Effectiveness of music therapy, aromatherapy, and massage therapy on people in palliative care with end-of-life needs: A systematic review.

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Title

Effectiveness of music therapy, aromatherapy, and massage therapy on people in palliative care with end-of-life needs: A systematic review.

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Abstract

Background: Music therapy, aromatherapy and massage therapy are widely used in palliative care in patients near end-of-life with the aim to reduce symptom burden and improve quality of life (QoL). Recent research shows an increase in popularity and use of complementary and integrative medicine however a more thorough evidence base about their usefulness is required.

Objectives: The aim of this study was to evaluate the available evidence on the use of music therapy, aromatherapy and massage therapy in palliative and hospice care and summarize findings.

Methods: A defined search strategy was used in reviewing literature from two major databases, MEDLINE and Embase for the period between 2010 and 2022. Studies were selected for further evaluation based on intervention type and relevancy. After evaluation using quality assessment tools, findings were summarised, and potential benefits were identified.

Results: Out of 1261 studies initially identified, 26 were selected for further evaluation. 16 evaluated music therapy, 4 aromatherapy and massage therapy. The most represented outcomes were pain, anxiety, well-being and QoL. Many studies demonstrated a short-term benefit in symptom improvement. Qualitative studies showed that these complementary methods are highly valued.

Conclusion: Main results found that music and massage therapy had the most potential benefits on a range of outcome parameters, including pain and QoL. Future studies may

consider using more qualitative and/or mixed methods to provide a more comprehensive evaluation of treatment.

Keywords

Complementary and integrative methods, palliative care, end-of-life, Quality of Life (QoL)

Introduction

Palliative care aims to support patients with incurable illnesses and their relatives on a physical and psychosocial level [1]. Many patients with advanced diseases suffer from, pain, nausea, vomiting and psychological distress [2] thus one of the main aims is improve the Quality of Life (QoL) by relieving symptom burden [3]. In addition to evidenced-based treatments, patients with advanced diseases often seek Complementary and Integrative Medicine (CIM) [4], previously referred to as Complementary and Alternative Medicine (CAM). Complementary Methods (CM therapies have been used in palliative care and settings for many years as complementary therapies offer different experiences than that of conventional medicine [5].A variety of CM therapies are often used alongside conventional therapies with one of the most popular being Music Therapy (MT) . It is used to reduce pain, anxiety, and improving the overall QoL of patients [6].

Similarly, a review of the literature showed that massage therapy is often used to reduce pain, anxiety, and depression in palliative care patients [7]. Additional methods such as aromatherapy are often used to treat symptoms of nausea and sleeping issues as well as pain and anxiety [8].

These CM methods have been often assessed over the years with the latest reviews in 2018 - 2020. A review by Zeng et al, 2018 reported on the effectiveness of a range of CM methods in palliative care. Results found that MT had an impact on pain, anxiety and QofL. However, only immediate effects were studied, so long-term benefits are unknown. The review also found that aromatherapy had a significant impact on psychological distress and anxiety, however reported mixed results on studies measuring pain and QofL. Results on massage therapy often varied citing methodological issues. Armstrong et al, 2019 explored the effectiveness of aromatherapy and massage therapy on patients with advanced cancer [9]. The results again were mixed for the standard outcome parameters, such as pain, anxiety and QofL. However, the main findings showed that patients reported an enhanced sense of well-being, escapism, and respite from their disease [9]. Candy et al, 2020 reported mixed results highlighting that future studies should focus on the best way to measure these therapies, focusing more on the quality of the study design[8]. In addition, a systematic review of qualitative evidence shows palliative care patients value complementary therapy [5].

These reviews are an important contribution to the literature however they took a much broader view on CM methods or in comparison searched for very specific terms. In addition, due to the increased number of mixed methods and qualitative studies, this review included both to ensure a comprehensive scope of the latest research, with a wider range of outcome parameters. Conclusions from previous reviews on the application of CM in palliative care debates the clinical effectiveness of CM stating an urgent need to review the latest research in this area.

The purpose of this systematic review was to identify and evaluate studies and new evidence of the most researched methods according to the literature; MT, aromatherapy, and massage therapy in treating patients in palliative end-of-life care and/or hospice settings.

Method

Protocol

The preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines were followed in this review [10]. This review was registered in INPLASY (International Platform of Registered Systematic Review and Meta-analysis Protocols. DOI number: 10.37766/inplasy2023.11.0087

Literature search

The following two medical databases were searched as part of the literature search: MEDLINE via PubMed and Embase via Elsevier for studies that assessed the efficacy of three complementary methods in a palliative or hospice setting. Specific terms were used according to the databases preferred terminology. Medical heading terms, thesaurus terms, Emtree terms and headings were used for PubMed and Embase. The search consisted of three base terms "palliative care," "complementary medicine" and "hospice care" and a specific intervention as a fourth term. These included "music therapy," "aromatherapy" or "massage therapy."

