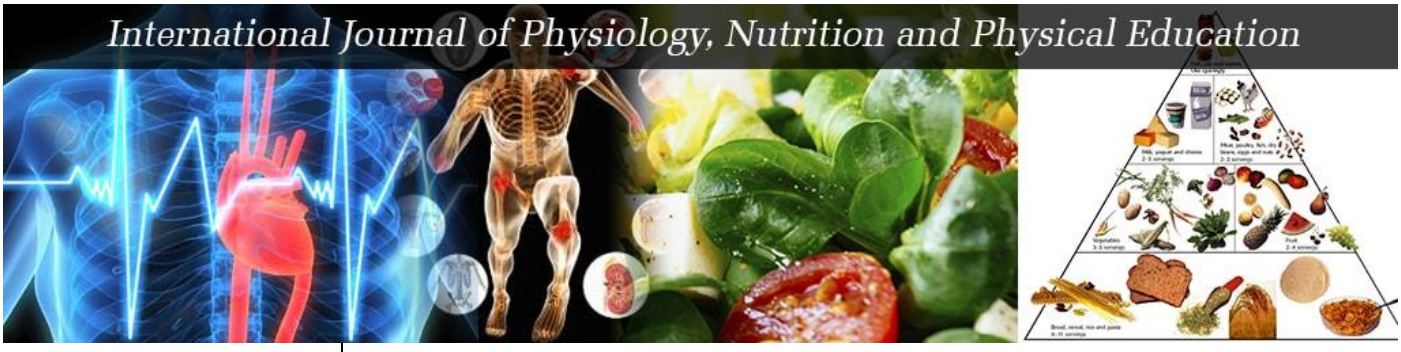

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Comparison of neuromuscular coordination of handball and volleyball inter-collegiate players of Purulia district

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Abstract
Neuro-muscular coordination in inter-collegiate players improves skill performance and decreases the risk of injuries during the activities. This coordination is primarily ascribed to the enhancement of eye-hand coordination. The purpose of the study was, "Comparison of Neuro-muscular Coordination of Handball and Volleyball inter-collegiate Players of Purulia district". The Researcher selected the various inter-collegiate players of Purulia district for research purpose. For comparing the neuromuscular researcher had selected total sixty subjects which were further divided into 30 handball and 30 volleyball players and age range from 18 to 21 years are selected for the data collection as per simple random sampling technique. After that researcher collects the data, from those players with the help of selected test.
After, the data collection the researcher analysis the data with the help of descriptive statistics (Mean, SD and 't'- test).

Keywords: Neuro-muscular coordination, handball and volleyball

Introduction
Movement analysts ranging from spectators and sportswriters, to teachers and coaches, to biomechanics and kinesiologists, to neuroscientists and robot cists believe that coordination is a desirable aspect of performance. Yet, there has been little coordination among movement analysts in the effort to understand and improve coordinated movement. Perhaps our disjointed activity is due in part to our diverse conceptions of coordination. If so, identifying and clarifying the various meanings of coordination may enable movement analysts to cooperate on the topic of coordination. Thus, the purpose of this paper is to ask and address a series of questions: What is meant by coordination. Are the meanings similar or different for professionals and non-professionals, for scholars and practitioners, Are the meanings complementary or contradictory for researchers in various fields, is there a common thread of meaning that could be used as both a basis of communication as well as a basis for research. Neuro-muscular coordination studies how to coordinate between the different parts of our body. They study individuals as well as group, observable the coordination's.
When the word coordination was first recorded in 1605, it meant "orderly combination" [1]. Though the basic meaning of coordination has not changed over the centuries, the contemporary meaning of coordination has become increasingly associated with harmonious and skillful movement; coordination is defined as the harmonious adjustment of action, as of muscles in producing complex movements.
Webster's connection between harmony and human movement has been accented in the physical education literature for teachers and coaches. For example, coordination has been defined as the "harmonious movement of independent body parts" [2], "the ability to integrate muscle movements into an efficient pattern of movement" [3] and "the use of muscles in such

