

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: <http://www.elsevier.com/locate/poamed>

Review article

Feldenkrais method on neck and low back pain to the type of exercises and outcome measurement tools: A systematic review

Vikram Mohan^{a,b}, Aatit Paungmali^{a,*}, Patraporn Silitertpisan^a,
Leonard Joseph Henry^a, Norazlin Binti Mohamad^b,
Nurul Nadiah Binti Kharami^b

^aNeuro-Musculoskeletal and Pain Research Unit, Department of Physical Therapy, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai, Thailand

^bDepartment of Physiotherapy, Faculty of Health Sciences, Universiti Teknologi MARA, Puncak Alam, Malaysia

ARTICLE INFO

Article history:

Received 28 January 2016

Received in revised form
21 June 2016

Accepted 21 October 2016

Available online xxx

Keywords:

Feldenkrais method

Low back pain

Musculoskeletal disorders

Neck pain

ABSTRACT

Introduction: Feldenkrais method (FM) has been applied on a large number of people as an educational method to create awareness of themselves and of their own body postures. Despite several existing FM studies, there has not yet been a review of FM in the context of musculoskeletal disorders.

Aim: This review aimed at determining the effect, type of exercises, duration and the outcome measure utilized in assessing the FM among individuals with neck and low back pain (LBP).

Material and methods: Four databases were searched for eligible studies, which were published in the years 1999–2015. Two authors individually assessed selected studies. From a total of 165 articles, 3 articles were selected and another 1 article from other resources with a total of 4 articles.

Results and discussion: The number of participants in all of the four included studies were 65.5 ± 30.1 (mean ± SD). The quality of the studies that was assessed using Physiotherapy Evidence Databases (PEDro) scale revealed the score of at least 5/10. Evidence exists that FM may be used for treating musculoskeletal disorders. However, the studies were not enough to make a decision because of different selections of FM lessons, duration and outcome measures. The review also determined type of exercises and outcome utilized in assessing the benefit of FM. **Conclusions:** Overall, judging from the increasing number of articles in recent years related to FM, this review reports sufficient evidence that FM is increasingly being used in the management of neck pain and LBP.

© 2016 Warmińsko-Mazurska Izba Lekarska w Olsztynie. Published by Elsevier Sp. z o.o.

All rights reserved.

* Correspondence to: Neuro-Musculoskeletal and Pain Research Unit, Department of Physical Therapy, Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai 50200, Thailand. Tel.: +66 53949246; fax: +66 53946042.

E-mail address: aatit.p@cmu.ac.th (A. Paungmali).

<http://dx.doi.org/10.1016/j.poamed.2016.10.003>

1230-8013/© 2016 Warmińsko-Mazurska Izba Lekarska w Olsztynie. Published by Elsevier Sp. z o.o. All rights reserved.

1. Introduction

An art of movement that is learned through the self-realization method with minimal effort and maximal efficiency is referred as Feldenkrais method (FM), commonly known as 'Feldenkrais'.¹⁻³ The instructional methods and its learning process are consequently labeled as a pedagogical method.⁴ This method, which was founded by Moshe Feldenkrais, basically applied self-realization technique for his own injury through the observation of how children learn to walk.² Hence, it can be alleged that this method of lessons is based on developmental movements.¹ In addition, the lessons are also based on functional activities, and abstract exploration of joint, muscle and postural relationships.¹

One of the core principles of FM is to develop the people's proprioceptive and kinesthetic awareness through a guided session by a teacher, thereby exploring an appropriate way of moving the body or correcting abnormal habitual posture.² The FM includes two modes of instruction, in which the first technique is referred as awareness through movement (ATM) and the second technique is referred as functional integration (FI).^{1,2,5} Each session of the self-awareness method is termed as 'lesson', which optimally could last for about 35–45 min.^{1,2} ATM lessons are taught as group lessons whereas individual lessons are termed as FI.^{1,2}

