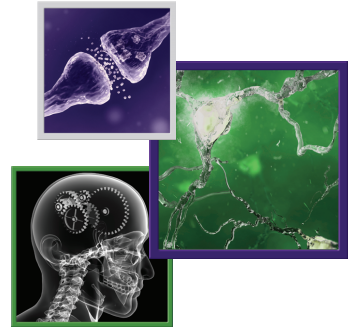


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The effectiveness of aromatherapy and reflexology in neurodegenerative disorders: a systematic review and meta-analysis



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Many neurodegenerative conditions are chronic disorders and result in a range of debilitating symptoms, with many people turning to complementary therapies. A systematic review and meta-analysis were conducted to investigate the evidence on effectiveness of aromatherapy and reflexology on all neurodegenerative conditions. We identified nine eligible studies (total sample $n = 504$ participants) all of which were on multiple sclerosis only. A meta-analysis was conducted including data from six studies, which demonstrated no significant benefit of aromatherapy/reflexology; however, the sample sizes were small and of low quality. This systematic review confirmed that it is not possible to draw conclusions regarding the effectiveness of reflexology and aromatherapy in multiple sclerosis. Larger high-quality studies are required to test these widely used therapies.

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There are over 600 neurological conditions which affect the brain, spinal cord and nerves ranging from acute conditions due to trauma, intermittent conditions such as epilepsy, relatively stable conditions such as cerebral palsy and more progressive neurodegenerative diseases [1]. The latter group of conditions include dementia, Parkinson's disease (PD), multiple sclerosis (MS), Huntington's disease (HD), Prion disease, amyotrophic lateral sclerosis (ALS) and motor neurone disease (MND) [1,2]. Due to the progressive nature of these conditions many result in a range of debilitating symptoms impacting on people's quality-of-life (QoL) with symptoms including pain, fatigue and muscle spasms [3]. The WHO predicted that healthcare providers and policy makers may not be well prepared to effectively manage the rising number of neurological disorders [4–6]. As there are currently no curative treatments for neurodegenerative disorders, management mainly involves relief of symptoms. As a result, patients and carers increasingly turn to complementary therapies to relieve their symptoms.

Complementary therapies include herbal medicines, massage, aromatherapy and reflexology [7]. Their approach is often described to be more holistic than conventional treatments, and there is a distinction between complementary therapies which are an adjunct to conventional therapy as opposed to alternative therapies which replace traditional treatments [8]. Aromatherapy is the use of essential oils from fragrant plants such as lavender and peppermint, applied via massage or inhalation which works by stimulating the olfactory nerves [9,10]. Reflexology is a form of touch therapy which uses gentle pressure on specific trigger points on feet and hands. It is based on the theory that certain trigger points correspond to different organs and glands [9,11]. Foot massage differs from reflexology as it involves less pressure and usually involves the whole area of the foot and not specific areas. A recent US survey of 435 people with PD found that 62.5% had used complementary therapies, while another survey conducted in Canada among 673 participants with MS found 70% had used complementary and alternative therapies to help manage their symptoms [12,13].

Despite their popularity there is little overall evidence for the benefits of these therapies in chronic neurodegenerative conditions. In addition these therapies are usually unregulated with only osteopathy and chiropractic practitioners having professional regulatory bodies [14]. The NICE has recommended the use of complementary therapies in a limited number of conditions ranging from massage for pain relief to the use of aromatherapy in dementia [9,14]. There is extensive research surrounding complementary therapies within cancer and palliative care settings. Touch-based therapies including aromatherapy, reflexology and massage have also been investigated in a systematic review within the palliative care environment among people with an advanced disease, in other words, cancer [15]. The results showed no statistically significant difference between aromatherapy and massage for anxiety, pain and QoL outcomes; however, there was some evidence on reflexology providing pain reduction. These results are in contrast to a qualitative review of five studies which explored patients' perspectives of aromatherapy, reflexology and massage, which found that participants felt these therapies had a positive effect providing respite and escapism from their disease [16].

