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Effect of Proprioceptive Training on Static Balance and Dynamic Balance of Junior Hockey Players

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Abstract: ***Proprioceptive training is important and an essential training tool for elite athletes to the everyday person. To achieve this purpose, 40 junior hockey players were selected randomly as subjects for this present study. The subjects selected (N=40), were assigned randomly into two groups namely experimental group-1and control group, consisting of 20 each. Thus they were named experimental group-1 as Proprioceptive Training Group (PTG), and Control Group (CG). Their age was fixed in the range of 14 – 16 years. PTG underwent proprioceptive training programme for three days a week for about twelve weeks. Subjects in the control group were not engaged in any activity. Before and after the training period data will be taken to all the subjects. The collected data were processed with Paired t-test was used. The obtained result was tested at 0.05 level of significance. The results of the study show that experimental group shows better improvement on static balance and dynamic balance when compared to control group.***

Keywords: Proprioceptive training, static balance and dynamic balance

1. Introduction

Success in field hockey is often associated with speed, balance, quick feet movement and agility. These are the most important physical attributes to possess. Little can be done to improve the innate sprint speed, but balance and foot agility can be improved significantly through practice. Rushing the execution of hockey techniques will only promote mistakes, which will reflect a lack of emotional balance as well as physical balance. A successful hockey player must see a point of balance in his relationship to the ball with every offensive and defensive technique. In field hockey training is given separately for goalkeepers, forwards, midfielders and defenders. It also involves many stance position and motor fitness, like all the field games. In motor fitness components, the one which directly stimulates the central nervous system (CNS) is said to be balance.

Human beings are dependent on balance. Without balance nothing will be complete in once life both physically and emotionally (Houglum, 2001). Balance is generally defined as the ability to maintain the bodys centre of gravity within its base of support and can be categorized as either static or dynamic balance. Static balance is the ability to sustain the body in static equilibrium or within its base of support (Goldie et al., 1989; Olmsted et al., 2002). Dynamic balance is supported to be more challenging because it requires the ability to maintain equilibrium during a transition from a dynamic to a static state (Ross and Guskiewicz, 2004). Both static and dynamic balance require integration of visual, vestibular, and proprioceptive inputs to produce an efferent response to control the body within its base of support (Irrgang et al., 1994; Guskiewicz and Perrin, 1996).

Balance training programs designed to enhance performance might start with exercises on a stable surface stance, bipedal stance and progress to unipedal stance and unstable surfaces (foam mat, tilt board, wobble board, inflated rubber disc) with eyes open, eyes shut and may then incorporate movements: tilting, rotating, squatting, hopping, jumping (Hrysomallis et.al., 2006). It is a highly integrated dynamic process involving multiple neurological pathways and also its improves through proprioceptive training. Proprioception includes balance, coordination and agility. Because, the body‘s proprioceptors control all these factors. Proprioception is a part of the sensory system that provides information on joint position sense or detecting joint motion and is a component of the balance system. Whether proprioception can really be improved by exercise has been questioned and it is speculated that athletes might just become more skilled at focusing and attending to important sensory cues with training and producing refined motor responses (Miller et.al. 2001).

Balance exercises aimed at improving proprioception; train the brain to recognize the body's segment position every moment. Therefore, a balance exercise program will train and facilitate proprioception pathways under competitive circumstances effectively. Specifically, in order to prevent limb injuries, peripheral and central nervous system receptors (Hanney, 2000). In other words, the goal of balance exercises possibly reduce the time between neural stimuli and muscular response (Zachazewski et al., 1996) preventing forthcoming injuries. Furthermore, many scientists (Bahr et al., 1997; Caraffa et al., 1996; Wedderkopp et al., 1999; Soderman et al., 2000; Malliou et al., 2004; Gioftsidou et al 2006) support that balance exercises are essential to athletic performance and should be incorporated into an athlete's daily training.