The two search databases PubMed and Embase were chosen as the main search engines. A preliminary search of CINAHL was also conducted, however the search did not add to the results. Therefore, this study decided to only include PubMed and Embase to ensure consistency in the search strategy. Filters for study types, dates range from 2010 – 2022. This timeframe criteria were decided after a discussion between reviewers. Using the prioritisation and sequential exclusion approach [11], it was decided that only articles after 2010 would be included to ensure a higher standard of information particularly focusing on the methodology used and the quality of information provided on CM outcomes. Language settings were applied.

Eligibility

This review included patients in specialist palliative care, end-of-life or hospice settings or participants in any care setting with a diagnosis of advanced life-limiting illnesses being treated with palliative intent and with a life expectancy of less than two years [12]. There were no restrictions as to age, gender, or ethnicity.

Data was extracted by one author and verified by a second author. For each study, the data extracted were, objective of study, study design, number of participants, intervention, outcome measures and main results. To be eligible for review, all studies had to assess the impact of the chosen intervention in managing a symptom or QoL in a palliative care setting. Due to patient population and depending on the therapy, a control group was not always used. The outcomes studied the primary and secondary endpoints with clinical relevance in the palliative care setting. Systematic reviews and meeting abstracts were excluded, duplicates

were also removed. In two cases, authors were contacted for more information or full article, however without success. These findings were not included in the study.

Types of intervention and comparison

Music, aromatherapy, and massage interventions. There was no restriction on how the intervention was provided or who provided it. There was no restriction that the comparative arm involved, for example, usual/ standard care or another type of intervention could be used. Restrictions were not applied as we wanted to capture all study evaluations. In our analysis, we distinguish between different characteristics in mode of delivery and type of comparison. Studies were restricted to the English and German language. We did not include studies involving as the only recipients of the therapy family carers.

Types of outcome measures

The primary outcomes of interest were pain, anxiety, wellbeing and QoL. These were selected as they are common issues in palliative care and are often the focus of studies when exploring the impact of complementary therapy. Secondary outcomes included mood, helpfulness, distress, agitation, sleep, and physical symptoms other than pain. Measures of care satisfaction were also included, such as self-report interviews and attrition rates.

Quality of evidence

For controlled trials, the risk of bias was assessed according to Jadad et al. modified as described in [13] with a maximum possible score of 4 for RCTs (see Table 5). Randomization, assessor blinding, and accountability for study participants are all factors assessed including selection, performance, detection, and attrition bias. Studies with a score of 2 or greater were included. Qualitative studies were assessed using the guidelines from the GRADE-CERQual ('Confidence in the Evidence from Reviews of Qualitative research') [14] following the guidelines set out in Cochrane. This study includes retrospective and mixed method studies. The author controlled for quality using an in-depth analysis of the method, design, and results for each study. Ensuring that each study met the inclusion and exclusion criteria and that the focus was in-line with the research questions as per the Cochrane guidelines [15].

Results

Music therapy

Figure 1 outlines the selection process for "Music Therapy" (MT). Out of 16 articles, 9 RCTs, 3 mixed method studies and 4 qualitative studies were included. In the RCT and mixed method studies, the most represented outcomes were pain (n = 8), anxiety (n = 5), QoL (n = 3) and well-being (n =2). Other parameters reported were agitation, comfort, physiological factors, distress, and fatigue. In the qualitative and mixed method studies, the most represented outcomes were QoL (n = 5), mood (n=3) and well-being (n = 2) Other parameters reported were empowerment and fatigue. Various music interventions were used to meet the individual needs of the participants, sometimes there was an active intervention i.e., therapists and sometimes passive music interventions i.e., chosen CD. The number of participants varied from 9 to 200 and 5 out of the 7 studies that measured pain and anxiety, reported decreased pain and anxiety, however some patients reported only short-term benefits or temporary relief.

Cadwalader et al., 2016 found a highly significant decrease in agitation in patients in the music treatment group (71%) [16]. A single session of music found a highly significant difference in reduced agitation using the Overt Agitation Severity Scale $p < 0.001$ [16]. In addition, Düzgun et al, 2021 found that patients in the music intervention group significantly reduced levels of pain [17]. Fernando et al, 2019 also found significant reduction in pain and anxiety ($p = 0.007$/ $p = 0.002$ respectively) in the music therapy intervention [18]. Pain scores after a single MT session with a music therapist also found significantly reduced pain scores $p < 0.001$ and significant reduced functional pain scores $p < 0.001$ [19]. An additional RCT found a significant reduction in pain scores ($P = 0.003$) however there was no significant difference in anxiety levels [20]In summary, many RCT studies reported significantly reduced pain scores, particularly in studies utilising a music therapist or a specialised music intervention. Studies that found no significant differences in pain scores or QofL had a very high attrition rate (73%) and therefore had an impact on reported effectiveness of MT [21].

Koehler et al., 2022 found that compared to mindfulness, MT significantly decreased distress ($p = .02$) however no interaction effects were found in the psychobiological outcomes [22]. Fallek et al, 2019 reported that MT was an accessible and adaptable intervention, with patients expression a high interest, receptivity and level of satisfaction with music bedside therapy [23].