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[2] Dictionary of the sport and exercise sciences, (1991), Champaign, IL: Human Kinetics.
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a manner that they work together smoothly and effectively rather than hinder one another" [4]. Roget's association of coordination and skillful movement was echoed by Schurr: "Coordination makes the difference between good performance and poor performance." Also [5], related coordination to athletic exemplars: "Neuromuscular coordination reflects the ability of athletes to perform their sports activities or events with a smooth, balanced, and fluid motion." While many practitioners in physical education describe coordination in terms of harmony or skillfulness, some scholars in physical education are more apt to emphasize the pattern of movement. For instance, "coordinated actions of the human body are executed by the controlled application of muscular forces which produce distinctive patterns of segment motions" [6]. And coordination is "the relationship among movement variables that constrains them into a behavioral unit." Further, a coordination variable is a "factor that, when changed, necessitates a new pattern of coordination.

Neuromuscular training programs by evidence have shown a greater improvement in the performance and have become integrated into clinical practice in rehabilitation of an athlete. Information regarding joint movement and joint positions are provided by mechanoreceptors in the skin, muscles, tendons, ligaments, and joints combine with input from the vestibular and visual systems to maintain balance and perform specific activity. Injury can alter the normal physiological process of motor control, leading to insufficient neurologic input or improper processing at the spinal, brain stem, or cognitive centers leading to an inadequate response by the motor system. The neuromuscular co-ordination and activity is one of the key considerations in sports performance. The motor cortex does not specify motor unit activation rather the body attempts to achieve a specific movement by activating muscle and or muscle groups [7]. The movements and skilled activity always requires complicated neuromuscular co-ordination, this is learned over time through practice and experience. A trained athlete performance is based on the needs and it is modified according to the changes applied. The motor learning is one of the key principles of neuromuscular training. A trained athlete reaches advanced motor learning skills necessary to accomplish complex motor tasks.

A sportsperson can perform optimally only when he is in a perfect state of physical, physiological and psychological preparedness for a given competitive event or performance. She must, of course, be fully equipped technically and tactically. Such a performance cannot be expected overnight or all of a sudden. It can only be materialized through long and sustained efforts over the years following unflinching discipline and an unwavering commitment. In this process, the pattern, the physical educator and the coach or trainer, have to play a specific role at particular stages in the making of these men of great sporting acumen. Physical proficiency is an important area of motor performance. Ability refers to a more general trait of the individual which has been inferred from response consistencies on certain kinds of tasks. Abilities are fairly enduring traits, which in adults, are more difficult to change. Many of these abilities are, of course, themselves a product of learning and develop at different stages, mainly during childhood and adolescence.

Introduction 5 Proficiency in any sport requires an ideal integration of numerous abilities developed into an ideal degree. However, performance measures of these abilities do vary from activity to activity. Fleishman identified the dimensions underlying the human performance into the physical proficiency (fitness) area and the psychomotor area. The factors of strength, power, stamina, flexibility, coordination and balance constituted proficiency whereas reaction-time, speed of movement, arm-hand steadiness, visual perception, manual dexterity and rate control were the abilities considered under psychomotor domain [8].

Team-handball is an Olympic sport ball game that is characterized by fast pace defensive and offensive action during the game with the objective of the game to score goals. To score goals, the offensive players (6 players and one goalie) attempt to establish an optimal position for the throwing player by fast movements over short distances performing powerful changes in direction (with and without the ball), one-on-one action against defensive players and passing the ball using different offensive tactics.

Review of related literature

Acsinte Alexandru *et al.* (2014) [9] was conducted to check the specialized sensory receptors in the muscles, joints and connective tissues enable the body to process information from a variety of stimuli, and turn that information into action. The key to creating what specialists refer to as movement intelligence involves individuals becoming consciously aware of their movements, and of the information their body is absorbing. To do this, stimuli are created to elicit a movement reaction through a variety of tasks or exercises. As skill improves, more stimuli are needed to continue improvement. So, the aim of this study was to prove the utility of complex and specific drills using additional materials in young handball players. The study has been developed on a sample of 10 young female handball players from CSS. Bacau, aged between 13-14 years. The evaluation of the subjects has been performed using the "T – Test", the "Slalom Test" and the "ZIGZAG Run Test", taken from the book "Functional Testing in Human Performance". The working protocol consisted in 8 coordinative and proprioceptive drills that were used during the training sessions and during warm-up, before official matches. An improvement in all values was recorded, as compared to the reference values.