The FM lessons were taught to inspect reduction in pain, promote balance, mobility, gait and reducing anxiety levels, which were carried on healthy adult populations, elderly, and those with neurological, respiratory and musculoskeletal disorders.⁶⁻⁹ These available evidences seem to suggest that the FM lessons can be applied to a wide range of populations to acquire the desirable benefit. A recent systematic review by Hillier and Worley has concluded that there is promising evidence that the FM may be effective for a varied population interested in improving balance measures.¹⁰ In addition, an earlier systematic review published by Ernst and Canter also concluded that there was favorable evidence but the credibility of the studies was lowered by less number of studies.¹¹ The above two systematic reviews specifically looked into the effectiveness, the nature and order of magnitude of beneficial effects following FM collectively on the elderly, and those with neurological and musculoskeletal disorders. One of the greatest challenges of these reviews is that they do not focus on a particular population and that could be the reason definite conclusive results were not produced. Hence, there is a need to focus on particular disorders to know the effectiveness of FM.

In this context, musculoskeletal disorders such as neck and low back pain (LBP) were considered to be one of the most commonly encountered clinical conditions among working people such as health care professionals, academicians and agricultural workers.¹²⁻¹⁴ Hence, appropriate management strategies are necessary to manage musculoskeletal disorders within wide range of populations. Even though a variety of treatment options are available to manage musculoskeletal disorders, no particular treatment option is superior to the others apart from exercise therapy in the care of neck and back pain.¹⁵⁻¹⁷ Therefore, it is often challenging to achieve justifiable management effects with one particular treatment. In

this perspective, FM lessons, which are gaining popularity, are suggested to be an alternative therapy in musculoskeletal rehabilitation for correcting the movement pattern.¹⁸

To our knowledge, in the past two decades, two systematic reviews have been seeking to determine the effect of Feldenkrais.^{10,11} However, none of the reviews focused specifically on musculoskeletal disorders and FM. Hence, it is appropriate to systematically review on the evidence on FM on these special populations. In addition, there is very little scientific understanding on types of approaches, whether ATM or FI to be selected as a mode of lessons for FM education. To date, this component has received scant attention in the research literature. A search of the literature revealed only few studies have been carried out on musculoskeletal disorders and FM which also shows inadequacies in the outcome measure used. The present systematic review, attempts to review the research in the field of musculoskeletal disorders and its effectiveness to FM.

2. Aim

The specific objective of this systematic review was to identify which types of approaches were commonly being used in FM educational program and to identify a range of outcome measures used among those who performed FM education program with musculoskeletal disorders.

3. Materials and methods

3.1. Search strategies for identification of articles

We comprehensively searched through the electronic online databases such as SCOPUS, PubMed, Science Direct, Taylor and Francis from 1st January 1999 to 22nd December 2015. A range of keywords for our search were: #1 (Feldenkrais) OR #2 (feldenkrais) AND #3 (musculoskeletal disorders) OR #4 (neck pain) OR #5 (low back pain). To complement the systematic search, hand search was executed by reviewing the reference lists of all the included studies. The systematic search strategy was restrained to literatures written in English.

3.2. Type of studies

Two reviewers (VM and AP) independently selected the eligible studies based on the inclusion and exclusion criteria as set by the study protocol. All quantitative studies that investigated FM in patients with musculoskeletal disorders were considered for inclusion in this review process in order to explore the effect and the type of FM and to identify the outcome measures used in the studies. Articles such as systematic review, semi-systematic review, commentaries, letter to editor, conference abstracts and animal studies were excluded from this systematic review process.

3.3. Type of participants and outcomes

All studies had to be carried on either the neck or LBP meaning that studies that used other than neck and low back problems

were excluded, while studies that had at least neck and low back problems were included.