Touch-based therapies and aromatherapy have also been researched among dementia patients. A systematic review of 13 studies investigating the effectiveness of aromatherapy in dementia patients particularly examining the effect on agitation, anxiety and other symptoms relating to dementia [17] found no evidence of benefit of aromatherapy in these patients. However, the authors stated there were many limitations to the studies reviewed with all the studies scoring 'very low' for quality of evidence, preventing them from reaching clear conclusions [17]. Another review, this time focusing on massage and touch with people who have dementia found only two trials which met the authors inclusion criteria [18]. This review reported limited evidence in favor of massage for behavioral and emotional support. Massage therapy has also been investigated in two other systematic reviews of PD and MS patients. One review investigated the effectiveness of massage on fatigue and pain in patients with MS and identified ten studies including randomized controlled trials (RCTs), comparative studies and quasi-experimental studies with six included in a meta-analysis [19]. The meta-analysis showed a statistically significant improvement for both fatigue and pain scores. A systematic review of massage therapy in people with PD found similar results with massage therapy improving non motor symptoms such as fatigue, and anxiety [20]. However, there is a paucity of evidence regarding the use of other complementary therapies in neurodegenerative diseases including MS, which forms the rationale for this systematic review.

There are currently no other systematic reviews exploring the effectiveness of reflexology and aromatherapy in the selected neurodegenerative disorders. Although aromatherapy is predominantly a touch-based therapy, in this review studies investigating the inhalation of oils will be included as this could also be beneficial.

Aim

To evaluate the evidence base for the use of aromatherapy and reflexology in people with chronic neurodegenerative disorders in particular PD, MS, HD, Prion disease, ALS and MND. Dementia (including Lewy body dementia) was excluded as there have been previous systematic reviews conducted in this group of patients, and we did not include other neurological conditions such as epilepsy. In addition, massage as a mode of complementary therapy was excluded as there is previous research regarding its use in PD and MS as reviewed above.

Materials & methods

The review protocol is registered on PROSPERO ID: CRD42021251488. The systematic review was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines 2020. The PRISMA checklist is shown in [Supplementary Figure 1](#).

Inclusion/exclusion criteria

Inclusion

- Adults over 18 living with one of the following neurodegenerative conditions:
 - PD;
 - MS;
 - HD;
 - Prion disease;
 - ALS;
 - MND.
- Peer reviewed research only

- RCTs
- Aromatherapy and/or reflexology. Aromatherapy where the use of essential oils from fragrant plants are either applied by massage or inhalation [9]. Reflexology, a touch therapy using gentle pressure on specific trigger points on the feet [9]. There were no restrictions on how the interventions are provided or comparator(s)/control(s) against which the intervention was compared.

Exclusion

- Where less than 50% of the study population had the neurodegenerative condition;
- Language other than English;
- Animal studies;
- Full text not available.

Outcome measures

There are two primary outcomes of this systematic review:

- Pain measurement;
- QoL.

These primary outcomes were selected as these are the most common issues associated with neurodegenerative diseases [21]. In addition three secondary outcomes were selected:

- Muscle spasms and spasticity;
- Fatigue;
- Anxiety;
- Activity of daily living (ADL).

These outcomes were measured using any validated self-report instrument and assessed at baseline and post intervention. No measures were excluded as long as the authors reported they were measuring the included construct.

Search strategy

Searches were conducted from the inception of the database to May 2021 and the following electronic databases were used:

- The Cochrane Controlled Trials Register: The Cochrane Library;
- MEDLINE (OVID);
- EMBASE (OVID);
- PsycINFO (OVID);
- AMED (OVID);
- CINAHL (EBSCO).

The search strategies used are detailed in [Supplementary Material 1](#).

Study selection

The search results were exported into Endnote20 [22]. Any duplicates were removed and titles and abstracts were independently screened by two authors (Raj Rawal and Elizabeth Chesterman) to identify studies for full text review according to the inclusion and exclusion criteria. The results were compared and any discrepancies were resolved by reaching an agreement through discussion. Full texts were retrieved of the studies which appeared to meet the inclusion criteria. At the full text review, any studies which did not meet the set criteria were excluded and explanations were recorded justifying their exclusion. For any trials which were yet to be published, attempts were made to contact the authors.

Data extraction

Key study characteristics were extracted using Microsoft Excel including aim, sample size, participants demographics, outcomes measured and results. Data extraction for the interventions was based on the TIDieR reporting guidelines which included key details [23]:

- What was the intervention?;
- How and where was the intervention delivered?;
- How many sessions and duration of the therapy?;
- Key personnel conducting the intervention and their expertise;
- Mode of delivery, for example face to face or in groups.

Risk of bias

The risk of bias for each study was assessed using the Cochrane Handbook for Systematic Reviews of Interventions [24]. Each study was given a score of high, low or unclear based on their risk of bias. The risk of bias is based on six key criteria: selection; performance; detection; attrition; reporting; and other bias [24].

