taking few components (see table 1) of it to determine its efficacy towards the recreational kho-kho players.

Each drill for 30 seconds with 30 seconds recovery time between each drill and repeated it for 3 sets with 3 minutes recovery time between each set. Progression of 15 seconds time for each exercise for every 2 weeks and they were given week wise in the below table.

Table 1: SAQ Training Protocol For Six Weeks Including Repetitions, Sets And Recovery Time

Activity	Repetition			Sets	Recovery in between repetition	Recovery in between sets
	1-2 weeks	3-4 weeks	4-6 weeks			
Standing stationary arm swing	30 sec each	45 sec each	60 sec each	3	30 sec	3 min
Butt kicks						
High knee						
Figure eight						
Cross-over skipping						
T-drill						
Lateral skater						
Sequence jumping jacks						

A comprehensive pre-intervention routine comprising a 10-minute warm-up was incorporated to prepare participants physically and mentally for the forthcoming training regimen.

Additionally, a structured cool-down period of 5 minutes was implemented post-intervention to facilitate a gradual transition from high-intensity exercise to a state of rest.

After the SAQ training, post values of SLST, T-test and SLJT were measured.

Statistical Analysis & Results
The variables considered under the study are speed, agility and LBP. These three variables were measured at base line and after 6 weeks SAQ training respectively. The data was tabulated into Microsoft excel spreadsheet and statistical analysis was done by using the statistical software Statistical Package for Social Sciences (SPSS) 25.0 version.

Paired t- test is used as the statistical technique to compare the pre and post values of the dependent variable for parametric data.

The statistical analysis results for the three outcome measures—SLST, T-Test, and SLJT before (pre) and after (post) the intervention were organized and presented in table 2.

Demographic Data
The demographic data for the sample of 40 individuals (females) with an average age of 19.22±1.68 years. In terms of physical characteristics, the sample exhibits an average height of 155.02±7.06 cm and average weight of 53.15±12.34 kg. The BMI provides insight into overall body composition, and the sample's average BMI is 22.00±4.582.

Table 2: Comparison Of Pre And Post Values Of SLST, T-TEST & SLJT After SAQ Training

Variables (N=40)	SLST (in sec)		T-TEST (in sec)		SLJT (in mts)	
	PRE	POST	PRE	POST	PRE	POST
Mean	11.25	8.61	13.83	9.55	1.24	1.53
SD	1.94	0.95	1.20	0.77	0.14	0.16
t-value	12.014		24.172		17.816	
t Critical two-tail	3.558		3.558		3.558	
Df	39		39		39	
p-value	0.000**		0.000**		0.000**	

The pre-intervention mean SLST time decreased significantly from 11.25±1.94 to 8.61±0.95 post-intervention (t-value = 12.014, P-value <0.001). Similarly, the pre-intervention mean T-Test score decreased notably from 13.83±1.20 to 9.55±0.77 post-intervention (t-value = 24.172, P-value <0.001). Additionally, the pre-intervention mean SLJT distance significantly increased from 1.24±0.14 to 1.53±0.16 post-intervention (t-value = 17.816, P-value <0.001). These findings indicate highly significant improvements in speed, agility, and lower body power following the intervention.

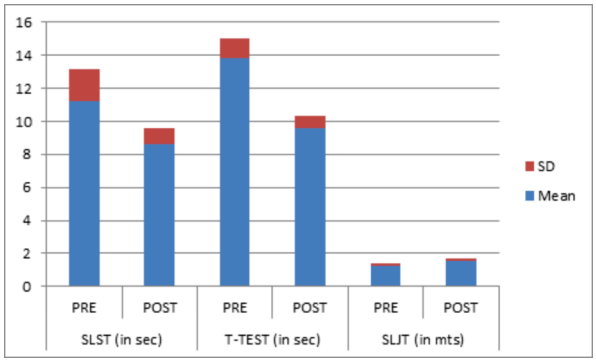

Figure 1: Graph Representing The Mean And SD Of Pre And Post Values Of SLST, T-TEST & SLJT.

The p-values from the two-tailed t-tests are extremely small P-value: 0.000, indicating a high level of significance (P<0.001) for all measures. These results collectively suggest that the SAQ training had a substantial and positive impact on the participants SLJT length, T-test and SLST time.

DISCUSSION

These results after the 6 weeks of SAQ training affirm its effectiveness in addressing specific fitness components crucial for kho-kho players. The study contributes valuable insights into the benefits of targeted SAQ interventions, particularly for female athletes engaged in this traditional Indian sport. Improving LBP, speed, and agility through SAQ training can result in various physiological changes. These adaptations are often specific to the demands of the training and the movements involved.

