The Effectiveness of the Feldenkrais Method: A systematic review of the evidence

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Executive Summary

The Feldenkrais Method (FM) has broad application in populations interested in improving awareness, health and ease of function. This systematic review aimed to update the evidence for the benefits of FM, and for which populations.

A best practice systematic review protocol was devised. Included studies were appraised using the Cochrane risk of bias approach and trial findings were analysed individually and collectively (meta-analyses) where possible.

Twenty randomised, controlled trials were included (an additional 14 to an earlier systematic review). The population, outcome and findings were highly heterogeneous. Some meta-analyses were able to be performed, finding in favour of FM for balance measures in ageing populations - for example Timed Up and Go and Functional Reach tests: MD -1.13sec [CI -1.7,10.56], p=0.0001; and MD 6.29cm [CI 4.28,8.3], p<0.00001, respectively. Single studies reported significant positive effects for reduced perceived effort, and increased comfort, body image perception, and dexterity. Risk of bias was high, thus tempering some results. Considered as a body of evidence, the beneficial effects seem to be generic, supporting the proposal that FM works on a learning paradigm rather than disease-based mechanisms.

Further research is required, however in the meantime, clinicians and professionals can promote the use of FM in populations interested in efficient function and self-efficacy, provided individual outcomes are monitored.

Introduction

The Feldenkrais Method (FM) was developed over a period of decades in the last century by Dr Moshe Feldenkrais. He claimed the basis of the approach was founded in the human potential for *learning how to learn* [1]. As such, he operationalised an experiential process, or set of processes, whereby an individual or a group could be guided through a series of movement- and sensation-based explorations. The purpose of these explorations was to practise the non-linear process of sensing the difference between two or more options to achieve the stated movement task, and making a discernment about which may feel easier, less effortful, more engaged and so on. The discernments are predicated on a judgement that is positive (pleasurable, easy, less effort) compared with experiencing a negative feedback signal such as pain, strain or discomfort. Further to this, the participants are encouraged to generate many alternative movement solutions to the guided task to increase the opportunity for further distinctions and improvements to be made. Thus the process of intention, action, gaining feedback, making decisions, and re-enacting with adaptations, constitutes the learning framework in a somatic context [2].

Description of the Feldenkrais Method delivery

The two modes of delivery that are offered to the public are either individual, manually-directed lessons (Functional Integration) or group, verbally-directed classes (Awareness Through Movement). The nomenclature for both reflect the fundamentals of the approach: that movement has to be based in a *functional* intention for the system to engage, and that by becoming *aware* of what and how we act (move) we become better placed to choose an alternative behaviour (movement pattern) [3].

Applications

The applications of the method have varied widely across countries from general education or children with learning issues, through to enhancing performance in sports and theatre. The clinical applications have received the most interest in the published literature because of the intuitive appeal of basing a health recovery process on a learning paradigm, and because of the inherent fostering of self-efficacy that occurs particularly in a group setting.

Reasons for current review

In the climate of evidence based practice in the health domain, any approach being offered to the public is being scrutinised for evidence of effectiveness and, if effective, for what type of benefit and of what magnitude for any clinical population. An earlier systematic review of the evidence for the method was published in 2005 by Ernst and Canter [4]. This review included six randomised controlled trials (RCTs) of low to moderate quality in populations such as multiple sclerosis, chronic low back pain and neck issues. They concluded that there was encouraging evidence, but not compelling, due to the low number of studies, high level of clinical heterogeneity between studies and methodological flaws. The methods employed by Ernst and Canter [4] were robust for the time, however their risk of bias assessment used a now discarded tool (the Jadad) and their search covered until 2003. Therefore it is timely to systematically update the evidence for the Feldenkrais Method with current review procedures.

Aims of this review

This review had the aims of:

1. systematically identifying and appraising the evidence for the effectiveness of the Feldenkrais Method, and, if there are beneficial outcomes,
2. determining what is the nature and order of magnitude of these benefits, and for which population/s.

Methods

The International Centre for Allied Health Evidence (iCAHE) team, University of South Australia, undertook an extensive independent literature search to identify all relevant primary evidence related to the project aims.

Objectives of the review

- To identify and critique all peer-reviewed primary evidence relating to the effectiveness and safety of the Feldenkrais Method for human (clinical) conditions.
- Analyse the findings from the primary evidence for specific conditions, by reporting the number and design of relevant trials per condition, identifying the potential domains of effect, collating the findings statistically and narratively, and making recommendations for clinical utility and for future research.

Criteria for considering studies for this review

We employed systematic review methods based on the PRISMA guidelines [5].

Types of studies

We considered all types of primary studies in the first instance in order to fully explore the potential populations and outcomes covered. In the final inclusion only studies with a random allocation and a stated control group were included. Any secondary research (systematic and semi-systematic reviews) found were not included, but rather their included studies were retrieved in full and added to the potential pool in order for all primary studies to be appraised with a consistent method.

Types of participants and outcomes

We included any population where there was an outcome of interest related to improvement in health and/or function.

Types of interventions and comparisons

Either form of Feldenkrais Method (Functional Integration or Awareness through Movement) were included. Comparisons included placebo, control or an alternate method.

Search methods for identification of studies

We searched the databases of AMED (Allied and Complementary Medicine), Embase Classic+Embase, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R), CINAHL , Scopus, Cochrane, PsycINFO, Pubmed and Google Scholar from inception to July 2014. We considered all languages and publication status.

The search terms included variations and combinations of methodology terms (such as randomised, trial, clinical, controlled), with intervention terms such as Feldenkrais (Method), Awareness through Movement and Functional Integration. An example of one full electronic search strategy is presented in Table 1.

