EFFECT OF PLYOMETRIC TRAINING ON SHOULDER PROPRIOCEPTION IN ATHELETIC SUBJECTS

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BY

AMIRA HUSSIN MOHAMMED DRAZ
M.SC. &M.Sc. in Physical Therapy
Assistant lecturer of Physical Therapy
for Basic Science Department

SUPERVISORS

Prof. Dr. Fatma Sedek Amin
Professor of Physical Therapy
Basic Science Department
Faculty of Physical Therapy
Cairo University

Prof. Dr. Mohammed Hussein El Gendy
Professor of Physical Therapy
Basic Science Department
Faculty of Physical Therapy
Cairo University

Ass. Prof. Dr. Ragia Mohammed Kamel
Assistant Professor in Physical Therapy
Basic Science Department
Faculty of Physical Therapy
Cairo University

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Cairo University
2009

SUPERVISORS

Prof. Dr. Fatma Sedek Amin
Professor of Physical Therapy
Basic Science Department
Faculty of Physical Therapy
Cairo University

Prof. Dr. Mohammed Hussein El Gendy
Professor of Physical Therapy
Basic Science Department
Faculty of Physical Therapy
Cairo University

Ass. Prof. Dr. Ragia Mohammed Kamel
Assisstant Professor in Physical Therapy
Basic Science Department
Faculty of Physical Therapy
Cairo University

EFFECT OF PLYOMETRIC TRAINING ON SHOULDER PROPRIOCEPTION IN ATHELETIC SUBJECTS/Amira Hussin Mohammed Draz. **Supervisors:** Prof. Dr. Fatma Sedek Amin; Prof. Dr.Mohamed hussein El Gendi, and Ass. Prof. Dr. Ragia Mohammed kamel. Department of Basic Science, Faculty of Physical Therapy, Cairo University(Egypt). 2009 (Doc. degree)

Abstract

Purpose: The purpose of the study was to investigate the effect of the plyometric training program on shoulder proprioception in healthy upper extremity athletes. **Materials and methods**: Fifty players were included at the starting of the study, They were divided into two groups;**Group A (Experimental)** which consisted of 25 players with mean value of age were 14.84±0.68 years, mean values of body weight were 69.4±6.72Kg ,mean value of height were 171.72±7.94cm, mean value of body mass index(BMI) were 23.56±2.07Kg/m2, and actively participated in the suggested plyometric training programin addition to their training program.**Group B (Control)** which consisted of 25players With mean value of age were 15.08±1.07years, The mean value of body weight were 70.16±5.03Kg, the mean value of height were 173.16±4.78cm, the mean value of body mass index(BMI) were 23.39±1.31Kg/m2.and actively participated in the traditional training program of their team. Measurement of their proprioception accuracy repositioning (active and passive tests) was conducted before and after the training period by using the Biodex Medical System III both groups were trained for succsessive six weeks in the preparatory period. **Results:** There was a significant difference due to the effect of plyometric training on proprioception accuracy level . **Conclusion**: there is an effect of plyometric training on shoulder proprioception in upper extremity athletes.

(Key Words: **Shoulder joint, Proprioception, Plyometric training)**

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CONTENTS

LIST of ABBREVIATIONS

ACJ	: Acromio-Clavicular Joint
ACL	: Anterior Cruciate Ligament.
ARAT	: Active Repositioning AccuracyTest.
BAPS	: Biomechanical Ankle Platform System.
DMP	: Directional Motion Perception.
GHJ	: Gleno-Humeral Joint.
GTOs	: Golgi Tendon Organs.
LBP	: Low Back Pain.
PMT	: Passive Motion Threshold.
PRAT	: Passive Repositioning Accuracy Test.
RA	: Repositioning Accuracy.
SCJ	: Sterno-Clavicular Joint.

