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## INFLUENCE OF FELDENKRAIS METHOD ON SPINE HEALTH IN PROFESSIONAL ORCHESTRAL MUSICIANS. PILOT STUDY

### INFLUENZA DEL METODO FELDENKRAIS SULLA SALUTE DEL RACHIDE IN MUSICISTI ORCHESTRALI PROFESSIONISTI. STUDIO PILOTA

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#### **Abstract**

*Objectives:* The aim of this study was to explore whether Feldenkrais Method was useful for improving muscular flexibility and reducing back pain in professional orchestral musicians.

*Materials and methods:* Seventeen participants were recruited from a symphony orchestra of Palermo (Italy) and randomly divided in a control group (C, n=8) and a Feldenkrais group (F, n=9). The first didn't participate in the Feldenkrais protocol and any other physical activity; while the second took part into a program consisting of four *Awareness through movement* (ATM) classes performed 2 hours/week for 4 weeks. In order to assess muscle fitness of spine, we used sit-and-reach and trunk lift test. The differences within each group and between C and F groups were respectively examined with Wilcoxon matched pair test and Mann-Whitney test; and considered significant with  $p \leq 0.05$ .

*Results:* The muscular flexibility of hamstring and low back, and trunk extensor strength, flexibility and endurance slightly increased in F group compared with C group after Feldenkrais protocol even if this variation was not statistically significant. Differently, C group showed a reduction by 5% in both tests after 4 weeks. After Feldenkrais protocol, height of F group was significantly bigger than before treatment. Moreover, we found that the number of participants, who stated to have strong and frequent pain in the back and limbs, decreased during performing the Feldenkrais protocol. This effect was bigger in the cervical than lumbar spine and upper limbs.

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*Conclusion:* Our outcomes illustrate that Feldenkrais method has positive effects on muscle flexibility and supports the use of this method for dissolving muscle tensions and contractions that can cause pain in professional orchestral musicians.

**Key words:** Health, Spine, Low back pain, Feldenkrais Method, Muscle flexibility.

### **Riassunto**

*Obiettivo:* Lo scopo di questo studio è stato quello di esaminare se il Metodo Feldenkrais fosse utile per migliorare la flessibilità muscolare e ridurre il dolore alla schiena in musicisti orchestrali professionisti.

*Materiali e metodi:* Diciassette partecipanti sono stati reclutati da un orchestra sinfonica di Palermo (Italia) e divisi casualmente in un gruppo di controllo (C, n = 8) e un gruppo Feldenkrais (F, n = 9). Il primo non ha partecipato al protocollo Feldenkrais e a qualsiasi altra attività fisica; mentre il secondo ha preso parte ad un programma costituito da quattro lezioni di gruppo di *Consapevolezza Attraverso il Movimento* (CAM) eseguito 2 ore alla settimana per 4 settimane. Al fine di valutare lo stato di salute della colonna vertebrale, abbiamo usato il sit-and-reach test ed il trunk lift test. Le differenze all'interno di ogni gruppo e tra il gruppo C e il gruppo F sono state rispettivamente esaminate con il test di Wilcoxon e quello di Mann-Whitney; e considerate significative con  $p \leq 0,05$ .

*Risultati:* La flessibilità muscolare del bicipite femorale e della regione lombare, e la forza, la flessibilità e la resistenza dei muscoli estensori del tronco era leggermente aumentata nel gruppo F rispetto al gruppo C dopo il protocollo Feldenkrais; anche se questa variazione non era statisticamente significativa. Diversamente, il gruppo C ha mostrato una riduzione del 5% in entrambi i test dopo 4 settimane. Dopo il protocollo Feldenkrais, l'altezza del gruppo F era significativamente maggiore rispetto a prima del trattamento. Inoltre, abbiamo trovato che il numero dei partecipanti, che hanno dichiarato di avere dolore forte e frequente alla schiena e agli arti, diminuiva durante il periodo di svolgimento del protocollo Feldenkrais. Questo effetto era maggiore nella regione cervicale rispetto a quella lombare e agli arti superiori.

*Conclusioni:* I nostri risultati mostrano che il Metodo Feldenkrais ha effetti positivi sulla flessibilità muscolare e supporta l'uso di questo metodo per sciogliere le tensioni e le contrazioni muscolari che possono causare dolore nei musicisti orchestrali professionisti.