#	Searches	Results
1	(Clinical trial or randomised trial or controlled trial).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, nm, kf, ps, rs, an, ui]	1900972
2	(Feldenkrais or awareness through movement or functional integration).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, nm, kf, ps, rs, an, ui]	2239
3	1 and 2	47
4	remove duplicates from 3	40

Table 1: Example of search strategy.

From the generated lists from each database, duplicates were removed and the first high level sift was performed by one author based on title alone. The second level of review was performed by both authors and required retrieval of the abstract at minimum. The surviving studies were examined in full to confirm inclusion. Those excluded were recorded with reasons.

All retrieved studies were checked for additional references, and experts in the field were contacted to assist in identifying any further studies published or unpublished.

Data collection and analysis

Relevant data were extracted from each of the included studies using a standard trial summary sheet by one author and checked by the second. Data included author, date, study design, population sample, intervention, comparison, outcome measures, results and comments. A risk of bias evaluation was also performed for each study by one author using standard Cochrane tables [6] with checking and data entry by the second author. Any disagreements were resolved by consensus.

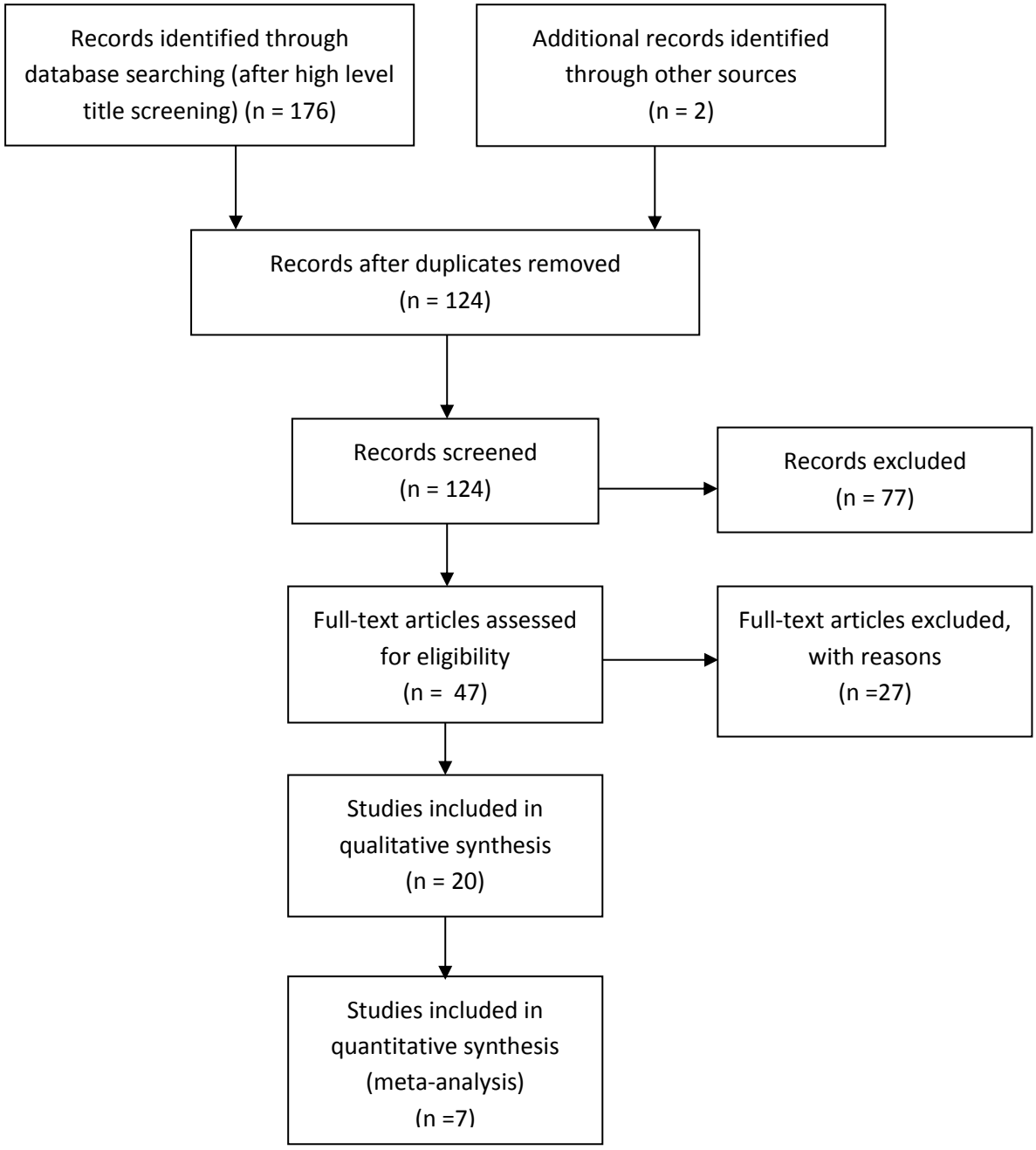
Where sufficient clinical homogeneity existed across studies (population and outcome), data were extracted for meta-analyses. We planned to extract and analyse data to calculate individual and total effect sizes through odds ratios or standardised mean differences (fixed effect), and 95% confidence intervals. This would require the identification of the number of participants in each group in each trial and total number (for dichotomous data) and number of participants plus mean and standard deviations for each group (for continuous outcome data). Statistical heterogeneity would be evaluated based on visual inspection of forest plots and on the I^2 statistic. It was not anticipated that any other analyses would be possible (sub-group or sensitivity) due to a paucity of studies.
Failing the possibility of meta-analyses, then results would be synthesised and reported narratively.

