

ORIGINAL RESEARCH

Nonpharmacological Interventions for People with Dementia - A Systematic Literature Review and Meta-Analysis

Intervenciones no farmacológicas para personas con demencia: revisión sistemática de la literatura y su metaanálisis

Chandrika KM. Nitte Usha Institute of Health Sciences, Mangalore, Karnataka, India.

Email: chandrika.20phdn203@student.nitte.edu.in, <https://orcid.org/0000-0003-2039-0432>

Shishir Kumar. Associate Professor, Department of Psychiatry, KS.Hegde Medical Academy, Nitte (Deemed to be University), Mangalore, Karnataka, India.

Email: shishirkumar@nitte.edu.in, <https://orcid.org/0000-0002-2881-7026>

Ankeeta MJ. Department of Community Health Medicine, Nitte Medical College, NITTE (Deemed to be University), Mangalore, Karnataka, India

Email: dr.ankeetamj_kshema@nitte.edu.in, <https://orcid.org/0000-0002-9839-3556>

Lokesh Babu. Sneha Manovikasa Kendra, Tumkur, Karnataka, India.

Email: samvaada74@gmail.com

Prathima Sherigarthy. Department of Mental Health Nursing, NITTE Usha Institute of Nursing Sciences, NITTE (Deemed to be University), Mangalore, Karnataka, India.

Email id: prathima.s@nitte.edu.in, <https://orcid.org/0000-0003-0605-837X>

Nalini M. Department of Mental Health Nursing, NITTE Usha Institute of Nursing Sciences, NITTE (Deemed to be University), Mangalore, India.

Email: nalini@nitte.edu.in, <https://orcid.org/0000-0003-3689-6227>

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Abstract

Background: Elderly individuals often contend with Dementia, a neurodegenerative disorder impeding cognitive functions and Quality of Life (QoL). Pharmacological remedies for Dementia commonly yield adverse effects. However, nonpharmacological interventions demonstrate efficacy in ameliorating cognitive functions. **Objective:** This systematic review and meta-analysis intends to explore the evidence for nonpharmacological interventions for people with Dementia. **Methods:** A systematic search of recent literature on nonpharmacological interventions for Dementia was conducted. Fifteen of 38 articles, including Randomized controlled trials (RCTs), focused on interventions like reminiscence therapy, reality orientation therapy, validation therapy, and life storybook interventions. Study quality was assessed, and statistical pooling was performed using Review Manager 5.4, with bias risk evaluated per Cochrane guidelines. **Results:** Meta-analysis revealed the overall effect size of Mini-Mental State Examination (MMSE) and Quality of Life (QoL) outcomes using standardized mean differences (SMD) and 95% confidence intervals. Reality orientation therapy exhibited a moderate impact on cognition, while life storybook intervention and reminiscence therapy had smaller effects on cognition and QoL, respectively. **Conclusion:** Nonpharmacological interventions offer a promising avenue for enhancing cognitive functions and QoL in dementia patients.

Keywords: Dementia, Reminiscence therapy, Nonpharmacological interventions, Quality of Life, Cognitive Functions

Resumen

Antecedentes. los ancianos a menudo padecen demencia, un trastorno neurodegenerativo que impide ciertas funciones cognitivas y disminuye la calidad de vida (CdV). Los remedios farmacológicos para la demencia suelen producir efectos adversos. No obstante, existen intervenciones no farmacológicas documentadas, con eficacia demostrada para el mejoramiento de las funciones cognitivas. **Objetivo.** esta revisión sistemática y su metaanálisis pretenden explorar la evidencia acumulada de intervenciones no farmacológicas para el tratamiento de personas con demencia. **Métodos.** se realizó una búsqueda sistemática de la literatura reciente sobre intervenciones no farmacológicas para la demencia. Quince de 38 artículos, incluidos ensayos controlados aleatorios (ECA), se centraron en intervenciones como la terapia de reminiscencia, la terapia de orientación a la realidad, terapia de validación y las intervenciones mediante libros con historias de vida. Se evaluó la calidad de los estudios y se realizó un agrupamiento estadístico mediante el *Review Manager 5.4*, evaluándose el riesgo de sesgo según las directrices Cochrane. **Resultados.** el metaanálisis reveló la dimensión del efecto global sobre los resultados del *Mini-Mental State Examination* (MMSE) y de calidad de vida (QoL) mediante diferencias de medias estandarizadas (DME) e intervalos de confianza de 95%. La terapia de orientación a la realidad mostró un impacto moderado sobre la cognición, mientras que la intervención con libros de historias de vida y la terapia de reminiscencia tuvieron efectos menores sobre la cognición y calidad de vida, respectivamente. **Conclusiones.** las intervenciones no farmacológicas ofrecen una vía prometedora para mejorar las funciones cognitivas y la CdV en pacientes con demencia.

Palabras clave: demencia, terapia de reminiscencia, intervenciones no farmacológicas, calidad de vida, funciones cognitivas



Introduction

Neurodegenerative diseases affect older people worldwide, with a prevalence estimation rate of 152.8 million by 2050.¹ Dementia, characterized by a slow and persistent neurodegenerative decline, manifests symptoms of impaired cognitive functions alongside neuropsychiatric symptoms. This condition adversely affects thinking, behaviour, memory, and emotions. While pharmacological interventions have shown some efficacy in alleviating impairments, they often lead to long-term physiological complications exacerbated by comorbidities. Consequently, dementia treatment remains a considerable challenge. Recent research indicates promising evidence for nonpharmacological interventions in improving cognitive functions and enhancing the Quality of life for dementia patients.² Emphasizing safety and the monitoring of both physical and mental well-being, nonpharmacological intervention therapy emerges as a key focus in addressing dementia management.