**Parole chiavi:** Salute, Colonna vertebrale, Dolore lombare, Metodo Feldenkrais, Flessibilità muscolare.

### *1. Introduction*

The Feldenkrais Method® is a process of body self-education through movement, which takes its name from the scientist, physicist and engineer who developed, Moshe Feldenkrais (Feldenkrais, 1978). It is primarily based on the sensory awareness that leads to improvement in functional movement. This method consists of sequences of simple movements involving all parts of the body in order to develop the perception, motor learning and people's ability to discover flexible and adaptable behaviors (Buchanan & Ulrich, 2001). Feldenkrais did not attempt to teach "the correct" posture, but gave criteria for a comfortable upright posture. It is applied in two forms: the group form, called *Awareness through movement* (ATM), and the individual form, named *Functional Integration* (IF) (Feldenkrais, 1978). This method is accessible to all people of any age and physical condition. Indeed, lessons usually take place in lying position with effort and speed reduced to a minimum.

Several recent studies (Ullmann et al., 2010; Connors et al., 2011) have linked this method with an increased mobility in older people. In particular, people perceived a more stretched and relaxed body side and showed a greater range of motion following Feldenkrais exercises compared with the other untreated side (Dunn & Rogers, 2000). Ullmann et al. (2010) examined the effects of Feldenkrais exercises in improving balance, mobility and balance confidence in older adults after 9 weeks of Feldenkrais lessons. The results of this study indicated that Feldenkrais exercises were an effective way to improve balance and mobility, and thus offer an alternative method to help offset age-related declines.

Connors et al. (2010) reported that Feldenkrais ATM lessons contained many elements consistent with current theories of motor skill acquisition and postural control, providing a theoretical basis for the effectiveness of the Feldenkrais approach in improving balance and posture. Another study carried out by Connors et al. (2011) analyzed changes in life quality of 48 clients after Feldenkrais sessions. All clients had problems performing daily functional tasks. Following the Feldenkrais sessions, their levels of pain decreased and their ability to perform tasks and quality of life significantly improved.

Strength, endurance and muscle flexibility particularly have an immense influence on the musician's performance. Playing an instrument requires both physical and mental skills, and too often all this leads to excessive demands. For this reason, professional musicians are exposed to high-risk musculoskeletal activities such as repetition, hours of exposure, and awkward postures when they play instruments. These activities may result in playing-related musculoskeletal disorders (Foxman & Burgel, 2006). Depending on the individual characteristics, the professional activity and the specific instrument, the performance-related risk factors and disorders differ widely (Jankovic & Ashoori, 2008). In their study, Leaver et al. (2011) noticed that the pain mainly affected the neck, low back and

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shoulders in professional orchestral musicians.

In the literature, there are many studies that connect musculoskeletal disorders and musicians: 15% of them presents problems which continue even for 1 year consecutively (Fishbein et al., 1988; Knishkowsky et al., 1986; Manchester & Lustik, 1989). Therefore, it should be necessary to highlight the possible causes and provide the musicians with a therapeutic intervention and educational work (Wilk et al., 2011). On this point, fourteen women with non-specific neck and shoulder pain participated in a group treatment design using the Feldenkrais ATM method (Ohman et al., 2011). Data were collected in two ways: diary notes directly after the sessions and thematic interviews 4-6 months after the intervention. The women reported positive changes in posture and balance, a feeling of release and increased self-confidence. In particular, “More erect without effort” and “Extended space for myself” represented participants’ descriptions of effects of Feldenkrais method. Moreover, these feelings of improved body awareness remained after 4-6 months. Although these results are encouraging, few studies are present in the scientific literature concerning the effectiveness of Feldenkrais method in reducing back pain induced by activity-related postural disorders and improving artistic performance of musicians.

### *2. Aims*

The aim of this study was to examine whether Feldenkrais Method reduced back pain of professional orchestral musicians by intervening on their spine muscular flexibility.