Three qualitative studies reported an increased QoL where patients receiving MT conducted a semi-structured interview. Overall, in most studies, MT was found to be an accessible and adaptable intervention, with patients expressing high interest, receptivity, and satisfaction. However, one study reported that for some patients' music caused negative emotions due to fatigue or by provoking thoughts about their disease and loss of autonomy [24]. This highlights the importance for music therapists to be trained, not to work alone and to have the sufficient resources to tackle situations which can be disconcerting [24].

Aromatherapy

Figure 2 outlines the selection process for "aromatherapy". 3 out of the 4 studies involved inhaling or deep breathing essential oils. 1 study involved applications of lemon oil on cotton pads. The session duration of these studies ranged from a one session treatment to receiving 222 applications over a 24-month period [25]. One study showed that conscious patients did not have different reactions to unconscious patients using different essential oils [26], however although not significant healthy patients reacted differently to both conscious and unconscious patients. Conscious and unconscious patients reacted with a significant increase in all measured parameters to lemon oil and with a significant decrease in all parameters except for oxygen saturation to lavender oil. This suggests that the treatment on conscious patients can guide in the treatment of unconscious patients.

Weaver et al, 2020 found a mean improvement of 3/10 (SD 2.21) on the nausea scale; 2.6/10 (SD 1.83) on the paid scale and 1.6/5 (SD 0.93) on the mood scale for the aromatherapy cohort ($p<0.0001$) [27]. Similarly, one RCT found aromatherapy provided adequate relief of nausea and vomiting for 149 (73%) applications which although not clinically significant was much better than the control group. Patients with severe nausea and vomiting did not significantly benefit from the aromatherapy intervention and required rescue medication. This

highlights that patients report symptom improvement however the effectiveness is impacted by the severity of the symptoms [25]. One RCT reported that although the aromatherapy treatment did not affect the vital signs of the patients it did have a clinically significant effects on enhanced sleep quality ($p < 0.05$) during the intervention and a clinically significant improved on sleep after the interventions ($p < 0.05$) [28]. One review reported issues with recruitment due to methodological issues, aversions, or allergies to the essential oils [29].

Massage

Figure 3 outlines the selection process for "massage therapy". In the RCTs, the most represented outcomes were pain (n = 3), QoL (n=3), and distress (n= 2). Other parameters include worry, fear, and satisfaction. One qualitative study measured QoL. Various massage interventions were used within the studies, ranging from 1 session to 1 session a week for a month. The duration of the massage lasted between 10 – 30 mins. Some studies did not have a control group.

4 out of 5 RCT studies reported significantly reduced pain levels in the massage treatment groups. One RCT found a significant decrease in pain with six reflexology sessions [30]. The six relaxation sessions, which were offered as part of the control group, also showed a clinically significant decrease in pain initially ($p < 0.001$) but reached a plateau after four weeks. In addition, there was a significant decrease in anxiety and depression ($p = 0.005$). In comparison to the relaxation group, reflexology found the QofL, both the physical and mental components were significantly greater ($p< 0.001$) [30]. This highlights, the clinically significant benefits of reflexology in reducing levels of pain and improving QofL [30]. Three out of four RCT studies found mixed results. Havyer et al, 2020 found that massage therapy was well received and rated as effective by patients [31]. The effect size estimates obtained suggests that a large majority of patients will strongly endorse and appreciate the availability of MT as part of a hospice care. The findings were similar in a RCT exploring the impact of massage therapy on pain [32]. Findings show that massage found signs of reduced pain and improved mood in patients in terminal cancer however this was deemed clinically significant. One qualitative study reported how massage reduced distress and created a sense of peace in patients, at least temporarily. In this study massage was reported as ameliorating some of the most pervasive challenges to QofL and therefore improving it [33]. In summary, the effects of massage with palliative care patients were often reported as positive however the effects were often short lived and did not find clinically significant differences.

Discussion

This systematic review described and critically appraised the current evidence on music therapy, aromatherapy, and massage therapy. To the best of our knowledge, this is the first systematic review specifically examining MT, aromatherapy, and massage therapy to evaluate evidence in palliative end-of-life and hospice care populations. Other reviews in palliative care differ on interventions and inclusion of study designs. For example, some have a broader focus on CM methods in general or focus on only one CM method and many only include RCT studies.

Older systematic reviews established no strong evidence of MT effectiveness for reducing pain [34] however the results of this review agree with additional recent studies that show a significant effect for MT in reducing pain [35], especially studies only focusing on pain as the

main outcome parameter [36]. This was similar for the studies which measured anxiety, as these outcomes were often measured together. The majority of the studies concluded MT should be used alongside conventional medicine in the treatment of pain. However, the reduced levels in pain were often reported as short-term or temporary particularly if the patients only received one MT session [37]. In addition, the studies that found no significant differences had high attrition rates or a smaller sample size. This indicates that future studies should explore potential long-term benefits by differing MT duration times and increase sample sizes to better control for attrition bias. Further large scale RCT studies are needed to strengthen the evidence for MT on pain and anxiety.