Results

Included studies

The systematic search yielded over 1,300 initial titles for high pass screening. See Figure 1 for the PRISMA Flow diagram. With duplicates removed, 124 records were considered at the abstract level by both authors, with an additional two studies sourced from experts in the field. From this, 47 full text articles were reviewed against the criteria and 27 excluded with reasons noted below.

Figure 1: PRISMA Flow diagram



Fourteen new RCTs were included along with the original six studies in the Ernst and Canter [4] review. See Appendix 1 for details of all included studies. From this total of 20 studies, there were seven studies sufficiently homogenous to allow meta-analysis.

Description of studies

Publication dates ranged from 1991 [7] through to 2014 [8]. Populations under investigation in the included RCTs ranged from healthy volunteers [7, 9-14], healthy ageing [15-17], institutional ageing [8], people with multiple sclerosis [18-23], eating disorders [24], myocardial infarct [25] and sleep bruxism [26]. Studies were generally low in sample size with a mean of 40.8 participants (SD 23.5). The nature of the Feldenkrais interventions also varied in delivery mode, intensity and frequency. The predominant methods were single or multiple ATM lessons delivered either in a group or individually using an audio recording. The comparison groups were most commonly an alternate form of therapy (such as relaxation classes or generic movement/balance classes) or usual activities/no intervention.

Outcomes were also heterogeneous in keeping with the needs of the diverse populations and are listed in Appendix 1. They were predominantly: performance or activity-based tests such as for balance or dexterity; symptom-based such as pain scores, perceived effort or mood; or linked to quality of life.

Excluded studies

A further five non-randomised but controlled trials were retrieved and have been reported in summary form at the end of Appendix 1 (one study was reported in three papers [27-29]). Studies (22) that were retrieved but excluded are available from the authors. Reasons for exclusion were predominantly around design: two were systematic reviews; eight had no control group; eight were non-systematic reviews; one was not exclusively Feldenkrais in the intervention group; one was a content analysis of an intervention; one was a phenomenological analysis and one was a commentary. See Appendix 2 for a list of excluded studies with reasons.

Risk of bias in included studies

Risk of bias was high in most studies. Less than a quarter of the studies had adequate random allocation processes and only a third had blinding of outcome assessments. It has to be acknowledged that for trials requiring an intervention like Feldenkrais it is difficult or inappropriate to expect blinding of participants or therapists. Figures 2 and 3 summarise the risk of bias analysis. It can be seen that a definitive judgement could not be made in many cases as it could be not be

confirmed whether there was a clear risk of bias (given a red status) or whether the authors had simply not stated the process in sufficient detail for a judgement to be made – hence the risk of bias indicator was left blank.

Figure 2: Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

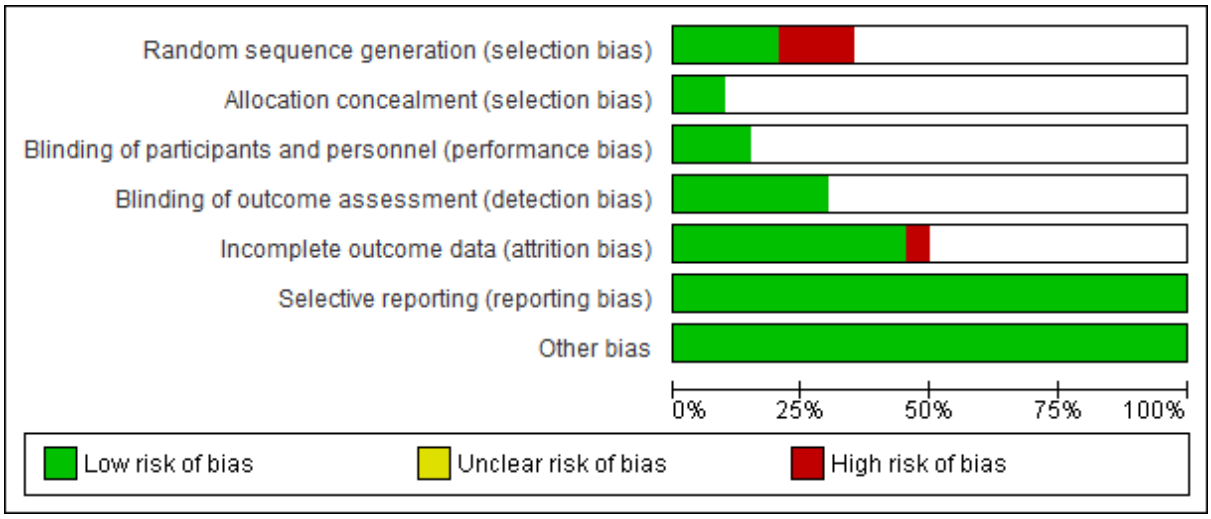
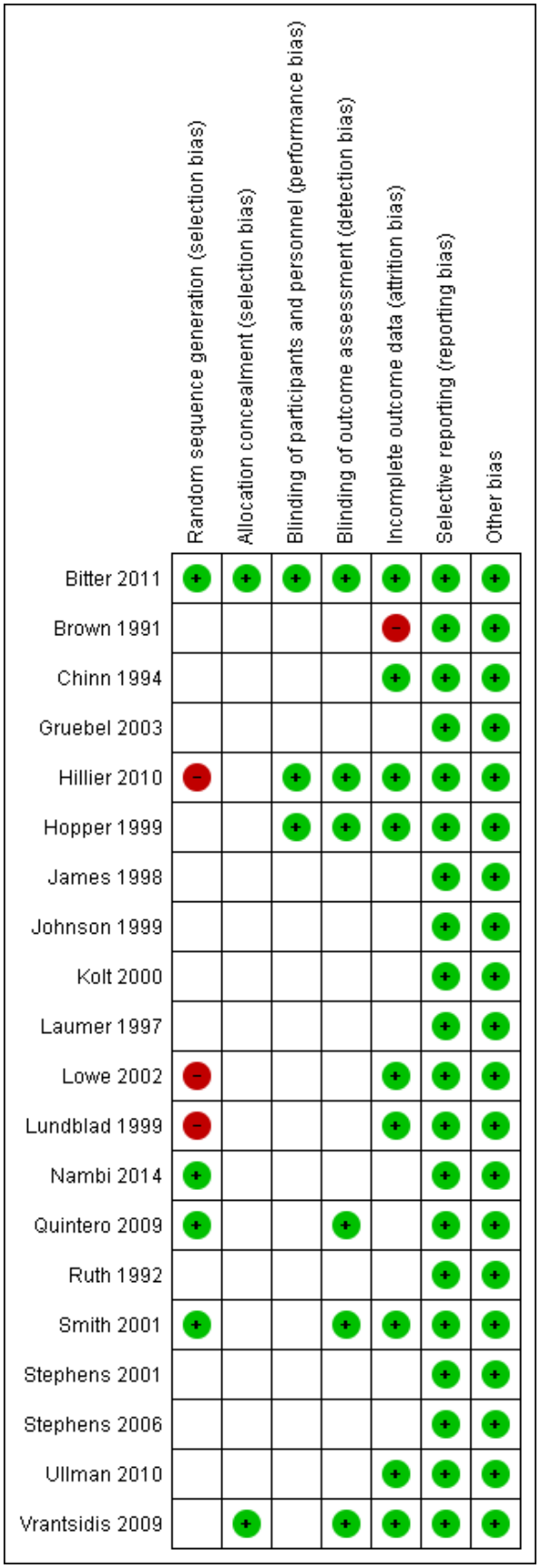