Mette K Zebis *et al.* (2008) [10] the study was conducted with aimed to implement neuromuscular training during a full soccer and handball league season and to experimentally analyze the neuromuscular adaptation mechanisms elicited by this training during a standardized side cutting maneuver known to be associated with non-contact anterior cruciate

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[9] Acsinte Alexandru, Alexandru Eftene, Hantau Cezar, Oscar Gutierrez Aquilar, Makoto Muramatsu, "Neuromuscular Coordination and Proprioceptive Training in Young Handball Players", *Procedia - Social and Behavioral Sciences*, Vol. 117, No. 19, (2014): pp. 451–456.

[10] Mette K Zebis, Jesper Bencke, Lars L Andersen, Simon Døssing, Tine Alkjær, S Peter Magnusson, Michael Kaer, Per Aagaard, "The Effects of Neuromuscular Training on Knee Joint Motor Control During Sidecutting in Female Elite Soccer and Handball Players", *Clin. J Sport Med*, Vol. 18, No. 3, (2008): pp. 329–337.

ligament (ACL) injury. Design: The players were tested before and after 1 season without implementation of the prophylactic training and subsequently before and after a full season with the implementation of prophylactic training. Participants: A total of 12 female elite soccer players and 8 female elite team handball players aged 26 6 3 years at the start of the study. Intervention: The subjects participated in a specific neuromuscular training program previously shown to reduce non-contact ACL injury. Methods: Neuromuscular activity at the knee joint, joint angles at the hip and knee, and ground reaction forces were recorded during a side cutting maneuver. Neuromuscular activity in the pre landing phase was obtained 10 and 50ms before foot strike on a force plate and at 10 and 50ms after foot strike on a force plate. Results: Neuromuscular training markedly increased pre landing activity and landing activity electromyography (EMG) of the semi-trendiness (P, 0.05), while quadriceps EMG activity remained unchanged. Conclusions: Neuromuscular training increased EMG activity for the medial hamstring muscles, thereby decreasing the risk of dynamic values. This observed neuromuscular adaptation during side cutting could potentially reduce the risk for non-contact ACL injury.

Tamara C Valovich McLeod *et al.* (2009) [11] was conducted to observe poor balance has been associated with increased injury risk among athletes. Neuromuscular-training programs have been advocated as a means of injury prevention, but little is known about the benefits of these programs on balance in high school athletes. Objective: To determine whether there is balance gains after participation in a neuromuscular-training program in high school athletes. Design: Nonrandomized controlled trial. Setting: All data were collected at each participating high school before and after a 6-wk intervention or control period. Participants: 62 female high school basketball players recruited from the local high school community and assigned to a training (n = 37) or control (n = 25) group. Intervention: Training-group subjects participated in a 6-wk neuromuscular-training program that included polymeric, functional-strengthening, balance, and stability-ball exercises. Main Outcome Measures: Data were collected for the Balance Error Scoring System (BESS) and Star Excursion Balance Test (SEBT) before and after the 6-wk intervention or control period. Results: The authors found a significant decrease in total BESS errors in the trained group at the posttest compared with their pretest and the control group (P = .003). Trained subjects also scored significantly fewer BESS errors on the single foam and tandem-foam conditions at the posttest than the control group and demonstrated improvements on the single-foam compared with their pretest (P = .033). The authors found improvements in reach in the lateral, antero-medial, medial, and posterior directions in the trained group at the posttest compared with the control group (P < .05) using the SEBT. Conclusion: The study demonstrates that a neuro-muscular training program can increase the balance and proprioceptive capabilities of female high school basketball players and that clinical balance measures are sensitive to detect these differences.

