Effects of Myofascial Induction Techniques on Physiologic and Psychologic Parameters: A Randomized Controlled Trial

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Abstract

Objectives: The objective was to determine the effect of myofascial techniques on the modulation of physiologic and psychologic variables.

Design: Forty-one (41) healthy male volunteers were randomly assigned to an experimental or control group.

Interventions: The experimental group underwent 3 manual therapy modalities: suboccipital muscle technique, compression of fourth intracranial ventricle, and deep cervical fascia technique. The control group remained in a resting position for the same time period under the same environmental conditions.

Outcome measures: Temperature, heart rate, and systolic and diastolic blood pressure (BP) were measured before, during, and after the intervention. State and trait anxiety levels and depression level were evaluated before and after the intervention.

Results: Repeated-measures analysis of variance revealed a significant time × groups interaction \( F = 4.7(1,40); p = 0.036 \) for state anxiety. There were no significant time × group interaction effects for depression \( F = 0.33(1,40); p = 0.57 \) or trait anxiety \( F = 3.76(1,40), p = 0.060 \). Among physiologic parameters, a significant time × group interaction was found for systolic BP \( F = 2.86(6,240); p = 0.033 \) and heart rate \( F = 2.89(6,240); p = 0.036 \).

Conclusions: Psychologic modulation is observed after application of manual therapy techniques, with a decrease in state anxiety in the experimental group. Heart rate and systolic BP were modulated during the course of myofascial induction techniques. All of these effects were observed up to 20 minutes after the therapy.

Introduction

Myofascial induction therapies (e.g., suboccipital muscle technique, compression of fourth ventricle [CV-4] and deep cervical fascia technique) have been widely used for clinical treatments by osteopaths, chiropractors, and physiotherapists. Although these techniques have proven highly effective in clinical practice, there has been little research into their effects. One of the most commonly used procedures for the cervical region is the release of myofascial restriction of suboccipital muscles, four small muscles localized between the occiput and the first two cervical vertebrae (rectus capitis posterior minor, obliquus capitis superior, rectus capitis major, and obliquus capitis inferior muscles). These muscles control rotatory movements of the head over the cervical region and their functions are related to eye movement, making them one of the most important muscle groups for posture control. A change in the reciprocal tension of the meninges is the most frequent reason for craniosacral system dysfunctions. Meninges are directly connected to the fourth intracranial ventricle and fascial structures. It is well known that when the dura mater is subject
to high long-term strain, meninges fibers appear to organize and align along the direction of the strain, as observed in vitro and in cadaver studies.²,¹⁶

The myofascial network in the cervical region is closely connected to the skeleton and to different organs of this region. Cervical fasciae, which are longitudinally oriented, link the trunk structures with the head. The fascial system forms a set of compartments that envelop, separate and support the muscles, bones, viscera, blood vessels and nervous system, and can be compared to a system of tubes concentrically placed inside one another.⁸

Only 2 reports could be found on the neurophysiologic effects of myofascial induction, both in Spanish: 1 by our group that addressed its effect on biochemical parameters, and another by Perez et al. on the effects of CV-4 technique on blood pressure (BP), heart rate, and temperature. With this background, the objective of the present study was to evaluate the effects of myofascial induction (suboccipital muscles technique, CV-4, and deep cervical fascia technique) on some physiologic and psychologic parameters.

Materials and Methods

Subjects

The study included 41 healthy male adult volunteers, all students of health science or physical education. The mean age was 22.14 years (standard deviation = 2.2 years) and the mean number of years of education was 13 years. Inclusion criteria were as follows: male sex, age 18–25 years, performance of sports activity for ≥1 hour at least 3 times a week, and no knowledge of the techniques used. Exclusion criteria were female sex (to avoid bias due to hormonal cycle), receipt of hormone or pharmacologic therapy, presence of disease that impedes or contraindicates induction or manipulation techniques or affects study variables (e.g., tumors, fractures, luxations, vertebral insufficiency, bone disease, skin disorders, neurologic disorders, fever, cardiovascular diseases, psychiatric disorders, etc.).

Selected participants signed their informed consent to participate in the study, which was approved by the ethics committee of our institution. The volunteers were randomly assigned to an experimental group or a control group for application of myofascial induction techniques or a period of rest under the same conditions, respectively.

