Review Article   **Open Access**

The effect of laughter and humor interventions on chronic non-cancer pain in older adults: A systematic review

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Abstract

Introduction: In recent decades, special attention has been paid to laughter therapies in medicine and psychology. A systematic review has not yet been performed on these therapies for pain in elderly people. This research aims to estimate the effect of Laughter and humor interventions on Chronic Non-Cancer Pain (CNCP) in older adults.

Materials and Methods: This study was a systematic review and meta-analysis of randomized clinical trials on the effects of laughter therapy on the severity of chronic pain in elderly non-cancer patients. We searched English and non-English articles published between 2010 and December 2023, using the MeSH search method and the keywords laughter, humor, chronic pain, and older adults in the international and Persian databases, including SID, IranMedex, Magiran, Cochrane Library, MEDLINE/PubMed, Web of Science, Scopus, ScienceDirect, Google Scholar, EBSCO, and EMBASE databases.

Results: Among 1075 articles in the initial search, seven that met the inclusion criteria were selected after removing duplicate and unrelated articles. Among the articles, three articles presented a positive and significant effect in reducing the pain intensity of the elderly, and three articles had a non-significant positive effect, which showed the moderate to low effect of laughter therapy in reducing the pain intensity. Only one article showed a non-significant negative effect. Overall, this review has a large heterogeneity between studies, which may indicate hidden variables or methodological differences.

Conclusion: Given the increasing aging population and the financial burden of healthcare, it is recommended to move towards low-cost interventions that are accessible to the general population and require minimal specialized facilities and training.

Keywords: Chronic pain, Elderly, Humor, Laughter

Introduction

The elderly population in the United States is projected to surpass 80 million by 2040. As the population grows, the number of people with chronic conditions, such as chronic pain, will likely increase (1). Globally, including in the

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United States, individuals aged over 65 years experience a notably higher incidence of pain compared to younger adults (2). Studies estimate that more than 70% of Americans over 65 suffer from Chronic Non-Cancer Pain (CNCP) stemming from conditions like diabetes, cardiovascular diseases, and musculoskeletal disorders (3).

Chronic pain is typically defined as persisting beyond three months or recurring periodically. It may originate directly from a primary disease (e.g., neuropathic pain) or as a secondary complication of prior illnesses such as cardiovascular disease or cancer (4). Most of the main causes of chronic pain in the elderly can be secondary and result from the person's previous illness, the most common of which include cancer pain, musculoskeletal pain, pain after trauma or surgery, chronic headaches, chronic visceral pain, and orofacial pain (5). To confirm the above, we can refer to a systematic review published in 2019, which shows that the prevalence of back pain among the elderly is as high as 75%, which causes pain-related disability and functional disability in up to 60% of the elderly (6). On the other hand, another systematic review shows that back pain, especially in the back and neck, is common among the elderly in about 65%, musculoskeletal pain in about 41%, diabetic neuropathic pain in about 36%, and joint pain in about 15-25% (7).

It has been reported that pain intensity, which is the main criterion for measuring pain in chronic musculoskeletal pain (8), causes more disability in the elderly, sleep disorders (9), psychological problems such as depression, anxiety, and a tendency to use drugs, especially in the elderly who suffer from chronic non-cancer pain (10). Consequently, there is growing interest in evidence-based, non-pharmacological approaches like Cognitive Behavioral Therapy (CBT) and Mindfulness-Based Stress Reduction (MBSR) programs for chronic pain management (11). Nevertheless, these methods offer moderate benefits, highlighting the need for broader exploration into positive psychological interventions (12). Research increasingly points to laughter and humor therapies as valuable strategies for enhancing psychological resilience and coping among those experiencing chronic pain (13).

The literature describes various methods of laughter intervention. Some involve external humor stimuli, such as watching comedic movies (14,15), while others, like laughter yoga, involve voluntary laughter combined with physical and breathing exercises, often performed in group settings (16). Laughter can be classified into spontaneous and simulated types, with studies indicating that simulated laughter can yield significant health benefits without adverse effects (17).

