Partnership of

College of Massage Therapists of Ontario

Project Title:

The effect of massage therapy on trunk muscular fatigue in patients with chronic low back pain.

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Abstract

Background and Objectives. Individuals with chronic low back pain often seek massage in order to reduce their pain symptoms and to improve their functional capacity (poor back muscles endurance and strength). The main objective was to determine if a single session of massage therapy can reduce the short-term physiological and clinical effects of muscle fatigue in non-specific cLBP individuals. The second objective was to study the possible association between physiological and clinical changes induced by massage.

Methods. Thirty-six non-specific cLBP individuals participated in 2 experimental sessions (separated by 48 to 72 hours). All participants completed questionnaires to assess several psychological and clinical outcomes. In one of the sessions, the fatigue protocol (Sorenson protocol) was preceded by a 30-minutes massage of the back region. Participants rated their lumbar pain intensity before and after massage as well as after the fatigue protocol. A two-way repeated-measures ANOVA was conducted to test the effect of massage therapy on both physiological and clinical variables for both conditions. Correlation analyses were conducted to determine the linear association between physiological and clinical responses to massage therapy.

Results. Results showed that pain perception was significantly reduced after a fatigue task when an individual received a 30-minute massage ($p = 0.004$). Individuals with a high score of low back pain related disability showed lower back muscles endurance time ($r = -0.35$). Massage therapy yielded no significant effect on fatigue-related physiological variables.

1. Introduction

Low back pain (LBP) ranks first in terms of years lived with disability among other musculoskeletal conditions according to the 2015 Global Burden of Disease study (Vos et al., 2016). Individuals with cLBP present alterations in several physiological mechanisms often associated with psychological components such as catastrophizing and kinesophobia (Meyer et al., 2009). For instance, individuals with cLBP usually present poor endurance and strength of their back muscles (da Silva et al., 2005). Furthermore, cLBP is characterized by the presence of excessive fatigability of lumbar paraspinal muscles (da Silva et al., 2005).

Individuals with cLBP usually seek care to reduce their back pain symptoms but also to improve their functional capacity (Furlan et al., 2015) and overall well-being (Okoro et al., 2011). In a recent clinical practice guideline of non-invasive treatments for LBP published by the American College of Physicians, the quality of the evidence was considered low to moderate for spinal manipulation and massage with regards to cLBP (Qaseem et al., 2017). The authors concluded that massage provides short-term pain relief and improves function in comparison to manipulation, exercise therapy, relaxation therapy, acupuncture, physiotherapy, or transcutaneous electronical nerve stimulation although effects were considered small by the authors (Qaseem et al., 2017). Tanaka et al., assessed the effect of massage on physiological parameters such as paraspinal muscle activity recorded by electromyography (EMG). Using a 90-second back extension movement assessment, the authors failed to identify any changes in paraspinal muscle activity amplitude and frequency domain (Tanaka et al., 2002). Overall, current evidence suggests that massage therapy can yield positive clinical outcomes such as clinical pain in individuals with cLBP. However, there is no clear evidence concerning the effect of massage on muscle fatigue physiological variables.

The main objective was to determine if a single session of massage therapy can reduce the short-term physiological (force and endurance) and clinical (pain intensity) effects of muscle fatigue in non-specific cLBP individuals. The second objective was to study the association between physiological and clinical changes induced by massage therapy.

2. Materials and Methods

Thirty-six participants with non-specific cLBP (20 men and 16 women), aged between 18 and 65 years old, were recruited. Using a cross-over design, participants with cLBP were assessed on two

days separated by 48 to 72 hours at the *Université du Québec à Trois-Rivières*. During the initial session, all participants completed questionnaires to assess several psychological and clinical outcomes.

During the control session, participants were asked to perform two maximal voluntary contractions (MVC) of back extensor muscles before and following a modified Sorensen protocol. During the MVC and the modified Sorensen protocol, participants adopted a prone position on a Roman chair inclined at 45°. Iliac crests were aligned with the edge of the chair cushion and the trunk maintained unsupported (head, arms, and trunk) (Champagne et al., 2009). For MVCs, participants lifted their trunk until they felt a tension in the belt (belt length was adjusted for each participant to ensure that their body remained in a straight position) than they were asked to perform two maximal isometric back extensions for five seconds. For the modified Sorensen protocol, participants had to hold a horizontal position relative to the ground for as long as possible (Champagne et al., 2009), their arms crossed on the chest while holding a 11.36 kg weight against their chest. Lumbar paraspinal muscle activity was recorded using surface electromyography (Bortec Biomedical, Calgary, Alberta, Canada) whereas maximal voluntary contraction force was measured using a load cell (NTEP-87-057A3 class III; Artech, Riverside, CA) before and following the fatigue protocol.

