

## Effect of Proprioceptive Training and Strength Training on Agility among Table Tennis Players

Barathsha Basha<sup>1\*</sup>, Suryaprakash Nagaraj<sup>1</sup>, Hari Hara Sudan<sup>1</sup>, Manoj Abraham<sup>1</sup>

<sup>1</sup>KG College of Physiotherapy, Coimbatore, Tamil Nadu, 641035, India.

\*Email: barath14.tpt@gmail.com

### Abstract

**Background:** Table tennis is a dynamic sport. Proprioception is an important sensory and motor function for all mobility action which also plays an important role in sports and contribute greatly to the performance of athletes. Strength training involves the performance of physical exercise that are designed to improve strength. Agility is the ability to move and change the direction and position of the body quickly and effectively under control.

**Objective:** To find out effect of proprioceptive training and strength training on agility among table tennis players.

**Methodology:** The study design was experimental study, conducted in KG college of Physiotherapy with total sample of 20 players were included in the study with 10 players each in the group. Sampling method was convenient sampling. Study duration was 6 months and individual training was 6 weeks. Male table tennis players, aged between 18-25 years who were practicing and playing table tennis for more than one year were included in the study. Players with any soft tissue injuries, recent fractures, recent musculoskeletal surgeries and neurological problems, irregular in training regime have been excluded.

**Result:** The post-test mean values of proprioceptive training group (N=10) was 9.38 whereas the players who are underwent strength training (N=10) was 10.20. Thus, proprioceptive training reflects better agility when compared with the strength training.

**Conclusion:** Agility involves starting, stopping, changing the direction, rotation, reaction and complex movements. Table tennis realize heavily on agility. Thus, proprioceptive training and strength training has to been given for better agility among table tennis players who are underwent proprioceptive training showed significant improvement in agility than strength training.

### Keywords

Sports, Proprioceptive feedback, Resistance training, Athletes, Muscle strength

### Introduction

Table tennis a sport in which success depends on many interconnected factors with motor coordination abilities indicated as the most important (Borysiuk, 2006). Table tennis is a dynamic sport. Table tennis being one of the fastest ball games, is characterized by perceptual

**Submission:** 17 August 2023; **Acceptance:** 19 September 2023



**Copyright:** © 2023. All the authors listed in this paper. The distribution, reproduction, and any other usage of the content of this paper is permitted, with credit given to all the author(s) and copyright owner(s) in accordance to common academic practice. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license, as stated in the website: <https://creativecommons.org/licenses/by/4.0/>

uncertainly and time pressure and hence requires a short Reaction time for success (Biawas et al., 2011).

Proprioception is an important sensory and motor function for all mobility actions (Batson, 2009). Proprioception plays an important role in sports and contributes greatly to the performance of athletes. Proprioception training is defined as a series of exercise or situations that will produce a reaction by the nervous system in response to an external stimulus (Ogard, 2011). Proprioception is very important to brain and plays coordination, posture, focus, balance and improves body control. Proprioception is a subsystem of somatosensory system which also includes touch, pain and temperature sense from the skin musculoskeletal structures (Bokil et al., 2020).

Strength training or resistance training involves the performance of physical exercise which are designed to improve strength and endurance. It is often associated with the use of weights. Strength training is typically associated with the production of lactate, which is a limiting factor of exercise performance. Regular endurance exercise leads to adaptations in skeletal muscle which can prevent lactate levels from rising during strength training. This is mediated via activation of PGC-1 alpha which alter the LDH (lactate dehydrogenase) isoenzyme complex composition and decreases the activity of the lactate generating enzyme LDHA, while increasing the activity of the lactate metabolizing enzyme LDHB.

Agility is the ability to move and change the direction and position of the body quickly and effectively while under control. It requires quick reflexes, coordination, balance, speed, and correct response to the changing situation. When you are agile, it means you are moving to the best position to take the next action, such as catching a ball or making a tackle. Agility ensures that your body and sports equipment are in the right position to take the next action effectively. The aim of the study was to find out the effect of proprioceptive training and strength training on agility in table tennis players.

There are more studies that analysed the strength training on agility improvement, as like as other studies analysed proprioceptive training on agility improvement of upper limb, But there are very limited studies in comparing the both training manoeuvres and particularly in table tennis, So there is a need to compare the proprioceptive training and strength training on agility in table tennis players.

## Methodology

A quasi-experimental study was conducted among 20 collegiate table tennis players at Kg college of physiotherapy, outpatient department, Coimbatore, India. A clear explanation was given to all the players and an informed consent was obtained prior to the study. Only male players whose age ranging between 18 to 25 years playing table tennis for more than a year with regular training were included in this study. Players with history of soft tissue injuries and recent fractures, suffered with any pain during the regime, if the players were irregular in training regime, any history of cardiovascular, musculoskeletal or neurological problems were excluded from this study (Ramalingam et al., 2023). Ethical clearance was obtained by the ethical committee of kg hospital and the written concern form was obtained from all the players who were participated in the study. The players were divided into two groups with 10 players in each. Players in group A underwent Proprioceptive training which includes, 1. Rhythmic stabilization (20 seconds hold-2 set) [Fig 1.1], 2. Kneel push-ups (20 seconds hold-2 set) [Fig 1.2], 3. Quadruped (20 seconds hold- 2 set) [Fig 1.3] 4. Push-ups (20 seconds hold-2 set) [Fig 1.4], 5. push-ups with elevated feet (20 seconds hold-

2 set) [Fig1.5], 6. Hands on wobble board (20 seconds hold-2 set) [Fig1.6], 7. Elbows on gymball (20 seconds hold-2 set) [Fig1.7] and players in group B underwent strength training which includes biceps, triceps, wrist flexors and extensors strengthening. The players in both the groups underwent training for 6 days in a week for 6 weeks. The pre and post-test measure on reaction agility was measured using Agility T test. SPSS version 22.0 was used to analyse and interpret the data. Independent t-test was used to compare the mean difference between the pre and post-test of two groups.