- Random sequence generation (selection bias): low risk of bias was given if the methodology of randomization was appropriate, in other words, computer generator.
- Allocation concealment (selection bias): low risk would be if centralized randomization is conducted by an independent researcher.
- Blinding of participants and personnel (performance bias): low risk would be if there was blinding of personnel and participants.
- Blinding of outcome assessment (detection bias): low risk would be if the outcome assessors were blinded.
- Incomplete outcome data (attrition bias): a low risk score would be if any missing data was adequately addressed and unlikely to have an impact on the study results.
- Selective reporting (reporting bias): most studies will be classed as unclear if there is insufficient detail, however if a study protocol is available with pre specified outcomes, then there is a low risk of bias.
- Other bias: considers any other potential sources of bias not covered in the other domains such as baseline imbalances.

Statistical analysis

Where the RCTs showed similar homogeneity, in other words, the trials were similar in terms of participants, interventions, controls, a meta-analysis was conducted for each of the outcomes using Review Manager software [25] with the results displayed using forest plots. Random effects estimates were reported and statistical heterogeneity was assessed using both χ^2 and I^2 statistics. We did not produce funnel plots to investigate possible publication bias due to the small number of studies in each meta-analysis. To assess the measure of treatment effect, mean differences and 95% CI for continuous outcomes were used, where $p < 0.05$ will be taken to be statistically significant. The meta-analysis methods will be outcome specific so if any of the treatment effects were reported as dichotomous, relative risks and their CIs were used. The values for the outcome measures used for the meta-analysis were those at follow-up, as opposed to change from baseline. Where median values and Interquartile range (IQR) were shown, the mean values and standard deviation (SD) were calculated using equations proposed by Wan *et al.* [26]:

Table 1. Criteria for judging the quality of evidence.

Criteria	Reasoning
Risk of bias	Based on Cochrane Risk of Bias. If the information from studies shows high risk of bias, this may weaken the confidence of the results
Inconsistency of results	When there is unexplained variability in results across the studies
Indirectness of evidence	When the population, intervention, control or outcomes are not of interest
Imprecision of results	Uncertainty of the results arises when there is a small sample size, small number of events causing wide CIs
Publication bias	Underestimation or overestimation of the effects due to the selective publication of studies

Table 2. How the evidence is graded.

Grade	Interpretation
High	Confident that the true effect is similar to the estimated effect
Moderate	Reasonably confident the estimated effect is close to the true effect
Low	The estimated effect may differ from the true effect. Limited confidence in effect estimate
Very Low	The true effect is most likely to be different to the estimated effect. Almost no confidence with effect estimate

Quality of evidence

To assess the quality of the studies the GRADE system was used. The GRADE approach is widely used among researchers and can help guide recommendations and clinical guidelines in healthcare [27]. This approach assesses the quality of the evidence by determining how confident one can be that the effect estimate is close to the true effect. Initially the RCTs were assigned a high grade and then downgraded by one level based on the five criteria judging the quality of evidence as shown in Table 1. The quality of evidence was combined for each outcome and a final grade assigned as either high, moderate, low or very low as shown in Table 2.

Results

Search results

The database search yielded 3026 studies after duplicates were removed, and following screening, 23 studies were identified for full text review. Articles were excluded based on the inclusion and exclusion criteria outlined in the methods section. Nine RCTs were identified and included in this systematic review. Full details of the search results and reasons for exclusions are shown in a PRISMA diagram in Figure 1.