One study found significant results on agitation for MT [16] and another found a significant difference on the distress of a patient [22]. This highlights that MT can be applied to treat a range of burdening symptoms, and that more studies need to be undertaken that measure this range of outcome parameters with patients. Older reviews which mainly included RCTs found no differences of MT on QoL. However, this current review found positive results and responses on QoL from patients participating in qualitative semi-structured interviews. This shows that future research should include more mixed methods and/or qualitative studies to measure QoL and well-being, to ensure a more comprehensive assessment of a patient`s treatment. There has been notable improvement in the specification of musical interventions during MT sessions in palliative care and more and more studies show the benefits of MT, not just on decreasing pain but improving other debilitating symptoms.

This systematic review found similar findings to previous reviews on studies using aromatherapy as a treatment with palliative care patients. There were some significant findings on the benefits of aromatherapy treatment and some mixed findings. This review showed that the main benefits to patients were the reduction in nausea and vomiting [25]. However, patients also reported improvements in mood and sleep on qualitative markers [27, 28, 32]. Qualitative evidence on patients' perceptions of aromatherapy highlights that aromatherapy is highly valued by patients [8]. This suggests it would be beneficial to conduct more studies that include qualitative measures that explore patients' perceptions of the impact of aromatherapy on stress, mood and QoL.

The current review reflected the literature in relation to reported mixed results in the use of aromatherapy. Despite using similar treatments and methodologies, the outcomes between studies were different. This may also be a result of recruitment issues and/or patients that had to be excluded in different population samples. Of the studies reviewed, no serious side effects were reported. However, there is a potential for allergies/ aversions thus affecting the recruitment or potential of participation [29].

Some previous studies did not find any strong evidence or links between massage therapy and outcomes such as pain, anxiety and QoL [8], with many studies highlighting methodological issues [8]. In addition, studies with high attrition rates and patients with severe symptoms often did not find a clinically significant effect. The lack of evidence can be attributed to the patient population and the difficulty in adhering to a rigid methodology.

However more recent reviews comparing reflexology and relaxation methods indicate there is some evidence of the benefits to patients, particularly in relation to additional outcomes such as reduced worry and fear [38]. In addition, patients reported an increased sense of satisfaction and peacefulness in qualitative studies [31]. This highlights the need to conduct

mixed method studies and/qualitative studies to ensure these less reported parameters are captured in the assessment of the effectiveness of these complementary methods.

Limitations

This systematic review has several limitations. In relation to the study design, two search databases PubMed and Embase were chosen as the main search engines. This may have limited the amount of search results for each search term. However, a preliminary search of CINAHL was also conducted and did not add to the results from PubMed and Embase. It is well known that different search engines, especially specialised search engines such as CINAHL translate a search strategy into multiple interfaces and search syntaxes, as field codes and proximity operators differ between interfaces [39]. As a result, this study decided to only include PubMed and Embase to ensure consistency in the search strategy and limit search strategy bias. Recent studies also support that the use of one or two main search engines are completely sufficient [40].

This study includes a range of study designs including retrospective and mixed method studies. Which in comparison to RCTs have considerable differences in evaluating bias. The author controlled for this using an in-depth analysis of the method, design, and results for each study. Ensuring that each study met the inclusion and exclusion criteria and that the focus was in-line with the research questions as per the Cochrane guidelines [15]. The contribution to the literature of qualitative and mixed method studies, outweighed the difficulties integrating the findings from different study designs, which were decided in advance.

Due to the nature of some interventions, it was not possible to always conduct blinded studies, both for the patient and the intervention provider. As a result a modified Jadad scale [13] was used as an evaluation tool, which led to more discussions about the eligibility of studies. Despite the included studies investigating similar symptoms, this study could not run a meta-analysis due to a lack of a universal assessment tool for each symptom. Moreover, some measurement tools evaluated the scores of multiple symptoms on one scale such as, the Edmonton symptom assessment scale [36] and therefore making it difficult to determine what symptoms benefit or worsen from the chosen intervention.

This systematic review included qualitative studies in addition to a range of quantitative study approaches, and they provided a more comprehensive view on the patients' experiences and perceptions of CM methods. However, there needs to be a more universal method of interviewing patients on CM methods and the different outcome parameters to ensure the findings are generalisable to this patient population. Qualitative approaches often reflected a more positive impact on some outcome parameters which were not found with standardised measures, such as QoL and patient wellbeing [41]. It may be that qualitative approaches are more suitable to capture the impact of treatments on these outcome parameters.

Conclusion

This systematic review identified and evaluated, RCTs, mixed methods, and qualitative studies and the impact and efficacy of MT, aromatherapy and massive therapy on palliative care and hospice patients. Since the previous review in 2018, additional studies evaluating CIM in the palliative and hospice setting have been published. Of the studies reviewed, MT and massage therapy had the most potential benefits on a range of outcome parameters, including pain and QoL although some mixed results were reported. The studies utilising

qualitive semi-structured interviews mainly reported positive results especially in relation to QoL and patient wellbeing. Future studies should consider conducting mixed method studies or creating a universal semi-structured interview on parameters, such as QoL so that patients can provide a more comprehensive view on how the treatment has impacted them.

