



## Review Article

# The Effectiveness of Dance as an Intervention on the Engagement in Occupation by Frail Older Adults: A Systematic Review

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### Abstract

**Importance:** Frail and Prefrail (FPF) older adults have limited ability to participate in many occupations due to physical and mental deficits. Options for occupational therapy interventions to address these problems can support successful outcomes.

**Objective:** To examine current evidence from dance interventions to enable factors of occupational engagement in FPF older adults.

**Data Sources:** CINAHL, Scopus, OVID, Cochrane Trial, Pedro Scale, PsychInfo, Pubmed, WorldCat, OTseeker, PEDro, and Google Scholar.

**Study selection & data collection:** Inclusion criteria were studies examining outcomes of FPF adults over the age of 50 who participated in dance interventions. Quantitative studies were examined using the AOTA systematic review and PRISMA guidelines.

**Findings:** Four level 1B, two level 2B, and six level 3B studies met the inclusion criteria and were examined. Outcomes included activities of daily living (ADLs), functional mobility, physical performance factors, socioemotional components, and cognition. Dance interventions improved physical factors, social participation, and reduced fall risk. Impact on range of motion (ROM) and cognition was limited.

**Conclusion & Relevance:** Evidence supports occupational therapists' use of dance as an intervention to improve the prerequisite skills required to participate in occupations by FPF older adults.

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**What this Article Adds:** This review synthesizes the available research regarding the impact of dance on occupational engagement by FPF older adults.

### Introduction

According to the 2020 United States Census, 55 million adults are aged 65 and above [1]. As Americans age, an increasing number of individuals are vulnerable to frailty. Frailty in older adults is a condition in which aging is associated with a decline in independence due to deficits in strength, functional mobility, physical performance factors, socioemotional components, and cognition [2]. It has been defined as the presence of three or more of five indicators: weakness (reduced grip strength), slowness (gait speed), weight loss, low physical activity, and exhaustion [3]. People with one or two of the indicators are classified as pre-frail. Approximately one-fourth to one-half of people over age 85 are considered frail [4]. Frailty limits participation in occupations, which decreases health, wellness, and overall quality of life [2]. Frail individuals are vulnerable to hospitalization because of injuries related to falls, which cost the American hospital system approximately \$50 billion per year for non-fatal falls [5]. Interventions that encourage this growing population to continue their engagement in meaningful activities are vital to support physical well-being and reduce health care costs. The aim of this review is to answer the following clinical question: "What is the evidence for the effectiveness of dance interventions to enable factors of occupational engagement in frail older adults?"

### Literature Review

Occupational therapists utilize client-centered and motivating interventions to assist clients in reaching desired outcomes of positive physical health and social well-being [6]. According to the Occupational Therapy Practice Framework, dance is a fundamental functional activity used in leisure, social participation, and health management [6]. Dance is defined as the use of rhythmic movements to promote emotional, social, cognitive, and physical performance [7]. Cross-sectional studies have found that older adults who dance on a regular basis have greater flexibility, postural control and balance, quicker reflexes, and better cognitive function than those who do not [8]. Many adults over the age of 60 live sedentary lifestyles, leading to physical limitations, early onset of medical conditions, and low self-efficacy. Dance is a form of physical activity that can be adapted for all skill levels to enable participation in desired occupations. Dance is an intervention useful for occupational therapists because it may contain cultural significance or be highly motivating, encouraging participation [9,10].

Limited research has examined how dance can enable the frail adult population to engage in desired occupations. We currently know that dance is an enjoyable and motivating form of exercise; however, this systematic review explores research that examines how dance impacts occupational engagement. This systematic review will help to clarify the potential value of using dance as an intervention for Frail and Prefrail (FPF) older adults.