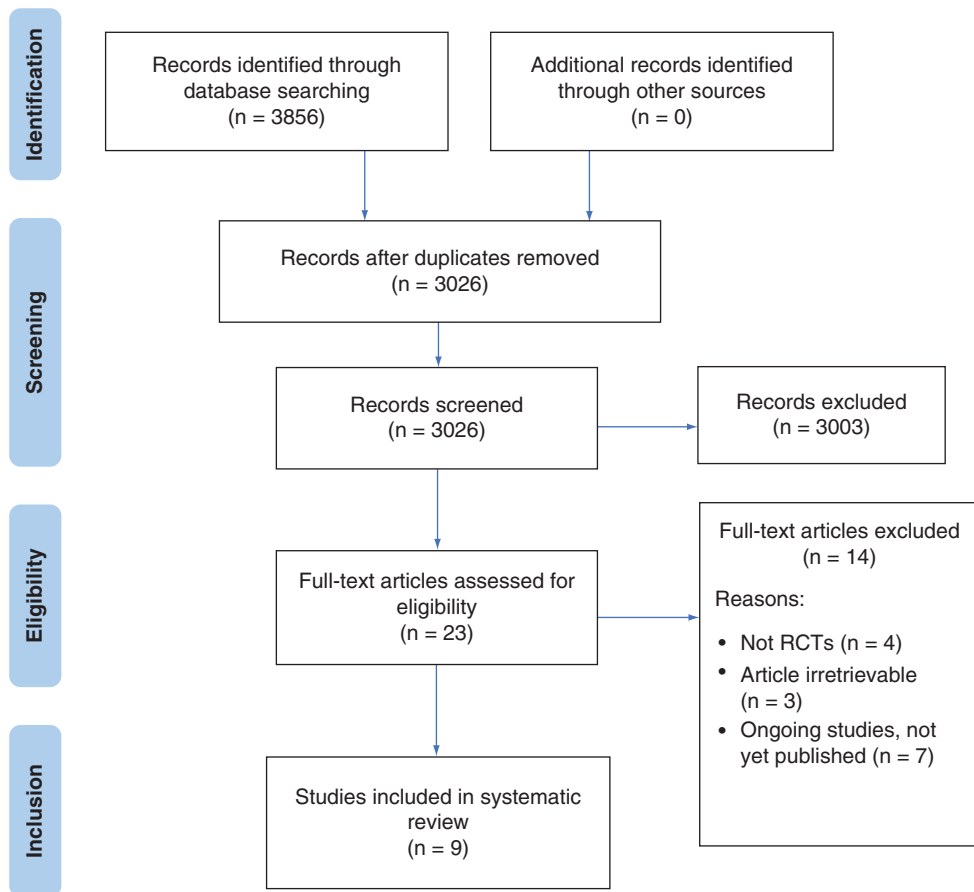


Figure 1. PRISMA flow chart.
RCT: Randomized controlled trial.

Study characteristics

The nine included RCTs involved a total of 504 participants with the majority of the studies conducted in Iran (n = 6) [28–33] with the remainder being in Scotland (n = 1) [34], Northern Ireland (n = 1) [35] and Israel (n = 1) [36]. All nine studies involved participants who were diagnosed with MS with the average time from diagnosis for each study ranging from 5.18 to 21 years. No RCT studies were identified with the interventions of interest for the other conditions.

Only one of the studies investigated aromatherapy [33] (via inhalation) whereas the eight remaining studies investigated reflexology [28–32,34–36]. The sample sizes for each of the intervention or control groups ranged from 10 to 36 participants with the mean age of participants ranging from 20 to 58.1 years and overall included 79% females. The sessions were delivered by suitably qualified or trained personnel, in other words, reflexologist, physiotherapist [25–32]. The duration and number of sessions per week varied between each of the studies ranging from 30 to 60 min on a weekly, twice weekly or three-times weekly basis. The comparators in the control group consisted of massage without specific pressure on trigger points. The control group for the aromatherapy trial [33] consisted of the same exercises as the intervention group but without the presence of any oils. For the outcomes, trials used a range of validated scales to measure the outcomes with measurements taken at baseline and at the end of the intervention with six studies [28,29,32,34–36] also following up participants for a further period post intervention. Key study characteristics are summarized in [Supplementary Table 1](#).

Risk of bias

Performance bias was a potential source of bias since personnel conducting reflexology sessions were not blinded in seven [29,31–36] out of nine studies. Only three studies [33,35,36] adequately described the methods used to conceal the group allocation where the other studies [28–32,34] were scored as unclear due to insufficient information. Six studies [28,29,31,34–36] were at low bias risk for blinding of outcome assessment due to the data collectors measuring the outcomes being blinded. Study protocols were available for four studies [30–33] reducing the risk for selective reporting bias. A risk of bias table and graph are shown in ([Figures 2 & 3](#)) respectively summarizing our judgements on the various bias components as described in the methods. The reasoning for each of the scores are shown in [Supplementary Material 2](#).

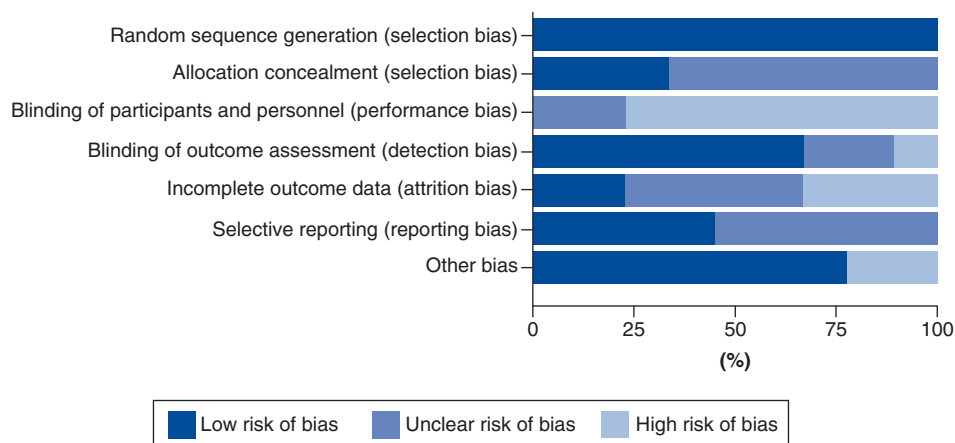


Figure 2. Risk of bias graph.

