

Relationship Between Subjective Experience of Individuals, Practitioner Seniority, Cavitation Occurrence, and 3-Dimensional Kinematics During Cervical Spine Manipulation

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ABSTRACT

Objective: The purpose of this study was to assess individual subjective experience (ISE) of the recipients of a cervical manipulation and to analyze the influence of kinematics, cavitation occurrence, and practitioner seniority on individual experience.

Methods: Practitioners with different seniority (years of experience) manipulated 20 asymptomatic volunteers at C3 and C5 on both sides. Kinematics were recorded using a 3-dimensional electrogoniometer, and ISE data were gathered through a questionnaire to explore the subjects' experiences of manipulation in terms of tactile sensations, relaxation, perception of the task, and therapist handling. Kinematics, occurrence of cavitation, practitioner's seniority, and ISE data were analyzed concurrently.

Results: Motion parameters obtained during manipulation were found to be influenced by cavitation occurrence and differences between practitioners. Data analysis indicated that ISE could be grouped into 2 factors. The first revolved around grip firmness and range and speed of practitioner's gesture. The second factor represented patient's relaxation and the precision of handling. Also, most ISE data correlated with kinematics, although a subjective measurement did not always correlate the highest with its objective counterpart. When cavitation occurred, ISE ratings were higher, suggesting that participants may associate cavitation with the success of manipulations. Higher practitioner seniority (more years of experience) induced feelings of higher speed, amplitude, firmness, and precision.

Conclusions: Recipients of cervical manipulation experienced different subjective feelings that can be expressed in 2 dimensions. These feelings are influenced by cavitation occurrence and practitioner's seniority. A better understanding of an individual's subjective experience related to cervical manipulation could increase confidence and improve the patient-therapist relationship, and it may provide further therapeutic perspectives for the practitioners. (*J Manipulative Physiol Ther* 2017;40:643-648)

Key Indexing Terms: *Spine, Cervical Vertebrae; Manipulation, Spinal; Biomechanical Phenomena*

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Paper submitted April 13, 2017; in revised form August 24, 2017; accepted September 8, 2017.

0161-4754

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INTRODUCTION

Spinal manipulative therapy is used largely for treating patients with musculoskeletal complaints, and clinical benefits are recognized in terms of pain, disability, functional impairments,¹ and patient satisfaction.² Various manual therapeutic techniques have also been described such as mobilization, manipulation, and muscle energy technique. For techniques similar to spinal manipulation, the different features have been described in terms of kinetic or kinematic characteristics related to expertise, skills, subject positioning, and direction of applied force.³⁻⁵ The repeatability of biomechanical parameters such as peak force and thrust duration can be improved by training procedures using feedback.^{6,7} This motor learning is modulated by the central nervous system and is crucial.⁸

Even so, no consensus on the outcomes related to manipulation efficacy has been established because of the variability in treatment and assessment methods.⁹ For some authors, cavitation may be a major feature of success. Nevertheless, the impact of this particular sound on patients is questionable.¹⁰ In addition to the potential neurophysiologic effects of spinal manipulation,¹¹ clinical improvement is likely to be influenced by various psychobiological responses involved in therapeutic management.¹² Patients' contextual factors may contribute to or alter the clinical outcomes. These include patient-practitioner relationship, patient's previous experience, beliefs, side effects, and global satisfaction of the health care setting features.^{13,14} Also, it has been suggested that the confidence of the practitioner in the performance of the spinal manipulation technique influences the effectiveness of the patient's management.¹⁵

To our knowledge, no data on the subject's experience during high-velocity, low-amplitude (HVLA) manipulation or on its relationship with kinematic parameters used by the practitioners have been published. The objectives of the present study were¹ to assess the subjective experience of asymptomatic volunteers with cervical manipulation and its relation to kinematic parameters, and to analyze concurrently the impact of² cavitation and³ the practitioner's seniority (years of experience) on an individual's subjective experience (ISE).

METHODS

Sample

The present study was conducted in parallel with our previous investigation on the 3-dimensional kinematics of cervical manipulation and the influence of practitioner and cavitation.⁵ Twenty asymptomatic subjects (9 females and 11 males; age range: 19-31 years) were sampled, and 4 practitioners (A-D) with different seniority (1-20 years of practice) were recruited.

Exclusion criteria were considered following clinical guidelines and recommendations such as red flags against cervical manipulation; history of pain- or whiplash-associated disorders; signs of radiculopathy; history of fracture of the cervical or upper thoracic spine; age <18 years.¹⁶ The study protocol was approved by the Université Libre de Bruxelles ethics board (P2017/378), and each volunteer signed an informed consent.

Procedure

Each practitioner performed an HVLA cervical manipulative technique on each participant, who was seated upright. Vertebral levels of interest were randomized between left and right C3 and C5 as this part of the cervical spine is consistent with respect to the kinematics used during manipulation.¹⁷ A reliable instrumented spatial linkage (CA 6000 Spine Motion Analyser, OSI, Union City, California) was mounted on the patient using an

Table 1. Items and Scales of the Subjective Questionnaire

Item	Topic	Rating
Relaxation	Did you feel relaxed?	3-Point Likert scale
Grip	Did you feel the grip as firm or soft?	Bipolar binary scale
Handling	Did you feel the handling as precise or imprecise?	Bipolar binary scale
Range	How ample did you experience the manipulation(s)?	6-Point Likert scale
Speed	How fast did you experience the manipulation(s)?	6-Point Likert scale

The subject's experiences were collected after each practitioner manipulated the participant; thus, these scores have to be considered as "mean" values for a set of attempts by each practitioner.

adjustable helmet and a thoracic harness.^{18,19} Head-trunk 3-dimensional motion was recorded (sampling rate 100 Hz) during manipulation, and data were processed to compute maximal range of motion (ROM), peak velocity, and acceleration in each anatomical plane.

Technical aspects of the task such as the use of primary or secondary levers were not imposed on the practitioner. The procedure ended as soon as a cavitation occurred, and a maximum of 4 attempts by the practitioner were allowed to produce a cavitation. Further details regarding this protocol can be found elsewhere.⁵

It is proposed that clinical outcomes may be influenced by environment, suggestibility, and perception of the therapist,¹⁴ but the modalities of this influence remain poorly explored. As no validated questionnaire was available regarding the subjective experience of individuals relative to manipulative approaches in the literature, an innovative questionnaire was developed to address these characteristics. Thus, various items were proposed for use in exploring the experience of persons undergoing a manipulative technique in terms of perception of the task, sensing of the therapist's handling, and relaxation. The inventory was developed and refined by clinicians and experts in manipulative therapeutics and musculoskeletal disorders.

Without being able to determine the role of incidental factors (eg, participant expectations, practitioner style) on our results,²⁰ the overall state of relaxation was assessed first. That therapists use HVLA manipulation aim to produce a manipulative gesture in a specific direction^{10,21} supposes the use of a precise handling and stable grip. It has been suggested that research be conducted to determine whether manipulated subjects can perceive a difference in precision (handling) and firmness (grip) between therapists and how ample and fast subjects perceived the gesture performed by practitioners using an HVLA technique.

Participants were invited to rate their feelings and perceptions after each practitioner's intervention using a 5-item questionnaire based on ordinal scales: a 3-point *relaxation* scale, a 2-point scale to rate *handling* in terms

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