Materials

Heart rate was measured using a Polar-Accurex Pulsoimeter™ with the Polar Training Advisor Interface Polar-Accurex Plus software package (Polar Electro Ibérica S.A., Barcelona, Spain). BP was measured with an automatic Omron Tensiometer™ (Omron, Peroxidos S.A., Barcelona) and body temperature with a Braun infra-red ear thermometer™ (Braun, Imprex Europe S.L., Madrid, Spain).

The State-Trait Anxiety Inventory (STAI)¹⁷ which contains 2 separate self-evaluation scales, was used to measure state and trait anxiety. It was developed to study anxiety in adults without psychiatric disorders.

The Beck Depression Inventory (BDI)¹⁸ was used to measure depression. It is a self-applied questionnaire of 21 items that focuses more on cognitive than behavioral or somatic components of depression. It is not a diagnostic instrument but provides a measure of the depth of depression in any type of patient (score of 10, no depression; 18, mild depression; 25, moderate depression; and 30, severe depression).

Therapeutic techniques

1. Suboccipital technique. The aim is to release myofascial restriction in the suboccipital region. The patient lies in the supine position, with the therapist seated at the head of the bed, on which his/her elbows are firmly placed. The therapist’s hands are placed below the patient’s head such that the spinous process of cervical vertebrae can be palpated with the fingers. The therapist’s fingers then move gradually upward to the occipital condyles and then downward to find the hollow between the condyles and the spinous process of the axis (the atlas has no spinous process). The therapist then raises the skull by bending his/her metacarpophalangeal joints. The therapist’s hands remain joined and the skull base rests on their palms, with the index, annular, and middle fingers used to apply pressure. Release of restrictions causing a forward head posture requires the release of restrictions of the rectus capitis posterior minor and obliquus capitis superior, exerting pressure with the index and annular fingers of each hand. However, if the aim is to reduce chronic neck hypertension, pressure must be exerted using the middle finger. Pressure is maintained until release of the fascia is noted. During the final phase of this technique, the therapist maintains the pressure and opens the hands, gently moving the head backward and relaxing the spinal canal from the dura mater to the sacrum.

2. CV-4 technique. The aim is to increase the production of endorphins (general antialgic action) and drain the posterior skull to relieve congestion. This technique also stimulates the sympathetic centers. The patient lies in supine position, and the therapist sits at the head of the bed with elbows on knees or on the bed. Both hands of the therapist are placed behind and on the temporal squama (i.e., above and below the asterion, avoiding the occipitomastoid suture). The occiput lies between the thaner eminences: the weight of the head should be the same on both hands. When the deep flexors of the fingers are contracted, the thaner eminences are brought toward each other and release the skull, as if it were a ball. The technique comprises a compression phase and a compression–cessation phase. In the second phase, the hands are separated very slowly from the skull. The slower the movement, the longer is the effect of the treatment.

3. Deep cervical fascia technique. The aim is to release myofascial restrictions in the prevertebral and paravertebral regions. The patient lies in supine position with his/her head extending beyond the bed. The therapist sits or stands at the head of the bed. In a first phase, the therapist holds the patient’s head with both hands and, raising it with a slight extension, starts a gentle traction. In a second phase of thoracic release (3-dimensional), the therapist places one hand on the sternum (applying caudal pressure) while keeping the patient’s head in slight hypertension with the other hand. The movement between the hands is 3-dimensional. In a third phase of oblique release, when the release is produced, the therapist’s hand moves from the sternum towards one of the shoulders and applies an oblique force following the direction of the release. This maneuver is then performed on the other side of the body.

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Procedure

After randomization of participants into the experimental or control groups, they were instructed to fast during the morning before the intervention and to avoid strenuous exercise during 24 hours before the session. Participants were excluded if they presented with an inflammatory processes (e.g., otitis or pharyngitis) that could affect tympanic temperature. Experimental group subjects consecutively underwent the 3 techniques described above. Control group subjects remained at rest on the bed for the same time period under identical temperature, humidity, and light conditions.

All subjects completed the STAI and BDI questionnaires before the intervention and at 20 minutes after the intervention. The heart rate of all participants was recorded before, during, and at 20 minutes after the intervention. Blood pressures and tympanic temperature were measured before the intervention, after the performance of each technique (in the experimental group) and at 5, 10, and 20 minutes after performance of the last technique (Fig. 1).