Figure 3: Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



Effects of interventions

Sufficiently homogenous data were able to be extracted to perform meta-analyses in the areas of balance training in ageing populations.

Four studies [8, 15-17], reported on the Timed Up and Go assessment for balance and mobility, finding in favour of Feldenkrais classes (Figure 4): pooling post intervention measures gave a mean difference of -0.88 s (95%CI -1.39, -0.36), p=0.0008. A sensitivity analysis was performed as one study by Hillier et al. [17] compared Feldenkrais to another balance class whereas the other three studies compared the FM class to wait list control or no class. Removal of Hillier et al. [17] (Figure 4a) strengthened the effect with a mean difference of -1.13 (95%CI -1.7, -0.56), p=0.0001.

Figure 4: Effect sizes of Feldenkrais versus control for the Timed up and go test (measured in seconds; balance and mobility)

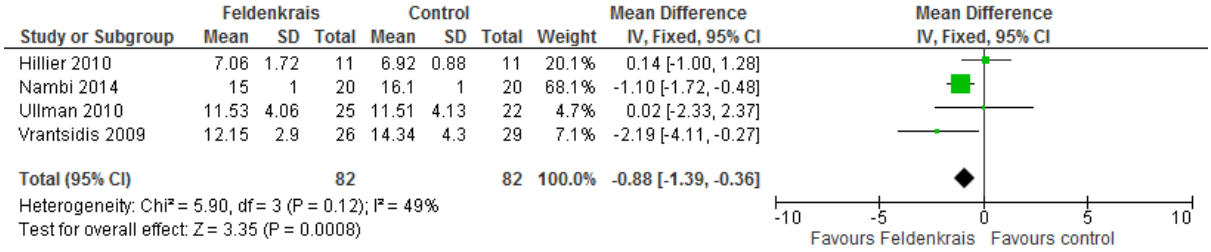
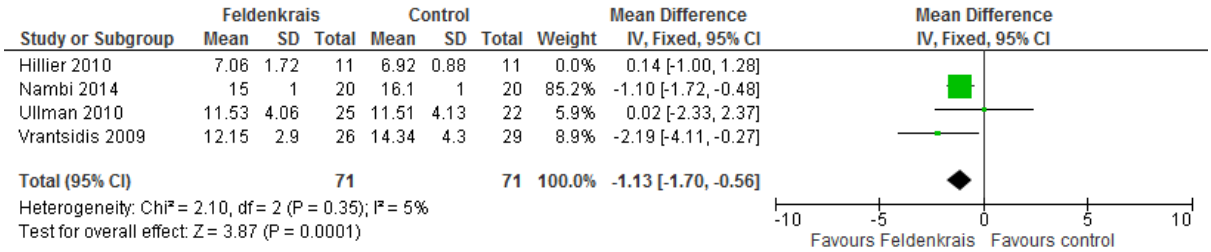
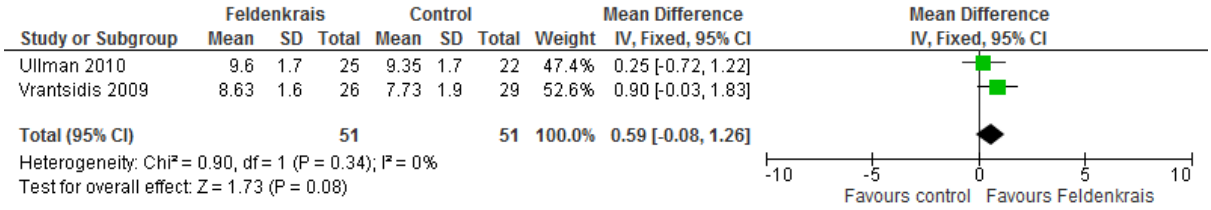