## Search Strategy

An electronic database search of CINAHL, Scopus, Cochrane Trial, and PsychInfo Results was completed. The reference librarian developed search strategies with feedback from the systematic review team. The search was done on 07/15/2022. The search strategy used keyword synonyms with frail older adults and dance movement therapy interventions. The search string in each database was conducted by using a combination of keywords, subject headings, and truncation. No limiters were used. Four team members first conducted a title and abstract review for inclusion criteria through Rayyan software. Following the title and abstract review, the first six authors reviewed each full article to determine eligibility for inclusion in the review. Disagreements regarding inclusion were discussed among the group. Final decisions were made through a thorough investigation of the study's inclusion/exclusion criteria and a unanimous decision among researchers for each study. Researchers included articles that did not state "frail," if the participants met the criteria for pre frail. The inclusion/exclusion criteria are listed in Table 2. Initial outcome criteria for the impact on occupational performance did not directly relate to occupation, so inclusion criteria were broadened to factors relating to occupational engagement. Factors included are not directly related to occupational performance but are strong indicators of occupational performance. Twelve articles were retrieved for full-text review and met the inclusion criteria. The search strategies were translated to each database using specific subject headings. The full search string terms are listed in table 1.

Category	Search Terms
Population	Adults 50+
Ovid (Medline)	1. exp Dancing/ or ((ballet or hip-hop or jazz or tango or ballroom or modern or folk or square or tap or line or salsa) adj2 dance*).mp. or dance*.mp. 2. exp Dance Therapy/ or ("dance therap*" or "dance train*" or "rhythmic movement*" or "therapeutic dance*" or "rhythmic rehab*" or "movement rehab*" or "dance movement therap*").mp. 3. exp Frail Elderly/ or exp Frailty/ or (frail* or "frail older adult*" or "frail elder*" or "functionally impaired adult*" or prefrail* or debilit* or vulnerable).mp. 4. 1 or 2 5. 3 and 4
PsycInfo	1. exp Dance/ or ((ballet or hip-hop or jazz or tango or ballroom or modern or folk or square or tap or line or salsa) adj2 dance*).mp. or dance*.mp. 2. exp Dance Therapy/ or ("dance therap*" or "dance train*" or "rhythmic movement*" or "therapeutic dance*" or "rhythmic rehab*" or "movement rehab*" or "dance movement therap*").mp. 3. exp Frail/ or (frail* or "frail older adult*" or "frail elder*" or "functionally impaired adult*" or prefrail* or debilit* or vulnerable).mp. 4. 1 or 2 5. 3 and 4
CINAHL	1. (MH "Dancing+") OR (MH "Aerobic Dancing") or ((ballet or hip-hop or jazz or tango or ballroom or modern or folk or square or tap or line or salsa) N2 dance*) or dance* 2. (MH "Dance Therapy") or ("dance therap*" or "dance train*" or "rhythmic movement*" or "therapeutic dance*" or "rhythmic rehab*" or "movement rehab*" or "dance movement therap*") 3. (MH "Frailty Syndrome") OR (MH "Frail Elderly") or (frail* or "frail older adult*" or "frail elder*" or "functionally impaired adult*" or prefrail* or debilit* or vulnerable) 4. S1 or S2 5. S3 and S4

Cochrane Trials	1. [mh Dancing] or (((ballet or hip-hop or jazz or tango or ballroom or modern or folk or square or tap or line or salsa) near/2 danc*) or danc*):ti,ab,kw 2. [mh "Dance Therapy"] or ("dance therap*" or "dance train*" or "rhythmic movement*" or "therapeutic dance*" or "rhythmic rehab*" or "movement rehab*" or "dance movement therap*"):ti,ab,kw 3. [mh "Frail Elderly"] or [mh Frailty] or (frail* or "frail older adult*" or "frail elder*" or "functionally impaired adult*" or prefrail* or debilit* or vulnerable):ti,ab,kw 4. #1 or #2 5. #3 and #4
Scopus	TITLE-ABS-KEY ( ( ballet OR hip-hop OR jazz OR tango OR ballroom OR modern OR folk OR square OR tap OR line OR salsa ) W/2 danc* ) OR TITLE-ABS-KEY ( danc* ) OR TITLE-ABS-KEY ( "dance therap*" OR "dance train*" OR "rhythmic movement*" OR "therapeutic dance*" OR "rhythmic rehab*" OR "movement rehab*" OR "dance movement therap*" ) AND TITLE-ABS-KEY ( frail* OR "frail older adult*" OR "frail elder*" OR "functionally impaired adult*" OR prefrail* OR debilit* OR vulnerable )