The randomized control trial results suggested that nonpharmacological interventions such as reminiscence therapy,³ cognitive stimulation therapy,⁴ psychosocial interventions, music therapy, reality orientation therapy, day care therapy, validation therapy, and life storybook therapy brought significant improvement in the cognition of the patients with Dementia.

Reminiscence therapy, the most widely used nonpharmacological intervention, emphasizes the memory process as a pleasant experience. It is practised as a healthcare activity for dementia patients to maintain their cognition ability and Quality of life (QoL). It also helps them link with past events in their life and boost positive responses.⁵ Therapy sessions are held in groups, individually or combined, and involve the use of photographs or sentimental objects. The outcome is measured in several domains, such as the level of cognitive functioning, daily life activities, and QoL.⁶ A comprehensive meta-analysis is attempted to find the effectiveness of

nonpharmacological interventions on dementia patients, and to identify the most effective nonpharmacological treatment for Dementia.

Methods

The Randomized Control Trials (RCTs) available in PubMed, Scopus, WoS, and Science Direct were conducted between January 2003 and December 2021 and were reported in the English language. Medical Sub Headings (MeSH) words like Dementia', nonpharmacological interventions', 'Reminiscence therapy', 'cognitive stimulation therapy', 'Randomized Control Trial', 'reality orientation therapy', 'validation therapy', 'music therapy', 'day care therapy', and 'life story book therapy" were used to screen potential articles. Two independent authors searched the articles, which are available as full text.

Interventions

Nonpharmacological interventions aim to prevent the utilization of riskier treatments, thereby mitigating the potential adverse effects associated with pharmacological treatments. The present study examines different types of nonpharmacological treatments for individuals with various forms of Dementia. These treatments encompass the following:

- 1) Reminiscence therapy and cognitive stimulation therapy play a vital role in stimulating the cognitive function of people with Dementia. These therapies are practiced either individually or in group reminiscence therapy, and involve the narration of past activities, experiences, and events, accompanied by music, photographs of past events, internet-based videos, and foods which trigger memories.⁷⁻¹²
- 2) Reality orientation therapy intends to stimulate the cognition of the present place and time. It is conducted in a structured group care program, and used to prevent further advancement of Dementia.¹³⁻¹⁵
- 3) Validation therapy helps validate the emotions or feelings of people with Dementia and solve residual life tasks.^{16,17}

4) Life storybook therapy is based on the representation of an album and involves story telling. It is conducted individually, in a couple's approach or in groups, with the help of mementoes from the patient's past.^{18,19}

A comparison of these nonpharmacological interventions was performed between the experimental and control groups, focusing on various therapies administered for a specified time with follow-up. The study assessed two key outcomes—cognition and quality of life (QoL)—along with other outcomes, which will be monitored throughout the intervention period.

Outcomes measured

Cognitive impairment significantly influences the Quality of life for individuals with Dementia. To evaluate the effectiveness of the interventions, we selected articles that employed the Mini-Mental State Examination (MMSE) to gauge cognitive functions. Additionally, we relied on QoL measurements, pertinent to both experimental and control groups, to assess the overall effectiveness of the nonpharmacological interventions in improving the lives of people with Dementia.

Inclusion and exclusion criteria

During the process of selecting research articles for our meta-analysis, we meticulously defined both inclusion and exclusion criteria to ensure the rigour and relevance of our study. These criteria are detailed below:

Inclusion Criteria:

1. Selection Criteria: The study encompassed research articles that clearly articulated the criteria used for selecting participants.

2. Number of Patients: We considered studies that reported the exact number of participants involved.

3. Age: Inclusion was extended to studies that provided the age range of the participants under examination.

4. Gender: We included research articles that documented the gender distribution of the participants.

5. Type of Dementia: Articles that specified the particular type of Dementia being investigated were incorporated.

6. Type of Intervention: Our analysis encompassed studies that explicitly outlined the nonpharmacological interventions employed.

7. Statistical Analysis: We incorporated studies that conducted relevant statistical analyses to evaluate the outcomes (Refer to Table 1).

8. Measurement Scales: Research articles utilizing the Mini-Mental State Examination (MMSE) and QoL as measurement scales for assessing cognitive function and overall Quality of life were included.

Exclusion Criteria

1. Non-Conforming Outcomes: Our meta-analysis solely considered outcomes directly associated with both the experimental and control groups.

2. Duplicate Publications: Duplicate research articles were excluded to ensure the integrity of the data.

3. Non-Compliance with Selection Criteria: Studies that did not align with our predefined selection criteria were excluded from the analysis.

4. Other Disposing Criteria: We meticulously examined outcomes linked to other disposing criteria, assessing their efficacy and comparing findings to gain a comprehensive perspective.