Figure 4a : Effect sizes of Feldenkrais versus control for the Timed up and go test (measured in seconds; balance and mobility) with Hillier 2010 removed (control group was alternate balance class)



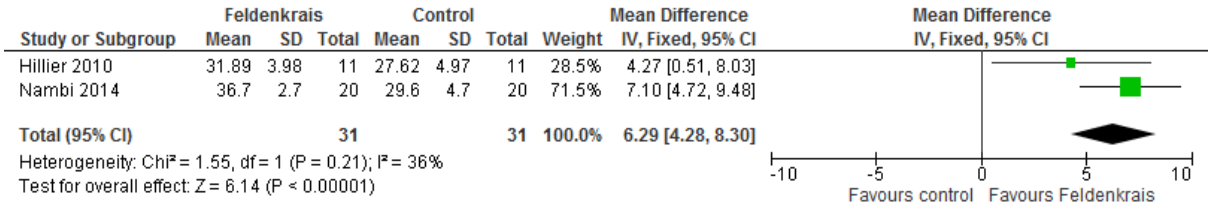
Two studies [15,16] evaluated balance confidence using the Falls Efficacy Scale after FM classes (Figure 5) – pooled results trended in favour of the FM however failed to reach significance (MD 0.59, 95%CI -0.08, 1.26; p=0.08).

Figure 5: Effect sizes of Feldenkrais versus control for the Falls Efficacy Scale (balance confidence)



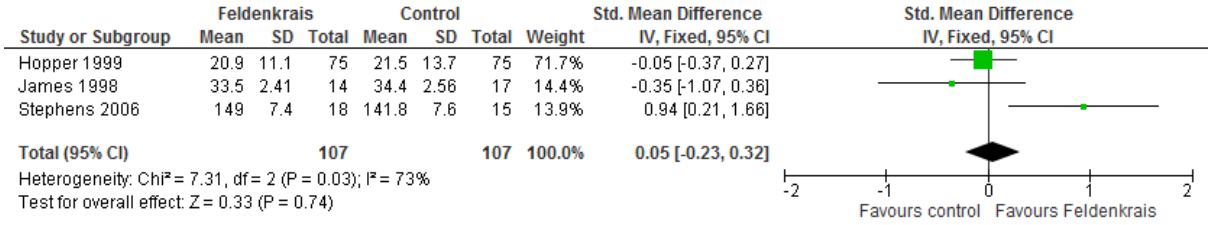
Two studies [8,17] evaluated balance using the Functional Reach Test after FM classes (Figure 6) – pooled results found in favour of the FM classes (compared to nothing or another generic balance class) with a mean difference of 6.29cm (95%CI 4.28,8.3), p<0.00001.

Figure 6: Effect sizes of Feldenkrais versus control for the Functional reach test (measured in cm; balance)



Meta-analysis was also able to be performed using three studies measuring the influence of FM classes on hamstring length in healthy populations [10,11,13]. Whilst the measure was reported as similar (active knee extension test) the results looked heterogeneous therefore a standardised mean difference was calculated. No significant effect was found after the intervention compared to control (SMD 0.05, 95%CI -0.23, 0.32; p=0.74) and statistical heterogeneity was high (I^2=73%) (Figure 7).

Figure 7: Effect sizes of the Feldenkrais Method on the Active Knee Extension Test



Single studies reported statistically significant positive benefits compared to control interventions and included:

- Greater neck flexion and less perceived effort after a single FM lesson for neck comfort [9]; reduced prevalence of neck pain and disability in symptomatic women after FM (individual and group sessions compared to conventional care or home exercises) [21]; reduced perceived effort in FM group for people with upper torso/limb discomfort [20]
- Improved balance in people with MS after eight FM sessions [19]
- Improved body image parameters in people with eating disorders after nine hour FM course [24]
- Reduction in nocturnal bruxism in young children after 10 week course of FM lessons [26]
- Improved dexterity in healthy young adults after a single session of FM class [14].

Seven of the 20 studies failed to show any superior positive effects of FM compared to other comparison modalities. See Appendix 1 for details.

No studies reported adverse events.

Discussion

Summary of main results

The majority of the 20 included studies reported significant positive effects of FM in a variety of populations and outcomes of interest. A high risk of bias/poor methods reporting does temper the interpretation of these findings. The low amount of confirmed/reported adherence to best practice conduct of RCTs may be partially attributable to the age of the studies when knowledge in the area of trial conduct was less.

Nevertheless meta-analyses in the area of balance training in ageing populations found in favour of the FM classes for clinical measures such as the Timed Up and Go and Functional Reach tests. Both these measures have import for falls risk and whilst the Timed Up and Go effect size was probably not clinically significant, the Functional Reach test effect size would indicate a clinically meaningful change.

The mechanism of action does often seem to be one of promoting awareness and relaxed/more efficient movement, as evidenced by reduced perceptions of effort in several studies, improved dexterity, improved comfort and even reducing the incidence of bruxism in young children. Inconsistent results were found for improving hamstrings length indicating a "relaxation" effect may be variable.

The populations varied in age and diagnosis indicating a generalised effect is possible – again this is consistent with the use of the FM in diverse populations and also consistent with the notion that it is not a healing or disease specific mechanism of action; rather one based on more generic learning and self-improvement.

The findings of this updated review have strengthened since the 2005 review by Ernst and Canter [4]. As the previous authors reported, the studies are still highly varied and of often questionable quality. But this does appear to be improving with some of the more recent studies reaching acceptable levels of risk of bias.

Implications for practice

There is evidence that FM should be considered for balance classes in ageing populations – both as a preventative approach and for people at risk of falls. There is also some evidence for the use of FM where reduced effort, efficiency of movement and awareness can play a part in reducing pain or discomfort.