### *3. Materials and methods*

#### ***Description of participants***

Seventeen participants were recruited from a symphony orchestra of Palermo (Italy) and randomly divided in two groups as shown in the table 1. Control group (C) didn’t participate in Feldenkrais protocol and any other physical activity; while Feldenkrais group (F) took part into a program consisting of four ATM classes performed 2 hours/week for 4 weeks. We did not find any significant difference in the anthropometric features between the two groups. Participants completed a questionnaire concerning their orchestral duties, lifestyle, previous experience with Feldenkrais Method and regional back pain in the past twelve months. All participants gave their informed consent prior to be involved in this study, which was approved by the local institutional ethics committee.

**Table 1. Anthropometric features of participants**

Groups	Age (years)	Weight (kg)	Height (cm)	BMI (kg/m <sup>2</sup> )
<b>Control (C)</b> N=8 (5 men, 3 women)	34.63±4.81	71.56±13.03	169.93±10.51	24.62±2.43
<b>Feldenkrais (F)</b> N=9 (5 men, 4 women)	34.78±8.50	69.56±12.45	168.92±9.72	24.26±2.5

In the control group (C), four musicians played the piano 3 hours/day for 5 days a week since 12 years. One musician played the violin (2 hours/day every day since 30 years), one the guitar (2 hours/day every day since 25 years), one the oboe (5 hours/day every day since 7 years) and one the drums (3 hours/day every day since 20 years). Four musicians had an active lifestyle (physical activity practiced 3 times a week for 3 consecutive months) and three did not perform any physical activity.

In the Feldenkrais group (F), two musicians played the harp with daily frequency and 4 hours of study since 30 years. One musician played the piano (3 days a week/3 hours a day since 40 years), one the flute (daily/4 hours a day since 24 years), one the guitar (daily/3 hours a day since 10 years), one the contrabass (daily/3 hours a day since 21 years), two musicians the drums (daily/3 hours a day since 30 years) and one the bassoon (5 days a week/3 hours a day since 9 years). Six musicians had an active lifestyle and three were inactive.

Before starting this study, all participants had previously familiarized with Feldenkrais Method for two weeks.

Pain location in cervical, dorsal, lumbar spinal tract and upper and lower limbs was considered. The intensity and frequency of pain were evaluated with the visual rating scale (VRS) ranging from “no pain (1)” to “very strong (6) and “never (0)” to “always (5)” respectively (Mannion et al., 2007). Moreover, musicians indicated whether pain occurred during the artistic performance and the presence of spinal protrusions or hernias.

Musicians of both groups stated to have pain in spine and limbs. In C group, no musician reported the presence of protrusions or hernias and two of them felt pain during the performance.

In F group, one participant presented 2 protrusions, one a lumbar hernia and one a cervical hypolordosis. Five musicians felt pain during the performance.

### ***The Feldenkrais Protocol***

The classes of Feldenkrais protocol (2 hours/week for 4 weeks) were carried out by Feldenkrais® teacher who guided the perceptions and movements of musicians to make them aware of their habitual neuromuscular patterns and rigidities and to expand options for new ways of moving while increasing

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sensitivity and improving efficiency (Apel, 1992). In particular, Feldenkrais lessons were aimed at exploring new ways of sitting, moving pelvis in connection with spine and head by the musicians.

In the supine position, exercises were performed in order to reestablish the connection between the pelvis and head, to transfer the information from the pelvis to the column and the head. It was highlighted the importance of breathing, use of eyes and exploration of jaw.

To release the unnecessary tension from shoulders, movements of shoulders, elbows and hands were followed. Exercises were carried out to bring awareness about the use of eye movements connected to the head, with the release of tension through exploratory movements of cervical tract in connection with spine, sternum, ribcage and pelvis.

After each movement, it was significant to scan the feelings and sensations in own body and notice areas of comfort and discomfort, differences between right and left sides and own breathing.

### ***Evaluation of spine health***

In order to assess muscle fitness of spine, we used sit-and-reach and trunk lift test which both are included in FitnessGram developed more than 20 years ago by the Cooper Institute. The first quantifies the flexibility of lower back and hamstring muscles (Wells & Dillon, 1952) and the second measures trunk extensor strength, flexibility and endurance (Cooper, 2007). Both tests were administered before and after 4 weeks of Feldenkrais protocol. Before starting both tests, participants of the two groups performed some stretching's exercise in order to activate the muscles involved. Each participant completed 3 trials and the final result of the test was taken by the average of the results in the three trials.

Additionally, we measured the participants' stature with stadiometer before and after 4 weeks of experimental period.

