Research Paper

A NEW INSTRUCTING METHODOLOGY INSPIRED BY PERFORMING ARTS AUGMENTS THE EFFECTS OF MYOFASCIAL TRAINING IN THE REDUCTION OF CHRONIC SPINAL PAIN

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Abstract

The aim of the present research was to investigate the effectiveness of myofascial training in the functional management of chronic spinal pain and to explore if the integration of a new instructing methodology derived from performing arts would bring added value to the reduction of pain. 33 women from 32 to 61 years who were experiencing chronic neck, upper back, and/or low back pain were split into three groups: "Exercise Group" (EXG), "Art Group" (AG), and "Control Group". Both experimental groups followed 18 digital prerecorded sessions of approximately 30 minutes each, for 6 weeks, 3 times weekly. The protocol included different types of stretches and self-myofascial release with a Foam Roller. The exercises and the instructions for the technical execution of them were identical for EXG and AG, but AG was receiving some additional instructions inspired by techniques used in the field of performing arts. Both experimental groups achieved a reduction of pain, but the positive outcomes were more prominent at the AG. These results indicate that the exercise protocol alone was effective in reducing pain in women suffering from chronic spinal pain but even more effective when combined with instructions derived from performing arts.

Keywords: Foam Rollers, Mental Imagery, Neck Pain, Low Back Pain, Mind-Body Exercise Programs

Introduction

As stated, in the 21st century, Arts will play a very important role in the fields of health, as their interaction with traditional medical/healing practices is already expanding (Pratt, 2004). So far, the most common interventions that attempt a coupling between Art and rehabilitation belong to the scientific field of "Art Therapy". Nevertheless, Art Therapy belongs as a specialty to psychology/psychoanalysis, and it requires special training (Angheluta & Lee, 2011), so interventions of this kind could not be used by exercise professionals as they don't belong to their scientific field. On the other hand, there are several researches in the field of exercise that, although they are not part of the discipline of Art Therapy, make use of Arts, implementing programs based on artistic activities, such as dance, with the aim to alleviate chronic conditions. However, these interventions are usually designed for populations with incurable diseases, such as rheumatoid arthritis (Moffet, Noreau, Parent, & Drolet, 2000), Parkinson's disease (Lee, Lee, & Song, 2015), etc. In contrast, the organized integration of artistic practices into exercise programs for the rehabilitation of manageable musculoskeletal disorders, such as chronic spinal pain, has not yet particularly concerned the literature. It is worth noting though that according to recent research, exercisers who use mental imagery

techniques during exercise are helped to alleviate pain of musculoskeletal origin (Daskalaki et al., 2021). Considering that imagery is widely used during physical training by actors and dancers who are also experts in mind-body techniques (Carreri, 2007; Overby & Dunn, 2011), it could be hypothesized that taking inspiration from performing arts would offer new insights in the field of therapeutic exercise.

On the other hand, an exercise practice that is often proposed as a solution for the management of chronic pain is the therapeutic intervention in the muscle fascia. As often emphasized, musculoskeletal dysfunctions arise due to the shortening of connective tissue, and pain comes as a result of myofascial restrictions (Barnes, 1997; Barnes, 2008). For this reason, according to some approaches, the first step in the functional management of musculoskeletal disorders is the therapeutic intervention in the fascia and specifically the application of self-myofascial release (SMR) with Foam Rollers (FRs) (Fiore, 2014; Lucett, 2014). To restore the health and elasticity of myofascia, it is also recommended to perform exercises and movements that activate the myofascial system as a "whole" (Myers, 2011; Schleip & Müller, 2013). A variety of different types of stretches that target not single, isolated muscles, but longer myofascial chains (Schleip & Bayer, 2017; Schleip & Müller, 2013; Simmel, 2015) are suggested to be used, as are, for example, slow static stretches that remind the slow stretches of Yoga (Schleip & Bayer, 2017), but also slow "flowing" stretches and dynamic stretches. Although the combination of the aforementioned techniques is considered by some researchers as the first prerequisite for the rehabilitation of myofascial limitations (Schleip & Müller, 2013), in practice there is a lack of scientific research that examines their effect on reducing musculoskeletal pain.

The aim of the present research was to investigate the effectiveness of myofascial training in the reduction of chronic spinal pain and to explore if the integration of a new instructing methodology derived from performing arts would bring added value to the intended outcome.

Method

Inclusion Criteria

Inclusion criteria for participating in the study were to be a woman, aged between 26-65 years, and to have experienced either persistent or recurring pain or discomfort in the neck and/or upper back, and/or low back, at least 2 times during the last trimester before the start of the study, of an average intensity between 3-7 in a Numeric Rating Scale (NRS).