3.4. Type of interventions and comparisons

If the subjects received either ATM or FI form of FM, the article was included in the systematic review process. The comparison group could include placebo or no treatment group, control or an alternative form of treatment such as conventional physiotherapy treatment sessions, body awareness technique and other forms of relaxation techniques.

3.5. Data extraction and analysis

Data extraction was carried out by one reviewer (VM) and confirmed by a second reviewer (AP). The following information was retrieved from full-text articles of all the included studies: year of publication, the first author's name, study design, population, intervention, and control group, outcome measures used in patients with musculoskeletal disorders in the study and key findings.

4. Results

4.1. Literature search

The systematic search retrieved a total of 165 potentially relevant articles and this was presented using PRISMA flow diagram (Fig. 1). After application of inclusion/exclusion

criteria to the titles of the study and abstract, duplicates and the other irrelevant articles were removed. A total of four articles were selected with one article from other appropriate resources. Out of four quantitative studies retrieved for this systematic review, only two studies^{19,20} were with randomized controlled trial and the other two studies were carried out with a study design of quasi-experimental and immediate pre- and post-study design.^{21,22} All the incorporated scientific literature normally had a sample size with a mean of 65.5 participants with a standard deviation of 30.1.

4.2. Description of included studies

The characteristics of the included studies are depicted in Table 1. The FM of lessons was employed in all of the included studies.¹⁹⁻²² People under investigation in the included studies ranged from different musculoskeletal disorders such as neck, scapula, shoulder and LBP. Three of the selected studies had neck pain¹⁹⁻²¹ and one of them had visually impairment subjects who suffered from neck/scapular pain.¹⁹ Similarly, two studies have been carried out on LBP population^{21,22} and in that only one study has been virtuously conceded out on LBP.²²

4.3. Type of approach/number of sessions/duration

To determine the type of approach, all of the four studies utilized both ATM lessons¹⁹⁻²² and in which FI methods were utilized by three of the total selected studies along with ATM lessons.¹⁹⁻²¹ On the other hand, only one study utilized ATM lessons alone.²² The number of sessions lasts between 1 and 20