Meta-analysis results

From the nine studies included in this review, there were differences in the way the interventions were delivered, the control groups, sample size and duration. A meta-analysis was possible with six of the studies [28–31,34,35] focusing on five outcomes where all of the reported outcomes were continuous. A meta-analysis was not possible in three of the studies due to heterogeneity across key characteristics such as comparators and outcome measurements.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Ebrahimi 2020	+	?	-	?	?	+	-
Hughes 2009	+	+	-	+	?	?	+
I Siev-Ner 2003	+	+	-	+	?	?	+
Miller 2013	+	?	-	+	+	?	+
Nazari 2015	+	?	?	+	-	?	+
Nazari 2016	+	?	-	+	-	?	+
Sajadi 2020	+	?	-	+	?	+	+
Sajadi 2020	+	?	?	?	+	+	+
Seddighi-Khavidak 2020	+	+	-	-	-	+	-

Figure 3. Summary of risk of bias.

Reflexology

Primary outcomes

Pain

A random effects meta-analysis was conducted for the outcome pain including 204 participants as shown in Figure 4. The pooled results show a standardized mean difference (SMD) of -0.21 (CI: -0.9, 0.48), $p = 0.56$. This indicates that there is no evidence to suggest that reflexology reduces pain. There was high heterogeneity with an I^2 value of 82%. This can be explained as the control group in one of the studies [29] which had the highest treatment effect only received usual care with no foot massage at all while the other studies [30,34,35] provided a foot massage with no pressure. A meta-analysis was done excluding this particular study and showed a SMD of 0.13 (CI: -0.19, 0.45), $p = 0.42$ with an I^2 value of 0%. This indicates that even with the exclusion of this study the conclusions remain the same.

In addition, for one of the studies [34] pain was a subscale of QoL. The quality of evidence was judged as very low due to inconsistency of results (unexplained heterogeneity), imprecision of results (small sample size) and risk of bias (performance bias).

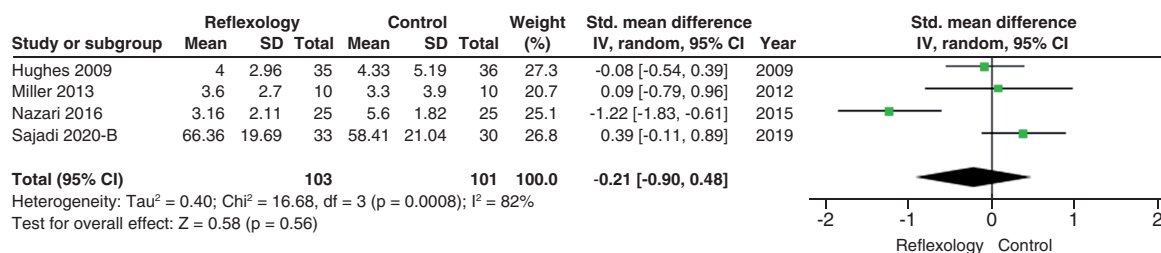


Figure 4. Meta-analysis of pain.
 SD: Standard deviation; Std.: Standardized.

Quality-of-life

Two studies [31,34] reported the mean effects of reflexology on QoL with 83 participants. The overall effects suggest reflexology having no impact on a person’s QoL with the pooled estimates showing a SMD of 0.08 (CI: -0.35, 0.51), p = 0.71 as shown in Figure 5. In addition, for one of the studies [30] there was no summary score for QoL, so data was used from ‘general health’ domain which is closely aligned to QoL. The effect of reflexology on QoL was judged as low due to imprecision of results (small sample size) and risk of bias (performance bias).