Table 1. Summary of studies included in the meta-analysis

Author, year, country	Participant number, age, gender, diagnosis	Type of intervention, duration	Outcome measurement	Findings
Astell et al. 2018, Sheffield, UK20	n=143, AGE >80 years, M-25, F-118, Dementia	Group-based cognitive stimulation, Computer Interactive Reminiscence and Conversation Aid (CIRCA), 3 months	Cognition and Quality of life	Notable improvements in overall health, quality of life, and cognitive
Asano et al. 2012, Japan19	n=36, AGE=89.1 years, M-4, F-32, Mild, Moderate and Severe Dementia	Reminiscence therapy by Life story book, 5 times weekly over 4 weeks	cognitive function, BPSD, Activities of daily living and vitality	Frequent intervention maintains cognition, vitality and activities of daily life in severe dementia patients
Deponte and Missan 2007, Italy16	n=27, AGE=86.8 years, Dementia	Validation therapy, twice a week session of 45 to 60 min for 3 months	Behavioural issues, everyday life tasks, and cognitive function	Validation therapy reduces behavioural problems and is useful for caregivers in understanding the patient's behaviour
Lin et al. 2018, Taiwan8	RT n=43, CST n=30, AGE=79.5, Dementia of behavioural problem of dispute, return and dissociate types	Reminiscence and cognitive stimulation therapy, 50 min session once a week for 10 weeks	cognitive function, Quality life and behavioural problems	RT and CST had a positive impact on cognition and Quality of life, as well as lowering dispute-type behavioural problem
Iiboshi et al. 2020, Tokyo17	n=73, AGE=76.3, M-36, F-37, Mild cognitive impairment and Dementia	Validation study by video teleconference for more than 3 months with a 2-week interval	cognitive function - reliability of VTC administered MoCA-J score	overall, participants' satisfaction with VC-administered MoCA, needs further replication in a large sample size
Ingersoll-Dayton et al. 2013, USA18	n=44, AGE=75.7, M-32, F-12, Dementia	Life story approach - Dyadic intervention of 76 minutes for 5 weeks	Cognition function, identification of memory gaps, communication with caregiver	Research on a couple's life story is useful but should be broadened with a large population
Gonzalez et al. 2015, Spain11	n=42, AGE=65 years, M-31, F-69, Dementia	Integrative reminiscence therapy in 10 sessions	Cognitive impairment, Depression, self-esteem, psychological well-being scales	a significant increase was observed between self-acceptance, autonomy, positive relations with others and mastery of the environment
Kallio et al. 2018, Finland10	n=147, AGE=83, M-41, F-106, Dementia of various types	Cognitive remediation therapy of 45 min sessions twice a week for 12 weeks	cognitive subscale- ADAS-Cog, HRQoL	Had little effect on global cognition in mild to moderate Dementia
Nakamura et al. 2016, Japan15	n=71, AGE=82.2, Mild cognitive	Group reminiscence approach and reality	cognitive function, Quality of life, self-	Significant time effect between 2 family

	impairment	orientation using patient report outcome of 2 hours per week for 12 weeks	awareness and caregiver/family active involvement	involvement groups in QoL scores and increases self-awareness of memory deficits of the order of events
İnel Manav and Simsek 2019, Turkey7	n=32, AGE=74.06, M-18, F-14, Mild dementia living in nursing homes	Reminiscence therapy using internet-based videos for 60 minutes a week for 3 months	cognitive functions and apathy levels	Prominent increase in mean cognitive function and apathy scores of the intervention group and no difference in the control group
Moon and Park 2020, Korea9	n=41, AGE=83, F-41 to improve dysfunctions in dementia patients	Digital reminiscence therapy of eight sessions for over 4 weeks	Cognition, depression, behavioural and psychological symptoms (BPSD)of Dementia	Depression decreased, engagement increased, but not much difference occurred in cognition and BPSD
Spector et al. 2003, England13	n=201, AGE=85.7, M-43, F-153, Older people with dementia	Cognitive stimulation therapy of 45 min sessions twice a week for 7 weeks	Cognition, Quality of life, communication, behaviour, global functioning and Depression and anxiety	intervention groups improved relative to the control group on MMSE, ADAS-Cog and QoL-ADS
Subramaniam and Woods. 2016, UK21	n=6, AGE=82, M-2, F-4, dementia	Multimedia digital life storybooks for 4 weeks	Quality of life, autobiographical memory, geriatric depression scale and Quality of caregiving relationship	Improvement in Quality of life, autobiographical memory and stability in Depression scores
TADAKA and KANAGAWA. 2004, Japan14	n=60, AGE=84.2, M-18, F-42, Elderly people with dementia	Reminiscence and reality orientation group care program for 1.5 hrs per session per week for 10 weeks	cognitive function, daily activity functions, disorientation and withdrawal	Significant effect on cognition function and daily activity function, disorientation and withdrawal compared with the control group.
Feng et al. 2019, USA22	n=80, AGE=82, M-34, F-46, Dementia	Reminiscence therapy- iPad game app- Memory matters, Sessions-30minutes, twice a week for 6 weeks	Quality of life, mood, social interaction and BPSD	Memory matters improved, as well as mood and social interaction, not much effect on Quality of life and BPSD

A brief summary of the studies that were part of the meta-analysis is given in Table 1. Authors, years, nations, participant characteristics, interventions, duration, outcome measures, and conclusions are provided. The studies encompass various interventions such as cognitive stimulation, reminiscence therapy, validation therapy, and digital interventions, all conducted across different regions and populations with Dementia. However, it is important to note that only English-speaking participants were included,

which limits the generalizability of the findings to non-English-speaking populations.

Notably, several studies were conducted in countries where English is not the primary language, such as Japan, Italy, Spain, Turkey, and Korea. It is necessary to consider whether the assessment tools, including the Mini-Mental State Examination (MMSE), were validated in these languages. For instance, studies conducted in Japan (Asano *et al.*, Nakamura *et al.*, Tadaka &

Kanagawa) and Korea (Moon & Park) likely used adapted versions of cognitive assessment tools. While the findings indicate significant improvements in cognition, Quality of life, mood, and behavioural symptoms across multiple interventions, the language limitations should be acknowledged when interpreting the results. Further research is needed to assess the applicability of these interventions to diverse linguistic and cultural populations.

Characteristics of trials included in the study

Nonpharmacological therapies performed in dementia patients included in this study are reminiscence therapy, cognitive stimulative therapy, reality-orientation therapy, validation therapy, and life storybook therapy, and were conducted in the UK, Japan, Italy, Taiwan, Tokyo, USA, Spain, Finland, Turkey and Korea between 2003 and 2020. The number of participants held in each study ranged from 6 to 201, with the mean average age of the patients with Dementia ranging from approximately 75 to 85 years. The duration of intervention therapy ranges from 4 weeks to 3 months, and detailed characteristic features of 15 articles included in these studies are listed in Table 1.