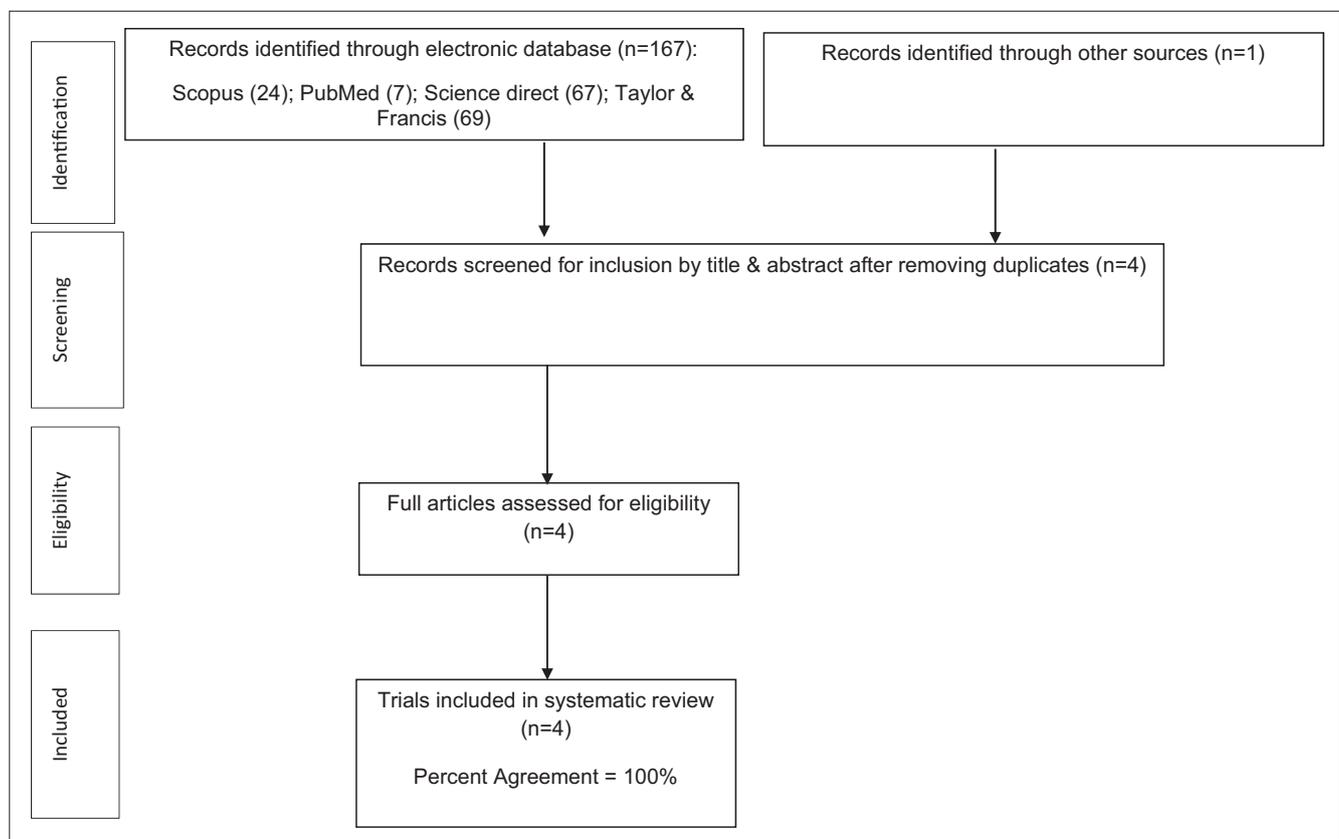


Fig. 1 – Flow chart of the process of selecting potential studies.

Table 1 – An overview of trails on Feldenkrais methods with relation to musculoskeletal disorders.

First author	Study design	Population	Intervention	Control	Outcome measures	Findings/ P-value/d	Quality assessment (PEDro)
Lundqvist et al. (2014)	RCT	Chronic neck/scapular pain – visually impaired (n = 61)	n = 30, FM ATM and FI in parallel forms/1 session/12 consecutive weeks/2 h per week	n = 31, did not receive any treatments	1. VAS 2. Visual, musculoskeletal, balance questionnaire 3. SF-36 questionnaire	FM group showed less pain in occipital left and trapezius left ($P < 0.01/d = 0.71$) and for trapezius right ($P < 0.001/d = 0.84$)	5/10
Smith et al. (2001)	Immediate: pre and post-trial	Chronic LBP (n = 26)	n = 14, FM ATM via audiotape/30 min	n = 12, 30 min audiotaped story	1. SF-MPQ 2. STAI	FM effective in reducing the affective dimension of pain ($P < 0.04/d = 0.22$)	5/10
Malmgren-Olsson et al. (2001)	A quasi-experimental study	Non-specific musculoskeletal disorders (n = 78)	1. n = 23, BAT/17 group sessions/3 individual sessions/90 min 2. n = 22, FM ATM/15 sessions/FI/5 individual sessions	n = 26, routine PT treatment/5–45 sessions	1. SCL-90 2. MPI instrument 3. SASB model	BAT and FM might be more effective than conventional treatment for certain dimension of pain ($P < 0.01/d > 0.5$)	5/10
Lundblad et al. (1999)	RCT	Neck-shoulder complaints (n = 97)	1. n = 20, FM ATM/12 sessions/7–8 subjects per group/50 min FI/4 individual sessions/50 min 2. n = 15, PT intervention/group of 5–8 subjects/16 weeks/twice a week/50 min	n = 23, did not receive any treatments	1. ROM neck and shoulder 2. Endurance score	FM showed positive changes in pain intensity ($P < 0.05/d = 0.5$)	5/10