**Table 1:** Search Terms.

A total of 501 records were discovered through database searches, with an additional 5 discovered through Pubmed, WorldCat, OTseeker, PEDro, and Google Scholar. Following the removal of 213 duplicates, 288 articles were screened by four researchers for inclusion and exclusion criteria. Studies were excluded during the initial title and abstract screening utilizing Rayyan software. Studies were excluded if the study did not meet FPF criteria, included MT, BMT, CIMT, LSVT/LSVT-BIG, mentioned dance's impact only for a specific diagnosis, and did not include dance as an intervention. A total of 77 full-text articles were reviewed for eligibility, with 12 meeting all the criteria. A total of 3 qualitative studies were excluded from the results.

The title of this systematic review was amended from the title originally submitted to PROSPERO, "The Effectiveness of Dance on Engagement in Occupations in Frail Older Adults." This title was amended to "The Effectiveness of Dance as an Intervention to Enable Occupational Engagement in Frail Older Adults: A Systematic Review" because we added factors that contribute to occupational engagement in addition to actual engagement in those occupations. We believe this to be a more comprehensive review.

## Selection criteria

Decisions on included and excluded research were based on preliminary factors stated in Table 2, which permitted the search to be concise yet thorough to assess the impact of dance on the population of frail older adults. Evidence from method designs of quantitative methods was included. Frail older adults were characterized as individuals who were deemed 'pre frail' or 'frail' based on their current health status. Studies were included if they did not specify the participants as 'frail' or 'pre frail' but were deemed appropriate for this research based on the review of participants' health status by meeting Fried's defined areas of frailty. The presence of three of the five factors: weakness (reduced grip strength), slowness (gait speed), weight loss, low physical activity, and exhaustion are considered frailty and two of the five factors are considered pre frail [3]. Included articles were required to discuss the participant's changes in occupational engagement or factors that influenced occupational engagement. The participant must meet table 2 inclusion criteria in conjunction with frailty's three main areas of decline. This process was necessary

because limited research has addressed the frail older adult population. Systematic reviews and meta-analyses were excluded from this review. Non-empirical sources such as opinion-based studies were also excluded.

Inclusion Criteria	Exclusion Criteria
Pre Frail/Frail Older Adults aged 50+	Populations under the ages of 50
Participants eligible to physically and cognitively participate in dance intervention	Older adults who do not qualify as 'pre frail' or 'frail'
Dance based Interventions only as the independent variable such as DMT, RMT* (not exclusive to these 2 types of dance)	Participants that are unable to participate in dance-based interventions due to cognition or physical impairments
Quantitative Studies investigating results on pre-requisite skills in reference to occupations of daily living	Interventions that include MT, BMT, CIMT, LSVT/LSVT-BIG*

**Table 2:** Selection Criteria.

Note: DMT= dance movement therapy. RMT=rhythmic movement training. MT=music therapy, BMT=bilateral movement therapy. CIMT=constraint-induced movement therapy. LSVT=Lee Silverman Voice Treatment

When assessing the impact of dance intervention on occupational engagement, functional mobility, ADLs, physical performance factors that contribute to occupation, cognition and socioemotional impacts were included. The impact on occupational engagement is defined for areas of physical performance factors, cognition, and socioemotional components, as the impact on occupational engagement is less clear than in ADLs and functional mobility. Cognition poses a significant impact on occupational engagement as lower levels of cognition are associated with decreased participation in occupation [11]. To fully assess dance intervention's impact on the factors of occupational engagement, the impact on cognition needs to be assessed. Social participation was included in socioemotional components as a measure of occupational participation as it is defined as an occupation in the Occupational Therapy Practice Framework [6]. Physical performance factors contributing to occupation, such as improved postural balance and reduced falls, are prerequisites to occupational engagement as stability and mobility are needed for numerous occupations [12].

