

AZUSA PACIFIC UNIVERSITY

**THE INFLUENCE OF LOCAL MUSCLE VIBRATION
ON PAIN REDUCTION IN COMBAT ATHLETE
WITH SHOULDER IMPINGEMENT**

by

Reiko Ortega

A capstone project submitted to the
School of Behavioral and Applied Sciences
in partial fulfillment of the requirements
for the degree Doctor of Physical Therapy

Azusa, California

December, 2019

ProQuest Number:22622866

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent on the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



ProQuest 22622866

Published by ProQuest LLC (2019). Copyright of the Dissertation is held by the Author.

All Rights Reserved.

This work is protected against unauthorized copying under Title 17, United States Code
Microform Edition © ProQuest LLC.

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

AZUSA PACIFIC UNIVERSITY

**THE INFLUENCE OF LOCAL MUSCLE VIBRATION
ON PAIN REDUCTION IN COMBAT ATHLETE
WITH SHOULDER IMPINGEMENT**

by

Reiko Ortega

has been approved by the

School of Behavioral and Applied Sciences

in partial fulfillment of the requirements

for the degree Doctor of Physical Therapy

Melissa Cole, DPT, Committee Chair

Susan Shore, Ph.D., PT, Committee Member

Robert K. Welsh, Ph.D., ABPP, Dean, School of Behavioral and Applied Sciences

PREVIEW

© Copyright by Reiko Ortega 2019

All Rights Reserved

DEDICATION

I wish to dedicate this thesis to my friend, Leo, whom this case report is based on. I would also like to dedicate this to my friends in the boxing community who support me, challenge me, and celebrate my boxing endeavors. It has been my pleasure learning from you all.

Lastly, I would like to dedicate this to my parents, Ramon and Donna. I would not have made it this far without you.

ACKNOWLEDGMENTS

I would like to thank L.A.K.O. Boxing Club & Training Studio for letting me use their facility to conduct my case report.

I would also like to thank my advisor, Dr. Cole, for her guidance and encouragement throughout this process.

PREVIEW

ABSTRACT

THE INFLUENCE OF LOCAL MUSCLE VIBRATION ON PAIN REDUCTION IN COMBAT ATHLETE WITH SHOULDER IMPINGEMENT

Reiko Ortega
Doctor of Physical Therapy, 2019
Azusa Pacific University
Advisor: Melissa Cole, DPT

Background. Whole body vibration (WBV) is effective in pain reduction in the low back and lower extremity (LE), but limited research exists on the use of local vibration (LV), particularly with shoulder injuries. Furthermore, there is limited research on injuries sustained by athletes during training, as most studies report post-competition injuries.

Purpose. The purpose of this study was to determine if LV is as effective as manual therapy (MT) on pain reduction in a combat athlete with shoulder impingement syndrome (SIS). *Literature review.* Nine articles were considered in the literature review. Seven articles reviewed the efficacy of manual therapy on SIS. One article examined scapular dysfunction in boxers, and another investigated the efficacy of vibration on pain. Current literature supports the use of WBV on pain reduction in LE and low back injuries. However, there are no studies on the use of LV on upper-extremity injuries. Research also supports the use of WBV for pain reduction in combat athletes, but limited research

exists on the use on LV in that population. *Case description.* The patient was a 28-year-old male combat athlete with insidious shoulder pain who complained of posterolateral and anterior shoulder pain as well as medial scapular border pain while training clients and working out. *Discussion.* Myofascial trigger points are hypothesized to cause shoulder impingement and alter scapular kinematics. In this study, vibration therapy (VT) was used to inhibit trigger points and reduce pain associated with SIS. Primary outcome measures include the Disabilities for Hand and Arm Questionnaire (DASH) and Numerical Pain Rating Scale (NPRS). The patient improved significantly in primary outcome measures from initial visit to discharge. Therefore, this case study supports the use of LV as an effective means of reducing shoulder pain.