Evaluation of outcomes measured

Thirty-eight articles included in the nonpharmacological intervention studies had various outcomes measured. Still, out of these, only fifteen articles were suitable for the primary outcome results shown in cognitive function and QoL improvement required for this meta-analysis with MMSE scores and QoL scores. The remaining 23 articles included outcome measures such as communication and interaction, Quality of relationship with the carer, behaviours such as agitation, activities of daily living and mood-related outcomes with apathy, anxiety and Depression. Cognitive function outcome measured in MMSE score showed a small improvement in the overall comparison of intervention and control

group (SMD:0.16, 95% CI [0.02, 0.31], $P < 0.00001$). Quality of life function did not show much effect on the intervention group based on the QoL score assessment (SMD: -0.83, 95% CI [-3.44, 1.78], $P < 0.0001$).

Data synthesis

In our data analysis, we utilized Review Manager Software (Version 5.4). For both the experimental and control groups, we considered the number of variables, mean, and standard deviation as continuous variables. The effect size was calculated using the weighted mean difference, accompanied by a 95% Confidence Interval. Our approach involved employing the random effect model and conducting a heterogeneity test. To gain insights into the impact of different intervention types, we conducted subgroup analyses based on outcome measurement results. Furthermore, we carried out an analysis of the overall effect stemming from all interventions.

Qualitative review synthesis

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was followed in the conduct of this meta-analysis research.²³ Two reviewers independently screened titles and abstracts during the initial screening process, and the full text of selected articles was taken further into the inclusion criteria. Any emergence of divergence in search strategy was solved with a team discussion. Random sequence creation, allocation sequence concealment, blinding of outcome evaluations, insufficient outcome data, selective reporting, and other biases were among the evaluation criteria employed in this research. On the basis of these seven criteria of risk bias, an assessment of three levels in 'low risk', 'unclear risk' and 'high risk' classification was performed and the Quality of evidence of the included articles in clinical trials was evaluated by two blinded reviewers in risk assessment determination.

Fig. 1. Flowchart of Qualitative Review Synthesis

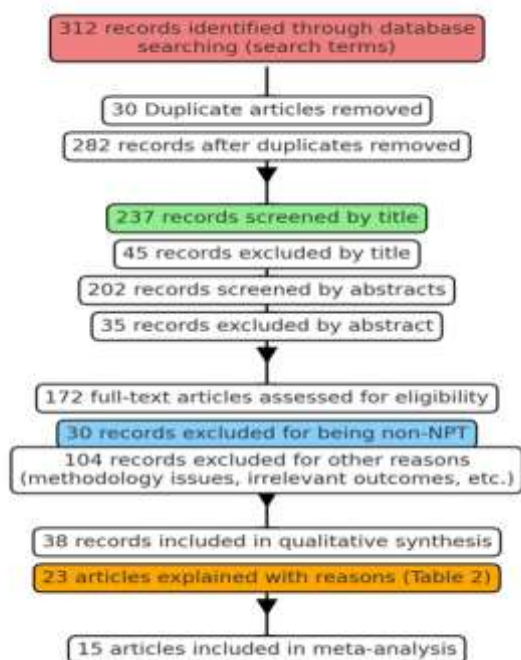


Fig. 1 illustrates that the PRISMA flowchart visually represents the systematic screening process for selecting studies included in the meta-analysis. It begins with the identification phase, where 312 records were initially retrieved through database searches. Following the removal of 30 duplicate articles, 282 records remained for further screening.

In the screening phase, 237 records were reviewed by title, excluding 45 records that did not meet the inclusion criteria. The remaining 202 records underwent abstract screening, where 35 additional records were excluded.

Next, 172 full-text articles were assessed for relevance and quality in the eligibility phase. Among these, 30 records were excluded for non-NPT (nonpharmacological therapy), and 104 were excluded due to methodological issues or irrelevant outcomes.

In the inclusion phase, 38 records were selected for qualitative synthesis. However, 23 articles were further explained with reasons for exclusion

(Table 2), resulting in 15 final articles being included in the meta-analysis.

Fig. 2. Summary of evaluation of authors - Risk bias assessment of included studies.

	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
Aimee Spector 2003	●	●	●	●	●	●	
Antonella Deponte 2007	●	●	●	●	●	●	
Arlene J. Astell 2018	●	●	●	●	●	●	●
Ayse Inel Manav 2019	●	●	●	●	●	●	
Bert Ingersoll-Dayton 2013	●	●	●				
Eeva-Liisa Kallio 2018	●	●	●	●	●	●	
Etsuko Tadaka 2004	●	●	●	●	●	●	
Fang Y 2019	●	●	●	●	●	●	●
Hsiu-Ching Lin 2017	●	●	●	●	●	●	
Jesus Gonzalez 2015	●	●	●	●	●	●	
Kei Nakamura 2016	●	●	●	●	●	●	
Kiyoko Iiboshi 2019	●	●	●	●	●	●	●
Ponnusamy Subramaniam 2016	●	●	●	●	●	●	
SeolHwa Moon 2020	●	●	●	●	●	●	
Tomoaki Asano 2020	●	●	●	●	●	●	

Blinding of outcome assessment (detection bias), blinding of participants and personnel (performance bias), allocation concealment (selection bias), selective reporting (reporting bias), incomplete outcome data (attrition bias), and random sequence generation (selection bias) were among the various types of biases that were evaluated (Fig. 2) in the included studies. This comprehensive assessment was conducted to ensure the accuracy and reliability of the study outcomes. Furthermore, the analysis included a range of authors and their respective studies. While specific author names are not provided here, this evaluation allows for a thorough examination of potential bias implications across multiple studies. The aim is to gauge how bias might impact the overall conclusions and insights drawn from these studies.