Mora-Repoll reviewed two types of laughter, simulated and spontaneous, and concluded that simulated laughter had positive effects on health compared to a control group (no intervention) or other intervention groups (exercise therapy). He also emphasized that laughter therapy has no side effects or contraindications for individuals and that few side effects have been reported (18).

Although a literature review suggests that laughter therapy has improved the quality of life in various settings, no studies have specifically examined the relationship between Positive Affect (PA) and chronic pain severity in the elderly (19,20). Howell et al. found that inducing positive approaches was associated with higher pain tolerance in their systematic review of experimental studies (21). In a study conducted by Kushlev et al. on 2.5 million respondents, the results showed that there is an inverse relationship between PA and physical pain (22). Of course, it is worth noting that in both studies, the type of physical pain experienced by people was acute and focal. Therefore, more studies should be conducted in this area to clarify the effects of PA on chronic pain. Previous studies have attempted to summarize the field. McCreaddie and Wiggins reviewed studies that showed direct and indirect effects of laughter therapy on various aspects of health, especially in nursing. Most studies did not use a valid, unified methodology for implementing laughter therapy. In addition, most studies conducted in this field were correlational; few were randomized clinical trials and did not have sufficient power to infer causality (23).

Given the increasing costs of healthcare and the increasing economic burden of treatment on families, there is a need for simple, inexpensive, and accessible interventions such as laughter therapy as complementary medicine alongside pharmacological treatments. Therefore, researchers and scientists in this field need to pay increased attention to and conduct more systematic studies on the potential effects of laughter therapy. However,

recent studies have been published to update information on laughter therapy and its effects. This systematic review and meta-analysis examined randomized clinical trial studies conducted on the effects of laughter therapy on the severity of chronic pain in elderly non-cancer patients.

Materials and Methods

This systematic review was conducted by the Cochrane Handbook for Systematic Reviews of Interventions (24) and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (25). A comprehensive search strategy based on PICO (Population, Intervention, Comparison, and Outcome) principles was employed to identify relevant studies. Searches were conducted across in the international and Persian databases, including SID, IranMedex, Magiran, Cochrane Library, MEDLINE/PubMed, Web of Science, Scopus, ScienceDirect, Google Scholar, EBSCO, and EMBASE databases. In Persian databases, keywords such as "humor

therapy," "laughter therapy," "chronic pain," "non-cancer pain," and "elderly" were utilized. For English-language databases, MeSH terms like "Laughter therapy," "aged," "chronic pain," "elderly," and "Wit and Humor as Topic" were applied using logical operators (AND, OR, NOT). Studies published between 2010 and December 2023 were eligible for inclusion. References of selected original and review articles were also manually screened to capture any additional relevant studies. Duplicate records were eliminated based on the title and abstract review. Subsequently, the full text of the remaining articles was examined for eligibility against the inclusion criteria.