## Results

An exhaustive search was completed based on the inclusion criteria (Table 2), and the completed research resulted in 12 articles. Four level 1B studies, two level 2B studies, and six level 3B studies were included. Four randomized control trials, five one-group pre-post studies, two quasi-experimental studies, and one mixed methods study that examined a total of 895 frail older adults aged 55 years to 89 years old were included in the review. The majority of participants were females, aged 65 to 86 years with declining physical and cognitive function. All 12 articles used dance as the experimental variable, but the most common style of dance intervention was ballroom dancing, which includes foxtrot, waltz, cha cha, rumba, bolero, swing, and samba [12-14]. The risk of bias for all 12 articles is described below (Tables 3&4). The impact of dance on each participant was assessed through several standardized assessments. The most common evidence-based outcome measures consisted of self-reported and clinician-administered examinations. The self-reported measures included the International Physical Activity Questionnaire short form (IPAQ-SF), Borg Perceived Exertion scale, Self-Evaluation of Life

Function (SELF), and a depression scale [12,15-17]. The common clinician-administered assessments that were focused on analyzing participants' physical capacities, psychosocial state, and functional status included the Timed Up & Go (TUG), Montreal Cognitive Assessment (MOCA), Mini-Mental State Exam (MMSE), Range of Motion (ROM), and Barthel Index [13,14,17,18].

## Risk of bias

Risk of bias at both the study level and outcome levels were evaluated and reported as "low" [16,19-21], "moderate" [12-15,18,22,23] or "high" [17] for the quantitative studies [24]. A risk of bias table was completed for quasi-experimental trials and randomized controlled trials (Table 3). A separate risk of bias table was completed for pre-post studies with no control group (Table 4). Each paper was then evaluated and rated individually per AOTA guidelines for systematic reviews [24]. The bias results revealed with four low risk of bias, six with moderate risk of bias, and two articles with a high risk of bias.

## Levels of evidence

The levels of evidence were determined through the AOTA guidelines for systematic reviews [24,25]. Four Level 1B [12-14,19], two Level 2B [15,17], and six Level 3B [16,18,20-23] were included in the review. The four Level 1B quantitative studies utilized a randomized controlled trial of high-quality evidence. The Level 2B studies were both quasi-experimental designs. None of the Level 3B studies included a control group but included a pretest and a posttest to compare the intervention implementation to baseline.

## Occupational engagement outcomes

Several of the articles indicated a linkage between dance/movement-based therapy increasing the level of full body functionality within the frail population. The studies examined 895 frail older adults aged 55 years to 89 years old, with females being the majority of participants. FPF older adults participated in various types of dance, such as line dance, Iranian dance, waltz, cha cha, fox-trot, and ballroom dance. Dance interventions were implemented in a variety of settings, such as inner-city neighborhoods, nursing homes, residential care facilities, YMCAs, table 5 displays details for each study reviewed. Below are the study occupational engagement outcomes.

## Activities of Daily Living (ADLs)

Two Level 1B, one Level 2B, and one Level 3B study examined the impact of various dance programs on frail older adults' overall physical capabilities to function in ADL independence. Three studies found benefits of aerobic, ballroom, or cultured dance, indicating improvement in participants' ability to perform everyday activities [12,14,16]. One Level 2B study found no significant improvement in ADL independence [17]. One Level 1B article examined prerequisite skills needed to perform occupations rather than occupation-based outcomes, so it was included in this category [12].

One Level 1B study conducted 1-hr graded general dance and ballroom dance, which consisted of cha cha, waltz, and foxtrot, once a week for three months for 211 nursing home residents in the Czech Republic [14]. The participants were assessed at baseline, and after three months of intervention using standardized outcome measures such as Lawton Instrumental Activities of Daily Living (IADL) Scale, Timed Get up and Go Test (TUG), and Barthel Index. The results from the dance intervention indicated it had contrasting effects on the

