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Effect of proprioceptive exercises on postural control and agility in hockey players of Vadodara

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Abstract
Background: India's national sport is field hockey, which is played all around the world. The capacity to combine sensory input from numerous mechanoreceptors to determine one's body position is known as proprioception. Movement sense, also known as kinaesthesia (kinesis: movement, aesthesis: sensation), is a part of proprioception. Proprioceptive receptors, the sense of touch, the vestibular system, and the processing of visual information all work together to govern tone and the experience of force and pressure during postural regulation. In general, agility is described in terms of two locomotor movements that are used in place of a linear sprint and a direction shift. Based on the listed potential effects of proprioceptive training, particularly the alteration in muscle force generation, it is assumed that some alterations in speed and explosiveness may be anticipated after this type of training.
Aim: To study to study the effect of proprioceptive exercise on postural control and agility in professional hockey players.
Methodology: Intervention given for 6 weeks, 3 session per week. Pre data was collected. For static postural control Reach test was used, and for the dynamic postural control SEBT was taken. Agility was measured by T test.
Result: There was significant effect of proprioceptive exercises on postural control and agility.
Conclusion: Proprioceptive exercises are effective in improvement in postural control and agility in Hockey Players.

Keywords: Proprioception, agility, postural control

Introduction
India's national sport is field hockey, which is played all around the world. The capacity to combine sensory input from numerous mechanoreceptors to determine one's body position is known as proprioception. Position and movements in space, and it is essential for maintaining balance. (Han *et al*., 2015) [6] Muscle spindles are believed to be the main source of proprioceptive input during the majority of movement, with the addition of additional input via capsular, ligamentous, and cutaneous mechanoreceptors for the perception of position and movement (Ogard, 2011) [9].

The visual, vestibular, and somatosensory systems constitute the majority of the afferent system. Somatosensory system is made up of peripheral sensors, sometimes known as "proprioceptors," that can detect changes in the body's position and posture. The capacity to keep the body's centre of gravity within the base of support is referred to as postural control. Proprioception and postural control are both impacted by a lack of visual input. (Nieto-Guisado *et al*., 2022) [15] To determine whether parts of postural control and balance are being tested (such as static or dynamic control), one should evaluate each test. In general, agility is described in terms of two loco motor movements that are used in place of a linear sprint and a direction shift. It takes a variety of skills for an athlete to quickly change direction while moving and maintain control of them posture, as well as to accelerate and decelerate while moving in the right direction**.** (Acar & Eler, 2019) [1] In practice, it is advised to integrate agility tests that incorporate direction and/or speed changes with cognitive assessments. Agility abilities that require three stages of information processing—stimulus perception, reaction selection, and movement execution—are key to success in many sports. (Zemková & Hamar, 2014) [17]. Enhanced intramuscular coordination, better body control during quick movements, and a lower chance of injury or reinjury are all advantages of increased agility.

(Raya *et al*., 2013) [14]. Based on the listed potential effects of proprioceptive training, particularly the alteration in muscle force generation, it is assumed that some alterations in speed and explosiveness may be anticipated after this type of training**.** (Jukic, 2008) [7]. The motor-neural system's excitation and neural activation, particularly with regard to the stretch-shortening cycle, can benefit from improved proprioception. Athletes would always need to be on guard and attentive of their movements if they lacked proprioception, even for the simplest movements. According to this theory, proprioception is crucial for athletes with high performance indicators as well as daily activities. Because of this, the proprioceptive system is essential for the proper operation of joints during physical activity, daily tasks, and some professional skills (Taskin & Bicer, 2015) [14].

Methodology

This experimental study was conducted after taking ethical approval from Institutional Ethical Committee of Drs. Kiran and Pallavi Patel Global University (KPGU). For this study 33 participants who met the inclusion criteria were recruited from Manjalpur sports complex. Verbal explanation was given to all players regarding study. Prior to conducting study, written consent was taken from all participants. Participants were selected randomly. The data was collected using structured Performa.

Inclusion Criteria

1. Players must have reached and played at district level of hockey.
2. Healthy individuals with age group 18 to 25 years
3. Both males and females included.
4. Players willing to participate.

Exclusion Criteria

1. Players with having musculoskeletal injuries in last six months.
2. Players with having any type of surgeries in last six months.

Before intervention baseline data were taken in form of:

Star excursion balance test (SEBT)

This dynamic postural control test that is SEBT, a simple test that uses a star on the floor of strips of athletic tape positioned at 45° angles to one another. The test re quires having an athlete maintain a base of support with one leg while maximally reaching in eight different directions with the opposite leg, without compromising the base of support on the stance leg.

Reach test

The functional reach test was developed by Duncan *et al*. It is the maximal distance one can reach forward beyond arm's length while maintaining a fixed BOS in the standing position.

T-Test

The T-validity tests and reliability as a gauge of leg strength, leg speed, and agility were investigated. For Intervention Floor exercises, In place tasks, sway limits, Rocker board and Wobble board exercises were given. Exercises takes total 30 minutes.5 min warm up, 20 min training session and 5 min cool down period. Intervention given for 6 weeks, 3 sessions per week.