Based on previous reviews and the most current evidence, particularly qualitative studies, it may be possible to provide clinical recommendations for this specific population of palliative patients. To help provide more definitive findings, it may be useful first to strengthen the methodology of these studies i.e. identify a universal tool for each symptom to ensure consistency in evaluating treatment. To further our knowledge of the impact of CM in palliative and hospice care continued research is essential.

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Table 1. Inclusion and exclusion criteria

Parameters	**Inclusion Criteria**	**Exclusion Criteria**
Databank	MEDLINE Embase	All other databanks
Timeframe	2010 – 2022	Years outside this timeframe
Country of study	All countries	No exclusion criteria
Intervention	Music Therapy Aromatherapy Massage	All other interventions
Study Design	RCT / Pilot study Quasi-randomised trials Qualitative studies Mixed methods Observation studies Retrospective studies	No intervention reported. No results reported. Animal studies Preclinical data
Age criteria	No age restriction, child patients were included	No exclusion criteria
Language	English German	All other languages
Country	All countries (so long that the study was published in English or German)	Only language exclusions not country exclusions
Population	Patients in palliative/hospice care settings	Only outcome parameters on patients included
Disease of patients	All patients in palliative care	No exclusion criteria
Comparison	Standard therapy No treatment	
Search terms	Three base terms were used “palliative care,” “complementary medicine” and “hospice care” and a specific intervention as a fourth term “music therapy,” “aromatherapy” and “massage therapy”	All other terms