Comments: d – Cohen d effect size ≥ 0.2 (small), ≥ 0.5 (medium), and ≥ 0.8 (large), PEDro – Physiotherapy Evidence Database, RCT – randomized controlled trial, FM – Feldenkrais method, ATM – awareness through movement, FI – functional integration, VAS – visual analog scale, SF-36 – 36-Item Short-Form Health Survey, SF-MPQ – Short-Form McGill Pain Questionnaire, STAI – the State-Trait Anxiety Inventory, BAT – body awareness therapy, PT – physiotherapy, SCL-90 – 90-item self-report symptom inventory for psychological symptom, MPI – Multidimensional Pain Inventory, SASB – Structural Analysis of Social Behavior, ROM – range of motion.

sessions between the selected studies.¹⁹⁻²² In terms of duration of the exercises, it ranged between 30 min to 2 h between the selected studies.^{19,20,22} One study did not report the duration.²¹

4.4. Outcome measure used

The visual analog scale (VAS), Visual, Musculoskeletal, and Balance complaints questionnaire, Medical Outcomes Study 36-Item Short-Form Health Survey bodily pain scale (SF-36), Short-Form McGill Pain Questionnaire (SF-MPQ), the State-trait Anxiety Inventory (STAI), Symptom Check List-90 (SCL-90), Swedish version of Multidimensional Pain Inventory (MPI), Structural Analysis of Social Behavior (SASB), goniometer, the Nordic Council of Ministers questionnaire concerning neck and shoulder complaints, Electronically braked bicycle ergometer, normogram, sportster, and isokinetic dynamometer are some of the outcome measures used in the included studies.¹⁹⁻²²

All of the included studies used different pain scales such as VAS, SF-MPQ, and an MPI Swedish version for assessing the pain level before and after treatment.¹⁹⁻²¹ SCL-90 and STAI were used by two of the selected studies for assessing psychological symptoms and anxiety levels.^{21,22} Visual, Musculoskeletal and Balance complaints questionnaire and the Nordic Council of Ministers questionnaire were used for ascertaining musculoskeletal complaints.^{19,20} Electronically braked bicycle ergometer was used for assessing the endurance level of the people before and following FM.²⁰ Remaining outcome measures did not show similarity in the variable tested among the studies and this is outlined in Table 1.

4.5. Validity assessment

The extracted data were analyzed to reduce risk of bias by two investigators (VM and AP). The quality of the selected studies was assessed using Physiotherapy Evidence Databases (PEDro) scale which has been shown to have a reliable scoring method.²³ The results are presented in Table 1. The score of the selected studies was at least 5/10. The PEDro scores reported by both authors were analyzed through percent agreement statistics using SPSS v. 21 (IBM Corporation; Armonk, NY). The results of the percent agreement revealed 100%, which indicates that both the authors scored equally for the selected articles.

5. Discussion

Intermediate results were found with all the four included studies showing effectiveness following FM of education program among musculoskeletal disorders. This overall arbitrate results were in support of a review article in which the authors suggested that the FM education program can be used as an alternative therapy in musculoskeletal rehabilitation.¹⁸ However, these findings cannot be extrapolated to all musculoskeletal patients as the included studies in the present systematic review had different categories of musculoskeletal disorder patients. Hence, the results of the study need to be interpreted with caution. These statements are in

accord with earlier published two systematic reviews in the field of FM, in which authors suggested that there were positive changes with high risk of bias, with clinical heterogeneity between studies, thus tampering the results.^{10,11} However, these reviews were carried out on a wide range of patients with different clinical conditions apart from musculoskeletal disorders.