Citation	Selection Bias (risk of bias arising from randomization process)			Performance Bias (effect of assignment on intervention)		Detection Bias		Attrition Bias	Reporting Bias	Overall risk of-bias assessment (low, moderate, high risk)
	Random Sequence Generation	Allocation Concealment (unit participants enrolled and assigned)	Baseline differences between intervention groups (suggest problem with randomization?)	Blinding of participants during the trial	Blinding of study personnel during the trial	Blinding of Outcome	Blinding of Outcome			
						Assessment: Self-reported outcomes	Assessment: Objective Outcomes (assessors aware of intervention received?)	Incomplete Outcome Data (data for all or nearly all participants)	Selective Reporting (results being reported selected on the basis of the results?)	
Meng et al., [15]	+	+	+	-	+	-	+	-	-	M
Franco et al., [19]	+	+	+	-	-	-	+	+	+	L
da Silva Borges et al., [12]	+	+	+	-	-	-	+	-	+	M
Machacova, Vancova, Volicer, & Holmerova [14]	+	+	-	-	-	-	-	-	-	M
Holmerová et al., [13]	+	+	+	-	+	-	+	-	-	M
Müller et al., [18]	+	+	-	-	-	-	+	+	+	M
Hewston et al., [23]	+	+	-	-	-	-	+	+	+	M
Valentine-Garzon, Maynard, & Selznick [17]	-	-	-	-	-	-	-	+	+	H

**Table 3:** Risk of Bias Table: Non-randomized controlled Trial (Quasi-Experimental Study) and Randomized Controlled Trial (RCT).

Note: Categories for risk of bias are as follows: Low risk of bias (+), unclear risk of bias (?), high risk of bias (-). Scoring for overall risk of bias assessment is as follows: 0–3 minuses, low risk of bias (L); 4–6 minuses, moderate risk of bias (M); 7–9 minuses, high risk of bias (H).

Citation	Study question or objective clear	Eligibility or selection criteria clearly described	Participants representative of real-world patients	All eligible participants enrolled	Sample size appropriate for confidence in findings	Intervention clearly described and delivered consistently	Outcome measures prespecified, defined, valid/ reliable, and assessed consistently	Assessors blinded to participant exposure to intervention	Loss to follow up after baseline 20% or less	Statistical methods examine changes in outcome measures from before to after intervention	Outcome measures were collected multiple times before and after intervention	Overall risk of bias assessment (low, moderate, high risk)
Murrock & Graor [16]	Y	Y	Y	Y	N	Y	Y	N	N	Y	Y	L
Ghadiri, Bahmani, Paulson, & Sadeghi [20]	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	L

Clifford et al., [22]	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	M
Krampe et al., [21]	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	L

**Table 4:** Risk of Bias for Before-After (Pre-Post) Studies with No Control Group.

Note: Y = yes; N = no; NR = not reported. Scoring for overall risk of bias assessment is as follows: 0–3 N, Low risk of bias (L); 4–8 N, Moderate risk of bias (M); 9–11 N, High risk of bias (H).