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CHAPTER I

INTRODUCTION

Today's sports and recreation activities have become more and more competitive, with this increased competitive nature comes an increase in the desire to improve performance. **(Wilk and Arrigo, 1993).**Shoulder and upper limb injuries account for 8% to 20% of all athletic injuries **(Muckle, 1978, and Terry and Chopp, 2000).** The shoulder is also subjected to trauma or overuse in contact sports as a result of throwing and bowling **(Williams and Warwick 1980,and Greenan et al., 1993).** Overhead-throwing athletes suffer from both acute and chronic upper extremity injuries, including impingements, tendinopathies, strains, subluxations, and dislocations **(Tripp et al., 2006)** .The highest risk ratios of these injuries in organized sports are seen in basketball, field hockey, track and field, handball and soccer **(Backx et al., 1989)**

The shoulder joint has the greatest range of motion of any joint in the body, which potentially compromises its stability. As a result of this large range of motion, muscular coordination is vital to maintaining joint stability. Consequently, the shoulder relies upon proprioceptive feedback to maintain dynamic stability **(Wassinger et al., 2007).** Most sports with overhead motions have complex mechanisms that require a high level of neuromuscular coordination of the shoulder muscles **(Glousman et al., 1988).** This neuromuscular coordination requires sensory feedback, which is important in mediating muscular control of the shoulder joint. This includes proprioception and kinesthesia with the contribution of

visual and vestibular centers **(Tyldesling and Greve, 1989and Warner et al., 1996).**

Without appropriate neuromuscular control, the shoulder can become dysfunctional. The end result will be poor athletic performance and ultimate clinical symptomatology **(Davies and Dickoff-Hoffman, 1993).** Concepts of proprioception and kinesthesia are often confused. Proprioception is a specialized variation of the sensory modality of touch that encompasses the sensation of joint movement (kinesthesia) and joint position (joint position sense) **(Lephart and Henry, 1995).** While kinesthesia is defined as the ability to discriminate joint position, relative weight of body parts, and joint movement including direction, amplitude, and speed **(Newton, 1982).**

Conscious proprioception is essential for proper joint function, in sports, activities of daily living, and occupational tasks.
Unconscious proprioception modulates muscle function and initiates reflex stabilization **(Lephart and Henry, 1995,and Michelson and Hutchins, 1995).** Brooks (1983) considered proprioception the most important sensory modality participating in control of human movement **(Brooks, 1983).** Deficits in proprioception that impair motor control produce a type of articular instability known as functional instability which may lead to slowed protective reflexes such that muscle contraction occurs too late to protect the joint **(Freeman et al., 1965and Kennely et al., 1982).**

Recent research describes propriocptive deficits as both a consequence and a cause of injury **(Parkhurst and Burnett, 1994).** Proprioception activity plays an important role in performance of those

athletes requiring precision in their movement patterns, so proprioception activities are very functional and are related to both injury reduction, performance enhancement and rehabilitating athletic injuries **(Johansson et al., 1991,and Lephart et al., 1995).**The goal of most athletic rehabilitation is to return the athlete to the activity that caused the injury safely and able to have a pain free participation. **(McMulien and Uhl ,2000).** It was stated that healthy upper extremity athletes might have kinesthetic deficits in their throwing shoulder compared with their non-dominant shoulder. In this study kinesthetic deficits was suggested to be a mechanism for instability of the shoulder **(Allegrucci et al., 1995).**

Plyometrics are training techniques used by athletes in all types of sports to increse strength and explosivness.**(Chu, 1998,Fleck and Kramer 2004)**. It is also established for enhancing atheletic performance and may facilitate beneficial adaptations in the sensorimotor system that enhance dynamic restraint mechanisms.**(Swanik et al., 2002).** Plyometrics consists of rapid stretching of a muscle(eccentric action) immediately followed by a concentric or shortening action of the same muscle and connective tissue **(Baechle and Earle, 2000).**The stretch reflex is initiated during the eccentric loading phase and can facilitate greater motor – unit recruitment during the ensuing concentric contraction**(Chimera et al., 2004).**

A plyometric activity is divided into three phases: 1) the eccentric preload phase, 2) the amoritization phase, and 3) the concentric contraction (**Peacock et al.,1981, and Baechle and Earle, 2000**). The eccentric preload is the phase in which elastis energy is stored in the series elastic components (SEC) of the muscle (The amortization phase is described as the time between the eccentric preload phase and the