

**CORRELATION BETWEEN CERVICAL PROPRIOCEPTION
AND CRANIO-CERVICAL FLEXION TESTS IN PATIENTS WITH
WHIPLASH - ASSOCIATED DISORDERS.**

Merle Snyckers

A research report submitted to the Faculty of health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Physiotherapy.

Johannesburg

January 2007

DECLARATION:

I, Merle Snyckers, declare that this research report is my own work. It is being submitted for the degree of Master of Science in Physiotherapy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

(Merle Snyckers)

_____ day of _____, 2007.

ABSTRACT:

Whiplash-associated disorders are a common occurrence. Physiotherapy rehabilitation of such disorders include, among others, improving the recruitment ability of the deep cervical flexor muscles. Cervical proprioception, which has recently gained attention, is not commonly addressed. Evidence points to a possible link between cervical proprioception and deep cervical flexor recruitment ability. This study aimed to determine whether such a correlation exists. This is significant as it highlights the role that recruitment training of the deep cervical flexors has on cervical proprioception.

A correlation study design was employed that involved 29 patients with whiplash-associated disorders. They were tested in their ability to perform the cranio-cervical flexion test and Revel's test for proprioception. Linear regression was employed to interpret the results.

This study concluded that a correlation exists between the ability to perform the cranio-cervical-flexion test and cervical proprioception.

ACKNOWLEDGEMENTS:

I would like to thank my supervisors Ms Nonceba Mbambo and Mrs Anita Nkusi for their endless patience and perseverance through this process. Thank you to Aimee Stewart for her guidance and support. Thank you also to Dr Becker for the statistical input.

LIST OF ABBREVIATIONS AND DEFINITIONS:

CCFT	Cranio-cervical-flexion test: This is an indirect measure of the recruitment ability of the deep cervical flexors. The patient is lying supine on a plinth with a bio-feed back unit placed under the occiput. The patient is instructed to “nod” the head to a reading of 22 mmHg. This is progressed to 30mmHg.
Whiplash	An acceleration-deceleration mechanism of energy transfer to the neck, normally due to a motor vehicle accident.
Proprioception	An awareness of the movements and position of the limbs and other body parts.
Neutral Zone	The small range of displacement around a vertebral segments neutral position where little resistance is offered by passive spinal restraints.
Stabilisers	Type I skeletal muscle fibres well adapted for slow, maintained contractions involved in the maintenance of body posture.
Movers	Type II skeletal muscle fibres specialised for fine, fast movement.
Global strengthening	Strengthening of all the movers and stabilisers of the spine.
Whiplash-associated-disorders	A variety of clinical manifestations due to bony or soft tissue injuries following a whiplash injury.

LIST OF TABLES AND FIGURES:		Page
Figure 1	Illustrating the positioning of the biofeedback unit	20
Figure 2	Positioning of the cervical proprioception test	20
Figure 3	Schematic representation of the target used in the proprioceptive test	23
Table 4.1	Demographic profile	23
Table 4.2	Frequency of distribution of the cranio-cervical- flexion test	24
Table 4.3	A comparison between cervical proprioception and cranio-cervical flexion ability	25
Table 4.4	A Bonferroni adjustment locating specific areas of correlation	26
Table 4.5	Final analysis of the comparison between the ability to perform the CCFT and cervical proprioception	27

TABLE OF CONTENTS:

	Page
Declaration	ii
Abstract	iii
Acknowledgements	iv
List of abbreviations and definitions	v
List of tables and figures	vi
CHAPTER 1 Introduction	1
Problem statement	3
Research question, aim and objectives	4
CHAPTER 2 Literature Review	5
2.1 Introduction	5
2.2 Cranio-cervical-flexion test	6
2.2.1 Rehabilitation of the deep cervical flexors	7
2.3 The mechanism of the whiplash-type injury	9
2.4 Muscle Imbalances	10
2.5 The stages of healing	11
2.6 The physiotherapeutic rehabilitation process involving the recruitment ability of the deep cervical flexors.	11
2.7 Cervical Proprioception testing	12
2.7.1 Proprioception.	14
2.7.2 How information reaches the brain for interpretation	13
2.8 Conclusion	16
CHAPTER 3 Methodology	17
3.1 Introduction	17
3.2 Study design	17
3.3 Ethical considerations	17
3.4 Sampling	17
3.5 Instrumentation	18
3.6 Procedure	19

3.6.1	The cranio-cervical flexion test	19
3.6.2	The cervical proprioception test	20
3.7	Data Analysis	21
CHAPTER 4:	RESULTS	23
4.1	Demographic data	23
4.2	Calculation of the results	23
4.2.1	The cervical proprioceptive test	23
4.2.2	Interpretation of results	23
4.2.3	Cranio-cervical flexion	24
4.3	A pairwise comparison using the Bonferroni adjustment for correlation between CCFT and cervical proprioception	26
CHAPTER 5 :	DISCUSSION	28
5.1	Introduction	28
5.2	Cranio-cervical flexion control	29
5.3	Correlation between cranio-cervical flexion control and cervical proprioceptive ability	
5.3.1	Deep cervical flexors	29
5.3.2	Proprioception	31
5.4	Demographic data	32
5.5	Conclusion	32
CHAPTER 6 :	CONCLUSION	34
6.1	Recommendations	35
6.2	Limitations	35
REFERENCES		36
APPENDIX 1	Consent form	
APPENDIX 2	Patient information sheet	
APPENDIX 3	Ethical clearance certificate	
APPENDIX 4	An example of the raw data collected for each participant	41