Author/Year DOI	Level of Evidence, Study Design, Themes	Participants Inclusion Criteria Study Setting	Intervention and Control Groups	Outcome Measures	Results (Including significance of findings)
Clifford et al., [22] <a href="https://doi.org/10.1016/j.ctim.2021.102745">https://doi.org/10.1016/j.ctim.2021.102745</a>	Level 3B mixed- methods study	9 participants >65 years old ≤6 weeks post discharge with reported decreased mobility Can follow instructions >3 meters with/without assistive devices  Setting: Midwest Ireland	Adapted dance and/or singing program. 1 hour/ 1 time per week for 4 weeks followed by a 4-week washout.  No control group.	-Recruitment rates -Attrition rates -Self-report of adverse events during or after intervention -Attendance -Exit interviews -Hospital readmission rates	Participants reported improvements in  • social inclusion and physical  • emotional well-being NIH Loneliness Questionnaire improved slightly from average of 7 pre-intervention to 5 post-intervention. 5= “never feeling alone”, 25= “always feeling alone”
Murrock & Graor [16] <a href="https://doi.org/10.1123/japa.2013-0003">https://doi.org/10.1123/japa.2013-0003</a>	Level 3B One group, repeated measures Test >Prospective cohort study (feasibility)	40 participants N(at the end of study)= 21 92% female Mean age: 63 75% African American underserved, low SES, and older adults.  Setting: Federal subsidized housing in inner-city neighborhood	Line Dance Intervention 2x/week for 12 weeks.  No control group.	-Charlson Scale (measured comorbidity) -Bioelectrical impedance analyzer (assess body fat & BMI) -SD-7.8 -NMC scale + height rod (assess lbs & height) -Depression Scale -LLFDI (assess physical function in community living elderly)	• Improved UE and LE functionality  • Depression (t=6.11,p<.001)  • Disability (t=-2.70, p=0.14)  • Certain UE movements were related to ADLs such as dressing, showering, feeding, and meal preparation (t=-2.74, p=0.13).
Ghadiri et al., [20] <a href="https://doi.org/10.1016/j.gerinurse.2022.03.003">https://doi.org/10.1016/j.gerinurse.2022.03.003</a>	Level 3B Quasi Experimental (pre/post) study	38 female participants (DTI: n=19, IDI: n=19) Mean Age (IDI- 73yrs DTI- 75yrs)  Moderate cognitive deficits 65-86 years old living in nursing home at least 2 years able to walk ≥10 months with no AE No depression  Setting: Nursing Home	2 groups were formed of Dual tasking intervention (DTI) & Iranian Dance (IDI)  10 weeks consisted of 3 50 min. training session on non-consecutive days.  No control group.  Randomized	- 3 walking trails in different conditions - Walking speed, stride length, and cadence to measure gait - Mean number of sessions attended by participants -Average time of session - Mean heart rate	• Both programs had profound effects on the participant’s single and dual-task gait which can relate to ADLs Single task (DTI: n=19, IDI: n=19) • Walking speed (p = .80) • Stride length (p < .4) • Cadence step/min (p < .001) • Dual task (DTI: n=19, IDI: n=19) • Walking speed (p = .14) • Stride length (p = .76) • Cadence step/min (p = .44) • Cost (DTI: n=19, IDI: n=19) • Walking speed (p = .08) • Stride length (p = .75) • Cadence step/min (p = .01)



<p>Holmerová et al., [13]  <a href="https://doi.org/10.1177/0898264309351738">https://doi.org/10.1177/0898264309351738</a></p>	<p>Level 1B                      RCT study</p>	<p>n=254                      Permanent residents in one of the seven residential care facilities (RCFs) ≥ 60 years or older able to walk a short distance without any assistive devices.                       Setting: 7 different Residential care Facilities in the Czech Republic.</p>	<p>75-minute group session 1x week (warm up, main dance: waltz, cancan, cha-cha-cha, polka, or foxtrot, a cool-down period                       Control group: Participated in regular RCF activities, and experimental group participated in dance therapy.