Fig. 3 visually represents the evaluation of potential biases in the included studies. A sliding scale from 0% to 100% is used in the graph to show the degree of danger connected to each bias. Risk levels are categorized as low, unclear, and high risk of bias. The graph serves as an overview of the biases' potential influence on the conclusions drawn from the studies.

Fig. 4. Effects of Nonpharmacological therapy with MMSE scores by Meta-analysis

Fig. 4 illustrates the outcomes of a meta-analysis examining the effects of various nonpharmacological therapies on MMSE scores in individuals with Dementia. Different interventions, such as Reminiscence, Reality Orientation, Validation, and Life Storybook Therapy, are assessed for their impact. The table displays the mean and standard deviation of

MMSE scores for the experimental and control groups for each intervention. It calculates the SMD between these groups, indicating the effect size. The 95% confidence intervals (CI) provide a range within which the true effect likely lies.

While the meta-analysis suggests that Reminiscence Therapy and Reality Orientation Therapy may positively affect MMSE scores, the findings are inconclusive as the 95% CI crosses the 0 vertical line. Validation Therapy is shown to have a negative effect; however, this result still favours the experimental group. Additionally, rather than yielding a neutral outcome, Life Storybook Therapy presents inconclusive evidence. The heterogeneity tests measure variability between studies, and the test for overall effect evaluates the collective impact of the interventions.

Fig. 3. A Graph of evaluation of authors - Risk bias assessment of included studies

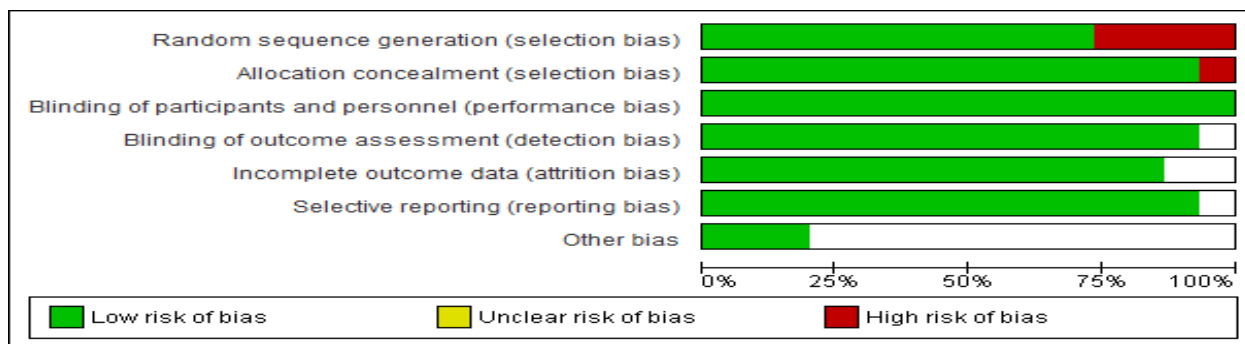


Fig. 5. Effects of Nonpharmacological therapy with QoL scores by Meta-analysis

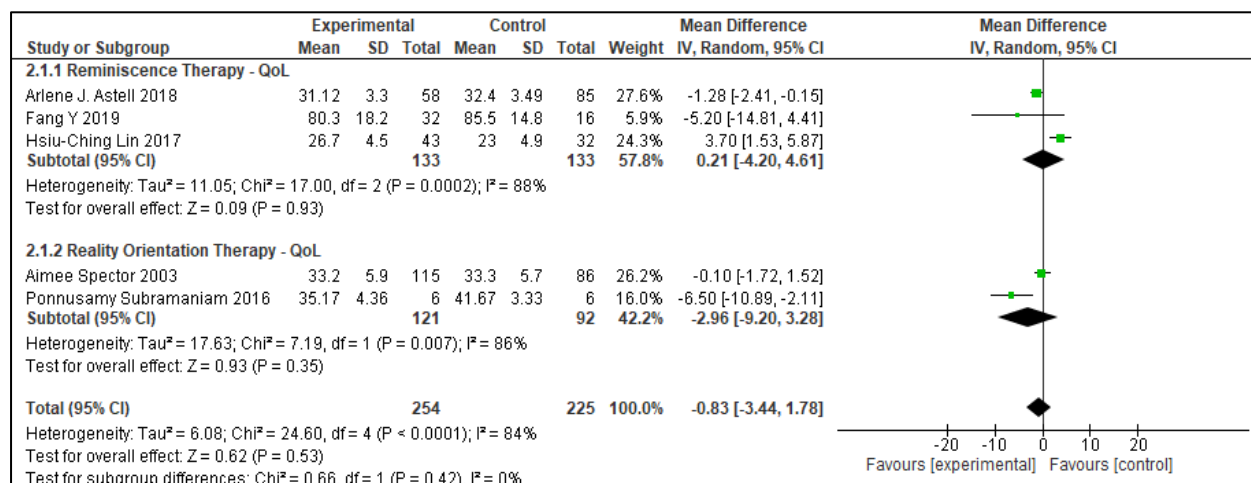


Fig. 5 presents findings from a meta-analysis exploring the influence of nonpharmacological therapies on QoL scores in individuals with Dementia. Two interventions, Reminiscence Therapy and Reality Orientation Therapy, are evaluated for their impact on QoL. In Reminiscence Therapy, Arlene J. Astell's study demonstrates a decrease in QoL scores, while Fang Y's study shows a substantial decrease. Hsiu-Ching Lin's study suggests an improvement in QoL scores for individuals undergoing this therapy. Regarding Reality Orientation Therapy, Aimee Spector's study indicates no significant change in QoL scores, while Ponnusamy Subramaniam's study suggests a notable decrease. The depicted effects are based on mean differences and their 95% confidence intervals. Overall, Fig. 5 helps to understand how these interventions impact QoL scores, with a visual depiction favouring either experimental or control groups.