Implications for research

Further high quality research is required comparing FM to other modalities. Investigations should focus on the impact on self-efficacy, functional independence and ease and efficiency of functioning, both as strategies for promotion of wellness and wellbeing, but also for people with impairment who wish to improve their sense of ease. Particular attention needs to be paid to the reporting of best practice trial design.

Conclusions

The FM appears to be safe and effective for a varied population interested in improving functions such as balance. Careful monitoring of individual impact is required given the varied evidence at a group level.

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Conflict of interest

The authors declare the following in terms of conflicts of interest regarding the publication of this paper:

- SH is an accredited Feldenkrais Practitioner
- SH is also a co-investigator on two of the included trials - these were independently scrutinised.

Contributions of authors

Ms Anthea Worley: conducted the search and preliminary inclusions.

Assoc Prof Susan Hillier: performed the meta-analyses.

Both authors contributed to the review of all included and excluded articles at all stages, including risk of bias, and constructed the final report.

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Appendix 1: Randomised controlled trials of FM (Ernst and Canter, 2005, n=6) with updated RCTs n=14 and controlled trials n=5

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
Ruth (1992) [9]	RCT 2 parallel groups	30 healthy volunteers	Single FM sequence	Participation in other random activities	Degree of neck flexion (goniometer); Perceived effort during flexion	Greater degree of neck flexion (goniometer) ($p<0.01$); less perceived effort during flexion ($p<0.05$)	Study has pilot character
Johnson (1999) [18]	RCT 2 group cross-over (2 phases)	20 people with MS	FM: 8x 45min sessions at weekly intervals	8 weeks sham non-therapeutic body work	L & R hand dexterity (pegboard test); 8 symptom/ performance scores; 5 mood scales	NSD Less perceived stress following FM ($p=0.01$)	Positive result could be due to multiple testing for significance
Lundblad (1999) [21]	RCT 3 parallel groups	97 females with neck and shoulder problems	FM: 4 individual sessions, 12 group sessions of 50 mins pw, for 16 weeks, home audio tapes	C1) physiotherapy 2 x 50 mins per week for 16 weeks, home exercises C2) no intervention	Clinical assessments (4 measures); Physiological tests (18 measures) Complaint indices (5 measures); VAS pain ratings (2 measures); Disability and sick leave measures (4 measures)	Prevalence of neck pain and disability during leisure decreased in FM versus C1 or C2 ($p<0.05$) 31 of 33 measures NSD	Important baseline differences – possible regression to the mean. High drop out rate and per protocol analysis. Multiple testing for significance.
Stephens (2001) [19]	RCT 2 parallel groups	12 people with MS	FM: 8x2-4 hours	Educational sessions over	3 clinical tests of balance;	Significant improvement in FM	Very small sample size.

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
			sessions over 10 weeks	10 weeks	3 symptom scales	compared to C for mCTSIB and Balance Confidence Scale; other 4 outcomes NSD	No baseline data or statistical analysis available.
Smith (2001) [22]	RCT 2 parallel groups	26 patients with chronic low back pain	FM: One 30 minute session	Attention control	Pain (McGill); Anxiety (STAI)	FM not C reduced affective dimension of pain pre-post (p=0.04) C not FM improved sensory dimension of pain pre-post test (p=0.03) NSD for evaluative dimension of pain or anxiety	Only acute effects were measured. Baseline differences between FM and C in duration of back pain may be important
Grübel (2003) [23]	RCT 2 parallel groups	66 patients with cancer	FM: 5x50 minutes sessions of functional integration in addition to conventional therapies	C: No adjunct therapy	Body image questionnaire; Frankfurter body concept scales; quality of life; sense of movement and body awareness	Both groups improved in all outcome measures	Non-significant trend favoured FM
Additional RCTs							
Brown (1991) [7]	RCT 2 parallel groups	21 (12 men & 9 women) volunteers pain free	FM: 45 min audio tape 'activating the flexors' lesson.	C: Listened to same 45 min audio tape modified to include only instructions pertaining to	EMG activity of flexors and extensors (UL) Perception of effort during flexion movement	NSD	There was an overall decrease in mean flexor activity with no change in mean

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
				exercise movements			extensor activity for both groups.
Chinn (1994) [20]	RCT 2 parallel groups	23 subjects with upper back, neck or shoulder discomfort	FM: single ATM lesson; 22 min audio tape	C: single sham treatment; 30 mins gentle neck and shoulder exercises	Functional reach task; perceived effort during the task	NSD Reduced perceived effort in FM group ($p<0.05$)	Small sample size
Laumer (1997) [24]	RCT 2 parallel groups	30 patients with eating disorder	FM: 9 hour course	C: Did not participate in FM	Body Cathexis Scale; Body Parts Satisfaction Scale; Body perception - Fragebogen zum Korpererleben; Emotion Inventory; Anorexia-Nervosa-Inventory for Self-Rating; Eating disorder inventory-2	FM participants showed increasing contentment with regard to problematic zones of their body and their own health and acceptance and familiarity with their body.	Full article in German
James (1998) [10]	RCT 3 parallel groups	48 healthy undergraduate students	FM : 4 x45minute sessions over 2 weeks of 4 different ATM lessons recorded on audiocassette	Relaxation: 4 x 45 min sessions over 2 weeks listened to relaxation training audiocassette C: no supervised lessons	Hamstring length (modified AKE test)	NSD	Insufficient exposure, low statistical power.