2. Literature Survey

Literature survey comprises locating, reading and evaluating reports of research as well as reports of casual observation and opinion that are related to the individuals planned as research report. A study of relevant literature is an essential step to get a full picture of what has been done with regard to the problem under study. The investigator has made an attempt to bring a brief review of research related to the present study to form the background for the present study

and presented the same with appropriate headings. In this section the studies related to effects of proprioceptive training variables related to the present study are presented.

3. Methodology

To achieve the purpose of the study, one hundred and forty four (N = 144) hockey players were selected as subjects from the qualified teams of the quarter finals in the inter CBSE school tournament. Finally 40 players were selected randomly as subjects for this present study. The subjects selected (N=40), were assigned randomly into two groups namely experimental group-1 and control group, consisting of 20 each. Thus they were named experimental group-1 as Proprioceptive Training Group (PTG), and Control Group (CG). The subjects of two groups were measured on the following variables: static balance and dynamic balance. Thus the data collected were considered as pre-test score. After completion of above task, the players of each group were moved to respective training. The Proprioceptive Training Group (PTG) underwent proprioceptive training programme for three days a week for about twelve weeks. Subjects in the control group were not engaged in any activity other than their regular hockey practice during the training period. After the completion of twelve weeks of treatment, the subjects of PTG and CG were tested on leg strength and static balance as such in the case of pre test. It was considered as post test score. The collected data were processed with appropriate statistical tool. To test the individualized effect of both combinations of PTG and CG on leg strength and static balance Paired t-test was used. The obtained result was tested at 0.05 level of significance.

4. Training Procedure

The data will be taken for both the groups before and after the experimental period of twelve weeks. After the initial measurements the specially designed training programme was given to the subjects of the experimental group named as Proprioceptive Training. The training for experimental groups was administrated at Satchidananda Jothi Nikethan International School, Kallar, Mettupalayam, Coimbatore District, Tamil Nadu. The training sessions were conducted three days a week i.e. (Monday, Wednesday, and Friday) over a period of twelve weeks. Each experimental session was of 30-45 minutes duration with excluding warm-up and warm-down. The training commenced with one week of general physical conditioning for the experimental groups, so that the subjects were ready physically and mentally to take on specific load administrated to them for the purpose of the study. After one week of conditioning the training was administrated to the experimental groups, which include balance board drills respectively for three days in a week i.e. (Monday, Wednesday, and Friday). A week schedule was repeated to the proceeding week and the load was adjusted progressively. A detail program is appended. The procedure adopted for the adjustment of load is as follows: The load intensity was kept low to moderate in first week and increased progressively in proceeding week moderate to high. The frequency of training was thrice in a week. The density was adjusted according to intensity because it is inversely related to intensity. The repetition and sets were increased progressively from first week to proceeding week. The duration of training was 30-45 min. for each experimental day. The duration of warm-up and warm-down were fixed at ten to fifteen minutes respectively. Control group was not allowed to take part in the specific experimental training programme expect they had daily general warming up and had their normal activities. The following drills were used for this study: Single-leg stance, Single-leg stance while swinging the raised leg, Open Single-leg stance while performing functional activities (dribbling, catching), Swinging the raised leg, Single-leg squat (30°-45°), Double-leg stance while rotating the board and Single-leg stance while rotating the board.

5. Results

Table 1: Significance of mean gains / losses between pre and post test Proprioceptive Training Group (PTG) and Control Group (CG) on static and dynamic balance of junior hockey players

Variables	Pre test (Mean and ±S.D)	Post test (Mean and ±S.D)	MD	SE	't' ratio
PTG					
Static Balance	51.25±40.60	60.88±44.75	9.63	4.37	2.20*
Dynamic Balance	83.25±6.54	92.75±6.17	9.50	1.58	6.02*
CG					
Static Balance	29.66±13.02	36.27±19.60	6.61	4.35	1.52
Dynamic Balance	85.00±7.43	86.25±7.73	1.25	0.74	1.70