Methodological differences between included studies may account for intermediate results, thus interfering with definite results of the present systematic review. There are some points in support of this view. Firstly, the type of approaches that are carried out in the included studies. Three of the four included studies had neck pain population, in which only one study had ATM and FI method of FM lessons in parallel.¹⁹ The method was against other two studies in which they had individualized sessions of FI, which is between four and five sessions apart from ATM lessons.^{20,21} However, an earlier published qualitative study has utilized ATM method of education alone and proved a positive experience following these lessons.⁴ It can therefore be assumed that either ATM or FI may produce desirable benefits to the people. This can be attributed to one of the included studies, which had chronic LBP population in which the methodology of ATM lessons has been utilized.²² Another key point to remember here is the evidence to suggest that this is the only study that was carried out on LBP. However, this result corroborates with earlier qualitative trials in which they have suggested that FM empowers adults with back, shoulder and neck pain.^{4,24} This finding has important implications for developing future studies that should focus on a particular type of exercise on specific population and this should be reflected as an important concern for future research.

Secondly, the number of sessions also varied between the studies which ranged between 1 session to 20 consecutive sessions. One of the included studies had seen the immediate effect and reported that the affective domain of pain component reduced, which indicates only one session is enough to produce a desirable result, if the people are going to totally focus on the instruction as provided by the practitioner.²² The concept of self-awareness principles, which is used in FM lessons, can be used for supporting the above notion.¹ Further studies, which take these variables into account, will need to be undertaken.

Thirdly, the duration of exercises that was reported in this review ranged between 30 min to 2 h. However, the finding of the current systematic review does not support the previous article in which the author has suggested that the optimal sessions should last for about 35-45 min.¹ The reason for this optimal time is suggested to be mental fatigue, which may occur after 45 min.¹ In addition, again this depends on the people's potential as the lessons are mainly based on their awareness.¹ In further research, the use of particular duration which is between 35-45 min, should be taken into account.¹

Finally, the outcome measure, which was used in these studies, is differing in many terms. In general, outcome measure is considered as one of the important tools used to determine the course of an intervention, which needed to be valid and reliable.²⁵ In this context, an earlier literature highlighted the importance of outcome measure handled by the FM practitioners as they face difficulty in using it, due to a wide range of applications of the FM.²⁵ Hence, we have

accounted to analyze the outcome measures, which were used in the included studies. Pain, which is considered as one of the important outcome measures for any musculoskeletal disorders, has been tested with different tools with diverse domains. Two of the included studies utilized pain intensity using a VAS scale, which ranged from 0 to 100 with 0 as no pain and 100 as maximal/unbearable pain.^{19,20} However, one of the studies, which confirmed pain by palpation method on visually challenged patients, did not show any changes following FM lessons.¹⁹ In contrast, the pain decreased in the treatment group of the same study on the muscular complaints questionnaire.¹⁹ In comparison, with the other study, the pain reduced in the FM group.²⁰ Hence, it can be inferred that the pain intensity differed following the FM lessons with different tools. Two studies that utilized SF-MPQ and MPI as one of the outcome measures for pain showed improvement in the affective dimension of pain.^{21,22} The study, which utilized MPI following FM, showed improvement, but when compared with other treatments the effect size was between small to medium.²¹ A possible explanation for the improvement in the affective dimension of the pain could be attributed to awareness, which is considered as central to the FM lessons, which would have eased the movement and neuromuscular functions.^{1,22} Hence, collectively it can be inferred that the pain intensity decreased following FM lessons.

Next in the outcome measure, which shares a common variable, is psychological symptom, and this was measured by STAI and SCL-90.^{21,22} Several psychological variables were tested in the studies, which utilized STAI and SCL-90, in which one study results did show alterations in a few sub-scales, where as in STAI, no change were reported following FM.^{21,22} This could be attributable to the difference in the protocol and timings as one study opted only a single session of an FM lesson for post readings.