This study included articles based on specific criteria: they had to be clinical trials focusing on chronic pain in the elderly population, excluding those related to cancer. Additionally, only articles discussing separate sessions for jokes and laughter were considered, regardless of whether they were in English or Persian. Articles without full text available were excluded (Figure 1).
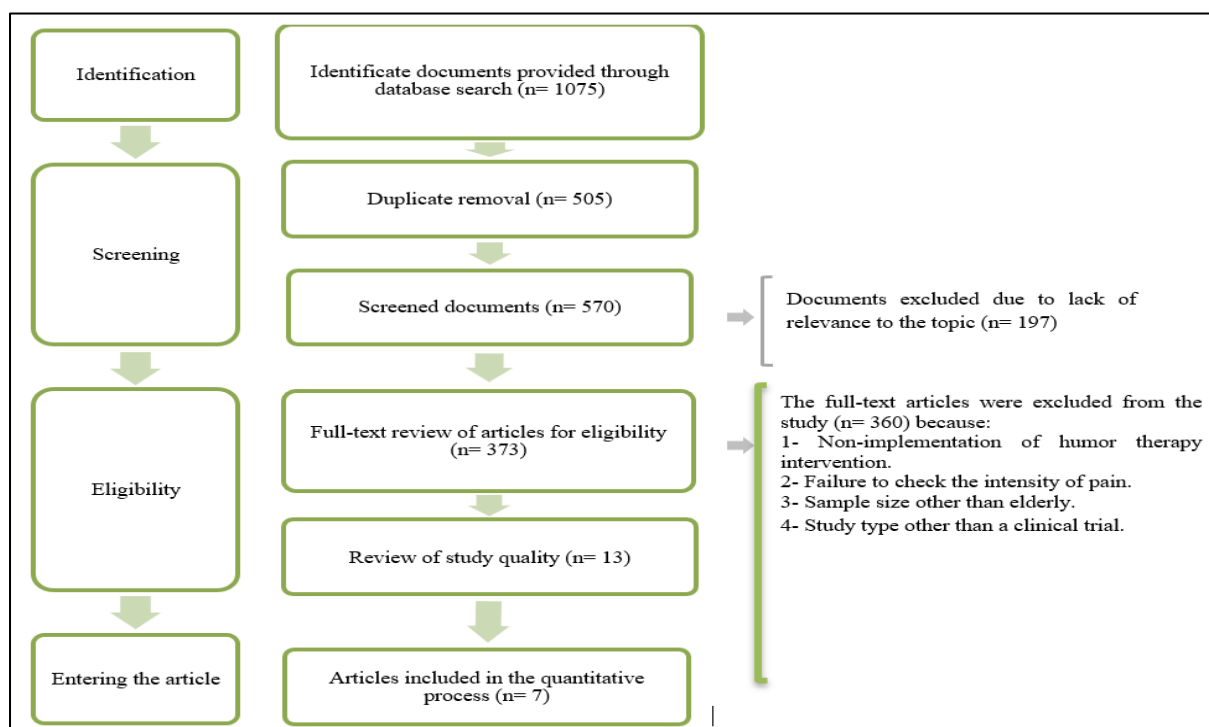
Figure 1. PRISMA flowchart and stages of study inclusion in a systematic review

This systematic review examines various laughter therapy techniques used in sessions, including long laughs, laughter techniques with hand movements (such as rhythmic clapping and rain clapping), laughter yoga (incorporating relaxation programs and

meditation with laughter), animal sounds laughter techniques, movement and spinning with upbeat songs, breathing exercises with different laughter models (such as deep ha-ha and inflating a balloon with laughter), reciting funny jokes, group laughter, playing funny

games (like the laughing ball technique), and watching comedy short films in research studies. To extract data and results from the articles, the researchers first reviewed the titles of the articles to remove duplicates. Next, they carefully reviewed the abstracts of the articles and excluded those that did not meet the inclusion criteria. Finally, the full text of potentially relevant articles was reviewed, and eligible articles were selected.

Two researchers conducted the article selection process independently, with disagreements resolved by a third party. Surveys indicate the existence of at least 25 different scales for assessing the quality of trial study reports, with the JADAD tool being more widely used due to its reliability in identifying methodological quality and its simplicity and brevity (26). In this study, the JADAD criterion was utilized to evaluate the quality of the articles by assessing bias in randomization, patient follow-up, and blinding. The JADAD criterion assigns scores based on the presence and correctness of randomization, blinding, and patient follow-up methods in the articles. One score is given if randomness is mentioned, and an additional score is awarded for correct scientific randomization methods. Conversely, a negative score is given for incorrect randomization methods. Similarly, one point is given for mentioning blinding, with an additional point for a correct and clear explanation and a negative point for incorrect blinding methods. Additionally, one point is awarded if the fate of all patients is specified in the article. The total score for each study ranges from 0 to 5, with a score of 3 or higher indicating appropriate methodology and inclusion in the systematic review (27).