During the massage session, the experimental protocol was preceded by a 30-minute massage of the back region. Participants rated their perception of exertion on a visual analog scale after the fatigue protocol as well as their lumbar pain intensity before and after massage as well as after the fatigue protocol. Using a counterbalancing method to control for order effects, 18 of the 36 participants received the 30-minute massage (16 minutes superficial massage followed by a 13 minutes deeper massage) at the initial session whereas the remaining participants received the same massage protocol at the second session.

A two-way repeated-measures ANOVA was conducted to test the effect of massage therapy on both physiological and clinical variables for both conditions. Correlation analyses were conducted to determine the linear association between physiological and clinical responses to massage therapy.

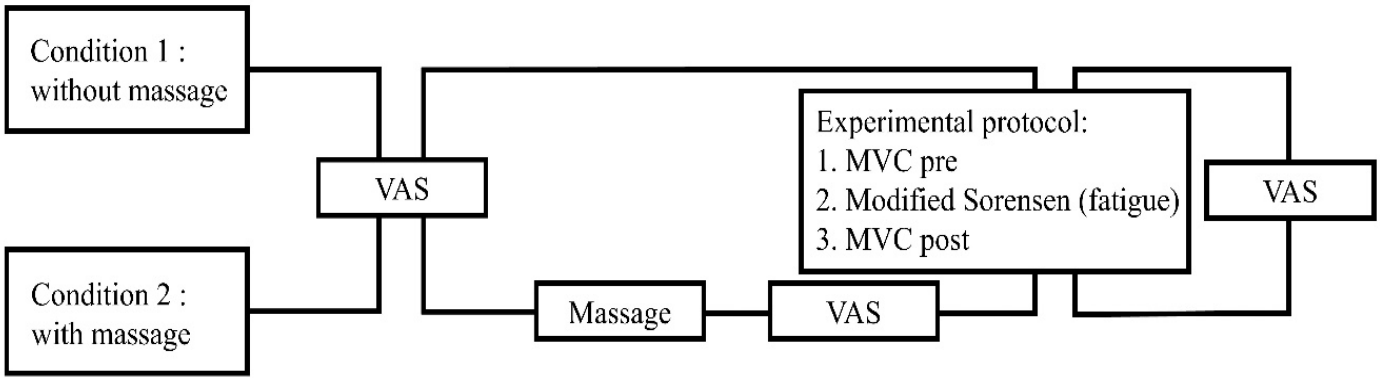

Figure 1. Experimental procedure. VAS: visual analog scale; MVC: maximal voluntary contraction.

Table 1. Complete massage protocol

Massage type	Techniques	Duration
Superficial massage	Effleurage using the palm of the hand	1m30
	Petrissage using side edge of the hand	1m30
	Circular friction	1m00
	Gliding	1m00
	Palm stroking	2m00
	Hands resting on each side the lumbar spine	1m00
Deeper massage	Muscle stripping (from spine towards the outside by maintaining pressure with one thumb at the spinous process)	1m00
	Trigger points using thumbs	2m00
	Muscle approximation (caudal to cephalic direction using muscles' line of action)	2m00
	Hands resting on each side the lumbar spine	1m00

3. Results and Discussion

Results showed that pain perception was significantly reduced after a 30-minute massage protocol. A significant effect of interaction effect was observed for clinical pain after the modified Sorensen Test. For the control condition, clinical pain intensity increased compared to baseline while for the massage condition it decreased.