Table 2 presents the outcomes of sub-group analyses focusing on MMSE scores for distinct intervention techniques within the dementia

context. It includes details for interventions like Reminiscence Therapy, Reality Orientation Therapy, Validation Therapy, and Life Story Book Therapy. For each intervention, the table provides the number of studies, total participants, and statistical indicators of heterogeneity (Chi-squared value, degrees of freedom, P-value, and I² value). The effect size, represented as SMD [CI 95%], is also shown. Reality Orientation Therapy shows the largest positive effect size (SMD = 0.50, CI [0.23, 0.77]), suggesting a moderate improvement in MMSE scores. In contrast, Validation Therapy exhibits a negative effect (SMD = -1.77, CI [-2.42, -1.12]), indicating a decline in MMSE scores, although this result still favours the experimental group. Life Story Book Therapy (SMD = 0.25, CI [-0.13, 0.63]) and Reminiscence Therapy (SMD = 0.13, CI [-0.07, 0.34]) show inconclusive effects, as their confidence intervals cross zero. The overall analysis across all interventions (SMD = 0.16, CI [0.02, 0.31]) suggests a slight benefit, but the high heterogeneity (I² = 90%) indicates considerable variability between studies.

Table 2. Results of sub-group analysis – MMSE Score

Intervention	Studies	Participants	Heterogeneity	SMD[CI 95%]
Reminiscence Therapy	6	212	Heterogeneity: Chi ² = 32.59, df = 5 (P < 0.00001); I ² = 85%	0.13 [-0.07, 0.34]
Reality orientation therapy	3	184	Heterogeneity: Chi ² = 20.64, df = 2 (P < 0.0001); I ² = 90%	0.50 [0.23, 0.77]
Validation therapy	2	23	Heterogeneity: Chi ² = 31.79, df = 1 (P < 0.00001); I ² = 97%	-1.77 [-2.42, -1.12]
Life storybook therapy	2	56	Heterogeneity: Chi ² = 0.00, df = 1 (P = 0.98); I ² = 0%	0.25 [-0.13, 0.63]
Overall	13	475	Heterogeneity: Chi ² = 125.59, df = 12 (P < 0.00001); I ² = 90%	0.16 [0.02, 0.31]

Table 3. Results of sub-group analysis – QoL Score

Intervention	Studies	Participants	Heterogeneity	SMD[CI 95%]
Reminiscence Therapy	3	133	Heterogeneity: Tau ² = 11.05; Chi ² = 17.00, df = 2 (P = 0.0002); I ² = 88%	0.21 [-4.20, 4.61]
Reality orientation therapy	2	121	Heterogeneity: Tau ² = 17.63; Chi ² = 7.19, df = 1 (P = 0.007); I ² = 86%	-2.96 [-9.20, 3.28]
Overall	5	254	Heterogeneity: Tau ² = 6.08; Chi ² = 24.60, df = 4 (P < 0.0001); I ² = 84%	-0.83 [-3.44, 1.78]

Table 3 outlines the outcomes from sub-group analyses concerning QoL scores in the context of various intervention techniques for individuals with Dementia. The interventions exhibit statistical heterogeneity (Tau², Chi-squared value, degrees of freedom, P-value, and I² value), suggesting substantial variability between the included studies. It is difficult to make firm conclusions when there is high heterogeneity (I² = 84%–88%) since it suggests that variations in research designs, demographics, or treatments may affect the outcomes.

Additionally, the effect size is presented as SMD [CI 95%], reflecting the magnitude of the intervention's impact on QoL scores. However, the overall SMD of -0.83 (CI [-3.44, 1.78]) is inconclusive, as the confidence interval crosses zero, indicating that the effect could range from a substantial negative effect to a potential positive effect. Similarly, Reminiscence Therapy (SMD = 0.21, CI [-4.20, 4.61]) and Reality Orientation Therapy (SMD = -2.96, CI [-9.20, 3.28]) show highly variable results, further emphasising the uncertainty in these findings.

Table 4. Outcome measures other than cognition and Quality of life

S. No	Author & year	Intervention	Study type	Population	Communication and interaction	Quality of relationship with carer	Behaviour agitation & activities of daily living (ADL)	Mood-related outcomes, including apathy, anxiety and depression
1	Chang and Chien. 2018 ²⁴	Group Reminiscence therapy	Depression, communication, mood	n=21, age =65, 6 sessions, 1hr/week for 1 month			Loss of interest in usual activity = 1.13 to 0.66 (reduced)	Anxiety 1.34, irritability=0.65(reduced),
2	Feng et al. 2019 ²²	RT-Memory matters, iPad rem game	mood, social, quality, behaviour, individual MM, group MM=30 mins every 2 weeks for 6 weeks	n=80, m(34), f(46), age=82		BPSD=caregiver=6.5	BPSD=3.7	Mood=11.7
3	Coelho et al. 2020 ²⁵	RT- Virtual reality headset	psychological and behaviour symptoms, simulation sickness symptom=4 sessions, Quality of life measured	n=9, age=86 m(3), f(6) mod=3, mod sev=3, sev=3			disability=Barthel Index score=14.2, Lawton and brody scale=5.6	Neuropsychiatry inventory scale (0-144)= 9.2 to 9.7,
4	Gonzalez et al. 2015 ¹¹	RT=Psychological intervention	Integrative RT- to improve Depression, self-acceptance	n=23, 10 sessions, age=80		self-esteem = RSES = 11.44 TO 11.66, SELF ACCEPTANCE=4.84 TO 5.28, RELATION WITH OTHERS=4.47 TO 4.93	Autonomy=4.50 to 5, personal growth=4.85 to 4.96, purpose in life=4.68 to 4.86	Depression = CES-D = 10.93 TO 4.26