Statistical analysis

For the analysis of the measurements at multiple time points, a univariate analysis of repeated measures was used, based on a general linear model with Greenhouse-Geisser adjusted error. To evaluate changes in state anxiety, trait anxiety, and depression, a 2 (groups = experimental and controls) × 2 (time points = baseline and postintervention) repeated measures analysis of variance (ANOVA) was used. In order to evaluate changes in body temperature, heart rate, and systolic and diastolic BP values, a 2 (experimental/control groups) × 7 (time points: before and after each technique and at 5, 10, and 20 minutes after the last technique) repeated-measures ANOVA was used. For analysis of intrasubject measurements, post hoc multiple-comparison analyses were performed using a Bonferroni correction. When a significant interaction was found, a figure was constructed.

Results

Effects of techniques on psychologic variables

At baseline, experimental and control subjects did not differ in state anxiety, trait anxiety, or depression scores. Repeated-measures ANOVA showed a significant time × groups interaction \([F = 4.7(1,40), p = 0.036]\) for state anxiety but not for depression \([F = 0.33(1,40), p = 0.57]\) or trait anxiety \([F = 3.76(1,40), p = 0.060]\). Intrasubject analyses showed that the experimental group had lower levels of state anxiety after the intervention versus baseline initial values \([F = 9.91(1,21), p = 0.005]\), with no changes in the control group \([F = 1.9(1,19), p = 0.93]\).

Effects of myofascial techniques on physiologic parameters

Analysis of temperature, heart rate, and systolic and diastolic BP values showed a significant time × groups interaction for systolic BP \([F = 2.86(6,240), p = 0.033]\) and heart rate \([F = 2.89(6,240), p = 0.036]\) but not for diastolic BP \([F = 0.583(6,240), p = 0.655]\) or temperature \([F = 1.176(6,240), p = 0.323]\). Figures 2 and 3 depict changes in BP and heart rate in the experimental group during the intervention. No changes were observed in the control group.

Discussion

This study was prompted by our observations in the clinical setting of modulations in the response of the autonomic nervous system when indirectly manipulating certain neurologic centers (e.g., the fourth ventricle, suboccipital muscles, and cervical fasciae). Results obtained demonstrate sig-
nificantly decreased anxiety levels in healthy young adults after the application of 3 corresponding myofascial induction techniques.

Systolic BP values increased after application of the sub-occipital techniques, decreased after the CV-4 technique, and increased after the deep fasciae techniques, when they returned to baseline levels. However, significantly lower systolic BP values versus baseline levels was recorded at 20 minutes after completion of the treatment, similar to findings by other authors after completion of the CV-4 technique.\textsuperscript{19,20} The same pattern was observed for diastolic BP values, although statistical significance was not reached. Likewise, the

\begin{figure}
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\includegraphics[width=\textwidth]{systolic_bp.png}
\caption{Systolic blood pressure values from both groups at 7 different time points.}
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\begin{figure}
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\includegraphics[width=\textwidth]{heart_rate.png}
\caption{Heart rate values of the 2 study groups at the 7 time points.}
\end{figure}
heart rate (Fig. 3) decreased after suboccipital technique, significantly increased after CV-4, and decreased after deep fascial technique. After the end of the intervention, the heart rate increased for up to 5 minutes after the intervention, and remained at values between the baseline rate and the post-suboccipital technique rate for 20 minutes after the intervention. No significant changes in body temperature were observed after the technique applications, although a decrease was observed at 5 minutes after the intervention.

In an earlier study on this issue, Pérez et al.19 examined the effects of CV-4 technique on BP, heart rate, and body temperature in 60 individuals aged 43–63 years (20 normotensive, 20 hypertensive, and 20 controls). Normotensive and hypertensive participants underwent compression for 20 minutes on 1 day and remained at rest for 20 minutes on another day. The control group underwent the nasal bones lift technique for the same time period. No significant differences in study variables were found among the groups at rest, with negligible difference in values before and after the 20-minute rest period. No significant change in body temperature was observed after undergoing the CV-4 technique, as in the present study. They reported that the CV-4 technique produced a decrease in BP and heart rate, observing the greatest decrease in BP, especially in systolic BP, in the hypertensive group.

A limitation of this preliminary study is that a placebo effect cannot be ruled out, since the controls received no type of treatment. The ideal study design would include a group undergoing myofascial induction techniques, a group undergoing sham treatment (involving touch), and a resting (“nontouch”) control group. Moreover, we measured a very short time effect and only in males, and future studies should address longer-term effects and include female populations.

Conclusions

Fascial induction techniques appear to decrease the state anxiety level of adult males. Further investigation is warranted to confirm this finding and clarify the effects of these procedures on heart rate, diastolic BP, and body temperature.

References


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