### ***Sit and reach test***

Before starting the test, the shoes were removed and participants sat on the floor with their back and head against a wall. Their legs were out straight ahead and knees flatted against the floor. The box was placed flat against their feet. While keeping their back and head against the wall, they stretched their arms out towards the box. The sliding ruler was adjusted so that the zero mark was at their fingertips. Participants placed their hands side by side, and leaned forward slowly as far as possible keeping the fingertips level with each other and the legs flat. They held the full reach position for two seconds and their score was recorded. The results of this test are important because tightness in this area is implicated in lumbar lordosis, forward pelvic tilt and lower back pain.

### ***Trunk lift test***

The aim of this test is to lift the upper body off the floor using the muscles of the back and hold the position to allow the measurement. Participants lay on the mat in a face down position, with toes pointed back behind the body and hands

placed under the thighs. When ready, they lifted the upper body off the floor, in a very slow and controlled manner. The head was maintained in a straight alignment with the spine. The position was held long enough for a measurement to be made of the distance - from the floor to the subject's chin. Once the measurement has been made with a ruler, the subject returned to the starting position. Three trials were recorded and the average was calculated.

#### **Statistical analysis**

Data was presented as averages and standard deviations. The differences within each group (before and after 4 weeks) were examined with Wilcoxon matched pair test and considered significant with  $p \leq 0.05$ . For analyzing the differences between C and F groups, we used Mann-Whitney test with  $p \leq 0.05$ .

#### **4. Results**

The muscular flexibility of hamstring and low back slightly increased in F group after Feldenkrais protocol even if this variation was not significant. Differently, C group showed a reduction in about 5% of the flexibility after 4 weeks (figure 1).

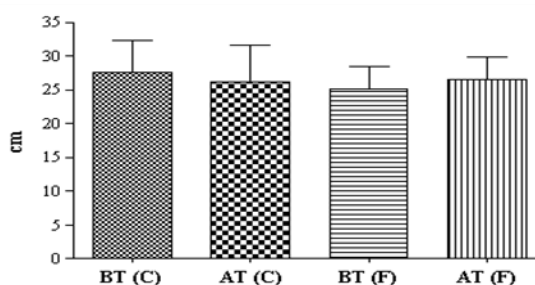


Fig 1. Muscular flexibility of hamstring and low back in C and F groups before (BT) and after (AT) 4 weeks of experimentation.

Differently by previous results, we found that F group showed an increase by 3.6% in trunk extensor strength, flexibility and endurance after 4 weeks of Feldenkrais protocol. However, this difference is not statistically significant (fig. 2). In contrast, in C group we noticed a decrease by 5.2% in this test as shown in the figure 2.

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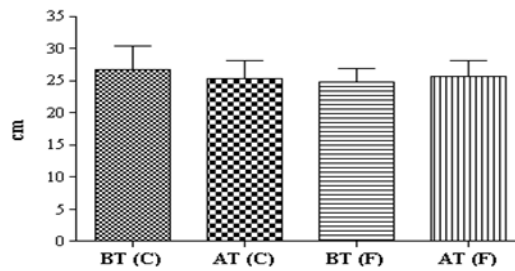


Fig 2. Trunk extensor strength, flexibility and endurance were evaluated before (BT) and after (AT) 4 weeks in control(C) group and Feldenkrais (F) group.

As shown in the figure 3, the height of F group significantly increased by 0.74 cm between before and after Feldenkrais protocol; while we did not observe any variation in C group.

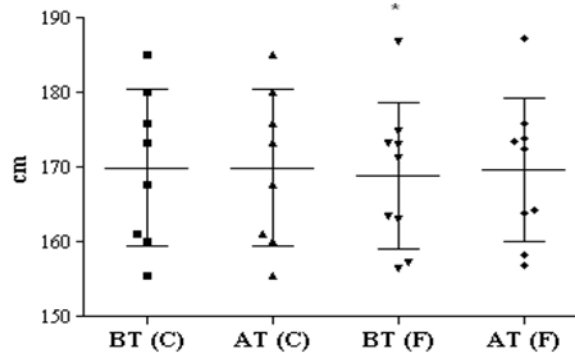


Fig 3. Analysis of height in C and F groups before and after 4 weeks of inactivity (C) and Feldenkrais protocol (F) respectively. \* $P \leq 0.05$  BT (F) vs. AT (F)