Participants

In the intervention participated 33 women from 32 to 61 years (mean age: 46.53±7.63) who at the time of the study were either sedentary or performing mild unsupervised physical activity (e.g. walking). They were split in a semi-random way (according to the order of appearance) into three groups: "Exercise Group" (EXG) (n=11), "Art Group" (AG) (n=11), and "Control Group" (CG) (n=11).

Procedures

Both experimental groups completed 18 digital prerecorded sessions of approximately 30 minutes each, which were performed for 6 weeks, 3 times per week (at a time individually chosen by every participant). The exercises and the instructions for the technical execution of them were identical for the two experimental groups, but AG was receiving some additional instructions inspired by techniques of training used in the field of performing arts, as these are described by Daskalaki (2021).

Exercise protocol

The exercise sessions included a combination of different types of stretches (flowing, static, and dynamic) that addressed mainly the 4 basic myofascial chains (Superficial Front Line, Superficial Back Line, Lateral Line, and Spiral Line) (Myers, 2009; Schleip & Bayer, 2017). Additionally, the protocol included static stretches targeting isolated muscles of the spine and of the lower limbs, "improvisational stretches", and SMR with FR.

"Flowing" ("moving") stretches were original sequences of movements in a flow, like small choreographies, which were mainly inspired by modern dance and Yoga movements and were linked in a way that continuous movement could be achieved from one posture to the other. Dynamic stretches involved soft elastic bounces "in the end range of available motion" (Schleip & Müller, 2013) and were majorly inspired by the Limon Technique (an example of a dynamic stretch is seen at the third photo of Figure 1). Aiming to lead the exercisers to "proprioceptive refinement" (Schleip & Müller, 2013) (*i.e.*, to help them discover and feel new bodily sensations) a new type of "flowing/moving stretches" was also created, called "improvisational stretches". Improvisational stretches were inspired by the principle of "Slow Motion" as described by Carreri (2007), they were executed in a standing or kneeling position and the exercisers were encouraged to move constantly and slowly, and stretch simultaneously different areas of their bodies.

Figure 1. Example of flowing stretches for a) the Superficial Front and Back Line, b) Lateral Line, c) Spiral Line.

SMR with a smooth FR was performed for the muscles of the torso (upper and lower back) and lower limbs (glutei, hip abductors/piriformis, hamstrings, hip adductors, quadriceps, ankle plantar flexors, plantar fascia). The technique of rolling consisted of continuous rolling the targeted muscle back and forth following the central line of the musculature, with a pace of 4 sec per direction for the majority of the exercises (*i.e.*, 8 sec per full roll). A progression made was that after the first nine sessions, for some muscles of the lower limbs, the application should not only focus on the central line of the muscle but should be multidirectional, *i.e.*, to move constantly in different directions the lower limbs while rolling back and forth. The duration of rolling per muscle area varied from 40 sec to 1 min approximately. Most sessions were ending with a cooling down phase of Relaxation on a FR of 3.50 min. during which the exerciser should remain still in a supine position on the FR with knees straightened or bent and after a while execute slow lateral micromovements from one scapula to the other, thus targeting mainly the middle trapezius and rhomboids. The full exercise protocol can be found in Daskalaki (2021).

Figure 2. Relaxation on FR.

Instructions inspired by performing arts

For AG additional instructional videos were created based on the methodology of building instructions of Daskalaki (2021) which is based on 15 principles deriving from the field of performing arts and also presents ways of using mental imagery techniques during exercise. Specifically, 18 "introductory videos" (one for each workout) were composed, which were shown at the beginning of each session and contained instructions specific to each workout. For some sessions, short videos were created which were shown between exercises and were related to the next exercise. Finally, for some exercises, short oral or written instructions were added to the videos that related to the whole exercise or to specific movements.

The 15 principles deriving from performing arts were inspired by the work of known artists, e.g. directors, actors, and choreographers, and could be described in brief as follows (the references refer to sources that inspired the composition of this text and they are adjusted and modified to be of use in the exercise field): Building instructions inspired by performing arts presupposes a disposition to shift from the usual way of seeing the exercise to an unusual, paradoxical, special way of thinking (Barba, 1999; Barba, 2008) (principle of extra-ordinary). Therefore, fitness trainers must first develop this artistic, "paradoxical" and extra-ordinary way of thinking, by cultivating their imagination, and then impart this way of thinking to the exercisers. The "principle of extra-ordinary" together with the "principle of imagination" (i.e. the ability to create mental images that are capable of evoking physical associations) are the

prerequisites for the fulfillment of all other principles. Therefore, fitness instructors must find unusual, imaginative ways to guide their programs, beyond the conventional ways offered by the usual guidelines about technique.