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
Hopper (1999) [11]	Study 1: RCT 2 parallel groups Study 2: Subsample of Study 1	Study 1: 75 undergrad physio students Study 2: 39 participants from Study 1	Study 1: FM: Single ATM , 45 min audio cassette lesson (no prior FM experience) Study 2: 4 different ATM lessons over 2 week s	Study 1: C: listened to soft non-verbal music Study 2: same ATM lessons over 4 sessions in 2 weeks when subjects had prior FM experience	Modified AKE test (hamstring length); Sit and Reach test; Borg's 6-20 rating of Perceived Exertion (during sit and reach test)	Study 1: NSD Study 2: For perceived exertion significant main effect p=0.0003. NSD others	In both studies there was a significant difference in exertion levels between males and females with males exerting more irrespective of group.
Kolt (2000) [12]	RCT 2 parallel groups	54 undergrad physio students with no prior FM experience	FM: 4 x 45 min ATM lessons via audiocassette over a 2 week period	Relaxation: 4 x 45 min relaxation sessions via audiocassette over a 2 week period C: no specific tasks over 2 week period	Bipolar Form of the Profile of Mood States (POMS-BI)	NSD Composed-anxious scores of the POMS-BI did vary significantly over time (p=0.001) for all participants. Females in FM and relaxation groups reported significantly lower anxiety scores at completion compared with control.	No differences between FM and relaxation groups.
Lowe (2002) [25]	Pseudo-Randomised – consecutive allocation	60 patients transferred to normal ward after acute treatment for MI	FM: 2x30 min individual sessions	Relaxation: 2x30 min individual PMR C: no body-oriented interventions	Body image questionnaire (FKB-20, German version); Hospital Anxiety and Depression Scale-German version	NSD	Overall improvements were seen in MLDL, GSES and FKB-20.

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
					(HADS-D); Munich Quality of Life Dimensions List (MLDL); German version Generalized Self efficacy Scale (GSES)		
Stephens (2006) [13]	RCT 2 parallel groups	38 graduate students	FM: 5 x15min ATM sessions/wk audiotape over 3 week period	C: regular daily activities	AKE (hamstring muscle length)	Significant increase in hamstring muscle length (p=.005) in ATM group compared with control.	Participants varied greatly in the duration and number of home sessions completed.
Quintero (2009) [26]	RCT 2 group (cross over design for control)	3-6 year old children with sleep bruxism	FM: 3hr sessions x 10 during 10-week period based on ATM	C: no details	Various measures of joint function; Nocturnal bruxism	Statistically significant increase of CVA angle (p=0.0) for FM c.f. C. After intervention 77% parents in FM reported no nocturnal bruxism c.f. 15.38% for C.	At baseline two groups were comparable.
Vrantsidis (2009) [15]	RCT 2 groups – (cross over design for control)	55 participants aged ≥ 55years	FM: Getting grounded gracefully program (based on ATM) 2x40-60min sessions/wk over 8 weeks	C: continue with usual activity	Frenchay Activity Index; Human Activity Profile; Assessment of Quality of Life; Modified Falls Efficacy Scale; Abbreviated Mental Test Score; Four-square step test;	Significant effects for gait speed (p=0.028) and Modified Falls Efficacy Scale (p=0.003) for FM group; near significant effect for timed up-and-go test (p=0.056). Positive feedback from survey.	No significant baseline differences between groups. High class attendance

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
					Timed Up-and-Go Test; the Step Test; Timed Sit-To-Stand Test; Clinical Stride Analyzer; Force-platform measures of gait, mobility and function; Satisfaction survey		
Ullman (2010) [16]	RCT 2 groups	47 relatively healthy independently living ≥65years olds	FM: 1 hour ATM sessions 3x/week for 5 weeks (provided by instructor)	C: waitlist	Falls Efficacy Scale; Activities Specific Balance Confidence Scale; Timed Up-and-Go and TUG with added cognitive task; GAITRite Walkway System; tandem stance	Balance (p=0.030) and mobility (p=0.042) increased for FM, whilst fear of falling decreased (p=0.042).	At baseline groups comparable except for higher BMI in intervention group.
Hillier (2010) [17]	Pseudo-randomised control trial 2 groups	22 healthy people post retirement	FM: ATM class, 1hr/week for 8 weeks	C: Generic Balance class 1hr/week for 8 weeks	SF-36; Patient Specific Functional Scale (PSFS); Timed Up-and-Go test; Functional Reach test (FRT); Single Leg Stance Time (SLS); Walk on Floor Eyes closed (WOFEC)	Significant time effect for all measures except for WOFEC. Significant improvements for both groups for SF-36, PSFS and FRT. SLS improved FM (p=0.016).	Post hoc individual analysis comparisons made.
Bitter (2011) [14]	RCT 3 arm	29 healthy university	FM1: ATM lesson 1x	C: relaxation lesson 1x 40	Purdue Pegboard Test; Grip-lift test;	FM1 significant group by time intervention	