As regards the evaluation of pain intensity and frequency, a bigger number of musicians (C and F groups) reported to have pain mainly in cervical and lumbar region, and limbs than dorsal tract before the study. In detail, a bigger percentage of C group participants stated to have more intense (from very strong to moderate) and frequent (from always to often) pain in lumbar spine and limbs compared to cervical and dorsal (tables 2 and 4). In F group (table 3), the biggest percentage of participants affirmed to have more intense pain (from very strong to moderate) in lumbar tract (55%) than cervical region (44%), upper limbs (33%), lower limbs (22%) and dorsal spine (11%). In the same group (table 5), pain was more recurrent (from always to often) in cervical, lumbar region and upper limbs of 22% participants before Feldenkrais protocol.



**Table 2. Percentage distribution of C group participants according to pain intensity before and after 4 weeks**

Intensity	Cervical		Dorsal		Lumbar		Upper Limbs		Lower Limbs	
	BT	AT	BT	AT	BT	AT	BT	AT	BT	AT
No Pain										
Very Slight					13	13				
Slight	25	25			13	13	13	13		
Moderate	13	13								
Strong			13	13	13	13	13	13	13	13
Very Strong					13	13	13	13	13	13

**Table 3. Percentage distribution of participants according to pain intensity before and after Feldenkrais protocol**

Intensity	Cervical		Dorsal		Lumbar		Upper Limbs		Lower Limbs	
	BT	AT	BT	AT	BT	AT	BT	AT	BT	AT
No pain		11								
Very slight	22	22								
Slight	22	22			22	33			11	11
Moderate	11	22	11	11	22	33	22	33	11	22
Strong	33	11			33	11	11		11	
Very strong										

After 4 weeks, there were not changes within the C group as shown in tables 2 and 4. In contrast, we found a relevant decrease of participants who had strong pain in cervical and lumbar region, and an increase of participants without pain or with moderate pain following Feldenkrais protocol (table 3). Pain reduction was bigger in cervical than lumbar tract. The same results have been obtained with upper and lower limbs. In particular, strong pain present in limbs of 11% participants declined to lower intensities in response to Feldenkrais method (table 3). Pain frequency decreased more in cervical region and limbs compared with lumbar spine in F group (table 5).

**Table 4. Percentage distribution of C group participants according to pain frequency before and after 4 weeks**

Frequency	Cervical		Dorsal		Lumbar		Upper Limbs		Lower Limbs	
	BT	AT	BT	AT	BT	AT	BT	AT	BT	AT
Never (no episode in 1 year)										
Occasionally (few random episodes in 1 year)	38	38			13	13	13	13		
Sometimes (more episodes in 1 year)			13	13	25	25			25	25
Often (3 or 4 acute episodes every month)							25	25		
Always (episodes every day)					13	13				

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**Table. 5. Percentage distribution of participants according to pain frequency before and after Feldenkrais protocol**

Frequency	Cervical		Dorsal		Lumbar		Upper Limbs		Lower Limbs	
	BT	AT	BT	AT	BT	AT	BT	AT	BT	AT
Never (no episode in 1 year)										
Occasionally (few random episodes in 1 year)	33	33			22	33			11	11
Sometimes (more episodes in 1 year)	33	44	11	11	33	22	11	33	22	33
Often (3 or 4 acute episodes every month)	22	11			22	22	22		11	
Always (episodes every day)										

### 5. Discussion

It is known the musculo-skeletal pain can be linked to an uncorrected posture that many times is associated with occupational needs (Ives & Shelley 1998). Performance-related disorders in professional musicians are most often caused by multiple risk factors. They are based on the chronic complex, rapid and forceful work that requires highest precision, as well as on poor ergonomic conditions and psychological strain. Predominantly, the musculo-skeletal system of the upper extremity and the spine is affected by acute or chronic pain syndromes and neurological disorders (Jankovic & Ashoori, 2008).