Exercisers should be encouraged to use all their energy, to be fully activated (principle of maximum energy) (Barba, 2008; Barba & Savarese, 2011), completely focused, directing 100% of their attention to the training and being in total connection with every single moment, in which they should concentrate with their whole "being" (Barba, 1999; Oida & Marshall, 1997) (principle of complete concentration). They have to try to gain full control over their muscular systems, know exactly where their bodies are at all times, and execute every movement consciously and not randomly (Oida & Marshall, 1997) (principle of total body control and conscious movement). To maintain muscle tension only where necessary and be able to locate and eliminate unnecessary muscular tension in a flash (Moore, 1992; Oida & Marshall, 1997; Stanislavski, n.d.) (principle of eliminating unnecessary muscular tension). They should also be taught to use different types of breathing according to the movement (e.g. thoracic/lateral, diaphragmatic, "full' breathing, etc.) (Grotowski, 1982) and in any case, they should not hold or block their breath while moving (principle of controlled breathing). Although an exercise is to do the same thing over and over again (*Chekhov, 1991)*, exercisers should be reminded that they are not "machines" and should always be encouraged to discover something new within already-known motor forms. Physical exercises should never be performed in a lifeless, mechanical, or automated manner (Carreri, 2007; Cieslak, n.d.; Grotowski, 1982; Marshall, 2003) (principle of non-mechanical movement) and should be approached with a spirit of research (Grotowski, 1982) (principle of continuous research). Exercisers should also be instructed to be totally involved in the exercises, with their bodies, minds, and souls (Oida & Marshall, 1997) (principle of total involvement). Exercises should be treated as "actions" and not as simple movements empty of content: a movement turns into a psychosomatic action when it is caused by some internal stimulus, it has a motive and a purpose (Moore, 1992; Nekrosius, Giammarini, & École des Maîtres, 2002; Stanislavski, 1977). Therefore, exercisers should be encouraged to have a deeper internal rationale for each bodily movement (Moore, 1992) (principle of personal justification of exercises). In addition, they could be asked to radiate their energy outwards, filling the space with light (principle of radiation), and/or to absorb from the environment anything positive *(*Chekhov, 2008) (principle of absorption). They should also maintain a continuous flow of their energy as they perform the exercises (principle of continuous flow of energy). Finally, the training should aim to fulfill the "principle of pleasure", i.e. to provide a pleasant and enjoyable experience for the exercisers (Marshall, 2003).

Having as a point of reference the aforementioned principles, the instructions that were given targeted every time to some of these principles. As for mental imagery techniques, these have been thoroughly described elsewhere (Daskalaki et al., 2021). In brief, they focus on enhancing cognitions and motivations during exercise through the formation of mental images. For example, a type widely used in conjunction with the "principle of pleasure" was motivational general-arousal mental imagery, that is to employ images of relaxation, stress reduction, etc.

Outcome Measures

Pain Intensity (NRS)

Pain intensity in the neck, upper back and lower back was measured through 11-point NRSs, since they are valid and reliable (Salaffi, Sarzi-Puttini, & Atzeni, 2015) and are the most recommended and preferred instruments for pain intensity measurement in neck (MacDermid et al., 2013) and chronic low back pain (Chiarotto, Terwee, & Ostelo, 2017). NRSs consisted of a numbered horizontal line from 0 to 10. The number 0 was at the left end of the scale and corresponded to "no pain at all" and the number 10 was at the right end and corresponded to "the worst pain possible". Participants completed 3 different NRSs (one for every anatomical area) and were asked to circle the number that corresponded to the intensity of pain in the respective area "in the past 4 weeks" for the three first measurements, and "in the past two weeks" in the follow up measurement. NRSs were completed at baseline (baseline measurement), after 3 weeks, *i.e.*, after 9 exercise sessions (middle measurement), after 6 weeks, *i.e.*, after 18 sessions (final measurement), and after 8 weeks (follow up measurement).

Statistical Analysis

The data were analyzed with SPSS and a two-way repeated-measures Anova (3X4) was used. The independent variable was "group" (EXG, AG, CG), the dependent variable was "score on NRS" and the repeated factor was "time" (*i.e.,* score on NRS in baseline measurement, middle measurement, final measurement, and follow up measurement). In case of an interaction, pairwise comparisons were performed (adjustment for multiple comparisons: Bonferroni). Statistical significance level was set at 0.05 ($p<0.05$).