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
		students	40min, dominant hand; FM2: same but non-dominant hand	min	subjective changes	effect when compared to control group for dexterity.	
Nambi (2014) [8]	RCT 3 arm	60 institutionalised ageing	FM: ATM classes 3x6 weeks	PI: Pilates classes 3x6 weeks C: sham walking 3x6 weeks.	Functional reach test; Timed Up and Go Test; Dynamic gait index; RAND-36 for Quality of life	Both FM and PI improved all measures ($p<0.000$); C; improved TUG and DGI only	
Additional CTs							
Kirkby (1994) [30]	Non-randomised – 3 parallel groups	48 females with serious premenstrual problems	Coping skills training (CBT oriented) 1hr/week for 6 weeks	ATM: hr/week for 6 weeks C: Waitlist group	Modified Menstrual Distress Questionnaire (MMDQ); anxiety (STAI); depression (BDI); irrationality (General attitude and Belief Scale (GABS))	Compared with controls, the coping skills group reported significant reductions in symptomology and irrational thinking. NSD between wait-list and the control.	ATM was a control treatment.
Seegert (1999) [31]	Non-randomised – 2 parallel groups	25 college students not suffering acute or chronic injury/illness	Selected FM & psychological re-education exercises	Rested in supine posture	Postural sway with eyes open (EO and eyes closed (EC); Postural alignment, Height measurement	Only FM showed statistically significant sway changes and reported feeling more efficient.	
Malmgren-Olsson (2001) [27]	Quasi-experimental controlled comparative outcome study	78 patients with nonspecific musculoskeletal	FM: 15 group treatment lessons (on ATM), 5	TAU: treated individually by physiotherapist – no set	Symptom Check-List-90 including the global severity index, personality severity	NSD	There were large variations in the treatment

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
		disorders	individual sessions on functional integration. Also received 2x audiotapes and written exercise sheet	treatment , # sessions, or duration BAT: 17 group sessions (90min ea x2/wk then 1x/ wk over 3-4 months) and 3 individual sessions	index , State Symptom Index , Swedish version West Haven Yale Multidimensional Pain Inventory including Pain Severity Scale , Pain Interference scale, life control, Affective Distress scale, Support scale, Structural Analysis of Social Behaviour		received, number of sessions and duration or the TAU group. Some had not finished treatment at the time of follow up.
Malmgren-Olsson (2002) [28]	Quasi-experimental controlled comparative outcome study	78 patients with nonspecific musculoskeletal disorders	FM: 20 sessions (both group and individual), individual sessions focused on functional integration.	TAU: treated individually by physiotherapist – no set treatment , # sessions, or duration BAT: 20 sessions	Swedish version of SF-36; Swedish version of Arthritis Self-Efficacy Scale; Sense of Coherence.	NSD: all groups improved. Larger effect size on all SF-36 variables for BAT and FM group compared to TAU.	
Malmgren-Olsson (2003) [29]	Quasi-experimental controlled comparative outcome study	78 patients with nonspecific musculoskeletal disorders	FM: 20 sessions (group and individual sessions) - individual sessions focused on functional	TAU: treated individually by physiotherapist – no set treatment , # sessions, or duration BAT: 20	Pain drawing; Swedish version West Haven Yale Multidimensional Pain Inventory; Arthritis Self-Efficacy Scale; Balance performance; Symptom Check-List-90; structural analysis	When the 3 cluster groups were analysed for their participation in the 3 treatment approaches significant differences were found $p<0.039$. The psychological effect was represented more	Psychological cluster group, pain effective cluster group – both positive treatment groups. Non-effect

Author (year)	Study design	Sample	Intervention	Control	Outcome	Results	Comments
			integration.	sessions	of social behaviour; Swedish version of SF-36; Sense of Coherence.	often in BAT, the pain effect in FK and the non-effect group in TAU.	cluster group – negative effectives treatment
Kerr (2002) [32]	Non randomised	45 volunteers (group based on no versus prior experience with FM)	10 ATM lessons conducted face to face	A single ATM lesson conducted face to face	State Trait Anxiety Inventory	Anxiety levels were significantly lower for single lesson & 10 lessons . NSD between new & returning students for 1 lesson, but significant difference for new students in 10 week group ($p<0.05$).	High dropout rate of new students
Connors (2011) [33]	Non randomised	63 community dwelling older adults	FM: balance classes: Getting grounded gracefully program 1hour session 2x/wk for 10 weeks	C: no intervention	Activities specific balance confidence questionnaire (ABC); four square step test (FSST); self-selected gait speed.	Significant improvements in FM ABC score ($p=0.005$); gait speed ($p=0.0.17$); FSST ($p=0.022$) compared to C.	At baseline C group had non-significant trend towards more mobile c.f. FM group, & significantly higher ABC scores.

Abbreviations: RCT – randomised controlled trial; FM – Feldenkrais method; MS – multiple sclerosis; L – left; R – right; C – control; pw – per week; VAS – visual analogue scale; mCTSIB – modified Clinical Test of Sensory Integration and Balance; NSD – no significant difference; STAI – State/Trait Anxiety Index; EMG – electromyography; UL – upper limb; ATM – awareness through movement (lesson); min – minutes; AKE – active knee extension test; MI – myocardial infarct; PMR – progressive muscle relaxation; c.f. – compared with; SF-36 – short form 36; CT – controlled trial; CBT – cognitive behaviour therapy; BDI – Becks depression inventory; TAU – treatment as usual; BAT – body awareness therapy.

Appendix 2. List of excluded studies with reason for exclusion.

Studies	Reason for exclusion
Bearman (1999)	Pre/post test (no control)
Huntley (2000)	SR
Dunn (2000)	Pre/post test (no control)
Junker (2003)	Post-test (no control)
Webb 2013	Pre/post test (no control)
Gard (2005)	review
Mehling (2005)	review
Galantino (2003)	review
Emerich (2003)	review
Fialka-Moser (2000)	commentary
Liptak (2005)	review
Batson (2005)	Pre/post test (no control)
Wennemer (2006)	Pre/post test (no control)
Porcino (2009)	descriptive
Mehling (2009)	Review (Ax)
Connors (2010)	Content analysis
Connors (2011b)	Pre/post test (no control)
Mehling (2011)	inquiry (Phenomenological)
Ohman (2011)	Pre and post test (no control)
Laird (2012)	Review
Mehling (2013)	Intervention (not exclusively FM)
Gross (2013)	SR