At this stage, a form was first completed containing the basic data required for the study for analysis. This included data related to the author's name, the year of the article, the country in which it was conducted, the sample size, the average age of the participants, the type of study, blinding, and measurement tools of pain. The method of conducting the study and the results of the study were collected in terms of average pain intensity after implementation of the reduction interventions (Table 1). Based on the explanations provided in the article, seven studies were included in the meta-analysis stage. The studies were combined based on the number of samples and the mean and standard deviation after the

intervention. The I2 index was used to assess the heterogeneity of the studies, and due to the presence of heterogeneity in the studies, the random effects model was used to combine the studies. Data analysis was conducted using STATA software, and a *P*-value less than 0.05 was considered significant.

Results

Out of the 1075 articles in the initial search, 505 articles were removed due to repetition in the title, and 563 articles were excluded for reasons such as the absence of humor therapy in the elderly with pain, lack of implementation of the humor and laughter intervention, also lack of access to the full-text of articles in a way that abstracts of the articles did not provide sufficient information, leading to their exclusion from the review process. Ultimately, seven articles that scored three or higher on the JADAD criterion were included in the systematic review (Table 1). This systematic review included studies from Iran, Israel, Turkey, Japan, and Hong Kong. Four articles used the Visual Analogue Scale (VAS) to measure chronic pain intensity in the elderly, while other studies utilized tools such as the Turkish Death Anxiety Scale (TDAS), Verbal Rating Scales (VRS), the bodily pain item of the Short Form 36-item Quality of Life Measure (SF-36), and the pain item of the RAND Health Status Questionnaire. The findings of seven studies were combined for analysis.
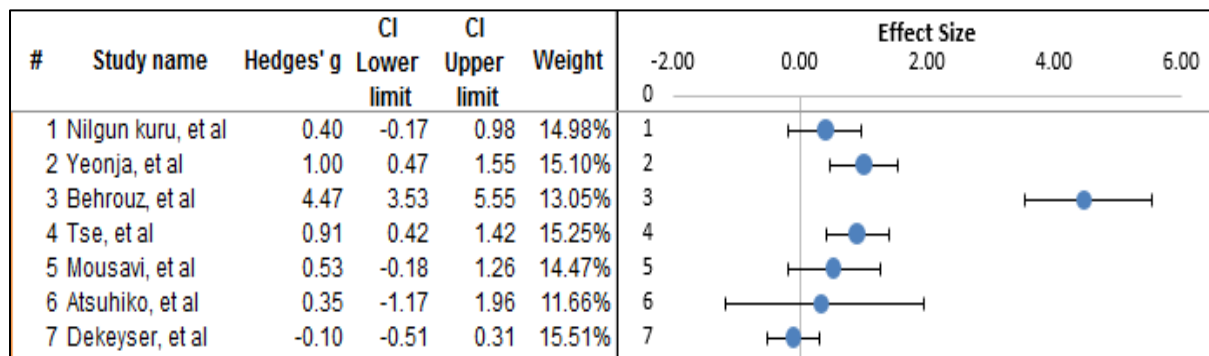
According to Figure 1, which shows effect size of each study and confidence interval, studies whose confidence interval crosses the zero vertical line indicate a lack of significance. Here, the studies of Behrouz (15), Ko (25), and Tse (26) have a positive effect size and significance. Hence, the effect size of Behrouz's study is equal to CI: 47.4 (15), the study of Ko is equal to CI: 0.1 (25), and Tse's study is equal to CI: 0.91 (26), these effects are large and beneficial for laughter therapy in reducing the pain intensity of the elderly.