Results

At baseline there weren't statistically significant differences between groups in the NRSs (neck, upper and lower back pain) ($p= 0 > 0.05$). After the implementation of the protocol, a statistically significant interaction between time*group was documented at score of NRS for neck pain ($F_{6,90} = 3.865$; $p=0.02 <0.05$), upper back pain ($F_{6,90} = 3.268$; $p=0.06 <0.05$) and low back pain ($F_{6,90} = 2.465$; $p=0.03 <0.05$), so analysis was continued performing pairwise comparisons with Bonferroni corrections.

Intensity of Neck Pain

By analyzing the interaction between time*group for every level of the factor "group", a statistically significant effect of the factor "time" was documented for the EXG ($F_{3,28}=8.083$, $p=0.000 <0.05$) and for AG ($F_{3,28}=4.188$, $p=0.015 <0.05$). In the EXG there were statistically significant decreases in the score of NRS in all measurements compared to baseline, while in the AG in the final and follow up measurement.

By analyzing the interaction between time*group for every level of the factor "time", a statistically significant effect of the factor "group" was documented at the final measurement ($F_{2,30}$=4.463, p=0.017 <0.05), where EXG had statistically significant lower score in NRS than CG.

Table 1. Score on NRS (Neck Pain)

	EXG	**AG**	**CG**
Baseline	4.64 (±1.29)	4.09 (+2.21)	4.09 (±2.12)
Middle	3.27 (±1.4)*	3.09 (±1.58)	4.36 (±1.75)
Final	2.45 (±1.51) *,**CG	2.73 (±1.42)*	4.36 (±1.80)
Follow Up	3.09 (±1.92)*	2.73 (±1.68)*	4.27 (±2.19)

**within groups, **between groups*

Intensity of Upper Back Pain

By analyzing the interaction between time*group for every level of the factor "group", a statistically significant effect of the factor "time" was documented for the AG ($F_{3,28}$=6.187, p=0.002 <0.05). In the AG there were statistically significant decreases in the score of NRS in the final and in the follow up measurement compared to baseline measurement. There weren't statistically significant differences between groups in any time point.

Table 2. Score on NRS (Upper Back Pain)

	EXG	**AG**	**CG**
Baseline	4.09 (±1.97)	5 (±1.84)	4 (±2.65)
Middle	3.27 (±1.35)	3.64 (±2.01)	4.73(±2.19)
Final	2.64 (±1.43)	2.82(±1.72)*	4.45(±1.97)
Follow Up	3.00 (±1.90)	2.55 (2.08)*	4.00 (±2.1)

Intensity of Low Back Pain

By analyzing the interaction between time*group for every level of the factor "group", a statistically significant effect of the factor "time" was documented for the EXG ($F_{3,28}$=4.069, p=0.016 <0.05) and for AG ($F_{3,28}$=5.170, p=0.006 <0.05). In the EXG there were statistically significant decreases in the score of NRS in the final measurement compared to baseline measurement, and in the AG in all measurements compared to baseline measurement. There weren't statistically significant differences between groups in any time point.

Table 3. Score on NRS (Low Back Pain)

	EXG	**AG**	**CG**
Baseline	4.36 (±2.6)	4.91 (±2.89)	3.82(±2.04)
Middle	3.45 (±2.07)	3.00(±2.00)*	3.64(±1.96)
Final	2.55(±2.02)*	2.82(±2.04)*	3.82(±2.48)
Follow Up	2.91 (±2.07)	2.82(±2.13)*	3.91(±2.30)

Discussion

According to the results of the present research, both experimental groups achieved a reduction of pain, but the positive outcomes were more prominent at the AG. Therefore, the exercise protocol alone was effective in reducing pain but even more effective when combined with instructions derived from performing arts. According to our knowledge, this is the first time that a myofascial training protocol combining different types of stretching and SMR with a FR was used. Previous research that used fascia-oriented exercises for the reduction of pain focused either on stretching the long myofascial lines (*i.e.*, in Yoga interventions) or on SMR and concluded in positive results. Specifically, Yoga interventions have been found to be effective in reducing pain both in patients with neck (Cramer et al., 2013; Michalsen et al., 2012) and low back pain (Williams et al., 2009; Williams et al., 2005). Its effectiveness, among others, is attributed to the stretching of shortened muscles and the strengthening of weak muscles (Crow et al., 2015; Ratzlaff, 2012). In contrast, in the present research, the emphasis was given to exercise techniques that are mainly used for the enhancement of flexibility, and these techniques alone were effective in reducing spinal pain. As for research using pressure techniques, it was found that SMR with small balls alone (Oh et al., 2016) or with their combination with Rumble Rollers was effective in reducing low back pain after a brief period of 4 (Ajishma, 2016) and 6 weeks (Oh et al., 2016), indicating that these techniques are, indeed, effective in the management of pain.