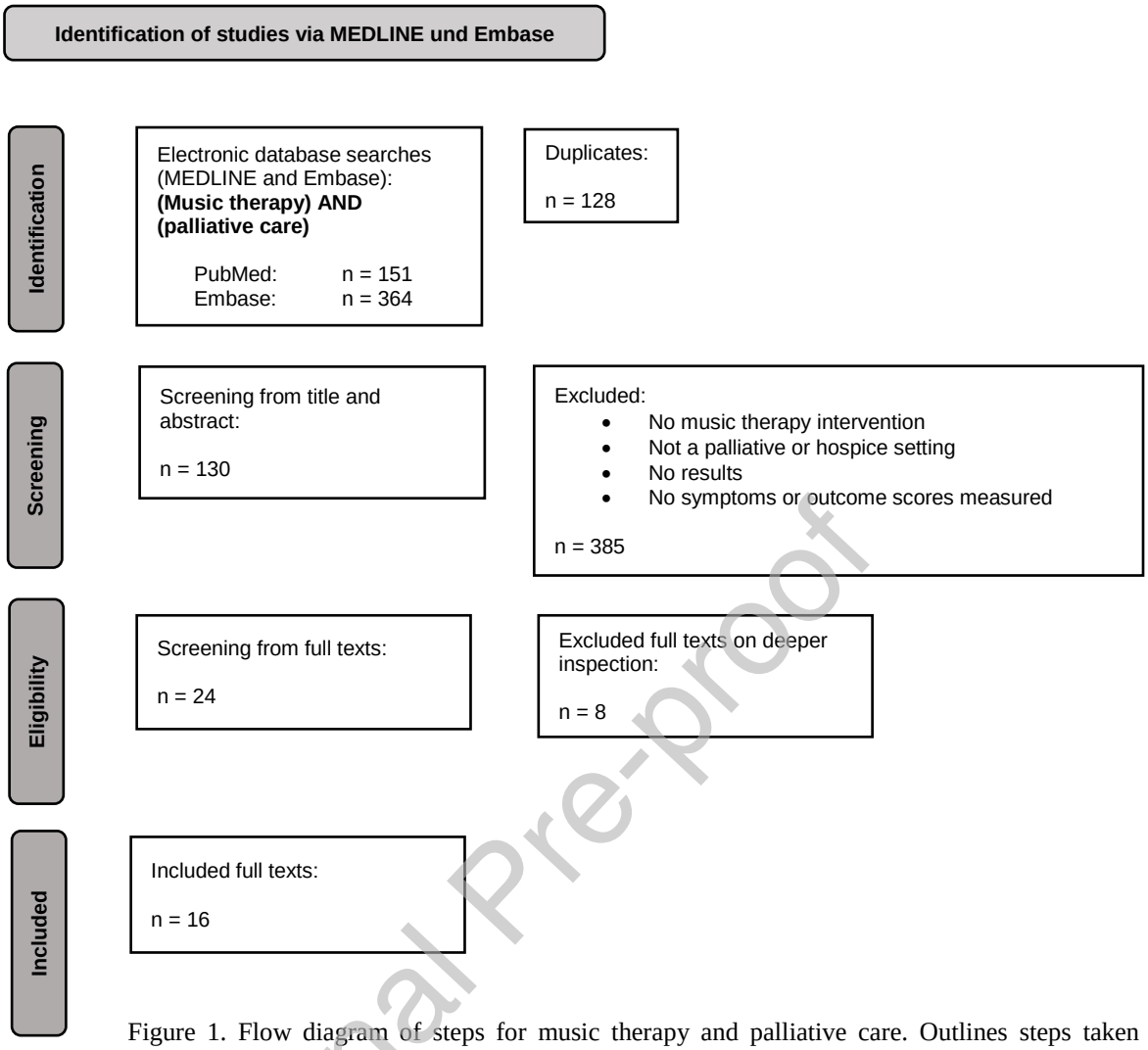

Figure 1. Flow diagram of steps for music therapy and palliative care. Outlines steps taken and number of studies excluded and included in each step.

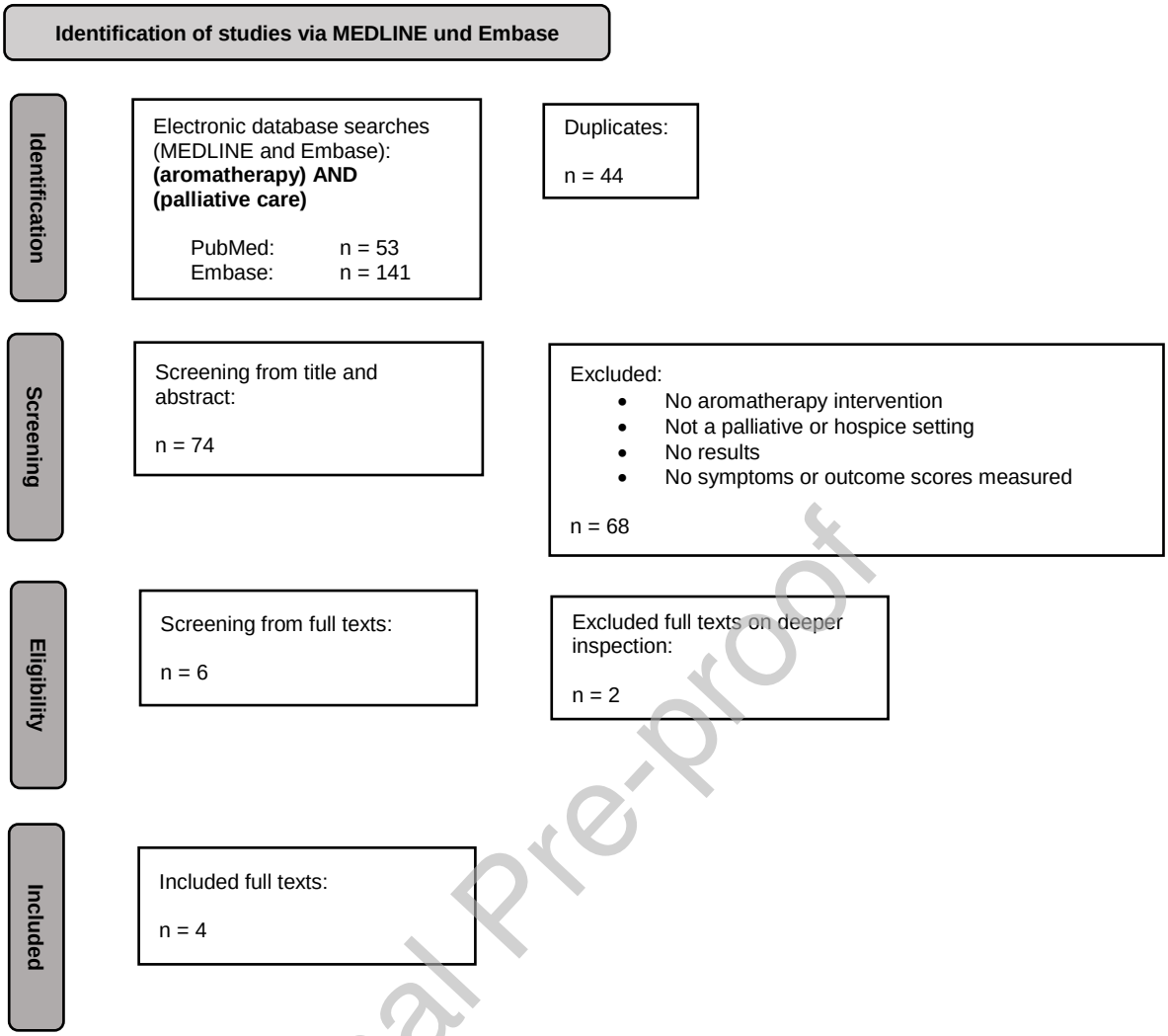

Figure 2. Flow diagram of steps for aromatherapy and palliative care. Outlines steps taken and number of studies excluded and included in each step.