Results

Mean age of female was 22.66+2.39 and mean age of male was 19.89±1.8.The average SEBT score was 62.91 + 3.72 before the intervention, while after the intervention of 3 weeks the score was 63.42+3.48 and after 6 weeks score was 72+4.28. Analysis of Reach Test .The average score of reach test was 38.79+6.79 before the intervention, while after the intervention of 3 weeks the score was 38.43+3.09 and after 6 weeks score was 44.87+2.86 which was shown in table. The average T test score was 12.15±1.71 before the intervention, while after the intervention of 3 weeks the score was 11.72±1.71 and after 6 weeks score was 10.03±1.19.

Table 1: Comparison of SEBT

SEBT	Mean	Standard Deviation	t value	p value
Pre intervention	62.91	3.72	2.1	< 0.047
3 weeks	63.42	3.48		
6 weeks	72	4.28	24.5	< 0.001

Table 2: Comparison of Reach Test

Reach test (in cm)	Mean	Standard Deviation	p value	t value
Pre intervention	38.79	6.79	0.731	0.3
3 weeks	38.43	3.90		
6 weeks	44.87	2.86	<0.001	6

Table 3: Comparison of T Test

T test (in sec)	Mean	Standard Deviation	p value	t value
Pre intervention	12.15	1.71	< 0.001	4.5
3weeks	11.72	0.5		
6 weeks	10.03	1.19	< 0.001	17.2

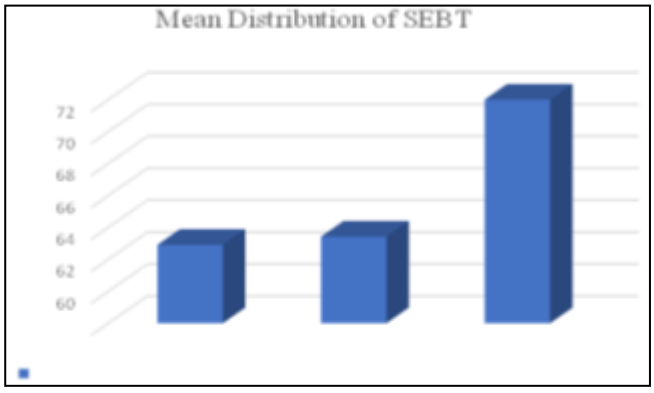

Fig 1: Mean Distribution of SEBT

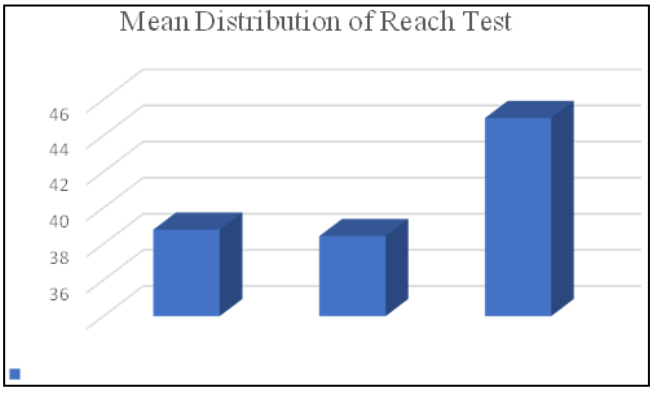

Fig 2: Mean Distribution of Reach Test

Fig 3: Mean Distribution of T test

Discussion

There is a paucity of published articles on the effect of proprioception on postural control and agility. According to current study the proprioceptive exercises are effective in postural control and agility. Chart shows the difference between baseline data, after 3 weeks and 6 weeks. The baseline data was 62.91±3.72 for SEBT and after 3 weeks the value was 63.42±3.48 and after 6 weeks the value was 72±4.28. So proprioceptive exercises have significant effect on dynamic postural control. For static postural control. The base line data of reach test was 38.79±6.79. After 3 weeks the values are 38.43±3.90 that shows non- significant difference. After 6 weeks the values are 44.87±2.86 that shows significant difference. For agility the data was shown in table the base line data of T test was 12.15±1.71. After intervention of 3 weeks 11.72±0.5 and after the intervention of 6 weeks 10.03±1.19 that given in table. After 3 weeks there is medium significant difference was noted and after 6 weeks there is significant large difference was noted. So, according to current study after 3 weeks of proprioceptive exercises there was small significant or non-significant difference was noted and after 6 weeks of intervention there was significant difference was noted.

Conclusion

According to the findings of the current study, proprioceptive workouts have an additional positive impact on hockey players' postural control and agility. The players' proprioception, postural control, and agility have all improved**.** The limitation of the lack of standardized proprioceptive activities in the literature is a limitation of the study. The current study's sample size (n=33) was too small to extrapolate to the entire population and Samples taken were only from Vadodara district.

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