In this study, results from table 2 shows that the SLST time significantly decreased from pre to post-intervention (11.25±1.94 to 8.61±0.95) representing the increased speed.

A similar study done by Eesam Nagesh and Dr. K. Sivakumar (2022) promulgated in their study that there was a positive effect on speed after participating in the SAQ training (10).

In another study, Chayan Majumder and Dr. Gopal Chandra Saha (2014) revealed that SAQ training have significance in improving cardiovascular endurance and agility (11).

The improvement of the speed among the subjects might be due to reduced ground contact time and improved cardiovascular fitness that contributed to faster and more efficient movements along with sustained effort during intense bursts of speed.

Results from the table 2 reveals that the T-test time significantly decreased from pre to post-intervention (13.83±1.20 to 9.55±0.77) representing the improved agility.

According to the findings of Neha and Dr. Yendrembam Nepoleon's (2023) study, physical fitness training significantly enhances speed, power, agility, coordination, and reaction time(12).

Dr. S Evelyna Retna Judy and Dr. K Tamilarasi (2023) in their study also concluded that after completing the SAQ training programme, there was a significant improvement in flexibility, balance & control (13).

G. Kumaran, Ibrar Ul Haq and V. Uma (2021) stated that speed and agility was improved significantly in SAQ group and also concluded that kho-kho game requires fast changes in direction, vertical jumps, forward lunges around the court (14).

The improvement of agility in the subjects could be due to the improved fast-twitch muscle fiber activation, neuromuscular coordination, joint range of motion and reaction time. This could lead to powerful contractions, enhanced communication between the nervous system and muscles, improvement in the flexibility and dynamic joint mobility and enhancement in cognitive processing speed and the ability to respond rapidly to visual or auditory cues contributing to better movement control and agility.

In this study, the results from table 2 shows that the SLJT distance significantly increased from pre to post-intervention (1.24±0.14 to 1.53±0.16) representing the increased LBP.

Gopa Saha (2022) in his study found that kho-kho players have a better leg strength and reaction ability after the SAQ training (1)

The improvement of lower body power among the subjects might be due to improvement in muscular strength which is attributed to enhanced muscle fibre recruitment and increased force production during dynamic movements.

Based on the overall training program, improvements in lower body power, speed, and agility can contribute to changes in body composition, including increased lean muscle mass and reduced body fat which is beneficiary to the kho-kho players for enhancing their performance.

Ajeet Jaiswal (2014) in his study stated that the kho-kho players were found to have significantly taller and less amount of subcutaneous tissue with more ectomorphic component. The kho-kho players also had higher lean body mass than the controls. The % body fat and total body fat were also lesser in kho-kho players (15).

Improved lower body strength, flexibility, and joint stability gained through SAQ training can help prevent injuries associated with sudden changes in direction, deceleration, and acceleration.

Furthermore, the study underscores the importance of tailored training protocols, emphasizing the gradual progression of intensity over the six-week period.

Overall, the evidence presented in this research supports the contention that SAQ training holds promise as an effective method to enhance physical fitness in female recreational kho-kho players, contributing to the broader understanding of sports-specific training interventions and these positive outcomes support the recommendation for integrating SAQ training into the regular fitness regimen of kho-kho players to optimize their performance and reduce the risk of injuries.

CONCLUSION

The findings of this study highlight the significant positive impact of the six-week SAQ training program on key fitness components—speed, agility, and LBP—among female recreational kho-kho players. The observed increase in standing long jump distance reflects enhanced LBP, while the notable decrease in T-Test scores indicates improved agility. Additionally, the substantial decrease in 50m sprint time signifies enhanced speed among the participants.

Limitations

The study acknowledges a relatively small sample size of 40 participants. While the results may be statistically significant, the generalizability of findings to a larger population may be limited.

The six-week duration of the SAQ training program might be considered relatively short.

The absence of a control group makes it challenging to attribute observed improvements solely to the SAQ training.

Recommendations

Future research could consider longer intervention periods to assess the sustainability of improvements over time. This would provide a more comprehensive understanding of the lasting effects of SAQ training. Including participants from various sports or fitness backgrounds would enhance the generalizability of the findings. Comparative studies with athletes engaged in different activities could reveal sport-specific effects.

Implementing controlled randomized trials with a control group that does not undergo SAQ training would help establish a causal relationship between the intervention and observed improvements. Incorporating a broader range of outcome measures, such as muscle strength, flexibility, and injury incidence, could offer a more comprehensive assessment of the impact of SAQ training on overall physical fitness and well-being.

Future studies may explore individual differences in response to SAQ training, considering factors like baseline fitness levels, motivation,

and adherence to the training program.

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