5	Mendrofa et al. 202126	RT=COG & mood	improvement in cognition, mood	n=30				Mood Score improved from 57.6 to 77.16
6	Moon and Park 20209	RT=cost eff intervention	Digital RT= 8 sessions cog, Depression, Beh psy dem	n=25, 4 weeks				depression=6.14, BPSD=16.24
7	İnel Manav and Simsek 20197	RT-Internet based video	mild Dementia	n=16, once a week/3 months, age=74			self-assessment=51.75 to 60.38	
8	Park 201827	Occupation based RT	cog fun, Depression, Quality on mild Dementia	n=31, 40 mins/week for 8 weeks				SGDS-K=6.10 Depression
9	Marinho et al. 20214	Psychosocial intervention	cognitive stimulation therapy -mild to moderate Dementia	n=23, 14 SESSIONS OF CST+TAU =7WEEKS			HIGH ACCEPTANCE	IMPROVED
10	Olakehinde et al. 201928	psychosocial intervention	cognitive stimulation therapy	n=9, 14 sessions 7-week, age=81	IQR=7			ANXIETY=IQR 20, DEPRESSION IQR=20
11	Onieva-Zafra et al. 201829	Music and RT	Appln of reality orientation tech=pos eff on Depression, anxiety	n=9, 8 weeks, age=82 f(8)m(1)				Goldberg Depression test mean score=1.44 to 1.56, anxiety=2 to 2(p=.89)
12	Cho 201830	Music therapy	singing group	n=52 m(43), f(9) age=67 to 99, 40 min session twice = 4 weeks			Music therapy=47.29 to 38.71, Music Medicine=39.29 to 41.43	
13	Cho 201831	Music with movement	MM compared with Music learning, Social activity, cog	n=58, 12 week, age=85	Comm MVFT= 8.69 TO 9.05			Anxiety RAID=8.48 TO 6.68, DEP GDS=5.99 TO 5.79
14	Kelly and Ahessy 202132	Rem-focussed music therapy	moderate Dementia, 5 weekly session	female=5				mood= positive 51.6%
15	Nakamura et al. 201615	GRA and RO	n=44,39 completed				6-m walking =4.8 to 4.7	
16	Tadaka E, Kanagaw A 200414	Reality Orientation Therapy	group care program	ex = 30, c=30, 1/week, 10 weeks		irritability=1 5.4 to 14.9	self-care=15.4 to 16.1	deoreession=18.6 to 17.1
17	Spector 200313	Reality Orientation Therapy	RCT	ex=115, c=86, 45min session/twice a week = 7	Holden score=1 1.1		Behaviour=CAP E-BRS=11.3	RAID=8.4, Cornell=5.2

				weeks				
18	Nishiura et al 202133	Reality orientation	time orientation memory	n=27, m(9), f(18), age 81.5	language =10			judgement=11 to 10
19	Deponte and Missan 200716	Validation therapy	comparison with sensorial reminiscence	n=30	NPI=18.9, C=10.6, T2=NPI=14.9, C=10.8			
20	Gridley et al. 201634	Life story work	PWD- Improving care quality	n=39		QCPR=13 to 4 after 6 months		
21	Subramaniam and Woods 201621	multimedia digital lifestory		n=6, f(4), m(2)		QCPR=32.83 to 39		GDR-12R=3.0 to 0.33
22	Asano et al. 202119	RT - LSB	Dem with different severity	n=36, m(4), f(32) 12 weeks			N-ADL=27 to 28	
23	Lin et al. 35	Day care service	comprehensive geriatric assessment - ADL, MMSE	N=18, Age=80.9, 6 months; VERY MILD=3, MD=10, MOD D=3, Sevd=2			ADL score improved from 75 to 77.5	
24	Chang and Chien 201836	RT=dem sp daycare	video analysis - behaviour	n=21, age=78, m(11), f(10)				Anxiety(depression)=1.15 to 1.34

Table 4 outlines diverse interventions and their effects on outcomes beyond cognition and Quality of life for individuals with Dementia. This table includes details on the studies, participants, and interventions. Various outcomes are covered, such as communication, relationship quality with caregivers, behaviour/agitation and activities of daily living (ADL), and mood-related factors like apathy, anxiety, and Depression. The table provides a snapshot of interventions' impacts on these outcomes, shedding light on potential benefits for individuals with Dementia.

Results

Literature search

After the search strategy, 312 articles were identified, from which 172 articles were incorporated into the review analysis. As per the inclusion and exclusion criteria, 38 articles met the

criteria, and 15 articles were included in the qualitative review synthesis, as summarized in the PRISMA Flow chart (Refer to Figure 1).

Effect of reminiscence therapy vs. control intervention- MMSE scores

Six of the trials included in this study targeted the effect of reminiscence therapy intervention vs. control intervention towards MMSE scores. As shown in Table 2, the SMD of those who received reminiscence therapy compared to control intervention was 0.13 (95% CI = [-0.07, 0.34], P=0.02) with $I^2 = 85%$ showed statistically significant heterogeneity. The results implied that control intervention had similar effects on cognitive function in dementia patients.

Effect of Realty Orientation Therapy Vs. Control intervention- MMSE scores

Three of the trials included in this study explored the effects of reality orientation intervention vs. control intervention towards MMSE scores. As observed in Table 2, the SMD of patients who received reality orientation intervention compared to control intervention was 0.50 (95% CI = [0.23, 0.77], $P=0.0003$), which represents moderate effect with $I^2 = 90\%$ showed statistically significant heterogeneity. The results implied that intervention therapy has an impact on the cognitive function of dementia patients.