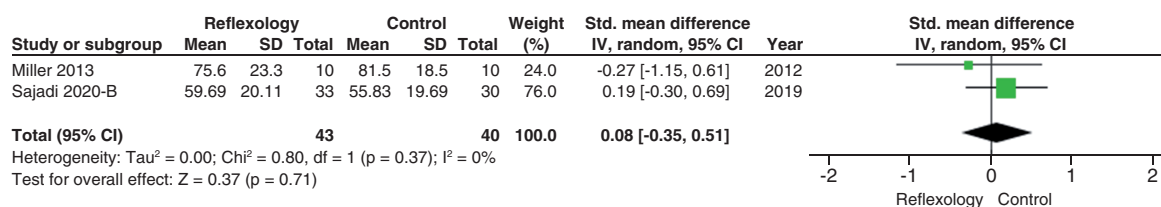


Figure 5. Meta-analysis of quality-of-life.
 SD: Standard deviation; Std.: Standardized.

Secondary outcomes

Fatigue

Four studies [28,30,31,35] measured fatigue as an outcome. A random effects meta-analysis was conducted with 247 participants as shown in Figure 6. The pooled results show an estimated SMD of -0.46 (CI: -0.93, 0.01), p = 0.05. This is not statistically significant at the 5% level. This suggests there is not enough evidence to conclude reflexology has a positive effect on fatigue.

The heterogeneity is high with an I² value of 70%. This can be explained by one of the studies [28] having a different control group to the rest of the studies. Another meta-analysis was performed excluding this particular study and showed a smaller SMD of -0.27 (CI: -0.67, 0.12). The p-value for the test for overall effect is 0.18 indicating there is no evidence to suggest that reflexology has an effect on fatigue. In addition for one of the studies [30] fatigue was a subscale of QoL.

For one study [35], the median and IQR were reported in the results. Attempts were made to contact the author seeking the mean values but without success, so the mean values and SD were calculated using the equations shown in the methods.

One trial [32] was not included in the meta-analysis due to their results not reporting SD, standard error (SE) or CIs, making within-group comparisons separately for the intervention and control groups. This trial showed a significant reduction in fatigue post intervention p = 0.037. However, there was no statistically significant change in fatigue in the control group, p = 1.

The quality of evidence for reflexology against fatigue was downgraded three levels to a score of very low due to inconsistency of results (unexplained heterogeneity), imprecision of results (small sample size) and risk of bias (performance bias).

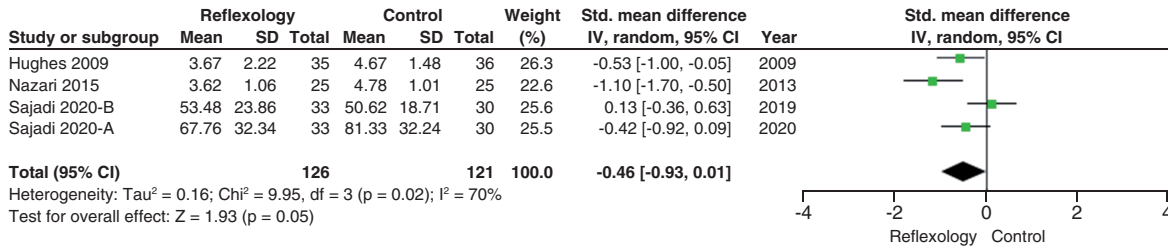


Figure 6. Meta-analysis of fatigue.
 SD: Standard deviation; Std.: Standardized.

Anxiety

Three studies [30,31,34] measured anxiety as an outcome in 146 participants. The results from the meta-analysis shown in Figure 7 show that there is no evidence to suggest that reflexology reduces anxiety (SMD = -0.81, [CI: -2.75, 1.13] p = 0.41).

For two of the trials [30,34] a subscale of QoL from larger multi-domain outcomes were included in the meta-analysis. The quality of evidence was scored as very low due to inconsistency of results (unexplained heterogeneity), imprecision of results (small sample size) and risk of bias (performance bias).

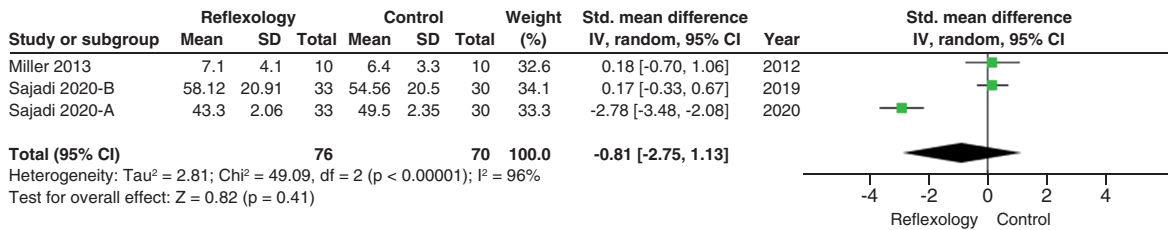


Figure 7. Meta-analysis of anxiety.
 SD: Standard deviation; Std.: Standardized.