Bastiurea Eugen *et al.* (2014) [12] was evaluated the relationship between muscle strength and coordination capacity was examined at 17 handball players aged between 16-18 years old (M = 17.06, SD = 0.827). Strength indices were calculated by reporting the measured values to body weight. "The muscle strain differentiation test of hands" was used for the neuromuscular coordination capacity and the "Pendulum-throw target" test for the throwing accuracy. The paper notes that muscle strength, being below the optimal values, does not significantly influence the coordination capacity (CI = 95%). During this period, it is important to intensify the intramuscular coordination training, due to the qualitative aging of the SNC.

[11] Tamara C Valovich McLeod, Travis Armstrong, Mathew Miller, Jamie L Sauers, "Balance Improvements in Female High School Basketball Players after a 6-Week Neuromuscular-Training Program", *Journal of Sport Rehabilitation*, Vol. 18, (2009): pp. 1-17.

[12] Bastiurea Eugena, Stan Zenoviaa, Rizescu Constantinb, Mihaila Ionc, Andronic Florinde, "The effect of muscle strength on the capacity of coordination in handball", *Procedia-Social and Behavioral Sciences*, Vol. 137, (2014): pp. 3–10.

Methodology

This chapter describes the method of research design, population, sample, tools, used for research apparatus or instrument employed statistical tools and procedures systematically. This is a comparison type of study under the description research. The study was conducted on the handball and volleyball inter-collegiate players of Purulia district. Standard Procedure was followed to conduct this study. This was a comparative type of study under the Laboratory research. This comparison was conducted to find the "Comparison of Neuro-Muscular coordination between Handball and volleyball inter-collegiate players of Purulia district" of the data was collected with the help of standard test.

Selection of subject

For comparing the neuromuscular researcher had selected total sixty subjects which were further divided into 30 handball and 30 volleyball inter-collegiate players. All the subjects were students of colleges of Purulia district. The selection process for subjects was purely based on random sampling technique. The subject's age group was ranged from 18 to 21 years.

Sample

Simple random sampling method was employed for the selection of subject from colleges of Purulia district. The subjects were (n=60), 30 Handball and 30 volleyball players and age range from 18 to 21 years.

Selection of variables

Neuro-Muscular Coordination.

Table 1: Tools selected for the study

Sl. No.	Test	Purpose of the test
1.	Eye-Hand Coordination Test	To measure the Neuro-muscular coordination between handball and volleyball inter-collegiate players

Statistical design

The collected data from selected subjects were treated on following statistical technique:-

The statistical analysis of Independent-'t' test was used for the present study and the level of significance is set at 0.05.

- Descriptive statistical technique was used to find out the scattering of the score.
- Independent "t" test was used to find out the significant difference between handball and volleyball players.

Analysis of data

The statistical analysis of data collected on 60 subjects (30 handball and 30 volleyball players) on Neuro-muscular coordination of inter-collegiate players of Purulia district has

been presented in this chapter. The detailed statistical analysis are done systematically and presented in the form of tables and graphs. The depth analysis of the data presented in this chapter has been separated into two sections. The first section deals with descriptive statistical measures, of the Neuro-muscular coordination.

Findings

This section deal with the descriptive statistical analysis applied on data collected from subjects on the Neuro-muscular coordination that are included in the study in the form of variables.

Table 2: Descriptive statistics on the neuro-muscular coordination of handball and volleyball inter-collegiate players

Group	N	Mean	MD	SD	SEM	DF	Cal. t.
Handball Players	30	33.56	4.19	4.83	0.88	58	0.077
Volleyball Players	30	37.77		4.07	0.74		

Significant at 0.05

Tabular-'t' Value (58) = 2.000

Table shows that, data collected on 30 handball players the mean was 33.56, standard deviation was 4.83 and standard Error of Mean was 0.88. For 30 volleyball players the mean was 37.77, standard deviation was 4.07 and standard Error of Mean was 0.74.