Effect of validation therapy vs. control intervention- MMSE scores

Two of the trials included in this study focussed on the effects of validation therapy vs. control intervention on MMSE scores. As shown in Table 2, the SMD of patients who received validation therapy compared to control intervention was -1.77 (95% CI = [-2.42, -1.12], $P < 0.00001$), which represents not much difference between Validation intervention and control intervention as SMD is less than 0, with $I^2 = 97\%$ showing statistically significant heterogeneity.

Effect of life storybook therapy vs. control intervention- MMSE scores

Two of the trials included in this study explored the effects of the life storybook approach vs. control intervention on MMSE scores. As per the results of Table 2, the SMD of patients who received life storybook therapy compared to control intervention was 0.25 (95% CI = [-0.13, 0.63], $P=0.20$) which states the small effect of the life story book intervention with $I^2 = 0\%$ showed nonsignificant heterogeneity.

Effect of quality of life (QoL) score of reminiscence therapy vs. Control intervention

Three of the trials included in this study focussed on the effect of reminiscence therapy intervention vs. control intervention on QoL scores. As shown in Table 3, the SMD of patients who underwent reminiscence therapy compared to control intervention was 0.21 (95% CI = [-4.20, 4.61], $P=0.93$), which represents the small effect of reminiscence therapy intervention with $I^2 = 88\%$ showed significant heterogeneity. However, in two

studies of reality orientation therapy vs. control intervention on QoL scores, the SMD was -2.96 (95% CI = [-9.20, 3.28], $P=0.35$, which represents not much difference between reality orientation intervention and control intervention as SMD is less than 0 on QoL outcome with $I^2 = 86\%$ showed substantial heterogeneity.

Risk of bias in the included trials

The possible risk of bias in all the included trials was assessed as shown in Figs. 2 and 3, which included a summary and graph of fifteen studies used in the nonpharmacological intervention trials based on seven criteria of risk of bias assessment performed using RevMan 5.4. tool. All 15 trials were included in the risk assessment, out of which 11 trials had a low risk of bias, and 4 trials^{8,11,17,21} showed a high risk in random sequence generation. 1 trial¹¹ reported high risk in allocation therapy^{13,14,21,37} combined with group reminiscence therapy^{15,38} in the trials. The programme allows the display of orientation details, activities, and themes that help people remember their names, groups, food, and childhood memories. The reality orientation technique improves the Quality of life, enhances orientation towards reality, and improves cognitive function¹⁴. Hence, it serves the correct purpose of being included in the current study. Validation therapy is also included because of the interpretative context and social factors, and it has a significant positive change in cognitive function^{16,17}. Life storybook therapy, incorporated in the study, aims to improve outcomes for individuals with dementia (PWD) by emphasizing nine key features of this complex approach and ensuring its proper implementation.^{18,19}

The presence of significant heterogeneity ($I^2 = 85\%–97\%$ in cognitive function outcomes and $I^2 = 84\%–88\%$ in QoL outcomes) suggests that the included studies exhibit considerable variability in methodologies, participant characteristics, intervention protocols, and outcome measurements. This level of heterogeneity has important implications for interpreting the meta-analysis results. While some interventions, such as Reality Orientation Therapy (SMD = 0.50, CI [0.23, 0.77]), indicate a moderately positive effect on cognition, the high I^2 value (90%) suggests that the observed effect may not be consistent across all studies.

Similarly, the effect size of Validation Therapy (SMD = -1.77, CI [-2.42, -1.12]) suggests a negative impact on MMSE scores, yet this result still favours the experimental group. In contrast, Life Storybook Therapy (SMD = 0.25, CI [-0.13, 0.63]) shows inconclusive results, as its confidence interval crosses zero. This inconsistency emphasizes the need for a cautious interpretation of the findings.

For QoL outcomes, the overall effect size (SMD = -0.83, CI [-3.44, 1.78]) does not allow for definitive conclusions due to its wide confidence interval crossing zero. Moreover, individual interventions like Reminiscence Therapy (SMD = 0.21, CI [-4.20, 4.61]) and Reality Orientation Therapy (SMD = -2.96, CI [-9.20, 3.28]) exhibit high heterogeneity, further complicating result interpretation.

Limitations

The meta-analysis has several limitations. Firstly, all 15 included trials had varying sample sizes. Additionally, out of the 38 trials with different outcome measures, some were excluded due to the selection of outcomes measured in the MMSE score, excluding several studies despite significant results. Furthermore, some trials lacked baseline scores and outcome measures, only describing improvement through behavioural descriptions rather than statistical analysis. For instance, certain studies omitted the standard deviation of obtained scores in the analysis, rendering them unsuitable for further inclusion. Second, the MMSE score used in this study, though it is a widely used outcome measurement on cognition, Montreal Cognitive Assessment (MoCA) is the preferred choice of advanced superior measure in evaluating cognitive function, especially for mild cognitive impairment patients^{39,25,37} as well as for Dementia in the recent times. It is one of the most important limitations encountered in the study. Third, the results of the interventions showed significant heterogeneity, with only a small, short-term effect observed in a few trials for two of the interventions. The overall effect was also small. Additionally, there are several limitations, including a mean age range of over 10 years, a wide variation in the number of participants, and

patients in different stages of dementia. These factors may help explain the small effect of the nonpharmacological interventions compared to the control intervention.

Conclusion

This study has comprehensively explored nonpharmacological interventions for individuals with Dementia, focusing on two primary outcome measures: cognitive function and quality of life. However, numerous advanced instruments exist that are better suited for assessing progress in these outcome measures. The interventions were analyzed individually, compared collectively, and extensively discussed regarding their potential impact on managing dementia symptoms globally. While the observed results may be modest or moderate, they nonetheless present significant opportunities for future improvement. This study underscores the importance of continued research and innovation in developing more effective treatments for dementia management.

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