Muscle spasms & spasticity

Two studies [34,35] investigate muscle spasms as an outcome measure among 91 participants. The results from the random effects meta-analysis shown in Figure 8 suggest reflexology had no effect on muscle spasm (SMD = -0.03, (CI: -0.44, 0.38), p = 0.89).

Only one study measured spasticity as an outcome. The results showed a statistically significant improvement for spasticity in the reflexology group (p = 0.03).

The quality of evidence was scored as low, downgrading by two due to imprecision of results (small sample size) and risk of bias (performance bias).

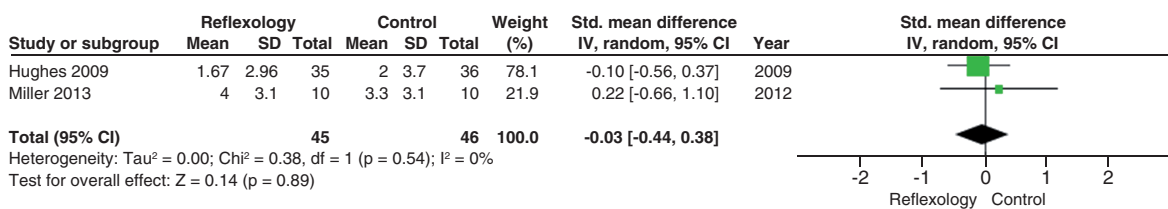


Figure 8. Meta-analysis of muscle spasms.
 SD: Standard deviation; Std.: Standardized.

Aromatherapy

One study [33] measured the effects of aromatherapy via inhalation on ADL among 30 participants with MS. The study used the MS impact scale to assess the impact of MS on the ability to carry out ADL which assessed both psychological and physical effects. The experimental group showed a statistically significant reduction in

the psychological effects of MS on daily life ($p = 0.034$) compared with the control. However, no significant improvements were shown in the experimental group with the physical component when compared with the control group ($p = 0.142$). There were significant differences between both groups for physical effects of MS, indicating evidence of baseline imbalance. This was judged as very low quality of evidence, downgrading the score by three levels due to a single study, imprecision of results (small sample size) and risk of bias (performance bias).

Discussion

This research identified and synthesized evidence on the effectiveness of aromatherapy and reflexology in people with neurodegenerative disorders. The systematic review search identified nine studies with a total of 504 participants, with eight studies [28–32,34–36] investigating reflexology and one study [33] focusing on aromatherapy. The overall results from the meta-analyses showed there is very low to low quality of evidence on the effectiveness of reflexology on the chosen outcomes, however the included studies were all small and mixed quality, and we cannot therefore conclude that this is evidence for lack of effectiveness. Despite aromatherapy being widely used, only one small low quality study ($n = 30$) [33] was identified using aromatherapy in people with MS, which showed some improvements with balance and fear of falling. Given the high prevalence of PD and the fact that complementary therapies are regularly used within this population it was surprising that no eligible studies were identified in this population [13] nor other neurodegenerative disorders.

The quality of evidence was assessed using the GRADE tool where all the outcomes were given a GRADE score of either low or very low with issues primarily relating to the small sample sizes and performance bias. This indicates that there is limited confidence that the true effect lies close to the estimated effect [27]. This is in keeping with existing research on the use of aromatherapy in dementia patients where the studies also were also found to be of low quality [17]. This makes it difficult to draw any definitive conclusions about the effectiveness of reflexology and aromatherapy for neurodegenerative disorders.

Results from a previous review in palliative care also found no statistically significant difference in the outcomes investigated here, apart from reflexology showing some evidence of reducing pain levels [15]. Other systematic reviews investigating massage therapy in patients with MS and PD found significant improvements in the levels of fatigue, pain and anxiety experienced [19,20]. Our review only yielded one study on aromatherapy limiting the conclusions that can be drawn. Existing literature on aromatherapy within dementia participants found no significant benefits [17]. Based on the current evidence base it appears massage may be a more effective touch based therapy for symptoms of neurodegenerative diseases than reflexology and aromatherapy; however, more robust studies are needed to confirm this. In addition, both systematic reviews investigating massage therapy in PD and MS included a variety of studies such as pilot studies and case series whereas this systematic review focused primarily on RCTs. Furthermore, even though massage and reflexology are both touch based therapies, their method and mechanism of action is different, with massage therapy including a variety of techniques ranging from Thai massage to traditional Japanese, hence variability in findings.