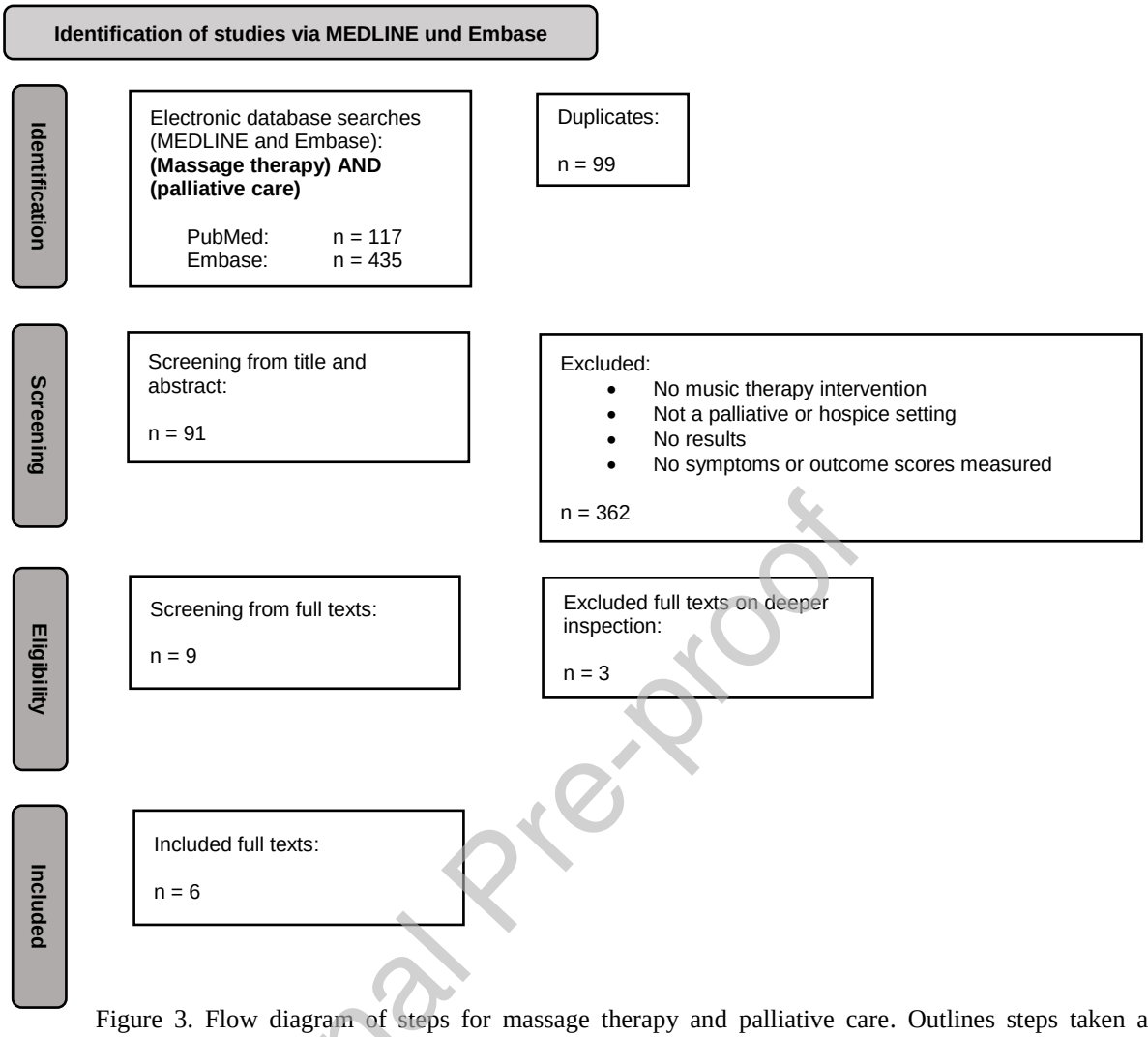

Figure 3. Flow diagram of steps for massage therapy and palliative care. Outlines steps taken and number of studies excluded and included in each step.

Table 2. Summary of Aromatherapy Articles

Primary author (year)	Objective	Study Design	Patient Number	Interventions	Duration of Study	Primary Symptoms and/or Measurements	Primary Outcome	Results
Goepfert et al, (2017) [26]	Analyse the reactions of healthy and unconscious patients to aroma stimuli	RCT	N = 30	Two essential oils: lemons and lavender. Water was the control stimulus	3 measurements after exposure between 10 – 90 minutes	Physiological measurements, breathing, heart rate, systolic diastolic and mean arterial pressure	Physiological measurements to lemon oil	Increase in all measured parameters
Weaver et al, (2019) [27]	Measure the impact of aromatherapy	RCT	N = 180	3 intervention arms including use of sachet scent	5 – 60 minutes	Baxter Retching Faces Children's anxiety pain scale (CAPS)	Nausea, pain, mood	Short-term/ temporary symptoms
Yildirim et al, (2020) [28]	Determine the effect of lavender oil on sleep	RCT	N = 68	Deep breathing lavender oil at bedtime	2 nights	Richards-Campbell sleep questionnaire	Sleep	Enhanced sleep quality. No effects on vital signs
Kreye et al, (2022) [25]	Investigate the impact of lemon pads against nausea and vomiting	Retrospective study	N = 66	222 applications of lemon oil	24 months	Nausea/vomiting	Nausea/vomiting	Reduction in nausea and vomiting in 73% of applications