The aim of the present study was to applying Feldenkrais method to professional orchestral musicians for improving their muscle flexibility and reducing pain intensity and frequency in the spine. Muscle flexibility assessment is an important component of health-related physical fitness, as inadequate flexibility decreases performance activities of daily living (Kaminsky, 2010). Reduced hamstring muscle flexibility has been implicated in lumbar spine dysfunction, with a number of studies showing a strong positive correlation between decreased hamstring flexibility and low back pain (Esola et al., 1996; Tafazzoli & Lamontagne, 1996, Halbertsma et al., 2001).

Several researchers (Halbertsma et al., 2001; McGorry et al., 2001) have suggested that hamstring muscle function in a variety of movements is part of a coordinated motor program and thus the appropriate periods of lengthening and shortening and perhaps even the degree of lengthening itself may be a learned part of the motor control process. On this point, Stephens et al. (2006) compared the results reported in the literature on passive stretching methods and those from *Awareness Through Movement (ATM)* lessons in order to explain which was more effective to increase muscle flexibility and produce long-term changes in the viscoelastic properties of muscle. This study showed that ATM lessons were an effective method of increasing active hamstring muscle length and flexibility indicating that hamstring muscles can be lengthened by a method that does not involve stretching.

In our study, we found a small increase in the flexibility of lower back and

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hamstring muscles measured with the Sit and Reach test after four ATM classes. Similar results have been reported in Hopper et al.'s (1999) and Dunn & Rogers's (2000) studies, in which there was an increase in the Sit and Reach Test after Feldenkrais lessons. In our work, the absence of a statistically significant increase in the flexibility might be due to the restricted number of participants, brief length and specificity of Feldenkrais protocol. However, this result is encouraging whether we consider the reduction in about 5% of flexibility by control group after 4 weeks of physical inactivity.

The association between low back pain and neuromuscular imbalance has been also reported by Renkawitz et al. (2006) who claimed that imbalanced patterns of erector spinal activity and reduced trunk extension strength have been observed among patients with low back pain.

In our research, measuring the trunk extensor strength, flexibility and endurance with the trunk lift test, we observed their slight increase in participants who followed the Feldenkrais protocol. In contrast, in control group we noticed a decrease by 5.2% suggesting that ATM lessons prevented a worsening of these abilities.

Polsgrove (2002) found positive changes in height and postural stability in a group of subjects who followed the Feldenkrais Method compared to a group that has followed only stretching classes. The data examined had already been analyzed by Seegert & Shapiro (1999) who had noticed a greater height in 25 U.S. collegial students as a result of lessons with the Feldenkrais Method. The authors explained this because the lessons were done in the supine position, and without the intervention of the force of gravity.

In our study, the height of Feldenkrais group was significantly bigger than control group after 4 weeks of training protocol. This effect might be due to the reduction in contractures and uncomfortable postures that lead to a vertebral compressions by the Feldenkrais method. Additionally, the supine position taken by the musicians during three of the four ATM classes might be one reason responsible for the increase in participants' height according to Seegert & Shapiro's (1999) study.

In his investigation, Alexander (2006) reported that the Feldenkrais method was effective in reducing pain perception and decreasing disability in a population experiencing chronic low back pain. Another study supported the Feldenkrais Method in pain reduction of seven chronic pain sufferers (Bearman & Shafarman, 1999).

Malmagren-Olsson & Branholm (2002) also showed that the Feldenkrais Method improved life quality and pain self-efficacy to a somewhat higher degree than the conventional physiotherapy in patients with non-specific musculoskeletal disorders.

In agreement with these previous studies, we found that the number of participants, who stated to have strong and frequent pain in the back and limbs,

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decreased during performing the Feldenkrais protocol. This outcome was bigger in the cervical than lumbar spine and upper limbs. This effect might be due to the type of movements executed in ATM classes and also might explain the reason for the limited modification in the flexibility of low back and hamstring muscle, and in the trunk extensor strength observed.

In conclusion, our results illustrate that Feldenkrais method has positive effects on muscle flexibility and supports the use of this method for dissolving muscle tensions and contractions that can cause pain in professional orchestral musicians. Further studies are needed to confirm these outcomes on a larger number of participants.

In the music, the performer's movement expressly elicits and affects the sound of the instrument. In some situations, the instrument becomes an extension of the body. Feldenkrais method can offer to the artist new ways of perceiving and sensing own movement to deepen understanding, maximize function, and at the same time, improve ease and balance (Schlinger, 2006).

### *6. Acknowledgements*

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