While the studies of Mosavi (27), Fukuoka (28), and Kuru Alıcı (24) showed the effect of laughter therapy in reducing pain intensity in the elderly, this reduction was insignificant. Thus, the effect size in Mosavi's study was CI: 0.53 (27), in Kuru Alıcı's study, it was CI: 0.40 (24), and in Fukuoka's study, it was CI: 0.35 (28), the effect sizes were moderate or small and did not provide strong evidence of a

treatment effect. In this analysis, only the Ganz study has a small negative effect (CI: 0.10) in favor of the control group (29). The heterogeneity results of this meta-analysis indicated significant differences among the studies. The I-SQUARED value for pain intensity was over 50% (I2: 97.91%), suggesting substantial heterogeneity in the data. The Q statistic (74.76) and *P*-value (0.000) confirm this heterogeneity is statistically significant, indicating that the study variations are not due to chance. Overall, this meta-analysis has high heterogeneity, which may indicate hidden variables or methodological differences between studies. This problem may make it more appropriate to use random-effects models to interpret the results. Overall, the meta-analysis shows a trend toward significance (one-tailed *P*-value= 0.03). However, the two-tailed *P*-value (two-tailed *P*-value= 0.06) means we cannot confidently conclude that the treatment effect is significant in all trials.

Some studies show a significant effect, while others show a small significant effect (Figure 2).

#	Study name	Hedges' g	CI Lower limit	CI Upper limit	Weight
1	Nilgun kuru, et al	0.40	-0.17	0.98	14.98%
2	Yeonja, et al	1.00	0.47	1.55	15.10%
3	Behrouz, et al	4.47	3.53	5.55	13.05%
4	Tse, et al	0.91	0.42	1.42	15.25%
5	Mousavi, et al	0.53	-0.18	1.26	14.47%
6	Atsuhiko, et al	0.35	-1.17	1.96	11.66%
7	Dekeyser, et al	-0.10	-0.51	0.31	15.51%

Figure 2. Significant effect based on the conducted studies

Table 1. Specifications of the articles

	Authors	Year/ Country	Location	Sample size	The average age	Type of study	Blinding	Pain measurement tool	Intervention	result	Jadad Score
1	Kuru Alıcı (24)	2017/ Turkey	Elders in Nursing Homes	50 elders IG:20 CG:30	69.1	Quasi-experimental 2 groups	Blind on one side	Pain in Turkish Death Anxiety Scale (TDAS)	laughter yoga Laughter therapy Application 5 weeks	Pain in IG not change but in CG increased P:0.42	3
2	Ko (25)	2013/ Korea	Elders in two different hospitals	60 elders with Osteoarthritis IG:30 CG:30	76.1	Quasi-experimental 2 groups	Blind on one side	Pain in Visual analogue scale (VAS)	Laughter therapy Four-week	Pain in IG decrease but in CG increased P:0.001	4
3	Behrouz (15)	2017 / Iran	Elderly living in nursing homes	55 elders IG: 28 CG : 27	73.2	Quasi-experimental 2 groups	Blind on both sides	Pain in Visual analogue scale (VAS)	Humor intervention was done during six 60-minute sessions. The content carried out in the intervention group sessions included showing humorous clips, playing games, telling stories and jokes, and humorous music.	Pain in IG decreased but in CG increased P:0.001	4
4	Tse (26)	2010/ Hong Kong	Older adults in a nursing home	70 elders with chronic pain IG:36 CG:34	78.9	Quasi-experimental 2 groups	Blind on both sides	Verbal Rating Scales (VRS)	Laughter therapy for 8 weeks in the form of "My happy collection", with comic photos, tapes and sounds and funny videos, comedy clips and cartoons and ridiculous stories	Pain in IG decreased but in CG not changed P:0.001	4
5	Mosavi (27)	2018/ Iran	Older adults in a nursing home	32 elders IG: 16 CG: 16	72	Quasi-experimental 2 groups	Blind on one side	Pain in Visual analogue scale (VAS)	4-week laughter therapy Handshake with laughter, Hindi greetings (Namaste), deep breathing, showing movies, reading jokes, meditation, performing various types of laughter such as bicycle laughter, sorry laughter, lion laughter, deep laughter	Pain in IG decreased but in CG increased P:0.002	4
6	Fukuoka (28)	2016 / Japan	People with stable COPD in rehabilitation institute	8 elderly with COPD	75.5	Pilot, with randomization	Blind on one side	Bodily pain In (SF-36)	Holding a 10-minute laughter yoga session before exercise for 2 weeks. Patients in both groups performed planned exercise interventions in the form of exercise programs, pulmonary physiotherapy, and nutritional counseling.	Pain in IG decreased and it wasn't significant but in CG not changed. P:0.05	3
7	Ganz (29)	2014/ Israel	Elderly people visiting day care centers	92 elders IG: 50 CG: 42	76.9	Quasi-experimental 2 groups	Blind on one side	Pain in RAND Health Status Questionnaire	The "Humor as a way of life" program consisted of a 2-3 hour session per week. The humor therapy content in each session included watching a comedy film, laughter meditation, holding loud and group laughing techniques, and dancing with laughter.	Pain in IG and CG both increased P:0.46	4