</p>	<p>-Baseline and pretests were obtained a week prior to the intervention, and posttests were obtained after the intervention was conducted                      - Barthel Index                      Lawton IADL scale                      -MMSE                      -Chair stand test                      -2-minute step test                      -Sit-and-reach test                      -TUG Test</p>	<ul style="list-style-type: none"> <li>• Positive effect on the participants' mobility.</li> <li>• Chair stand test: the control group performed moderately better than the experimental group.</li> <li>• 2-minute step test and TUG test: the intervention group performed moderately better.</li> <li>• Chair stand test (p&lt;.001)</li> <li>• 2 min step test (p=.009)</li> <li>• Chair sit-and-reach-test (p=.026)</li> <li>• TUG test (p=.014)</li> </ul>
<p>Hewston et al., [23]  <a href="https://doi.org/10.1186/s40814-021-00956-3">https://doi.org/10.1186/s40814-021-00956-3</a></p>	<p>Level 3B                      RCT&gt;                      prospective cohort single-arm study (pre/post)</p>	<p>n=25 participants (M age, 77.5 yr; 70% female; 30% male)                      Older adults ≥ 60+ yrs of age with presence of cognitive and mobility impairments Ability to follow three step commands Ability to move independently with or without assistive devices, from a regional specialized geriatric clinic, community groups and recreational centers                      Setting: YMCA</p>	<p>15- week mind-body program GERAS DANCE                      -In-person classes 2x weekly, 60 min                      Homework (10 min daily) routines combined the foundational skills into full.                      choreographed dances to music from the 1950s and 1960s.                       No control group.</p>	<p>-Feedback questionnaire</p>	<ul style="list-style-type: none"> <li>• The GERAS DANCE intervention showed participants found social connectedness, fun, and enjoyment in dance intervention.</li> <li>• All areas of enjoyment of the dance program were above 70%, with 2/3rds of the categories scoring 100% enjoyment.</li> <li>• 95% of participants viewed the challenge as 'just right.'</li> </ul>
<p>Müller et al., [18]  <a href="https://doi.org/10.3389/fnagi.2017.00056">https://doi.org/10.3389/fnagi.2017.00056</a></p>	<p>Level 3B                      RCT&gt;                      longitudinal randomized study (Pre/Post)</p>	<p>n=62 (baseline) 10 (excluded) participants                      Mean age, 68 yrs                      Healthy elderly individuals between 63-80 yrs old excludes claustrophobia, metal implants, tinnitus, tattoos, diabetes mellitus, depression, (BDI-II &gt; 13), cognitive deficits. (MMSE &lt; 27), neurological diseases and regular exercising (≥1 hour/week)                      Setting: Otto von-Guericke University, Magdeburg, Germany</p>	<p>Participants were assigned to either dance or sports training programs. Both groups were comparable in terms of intensity, duration, and frequency after a period of 6 and 18 months to compare the effects of participation in a dance program on brain function and volume in healthy seniors.                       No control group.                       Intervention 1:                      Period of Training (n=28) 2x per week, 90 min, 6 months                       Intervention 2:                      Period of Training (n=22) 1x per week, 90 min, 12 months</p>	<p>-PWC 130 achieved on a cycle baseline                      -VLMT                      -Attention Test Battery                      -TAP                       - MRI - Images were analyzed using VBM-analyzed difference in gray matter volume changes</p>	<ul style="list-style-type: none"> <li>• Cardiovascular fitness (PWC 130) did not increase for either group.</li> <li>• Both groups showed improvements in VLMT scores from 0-6 months and 6-18 months.</li> <li>• Significant TAP improvements were shown in both groups.</li> <li>• Dance group showed increase in gray matter volume in precentral gyrus and right parahippocampal gyrus at 18 months.</li> </ul>