A common theme identified within the existing literature and from this review were issues regarding study design and in particular the small sample sizes of both intervention and control groups. It was decided to only include RCTs in this review as these are recognized as the gold standard for clinical research [37]. However, there are key methodological limitations with RCTs of complex interventions delivered by therapists, especially relating to performance bias [24]. In these types of trials, it is not possible to blind the therapist conducting the interventions, and the Hawthorne effect can influence the behavior of participants [38]. This can be minimized by having another independent researcher who is blinded to assess and collect the outcome measures. In addition, safeguards should be taken to increase allocation concealment and ensuring participants and researchers will have no influence over the allocations.

Limitations of the primary studies

Only a small proportion of studies could be included in the meta-analysis and these demonstrated heterogeneity with different durations, follow-up time points, outcome measures and control groups. Furthermore, the participants in the trials potentially could have variability in the time since diagnosis and baseline severity of symptoms. This in turn would have affected the perceived benefits of the therapies on their condition. Six of the studies [28–33] were conducted in Iran, hence may not be generalizable to other populations. The paucity of research in different countries may reflect difficulties in attracting funding for investigating complementary therapies [39]. There may also be a gender bias as it was noted that a higher proportion of females (79%) were included in the trials. This is

unsurprising considering women are two to three times more likely to develop MS compared with men [3]. Sample size was also an issue as all the studies included had small sample sizes. This reduces the power of the studies and makes generalizability more difficult [37].

Limitations of systematic review

This systematic review only included and searched for studies written in English and so the findings could be limited with the possibility that further studies are available in other languages. In our search we did not identify any studies written in other languages, but we did not search regional databases where non-English papers are more typically published. Given the popularity of complementary therapies in Middle Eastern and Far Eastern countries, some evidence may have been missed. Moreover, grey literature was not included in the search which may have revealed additional findings. However, this systematic review focused on peer reviewed publications which is perceived as the gold standard for research [40].

Future research & clinical recommendations

There is a currently lack of evidence to support the recommendation for reflexology and aromatherapy in MS or neurodegenerative conditions. This is largely due to a small evidence base centered solely on MS in small mixed quality studies mainly conducted in Iran. There is however insufficient evidence to conclude a lack of benefit. Further well-designed RCTs that are better controlled with greater sample sizes are required to determine the effectiveness of aromatherapy and reflexology in neurodegenerative conditions. There also needs to be larger well designed RCTs to investigate the clinical and cost-effectiveness of complementary therapies in a variety of neurodegenerative conditions. Furthermore, these need to be conducted in different populations and healthcare systems. The literature search did identify seven trials which are ongoing and yet to be published which would contribute to future systematic reviews and meta-analyses. As other reviews have suggested some benefit for massage on pain and fatigue in MS and PD, if patients are seeking complementary therapies there is more evidence to currently support massage than reflexology or aromatherapy.

The findings within palliative care indicated interventions were not being delivered as true to life due to standardizing the therapies and the QoL outcome measures were inappropriate to capture the complementary therapy benefits. This is where qualitative research exploring the benefits of these therapies in people living with neurodegenerative diseases would be a useful addition to the evidence base, complementing the quantitative studies found here. Qualitative research explores in greater depth the patients' experience which is not possible within the quantitative paradigm. Previous evidence has suggested by synthesizing quantitative and qualitative evidence from systematic reviews, we can see more clearly whether the complementary therapies are being delivered as true to life and whether the outcome measures are appropriate [41].

Conclusion

This is the first systematic review to synthesize studies relating to reflexology and aromatherapy in people with neurodegenerative diseases. The results revealed a paucity of high quality studies and therefore no conclusions on the effectiveness of reflexology or aromatherapy can be drawn. Conclusions are restricted by the limited number of studies and the poor design of the available studies. Larger well-designed studies are required in MS and other neurodegenerative disorders that include cost as well as clinical effectiveness. More RCTs of complementary therapies are also needed in a range of other neurodegenerative conditions, before these therapies can be recommended in the management of these conditions.

Executive summary

- The overall results suggest there is not sufficient evidence to suggest reflexology has an effect on people with multiple sclerosis (MS).
- Aromatherapy showed an improvement in the psychological effects of MS on daily life, however these findings are from one very small (n = 30) study only.
- Conclusions are limited to MS due to the lack of eligible studies identified for other conditions.
- Larger, better designed studies are required determining the effectiveness of aromatherapy and reflexology in neurodegenerative conditions.

Supplementary data

To view the supplementary data that accompany this paper please visit the journal website at: www.futuremedicine.com/doi/suppl/10.2217/nmt-2021-0056

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