***Significant at 0.05 level: 2.09. PTG –** Proprioceptive Training Group**, CG –** Control Group

Table 1 indicates that the obtained't' values of the proprioceptive training group (PTG) on variables are: 2020 (static balance) 6.02 (dynamic balance). The obtained t-values are significant at 0.05 levels for degree of freedom 1, 19 and the required critical value is 2.09. Hence the obtained t-values on the selected variables are higher than the required critical value, it is concluded that the proprioceptive training group, has produced significant changes positively from its baseline to post treatment on static balance (+9.63 P<0.5) and dynamic balance (+9.50P<0.05). The obtained 't' values of the control group (CG) on variables are: 1.52 (static balance) 1.70 (dynamic balance). The obtained 't'- values are significant at 0.05 levels for degree of freedom 1, 19 and the required critical value is 2.09. Hence the obtained t-values on the variables were failed to reach the significant level. It was concluded that the changes made from pre-test to post test was statistically not significant.

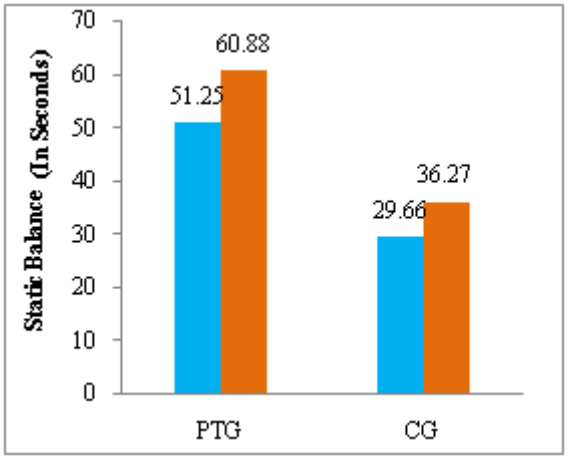

Figure 1: Bar diagram showing the mean values of pre test and post-test on static balance

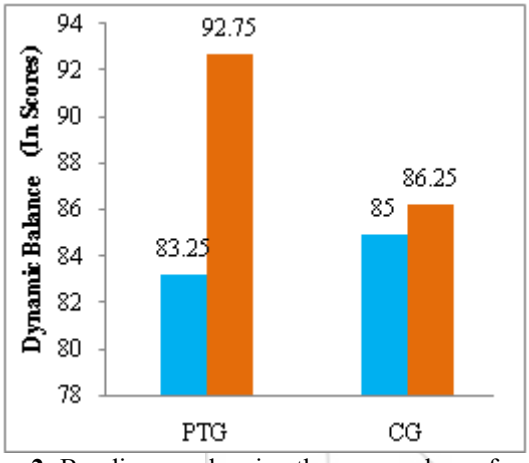

Figure 2: Bar diagram showing the mean values of pre test and post-test on Dynamic balance

6. Discussion on Findings

In testing the individualized effect of proprioceptive training and control group, the findings observed are as follows. In studying the changes observed from effect individualized effect, the derived results are as follows. Base line to post treatment on proprioceptive training, the proprioceptive training has increased significantly on static balance and dynamic balance. Further, in studying the changes observed from the baseline to the post treatment on subjects of control group, no significant changes was observed on selected visual skills fitness variables used in the study. The results of the study supported with suitable literature According to Myer et al., 2005 believes that the sportsman that include in their preparation also the proprioception exercises will benefit in terms of strength and neuromuscular control, dynamic stability and growth of the joints and relearning pattern of movements and skills used during the performance of daily activities and those that are specific to the sport practised. Zouita et al., 2009 concluded that proprioceptive training must be carried out by all the athletes who practice a sport characterized by a large number of jumps and changes of direction, in which the proportion of sprains and knee to the ankle is great and where physical fatigue occurs significantly.

7. Conclusions

Based on the results the following conclusions have been made. In the present study selected variables such as static balance and dynamic balance were significantly better as compared to players practiced with conventional training. In analyzing significant effect of PTG, it was observed that the proprioceptive training as they help to develop the static and dynamic balance when compared to control group.

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