Figure 1.1 Rhythmic stabilization



Figure 1.2 Kneel push ups



Figure 1.3 Quadruped



Figure 1.4 Push ups



Figure 1.5 Push-ups with elevated feet



Figure 1.6 Hands on wobble board



Figure 1.7 Elbows on gym ball

Table 1. Example of the caption for the Table

Groups	Mean	Standard Deviation	Calculated T Value	Tabulated T Value
Group A	9.38	0.55	3.1405	1.860
Group B	10.20	0.60		

## Results and Discussion

The study was conducted to find out the effect of proprioceptive and strength training on agility for table tennis players. When comparing the mean values of both the posttest mean values proprioceptive training (N=10 subjects) are as follows (Agility-9.38). strength training (N=10 subjects) are as follows (Agility- 10.20). so proprioceptive training groups shows a significant improvement in agility than the strength training group.

In fast movement sports like Table tennis, the success depends on the speed of the athlete in deciding the counter movements and the speed of the reaction (Richard, 1991). Table tennis is a dynamic sport activity requires hundreds of rapid movements and reaction; the speed of ball makes agility as one of the important components for success (Abernethy et al., 1999). Agility not only enhances the reaction time also helps in reducing rate of injury. Balance, coordination and agility are the building blocks are table tennis, among which agility plays vital role for greater results. Recognizing the important of the fundamentals and incorporating them into the training session will enhance and enrich the victory of players. Table tennis is characterized by perceptual uncertainty and time pressure and hence requires a short reaction time for success.

Proprioception is an important sensory, motor function for all mobility action. Another study stated that the improvement in reaction time may be associated with the development in the process skills of the sensory- motor performance and central neural system due to the training (Ceylan and Saygin, 2015).

The results of this study show a significant statistical difference between the pre-test and post-test RT of the experimental group after 6 weeks of upper extremity proprioception training. This is in accordance with many studies which proved that proprioception is an important sensorimotor function for all mobility actions (Taha and Chong, 2013). Another study stated that the improvement in reaction time may be associated with the development in the process skills of the sensory-motor performance and central neural system due to the training (Harvey et al., 2011).

## Conclusion

In conclusion, proprioceptive training is more effective in improving the Agility and then the strength training. Thus, proprioceptive exercise has to be trained for a better improvement in the overall game play among table tennis players.

## Acknowledgements

Grant and fund providers should be acknowledged. This research work is presented during Stride'23 International Physiotherapy conference on April 6th and 7th and the abstract is published as conference proceedings in International Journal of Physiotherapy and Occupational therapy (IJPOT)

## References

- Abernethy, B., Wood, J. M., & Parks, S. (1999). Can the anticipatory skills of experts be learned by novices?. *Research quarterly for exercise and sport*, 70(3), 313-318.
- Batson, G. (2009). Update on proprioception: considerations for dance education. *Journal of Dance Medicine & Science*, 13(2), 35-41.
- Biol Sport, 23(1), 41– 53.
- Biswas, S. K., Paul, M., & Sandhu, J. S. (2011). Role of sports vision and eye hand coordination training in performance of table tennis players. *Brazilian Journal of Biomotricity*, 5(2), 106-116.
- Bokil, C., Bisen, R., & Kalra, K. (2020). Effectiveness of upper extremity proprioceptive training on reaction time in table tennis players. *training*, 5, 7.
- Borysiuk, Z. (2006). Complex evaluation of fencers predisposition in three stages of sport development.
- Ceylan, H. I., & Saygin, O. (2015). Examining the effects of proprioceptive training on coincidence anticipation timing, reaction time and hand-eye coordination. *The Anthropologist*, 20(3), 437-445.
- Harvey, R. H., Beauchamp, M. K., Saab, M., & Beauchamp, P. (2011). Biofeedback reaction-time training: Toward Olympic gold. *Biofeedback*, 39(1), 7-14.
- Ogard, W. K. (2011). Proprioception in sports medicine and athletic conditioning. *Strength & Conditioning Journal*, 33(3), 111-118.
- Ramalingam, V., Jagatheesan, A., & Suganthirababu, P. (Eds). (2023). Proceedings of International Physiotherapy Conference - Stride'23 in International Journal of Physiotherapy and Occupational therapy (pp 1-143). <https://ijpot.com/conference.html>
- Richard, S. A. (1991). Motor learning and performance: from principles to practice. *Champaign, Illinois, Human Kinetics*.
- Taha, S. & Chong, R. (2013). Effectiveness of an alternate hand wall toss on reaction time among archery, shooting and fencing athletes. Conference paper presented at the International Sport Science Students Conference, University Malaya, Kuala Lumpur.