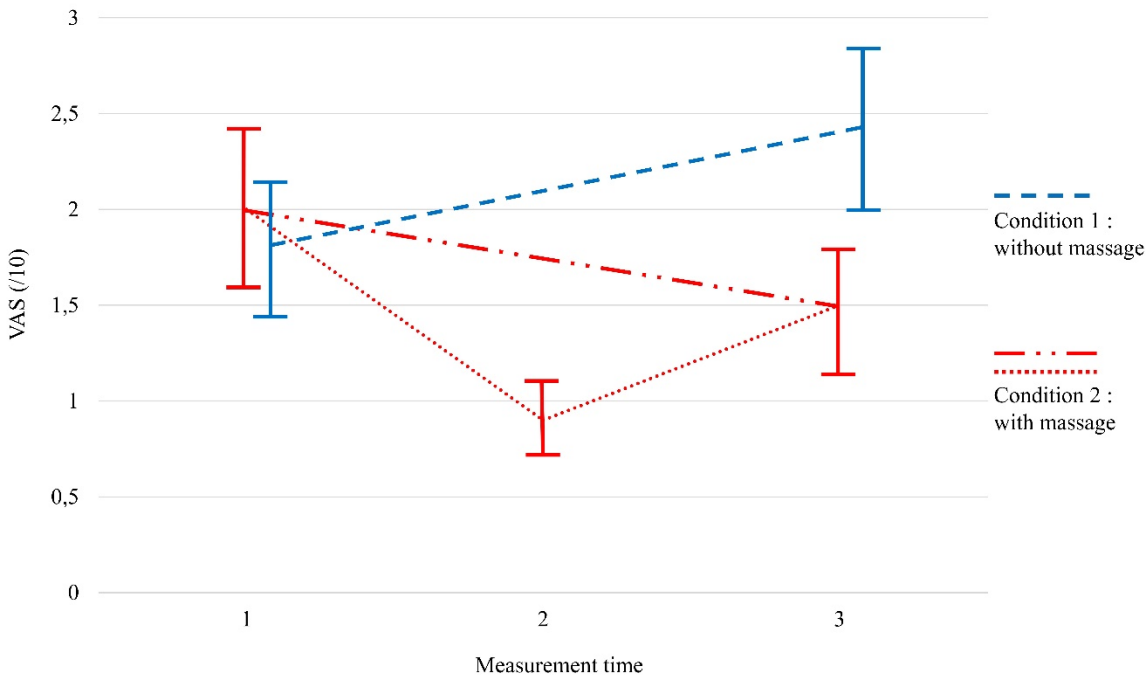

Figure 2. Representation of the evaluation of clinical pain intensity for both condition at three time: (1) at the beginning of the session, (2) after massage (in dashed line for massage condition only) and (3) after the experimental protocol.

Results showed no statistical difference between the RMS values during pre- and post-MVCs for both the control and massage conditions ($p > 0.05$). Also, results showed no statistical difference between RMS values for both conditions ($t = 0.9$, $p > 0.05$). No correlation was found between physiological and clinical variables. Finally, a significant negative correlation was found between the ODQ score and the endurance on the Sorensen test for the massage condition only which suggested that individuals with a high score of low back pain related disability showed lower back muscles endurance time. Overall, the results suggest that changes in clinical outcomes following

massage therapy are not mediated by physiological changes in muscles and that any "fatigue-prevention effects" may be due to non-specific components of the massage therapy. Some limitations of the study are: lack of blinding (the therapist who performed the massage protocol also conducted the participant's assessment of clinical pain intensity), generalizability to individuals with more severe LBP and the absence of a 30-minute rest period for the control condition.

4. Conclusion

Chronic low back pain (cLBP) commonly present poor back muscles endurance and strength. Individuals with cLBP usually seek complementary and alternative medicine, such as massage, in order to reduce their pain symptoms but also to improve their functional capacity. The main objective was to determine if a single session of massage therapy can reduce the short-term physiological and clinical effects of muscle fatigue in non-specific cLBP individuals. The second objective was to study the possible association between physiological and clinical changes induced by massage. This study shows that a single session of 30-minute massage can reduce pain intensity in cLBP individuals with localized muscle fatigue. Also, results of EMG parameters (MF, RMS) did not show a significant difference between the control and massage conditions. Even though massage led to positive effects on pain intensity, no changes in muscle fatigues indices could be observed indicating that any "fatigue-prevention effects" may mostly be due to pain decrease and other non-specific components of the massage therapy. More studies are needed to better understand the physiological effects massage therapy.

5. Project Plan

Table 2. Timeline and major milestones for the project.

MTRF 2014/2015 Competition	September 2015
University's ethics committee	Accepted on October 30, 2015
Data collection	Mai 2016 to November 2016
Data Analyses	November 2016 to March 2017
Writing of the scientific article	March 2017 to November 2017
International conference	September 2017
Scientific article submission	October 2017

All the phases of the project are now completed and the project took place as proposed. Results were presented at an international conference and a scientific article has been submitted for publication to the Journal of Manipulative and Physiological Therapeutics.

Daneau C, Cantin V, Descarreaux M. INFLUENCE OF MASSAGE ON MUSCLE FATIGUE AND LOW BACK PAIN: PHYSIOLOGICAL OR CLINICAL CHANGES? AAOMPT 2017 Conference October 18-22, 2017, Salt Lake City, UT, USA.

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