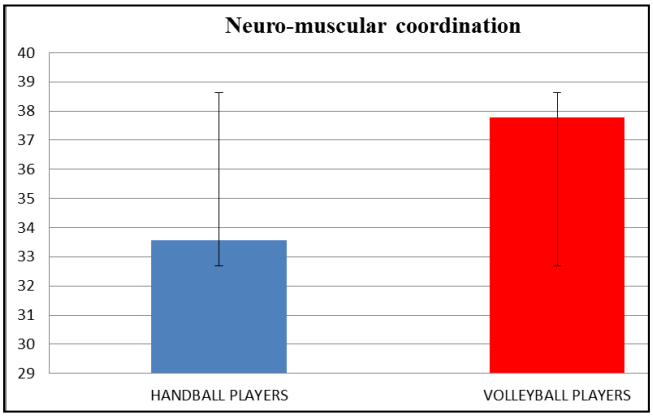

Fig 1: The graphical presentation of neuro-muscular coordination between the 30 handball and 30 volleyball inter-collegiate players has presented in the fig.

Discussion of findings

Human physiological is consists of different types of components of fitness which makes every individual humans differ from each other. Hence, when it comes to understand. Human Physiological traits the origin of physiological comes into exit. Physiological is the connection of applied to Neuro-muscular, educational and theoretical science. It is the study of coordination, performance and the mental operations of people. Physiological is also in reference to the usage and application of coordination and understanding various activities undertaken by humans and how they are used through daily activities, whether that is within events, talking to people, education and employment, relationships and coordination activities.

The research studies conducted on handball and volleyball players revealed that your coordination is very much influence from the different factors. In nut shell your Neuro-muscular coordination reflects the person coordination ability between muscle and neuron. The study was an Endeavour in similar way to find out and compare the diversity among the handball and volleyball inter-collegiate players in terms coordination. In this aspect the researcher had selected 30 handball and 30 volleyball players. The purpose was to assess the Neuro-muscular coordination of handball and volleyball inter-collegiate players of Purulia district.

In the light of the results of analysis researcher found that there were no significant difference was observed between the Neuro-muscular coordination of handball and volleyball inter-collegiate players of Purulia district. As studies shows that you're surrounding specially where you play having no influence on Neuro-muscular coordination. This dispersion because of demand of the sports and works which make you to react differs from situation to situation.

Here, also Neuro-muscular coordination of handball and volleyball players are regularly participating in sports activities and sports involvement bring changes in the performance in terms of coordination. Sports participation requires coordination between the neuron and muscular. Therefore, researcher felt these all above factors might be reasons to bring the no significant difference between handball and volleyball players Neuro-muscular coordination.

Discussion of hypothesis

On the basis of literature, discussion with experts and the research scholar's own understanding it was hypothesized that-

Ho: There would be no significant difference among handball and volleyball in relation with neuromuscular coordination. Hence, this above hypothesis is accepted.

Summary

The purpose of the study was to compare the Neuro-muscular coordination of handball and volleyball inter-collegiate players in Purulia district. The present study was conducted on the 30 handball and 30 volleyball players on the basis of evidence available in the literature and with personal experience as well as discussion with experts the following hypothesis was formulated what there may be significant difference in Neuro-muscular coordination of handball and volleyball players in Purulia district. The eye-hand coordination test was conducted for the collected, test was selected for the collection of data because it was found to be most reliable and have been very often used in research in profession physical education and sports.

In order to determine the Neuro-muscular coordination of handball and volleyball players independent 't'-test was employed and the level of significance was set (0.05) It is observe that, calculated value is 0.77 lower than the tabulated t- value 2.000, hence there is no significant difference was found between the Neuro-muscular coordination of handball and volleyball players.

Conclusion

On the basis of findings researcher able to draw following conclusion:-

- Researcher concluded the data collected on Neuro-muscular coordination from selected subject; handball and volleyball players has shown their coordination, but volleyball players had showed better responses in

comparison to handball players.

- Further, researcher able to conclude that there was no statistical significant difference was observed in between handball and volleyball players Neuro-muscular coordination.

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