IG: intervention group   CG: control group

Discussion

The effects of laughter intervention in health units to achieve physiological and psychological health and the benefits associated with implementing this intervention in the context of pain in the elderly are still unclear. Despite many studies conducted in the field of laughter therapy in cancer patients, children, dialysis patients, and the elderly, no article was found that measured the results of clinical trial studies in chronic non-cancer pain in the elderly. This study aims to assess all clinical trial articles on chronic non-cancer pain in the elderly group. Laughter therapy interventions in this systematic review included performing funny programs such as playing funny movies, telling funny stories, laughing exercises such as laughter yoga, and performing laughter with a clown or fake laughter. The effects of laughter therapy include effects on depression, anxiety, pain, safety, and quality of life. However, more research is needed on chronic pain, especially in the elderly (30). Other research has also shown that humor and engaging in humorous activities can effectively manage adult pain. This study highlights that watching funny movies reduces children's pain response as measured by the hormone cortisol (31).

A study conducted by Ghafouri in 2016 showed that laughter and humor only reduce pain and anxiety for patients for a short time and are more beneficial for acute pain. This method is not significantly effective in reducing chronic pain in patients (32). However, another study that supports the effect of laughter therapy on chronic pain, conducted by Leise et al. in 2015 on adults, showed a positive relationship between chronic pain and a sense of humor (33). Another study that supports the effectiveness of humor therapy on the fear of pain is done by Behrouz, who stated that humor therapy as a low-cost method could effectively reduce the quality and fear of pain in the elderly pain (15).

Some studies believe that humor and laughter therapy are a suitable method and strategies for improving the mental health of patients with chronic pain. For example, humor is an appropriate and low-risk coping method for dealing with different pain levels that effectively reduces pain (34).

In line with the aforementioned results, the study by Tse et al. showed that laughter therapy reduces loneliness and pain intensity and increases happiness and life satisfaction in older people with chronic pain living in nursing homes (N=70). This study measured loneliness intensity with the UCLA Revised Loneliness Scale, happiness with the Subjective Happiness Scale, and life satisfaction with the Life Satisfaction Index-A (26).

Rotton and Sheets concluded that humorous films may have a negative effect on pain tolerance if the film does not match an individual's humor preference. In their experiment with 78 postoperative patients, those who preferred a humorous movie to a serious movie requested less pain medication two days after surgery when it was accompanied by positive expectations of pain relief. Interestingly, when only the comedic option was available, patients self-prescribed more analgesia, suggesting that the ability to choose what to watch played a significant role in enjoyment and pain tolerance (34). The study suggests that patients' characteristics, such as specific personality traits and humor preferences, may influence their response to different types of movies rather than the humor stimulus being solely responsible for the effect.

