

EFFECT OF PLYOMETRIC TRAINING ON SHOULDER PROPRIOCEPTION IN ATHELETIC SUBJECTS

Thesis

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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 ± 6.72 Kg, mean value of height were 171.72 ± 7.94 cm, mean value of body mass index(BMI) were 23.56 ± 2.07 Kg/m², and actively participated in the suggested plyometric training program in addition to their training program. **Group B (Control)** which consisted of 25 players With mean value of age were 15.08 ± 1.07 years, The mean value of body weight were 70.16 ± 5.03 Kg, the mean value of height were 173.16 ± 4.78 cm, the mean value of body mass index(BMI) were 23.39 ± 1.31 Kg/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 successive 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

CHAPTER I

INTRODUCTION.....	1
Statement of the problem.....	5
Purpose of the Study.....	5
Justification of the study.....	5
Delimitation.....	6
Limitations.....	6
Basic assumption.....	6
Hypotheses of the Study.....	7
Operational definition.....	7
Definition of Terms.....	7

CHAPTER II 11

REVIEW OF RELLATED LITERATURE 11

1)Anatomy of the shoulder joint.....	11
2)The shoulder joint complex.....	14
3)Shoulder in throwing sports.....	19
4)Biomechanics of shoulder during throwing.....	23
5)plyometric training	28
6)Proprioception.....	42
7)Shoulder and proprioception:.....	58
8)Measurement of the proprioception system.....	59

CHAPTER III

SUBJECTS, MATERIALS AND METHOD.....	62
Subjects	62
Materials.....	63
Assessment of Joint Proprioception	67

Exercise Protocol.....	76
Statistical design.....	93
CHAPTER IV	94
RESULTS.....	94
-Results of subjects' characteristics	94
-Results of shoulder sensibility level of proprioception for experimental group.....	98
- Results of shoulder sensibility level of proprioception for control group.....	102
- Comparison of shoulder sensibility level of proprioception between experimental and control group.....	106
CHAPTER V	111
DISCUSSION.....	111
SUMMARY AND CONCLUSION.....	120
RECOMMENDATIONS.....	123
REFERENCES.....	125
APPENDICES.....	
ARABIC SUMMARY	
ARABIC ABSTRACT	

LIST of ABBREVIATIONS

ACJ	: Acromio-Clavicular Joint
ACL	: Anterior Cruciate Ligament.
ARAT	: Active Repositioning Accuracy Test.
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.

LIST OF TABLES

Table No	Subject	Page
1	Passive shoulder restraints.....	18
2	glenohumeral joint stability.....	19
3	Variation in the description of pitching phases.....	21
4	Summary characteristics of joint receptors.....	46
5	Clinical assessment of proprioceptive system functions....	60
6	The traditional training program for the control group	75
7	The mean and standard deviation of the physical characteristics of all subjects for both experimental and control groups (A&B).....	95
8	The mean values and standard deviation, maximum and minimum values of (ARAT), of dominant shoulder external rotation, at the beginning (Pre) and after the end of the study (Post) for experimental group.....	99

9	The mean values and standard deviation, maximum and minimum values of (PRAT), of dominant shoulder external rotation, at the beginning (Pre) and after the end of the study (Post) for experimental group.....	101
10	The mean values and standard deviation, maximum and minimum values of (ARAT), of dominant shoulder external rotation, at the beginning (Pre) and after the end of the study (Post) for control group.....	103
11	The mean values and standard deviation, maximum and minimum values of (PRAT), of dominant shoulder external rotation, at the beginning (Pre) and after the end of the study (Post) for control group.....	105
12	The mean values of active repositioning test at the beginning (Pre) and after the end of the study (Post) between experimental and control group.....	107
13	The mean values of passive repositioning test at the beginning (Pre) and after the end of the study (Post) between experimental and control group.....	109

LIST OF FIGURES

Figure No	Subject	Page
1	Anatomy of the shoulder complex.....	12
2	Shoulder's soft-tissue stabilizers.....	16
3	Phases of the pitch from left to right.....	21
4	Scapulohumeral rhythm	25
5,a	End of cocking phase.....	26
5,b	Shoulder position at foot plant.....	26
6	Follow -through phase.....	28
7	Overhead Throws ex.....	34
8	Side Throws ex.....	34
9	Over Back Toss ex.....	35
10	Slams ex.....	36
11	Explosive Start Throws ex.....	36
12	Single Arm Overhead Throws ex.....	37
13	Squat Throws ex.....	38
14	Plyometric Push-Ups ex.....	38
15	Kneel to Push Ups ex.....	39
16	Single Leg Chops ex.....	40
17	Figure of Eights ex.....	40

38a,b.	Overhead Throws ex. Stages.....	79
39	Side Throws ex. Stages.....	80
40a,b.	Over Back Toss ex Stages.....	81
41a,b.	Slams ex Stages.....	82
42a,b.	Explosive Start Throws ex: Stages.....	83
42c	Explosive Start Throws ex. Stages.....	84
43a	Single Arm Overhead Throws ex. Stages.....	84
43b,c	Single Arm Overhead Throws ex. Stages.....	85
44	Squat Throws ex.....	86
45	Plyometric Push ex.....	87
46a,b,c.	Kneel to Push Ups stage ex.....	88
47	Single Leg Chops ex.	89
48a,b.	Figure of Eights ex stages.....	90
48c,d.	Figure of Eights ex stages.....	91
49a,b.	Single Leg V-Ups ex. Stages.....	92
49c.	Single Leg V-Ups ex. Stages.....	93
50	Mean values of age for experimental and control groups.	96
51	Mean values of weight for experimental and control groups.	96
52	Mean values of height for experimental and control groups.	97

53	Mean values of BMI for experimental and control groups.	97
54	The mean values active repositioning tests at the beginning (Pre) and after the end of the study (Post) for experimental group.....	100
55	The mean values of passive repositioning tests at the beginning (Pre) and after the end of the study (Post) for experimental group.....	102
56	The mean values active repositioning tests at the beginning (Pre) and after the end of the study (Post) for control group	104
57	The mean values of passive repositioning tests at the beginning (Pre) and after the end of the study (Post) for control group.....	106
58	The mean values of active repositioning tests at the beginning (Pre) and after the end of the study (Post) for experimental and control group.....	108
59	The mean values of passive repositioning tests at the beginning (Pre) and after the end of the study (Post) for experimental and control group.....	110

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, 1989 and 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., 1965 and Kennely et al., 1982).

Recent research describes proprioceptive 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 increase strength and explosiveness. (Chu, 1998, Fleck and Kramer 2004). It is also established for enhancing athletic 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 amortization phase, and 3) the concentric contraction (Peacock et al., 1981, and Baechle and Earle, 2000). The eccentric preload is the phase in which elastic 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