Table 3. Summary of Massage Therapy Articles

Primary author (year)	Objective	Study Design	Patient Number	Interventions	Duration of Study	Primary Symptoms and/or Measurements	Primary Outcome	Results
Genik et al, (2020) [38]	Investigate massage therapy on children	RCT	n = 8	Massage therapy to all patients	1 session a week lasting 1 hour	Pain, worry, fear, satisfaction, QofL	Pain	Significantly decreased pain and worry No significant decrease in QofL
Groninger et al, (2023) [47]	Compare 3 massage dosing strategies	RCT	n = 387	3 groups were given 3 different dosages of massages	10/20 min daily sessions. 1 single 20 min session	Pain, distress, QofL, distress, satisfaction	Pain and distress	Significantly reduced pain and distress. Longer improvements for distress
Mantoudi et al, (2020) [30]	Comparison of the effects of reflexology	RCT	n = 24	Massage sessions vs light exercise sessions	6 sessions over 2 weeks	Pain (Brief Pain Inventory), distress (Global Distress)	Pain, distress	Significantly reduced pain and distress
Havyer et al, (2022) [31]	Investigate the effects of massage and exercise on terminal cancer patients	RCT	N = 27	1 massage a week for 3 weeks	3 weeks	Qofl, pain, depression, anxiety, well-being, satisfaction	QofL, pain	No significant differences in all outcomes except satisfaction
Keleman et al, (2020) [33]	Examine the experience of massage therapy	Qualitative	n = 20	Different session lengths of massage therapy (10 or 20 mins on consecutive days or 1 20 min massage)	Between 1 and 5 days	Interviews, QofL	QofL	Improved QofL

Table 4. Risk of Bias for all RCTs included in the study

Study	Described as randomised	Method described and appropriate	Assessor unaware of group allocation of subjects	Description of withdrawals and drop-outs	Score [48, 49]
Cadwalder et al, (2016) [16]	No	Yes	No	Yes	2
Düzgun et al, (2021) [17]	Yes	Yes	Yes	No	3
Fernando et al, (2019) [18]	Yes	Yes	No	Yes	3
Gutgsell et al, (2013) [19]	Yes	Yes	No	Yes	3
Koehler et al, (2022) [22]	Yes	Yes	No	Yes	3
Krishnaswamy et al, (2016) [20]	No	Yes	No	Yes	2
Porter et al, (2018) [21]	Yes	Yes	Yes	Yes	4
Ramirez et al, (2018) [42]	Yes	Yes	No	No	2
Warth et al, (2015) [43]	Yes	Yes	No	No	2
Goepfert et al, (2017) [26]	Yes	Yes	No	No	2
Weaver et al, (2019) [27]	Yes	Yes	No	Yes	3
Yildirim et al, (2020) [28]	Yes	Yes	No	Yes	3
Genik et al, (2020) [38]	No	Yes	No	Yes	2
Groniger et al, (2023) [47]	Yes	Yes	No	No	2
Mantoudi et al, (2020) [30]	Yes	Yes	No	No	2
Lopez-Sendin et al, (2021) [32]	Yes	Yes	No	Yes	3
Havyer et al, (2020) [31]	Yes	Yes	No	Yes	

Table 5. Risk of Bias for all RCTs included in the study

Study	Described as randomised	Method described and appropriate	Assessor unaware of group allocation of subjects	Description of withdrawals and drop-outs	Score [48, 49]
Cadwalder et al, (2016) [16]	No	Yes	No	Yes	2
Düzgun et al, (2021) [17]	Yes	Yes	Yes	No	3
Fernando et al, (2019) [18]	Yes	Yes	No	Yes	3
Gutgsell et al, (2013) [19]	Yes	Yes	No	Yes	3
Koehler et al, (2022) [22]	Yes	Yes	No	Yes	3
Krishnaswamy et al, (2016) [20]	No	Yes	No	Yes	2
Porter et al, (2018) [21]	Yes	Yes	Yes	Yes	4
Ramirez et al, (2018) [42]	Yes	Yes	No	No	2
Warth et al, (2015) [43]	Yes	Yes	No	No	2
Goepfert et al, (2017) [26]	Yes	Yes	No	No	2
Weaver et al, (2019) [27]	Yes	Yes	No	Yes	3
Yildirim et al, (2020) [28]	Yes	Yes	No	Yes	3
Genik et al, (2020) [38]	No	Yes	No	Yes	2
Groniger et al, (2023) [47]	Yes	Yes	No	No	2
Mantoudi et al, (2020) [30]	Yes	Yes	No	No	2
Lopez-Sendin et al, (2021) [32]	Yes	Yes	No	Yes	3
Havyer et al, (2020) [31]	Yes	Yes	No	Yes	