Considering the results of the present investigation, the reduction in pain for both experimental groups may be due to the achievement of a healthier state of the muscle fascia (e.g. hydration of the fascia and reduction of fibrous adhesions), improvement of its elasticity, and reduction of myofascial limitations (e.g. myofascial trigger points), effects that are commonly attributed to both "myofascial stretches" and SMR, through a variety of mechanisms (Schleip & Baker, 2015). Also, pressure techniques performed slowly (as it was the application of SMR) are thought to stimulate particular mechanoreceptors of the fascia (*i.e.*, Ruffini and interstitial mechanoreceptors) which has an effect on the autonomic nervous system (lowering of sympathetic activity) and leads not only to global muscle relaxation but also to less emotional arousal and to a more peaceful mind (Schleip, 2003a; Schleip, 2003b). Taking into account that myofascial techniques can affect psychological and emotional parameters (Bordoni & Marelli, 2017) than in their turn could affect the sensation of pain (Lumley et al., 2011), it could be hypothesized that the exercise protocol created was effective in reducing pain through its simultaneous effects on the state of fascia and on the emotional state of the exercisers.

As for the better progress of the AG, this is probably due to the "holistic nature" of the intervention, which purposely addressed not only physical but also mental and psychological parameters. A key prerequisite was, for example, the coordinated physical, mental, and spiritual/intellectual involvement and the use of imagination. There is strong evidence for the incorporation of different mind-body techniques in the treatment of chronic spinal pain (one of which is the use of imagery) which facilitates the mind's ability to influence the body's function and its symptoms (Astin et al., 2003). Principles like the "principle of total body control and conscious movement", the "principle of eliminating unnecessary muscular tension", and the "principle of non-mechanical movement" may have attributed to a greater enhancement of proprioception in the AG. Focusing attention on bodily sensations and stimuli

is thought to maximize the effect of pain-reducing treatments by increasing proprioceptive acuity which in its turn leads to "deactivation" of nociceptive receptors (e.g. neurons that respond to pain) through a strategy called "proprioception against potential nociception" (Schleip, 2015). The increase of proprioception makes it possible to recognize incorrect body posture and identify the existence of unnecessary muscle tension both during exercise and in everyday life, leading to self-correction of incorrect movement patterns, and ultimately, resulting in pain reduction (Cramer et al., 2013). Therefore, the greater physical and mental awareness probably achieved through the instructions given to AG, may have led to an increase in self-regulation and more usual self-correction, that in their turn led to a more pronounced reduction of pain. This same rationale has been also described in Feldenkrais (Öhman, Åström, & Malmgren-Olsson, 2011).

In addition, cognitive and perceptual processing of external stimuli, intentions and motivation can affect interoceptive internal information and alter the internal representation of interoceptive sensations (e.g. pain), thereby influencing autonomic bodily reactions and emotions (Critchley et al., 2002). At the same time, as it has been argued, pain is not only a physical but also an emotional experience, biological and psychosocial processes coexist and interact in the pain experience, and the brain (basis of mental processes) and emotions mediate and influence how one experiences pain: for example, stress increases pain and is associated with chronic pain, while positive emotions lead to the reduction of pain (Lumley et al., 2011). The use of motivational general-arousal mental imagery together with instructions aiming to fulfill the "principle of enjoyment" possibly contributed to the generation of relaxing and positive feelings, which together with the effects of the exercise itself led to a greater reduction of pain at AG. The same mechanism has been also proposed for other "holistic exercise programs", like Yoga, Tai Chi, and Qigong, which combine physical postures with breathing techniques and conscious relaxation: specifically, it has been suggested that they are likely to be more effective in reducing pain and improving emotional state compared to exercise programs that focus only on physical parameters (Park, Krause-Parello, & Barnes, 2020). Considering all these, it could be argued that the use of techniques inspired by performing arts offered an alternative and effective way of creating a new kind of mind-body exercise program which has the potential of offering additional benefits.

Conclusion

Taking inspiration from Art and from the work of performing arts practitioners was valuable in creating a new instructional methodology that was proven to be effective in augmenting the exercise-induced effects on the reduction of spinal pain. The integration of artistic methods into therapeutic exercise programs generates a new, transdisciplinary approach that seems to be a valuable adjunct to the management of chronic pain in the spine.

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