Another variable that is of interest in relation to the principles of FM lesson is maximum oxygen uptake (VO_2). This was measured by normogram, which was adjusted for age in one of the included studies.²⁰ Following, the intervention, the VO_2 showed changes only in the FM group as compared to the other group. The reason for this is not clear, but it may have something to do with respiratory mechanical principles of FM.¹ The ease of respiration, which would have been achieved as because of FM of lessons during the one year follow-up, might be the reason for the increase in VO_2 . The appropriate breathing mechanism is one of the skills that should be acquired when a subject masters the technique in FM. Future topics on the impact of respiratory mechanism following FM are therefore recommended and trials are underway among our group to produce evidence on these constituents.

The outcome measures, which were used to measure the musculoskeletal complaint, such as visual, musculoskeletal, and balance complaints questionnaire and the Nordic Council of Ministers questionnaire concerning neck and shoulder complaints and other outcome measures, also differed entirely between the studies. Apart from the type of exercises and outcome measures used, it has been inferred that three of the included articles have carried out their studies in Sweden and another one study in Australia. Hence, the information obtained in this systematic review was restricted to a

particular population. Therefore, the results could not be generalized. Hence, trials are to be carried out in different zones in order to generalize the study findings of the effectiveness of FM lessons.

5.1. Significance of the study

The findings of this systematic review provided knowledge on the effect of the Feldenkrais method on the conditions such as neck and LBP, considering type, number of sessions, and duration and outcome measures into account.

5.2. Implications for clinical practice

Faulty movement patterns and habitual abnormal body posture as because of pain may predispose to an abnormal breathing pattern. An optimal respiratory mechanism which is considered to be a mastery level in FM can be considered when prescribing FM to the people. There are favorable evidences that FM of educational approach may be considered for musculoskeletal disorders such as neck and LBP in reducing the intensity of pain as well to reduce the impact of anxiety levels. Considering all the above discussion for clinical practice, it can be suggested that if all the principles, which are suggested for FM lessons, are applied systematically, it will benefit the people.

5.3. Implications for research

Further high quality research is required with valid and reliable outcome measures for FM of educational program investigating neck and back problem separately. This needs to account the type, number of sessions and duration of lessons. The investigation should focus on the impact of the respiratory mechanism before and after the FM of education program as this is considered as one of the important principles of learning FM lessons.

6. Conclusions

In conclusion, this systematic review indicates that across different musculoskeletal conditions, different type of exercise mode and duration are inconsistently reported. Given the fact that the positive effect following FM among neck and LBP disorders was reported by all of the studies, some of good quality, it is concluded that FM proved to be effective, but not in all people with musculoskeletal disorders.

Conflict of interest

None declared.