Keywords: vibration, local vibration, combat athlete, boxing, shoulder impingement, shoulder pain

TABLE OF CONTENTS

Dedication	iii
Acknowledgments	iv
Abstract	v
List of Tables	x
List of Figures	xi
Chapter	Page
1. Introduction	1
2. Literature Review	3
Problem	4
Purpose	4
Methods: Evidence Acquisition	5
Data Sources and Search Strategies	5
Study Selection	5
Assessment of Methodologic Quality	6
Methods: Evidence Synthesis	6
Clinical Practice Guidelines and Systematic Reviews	6
Randomized Control Trials	7
Observational Studies	7
Summary of Results	8

Chapter	Page
Discussion	8
Conclusion	9
3. Case Report.....	10
Background and Purpose	10
Prevalence of Injuries in Combat Sports	11
Manual Therapy for Shoulder Impingement Syndrome	14
Vibration Therapy.....	16
Case Description: Patient History and Systems Review.....	18
Clinical Impression #1	20
Examination	21
Posture Assessment and Palpation	21
Movement Assessment and ROM	22
Manual Muscle Test	23
Special Testing	23
Clinical Impression #2	27
Prognosis.....	27
Plan of Care.....	28
Intervention.....	29
Outcomes	33
Primary Outcomes	33
Secondary Outcomes	34
Discussion	34

Chapter	Page
4. Discussion	38
Summary of the Literature Review	38
Limitations in the Literature Review	39
Summary of the Case Report	40
Limitations of the Case Report	41
Future Studies	41
Clinical Relevance	42
References	44
Appendix	Page
A: Figure and Tables from Literature Review	50
B: Tables and Figures from Case Report	56

LIST OF TABLES

Table A1: CEBM and Quality Ratings of Individual Articles.....	52
Table A2: Clinical Practice Guidelines.....	53
Table A3: Systematic Reviews and Meta-Analyses	53
Table A4: Randomized Control Trials.....	54
Table A5: Observational Studies	55
Table B1: Pain Assessment.....	57
Table B2: Range of Motion	57
Table B3: Manual Muscle Test.....	58
Table B4: Special Test.....	58
Table B5: Two-point Discrimination Test.....	59
Table B6: Myofascial Slings and Boxing Applications.....	60
Table B7: Regions of Myofascial Slings Addressed in IASTM.....	61

LIST OF FIGURES

Figure A1: Search Strategy	51
Figure B1: Timeline of Patient Care	62
Figure B2: International Classification of Functioning, Disability, and Health (ICF) Model	63
Figure B3: Basic Boxing Punches Demonstrated by Author	64
Figure B4: Orthodox Fight Stance	65
Figure B5: Posture Assessment – Left Lateral View, Anterior View, and Posterior View	66
Figure B6: Hand Behind Back Assessment – Left Side	66
Figure B7: Hypersphere™ by HyperIce	67
Figure B8: Palpating Trigger Points on Pectoralis Minor	67
Figure B9: Vibration Intervention on Pectoralis Minor	68
Figure B10: Vibration Intervention on Pectoralis Major, Sternal Head	68
Figure B11: Vibration Intervention on Pectoralis Major, Clavicular Head	69
Figure B12: Self-Reported “Worst” Pain at Evaluation and Discharge	69
Figure B13: Self-Reported “Best” Pain at Evaluation and Discharge	70
Figure B14: DASH Score	70

CHAPTER 1

INTRODUCTION

Shoulder impingement syndrome (SIS) is the most common reason for non-traumatic unilateral upper-limb pain (Bron, Dommerholt, Stegenga, Wensing, & Oostendorp, 2011). Older studies attribute SIS to inflammation and degeneration of tendons and bursae under the subacromial arch. However, more recent studies suggest myofascial trigger points (MTrPs) as primary factors for SIS. Researchers claim that MTrPs decreases muscle extensibility and strength, alters motor patterns and scapular kinematics, produces pain, and inhibits range of motion (Bron, Dommerholt, et al., 2011). Manual therapy when combined with exercise has been documented as an effective treatment for SIS. The purpose of this study was to determine if vibration therapy (VT) is as effective as manual therapy in reducing pain in a combat athlete with SIS. Combat athletes in striking sports sustain numerous upper- and lower-extremity injuries from delivering and receiving blows. In addition, they spend many hours training in an adapted posture that puts them at risk for SIS and other upper-limb injuries.