The review of different articles shows that reduce pain through laughter therapy, such as Choi et al. in mastectomy patients (35), Herschenhorn in young women with rheumatoid arthritis (36), Kessler et al. in palliative care (37), Yu and Kim in military personnel with low back pain (38). Among the topics mentioned, the effect of laughter therapy on pain intensity in women with rheumatoid arthritis is seen. Unfortunately, this article did not report its effectiveness or lack thereof (36). It should be noted that such articles cannot be relied upon due to the small sample size and high risk of bias. However, all these articles were done on patients other than elderly patients. Since the type and intensity of pain in the elderly are different from cancer pain, the results of these articles cannot be used in line with the results of our study.

In a review conducted by van der Wal in 2019, 21 studies were used to measure the effects of laughter and sense of humor on older adults' mental and physical health. This systematic review showed that laughter therapy was effective and significant in reducing depression and pain in older adults, improving sleep quality, improving mood, and increasing life satisfaction (39). Most studies have concluded that laughter therapy has sufficient and credible evidence to improve various areas

of health. However, a unified guideline and method for implementing laughter therapy as a complementary therapy is necessary. Mora-Ripoll indicated that "simulated" laughter is a well-established and robust method of laughter therapy due to its high effectiveness in most societies, environments, and cultures (18,30).

A systematic review by van der Wal found that laughter and joking can significantly reduce cortisol and pain levels. Although a summary of these studies suggests the overall positive effects of laughter therapy, methodological shortcomings in these studies make it difficult to interpret the positive results of the summary critically. Among the limitations of the article mentioned are many low-quality studies (without control, a small number, or no results in the conference abstract) and studies with a high risk of bias (39). One of the biggest limitations of this study, among other things, is the difference in the pain intensity measurement tool in the elderly. For example, in the Kuru Alıcı study, the Turkish Death Anxiety Scale pain measurement tool was used, which assessed the intensity of pain along with the risk of death. In the Fukuoka study, the Health Survey Short Form 36-item (SF-36) measurement tool was used, which measured only physical pain. Therefore, the difference in measurement tools is one of the important differences in this review. In this systematic review, limitations of the articles included the low quality of the studies and the high risk of bias in the included studies. Many studies in this analysis had a very low sample size (mean n= 52). One study (Fukuoka) had 8 participants per condition, which could more accurately describe pilot studies unsuitable for reliable effect size estimations. Some studies did not measure the independent effect of laughter therapy alone and combined treatments with laughter therapy, making it difficult to conclude whether the results were related to laughter or humor therapy or non-specific treatment effects. For example, studies by Fukuoka and Kuru Alıcı used laughter yoga to reduce pain in the elderly, which can show different results (24,28). Many non-English articles have been published in various Asian journals, which, due to the lack of English translation, can increase the risk of language bias in the articles. Therefore, it is recommended that respected authors make the English translation of their articles available to others. Finally, due to the great care taken by the authors in searching for keywords, phrases, and content of laughter therapy, it was decided to use a reputable database for meta-analysis research: WOS, EMBASE, Cochrane Library, and PUBMED. Furthermore, using common words among researchers to define "laughter therapy" has led to a wide range of terms, terminology, and definitions being used. This indicates a lack of maturity among researchers on this issue and topic.

Conclusion

This systematic review and meta-analysis aimed to review all randomized and quasi-experimental clinical trial studies that have analyzed the different effects of laughter and humor on the severity of chronic pain in elderly non-cancer patients. The results of this systematic review showed that humor was effective in reducing the severity of chronic pain in elderly patients. In addition, humor-based interventions, due to their accessibility and lack of special expertise, can also be used to increase hope, pain tolerance, and quality of life in older adults receiving treatment in nursing homes. Future directions for this area of research include conducting randomized clinical trials with control groups, assigning standardized laughter therapy activities based on universal laughter theories, implementing laughter therapies in clinical settings with trained staff, developing interventions in which the precise amount or duration of laughter can be measured and managed, and examining the number of sessions for different purposes.

Acknowledgments

Authors' Contributions

AE collected the articles and checked their quality. SHB analyzed the articles and wrote a review article.

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