REFERENCES

1. Lyttle T. The Feldenkrais method: application, practice and principles. *J Bodyw Mov Ther.* 1997;1(5):262-269.

2. Plastaras C, Schran S, Kim N, Darr D, Chen MS. Manipulative therapy (Feldenkrais, massage, chiropractic manipulation) for neck pain. *Curr Rheumatol Rep*. 2013;15(7):339.
3. Posadzki P, Stöckl A, Mucha D. Qi Gong exercises and Feldenkrais method from the perspective of Gestalt concept and humanistic psychology. *J Bodyw Mov Ther*. 2010;14(3):227–233.
4. Ohman A, Aström L, Malmgren-Olsson E-B. Feldenkrais therapy as group treatment for chronic pain – a qualitative evaluation. *J Bodyw Mov Ther*. 2011;15(2):153–161.
5. Buchanan PA, Ulrich BD. The Feldenkrais method: a dynamic approach to changing motor behavior. *Res Q Exerc Sport*. 2001;72(4):315–323.
6. Kolt G, McConville J. The effects of a Feldenkrais Awareness Through Movement program on state anxiety. *J Bodyw Mov Ther*. 2000;4(3):216–220.
7. Ullmann G, Williams HG, Hussey J, Durstine JLM. Effects of Feldenkrais exercises on balance, mobility, balance confidence, and gait performance in community-dwelling adults age 65 and older. *J Altern Complement Med*. 2010;16(1):97–105.
8. Stephens J, DuShuttle D, Hatcher C, Shmunis J, Slaninka C. Use of awareness through movement improves balance and balance confidence in people with multiple sclerosis: a randomized controlled study. *Neurol Rep*. 2001;25(2):39–49.
9. Ayiesha R, Joseph HL, Roslan H. Preliminary evidence on the Feldenkrais method as an alternative therapy for patients with chronic obstructive pulmonary disease. *Focus Altern*. 2013;18(3):126–132.
10. Hillier S, Worley A. The effectiveness of the Feldenkrais method: a systematic review of the evidence. *Evid Based Complement Altern Med*. 2015;1–12.
11. Ernst E, Canter P. The Feldenkrais method – a systematic review of randomized clinical trials. *Phys Medizin Rehabil Kurortmedizin*. 2005;15(3):151–156.
12. Nordin NAM, Leonard JH, Thye NC. Work-related injuries among physiotherapists in public hospitals: a Southeast Asian picture. *Clinics (Sao Paulo)*. 2011;66(3):373–378.
13. Mohan V, Justine M, Jagannathan M, Bt Aminudin S, Bt Johari SH. Preliminary study of the patterns and physical risk factors of work-related musculoskeletal disorders among academicians in a higher learning institute. *J Orthop Sci*. 2015;20(2):410–417.
14. Henry LJ, Jafarzadeh Esfehiani A, Ramli A, Ishak I, Justine M, Mohan V. Patterns of work-related musculoskeletal disorders among workers in palm plantation occupation. *Asia Pac J Public Health*. 2015;27(2):NP1785–NP1792.
15. Ferrari R, Russell AS. Neck pain. *Best Pract Res Clin Rheumatol*. 2003;17(1):57–70.
16. Jensen I, Harms-Ringdahl K. Neck pain. *Best Pract Res Clin Rheumatol*. 2007;21(1):93–108.
17. Airaksinen O, Brox JI, Cedraschi C, et al. European guidelines for the management of chronic non-specific low back pain. *Eur Spine J*. 2006;15(suppl 2):S192–S300.
18. Henry LJ, Paungmali A, Mohan V, Ramli A. Feldenkrais method and movement education – an alternate therapy in musculoskeletal rehabilitation. *Polish Ann Med*. 2015.
19. Lundqvist L-O, Zetterlund C, Richter HO. Effects of Feldenkrais on chronic neck/scapular pain in people with visual impairment: a randomized controlled trial with one-year follow-up. *Arch Phys Med Rehabil*. 2014;95(9):1656–1661.
20. Lundblad I, Elert J, Gerdle B. Randomized controlled trial of physiotherapy and Feldenkrais interventions in female workers with neck-shoulder complaints. *J Occup Rehabil*. 1999;9(3):179–194.
21. Malmgren-Olsson E-B, Armelius B-A, Armelius K. A comparative outcome study of body awareness therapy, Feldenkrais, and conventional physiotherapy for patients with nonspecific musculoskeletal disorders: changes in psychological symptoms, pain, and self-image. *Physiother Theory Pract*. 2001;17(2):77–95.
22. Smith A, Kolt G, McConville J. The effect of the Feldenkrais method on pain and anxiety in people experiencing chronic low back pain. *New Zeal J Physiother*. 2001;29(1):6–14.
23. Maher CG, Sherrington C, Herbert RD, Moseley AM, Elkins M. Reliability of the PEDro scale for rating quality of randomized controlled trials. *Phys Ther*. 2003;83(8):713–721.
24. Pugh JD, Williams AM. Feldenkrais method empowers adults with chronic back pain. *Holist Nurs Pract*. 2014;28(3):171–183.
25. Connors KA, Pile C, Nichols ME. Does the Feldenkrais method make a difference? An investigation into the use of outcome measurement tools for evaluating changes in clients. *J Bodyw Mov Ther*. 2011;15(4):446–452.