Chapter 2 reviews literature on manual therapy interventions for SIS, shoulder injuries sustained by boxers, and the influence of vibration on pain. Limited research exists on local muscle vibration, as most studies (not included in the literature review) employ whole body vibration platforms. In addition, there is limited research on the effect of vibration on upper-extremity injuries, as most studies discuss low back and

lower extremity injuries. There is limited research on injuries sustained by combat athletes during training, as most studies report injuries post-competition.

Chapter 3 is a case report evaluating the efficacy of vibration therapy for pain reduction in a combat athlete with shoulder impingement. Local muscle vibration on MTrPs was the primary intervention and was supplemented with exercises directed toward the rotator cuff and scapular stabilizers. The primary outcome measures included Numeric Pain Rating Scale and Disabilities of Arm and Hand (DASH) questionnaire. Secondary outcome measures included manual muscle test (MMT) scores. At the end of the 8-week intervention, the combat athlete improved in pain, DASH scores, and MMT scores.

Chapter 4 reviews the implications of the findings of the case report and discusses the clinical significance of the outcomes. The discussion also reviews the limitations of the study and suggests possible studies for the future.

CHAPTER 2

LITERATURE REVIEW

Research shows that combat styles involving striking, such as kickboxing, boxing, mixed martial arts (MMA), and Muay Thai, have higher incidences of injuries than non-striking styles, such as wrestling and jiu-jitsu (Bledsoe, Hsu, Grabowski, Brill, & Li, 2006; Ngai, Levy, & Hsu, 2008; Rainey, 2009). There is conflicting research about which body area is most commonly injured in combat sports, as characteristics of injuries differ according to rules and skills utilized, but research trends show more injuries to the extremities in striking sports and, specifically, more shoulder injuries in boxing (Bledsoe et al., 2006; Jensen, Maciel, Petrigliano, Rodriguez, & Brooks, 2017; Lystad, 2015; Noh et al., 2015; Rainey, 2009).

Current literature supports the use of manual therapy (MT) in alleviating symptoms related to shoulder impingement syndrome (SIS), in which the rotator cuff tendons in the subacromial space are compressed by the coracoacromial arch or by the humeral head during elevation of the arm (Bang & Deyle, 2000; Ludewig & Braman, 2011). Many factors contribute to pain associated with SIS, such as tight musculature around the shoulder, lack of motor control of the scapulothoracic muscles, and myofascial trigger points (MTrPs), which are tender spots in muscle that produce pain (Bron, de Gast, et al., 2011; Ludewig & Braman, 2011). Research shows that MT, including stretching, massage, and treatment of MTrP, have immediate effects on pain

reduction and that MT plus exercise was superior to exercise alone for pain (Bang & Deyle, 2000; Diercks et al., 2014; Hidalgo-Lozano et al., 2011; Senbursa, Baltaci, & Atay, 2011; Steuri et al., 2017; van den Dolder & Roberts, 2003).

Research has shown the effectiveness of whole-body vibration (WBV) on pain reduction, range of motion (ROM), flexibility, muscle performance, and prevention of delayed onset muscle soreness in musculoskeletal conditions (Cerciello, Rossi, Visonà, Corona, & Oliva, 2016; Hollins, McDermott, & Harper, 2014). Current literature supports the use of vibration in lower-extremity (LE) injuries, but there is none so far addressing its feasibility in upper-extremity injuries.

Problem

Shoulder injuries are prevalent in combat sports due to the nature of the sport as well as the fighter's training posture. However, there is limited research on upper-extremity injuries sustained by combat athletes from long-term training, as most studies record acute injuries after competition. There is also limited research on the effectiveness of local vibration (LV) therapy on pain reduction, particularly in the upper extremities, as most studies report on LE and low back.

Purpose

The purpose of this systematic literature review is to evaluate the effectiveness of LV therapy for pain reduction in combat athletes with chronic pain related to shoulder impingement syndrome.