<p>Valentine-Garzon et al., [17]  <a href="https://doi.org/10.1080/j148v11n01_06">https://doi.org/10.1080/j148v11n01_06</a></p>	<p>Level 2B                      RCT (Pre/Post)</p>	<p>17 female participants                      Age Range: 64-85                      Mean: 74.8                      Elderly females currently participating in Stuart Circle daycare program                      Medically approved for participation                      Upper extremity ROM within functional limits                      No previous experience within the last year in a ROM dance exercise program                      Cognitive level of four on Allen's cognitive scale                      Setting: Stuart Circle Center, an adult day care center located in Richmond, Virginia</p>	<p>2 ROM dance program sessions a week for approximately 30 minutes.                      The experimental group continued with their normal exercise and rest routine, along with their participation in the ROM Dance Program.                      Control group: Involving participation in their normal exercise and rest routine</p>	<p>-Functional range of motion assessment                      -Shortened Questionnaire from: SELF</p>	<ul style="list-style-type: none"> <li>The pre-program and initial post-program mean score variances showed no significant differences between experimental and control groups, in the ADL, self-esteem, or ROM variables.</li> <li>The experimental group perceived the ROM dance program as more beneficial and enjoyable.</li> </ul>
<p>Meng et al., [15]  <a href="https://doi.org/10.1016/j.archger.2019.104001">https://doi.org/10.1016/j.archger.2019.104001</a></p>	<p>Level 2B                      Quasi-experimental, two group trial</p>	<p>66 participants                      Gender: 71% Female                      Mean Age: 81.8                      Nursing home Residents &gt;60 years.                      During the trial, residents would not leave their nursing home, participate in less than 3 hours of physical activity weekly and were able to walk.                      Setting: Nursing home floor of residence</p>	<p>Participants allocated to the dance group attended 40 min square dance sessions in a nursing home, three times a week for 12 weeks. Assessments were conducted at baseline, 6 weeks, and 12 weeks by researchers blinded to the allocation.                      Participants allocated to the control group maintained their normal daily activities.</p>	<p>-Unintentional weight loss evaluated through two questions about food interest and unintentional weight loss                      -6-meter gait speed test                      -Hand-held dynamometer and stratified by gender and body mass index                      -IPAQ-SF                      -Exhaustion determined according to two questions derived from the CES-D Scale</p>	<ul style="list-style-type: none"> <li>Severity of frailty in older adults was significantly reduced in the dance intervention group.</li> <li>Frailty (p=.002)</li> <li>Slowness (p=.002)</li> <li>Weakness (p=.005)</li> <li>Low physical (p&lt;.001)</li> <li>No relationship between the dance program and the improvement in weight loss and exhaustion</li> </ul>
<p>Franco et al., [19]  <a href="https://doi.org/10.1093/ptj/pzz187">https://doi.org/10.1093/ptj/pzz187</a></p>	<p>Level 1B                      RCT</p>	<p>n=82 participants (41/group)                      Allocate to 2 groups (intervention/control)                      Mean Age: 69 yrs                      Community dwelling 60 and up                      Cognition intact (24 pts on MMSE, minimum)                      Setting: Presidente Prudente, Sao Paulo, Brazil</p>	<p>1 hour single educational class + 12 week Senior Dance Program with choreography to Rhythmic Folk music.                      Control group only attended the educational class.</p>	<p>-Single Leg Stance with vision occluded (no DME)                      -Short Physical Performance Battery &amp; various LE stances                      -MOCA                      -TMT</p>	<ul style="list-style-type: none"> <li>Cognition was not improved due to low homogeneity and small sample size.</li> <li>Senior Dance group improved in standing balance, sit to stand, and 4m walk tests.</li> </ul>
<p>Machacova et al., [14]  <a href="https://doi.org/10.1177/0733464815602111">https://doi.org/10.1177/0733464815602111</a></p>	<p>Level 1B                      Multicenter Randomized Control Trial</p>	<p>Main sample:                      n=211 participants                      Mean age 83                      Subsample:                      n=52 participants                      Mean age 83                      Permanent Residents of 1 of 7 nursing homes in the Czech Republic (subsample in 3 of Prague)                      ≥60 yrs and older                      Completion of Mobility baseline and follow-up tests                      TUG score above 0 baseline                      Setting: Nursing Home</p>	<p>1 hour Ballroom dance program for 3 months                      Control group received no dance classes but allowed to attend end of trial, group participated in regular nursing home activities.</p>	<p>Main Sample:                      -TUG Test                      -Barthel Index                      -Lawton Scale for IADLs                      Subsample:                      -SFT                      -Arm Curl Test                      -2 min step test                      -Chair Test                      -Sit &amp; Reach Test                      -Back &amp; Scratch Test                      -8 foot-timed</p>	<ul style="list-style-type: none"> <li>Dance intervention increased ADL, IADL, balance, and increased activity tolerance for the intervention group (Chair stand test p=.006; Chair sit and reach test p=.008) as opposed to minimal improvements and adverse declines in function for the control (Chair stand test p = .011; 2-min step test p = .024; 8-foot timed test p = .047; Back scratch test p = .036)</li> </ul>

<p>da Silva Borges et al., [12]  <a href="https://doi.org/10.1016/j.archger.2014.03.013">https://doi.org/10.1016/j.archger.2014.03.013</a></p>	<p>Level 1B                  Randomized                  Control Trial</p>	<p>n=59 participants                  Elderly population with                  cognitive impairment</p> <p>Settings: Residents of                  long-stay institutions                  from Brazil</p>	<p>Three 50-minute ball-                  room dance sessions each                  week on alternate days                  for 12 weeks</p> <p>Control group partici-                  pated in normal daily                  activities and agreed to                  no regular exercise until                  after post testing</p>	<p>-Medical records to                  determine frequency of                  falls 3 months prior to the                  intervention</p> <p>-Lizard stabilometric                  -Posturometric platform                  -Postural static balance                  -Borg Perceived Exertion                  Scale</p>	<ul style="list-style-type: none"> <li>Participants showed an increase in balance (p=.076). The number of falls reduced (p=.219) while improving overall balance and gait.</li> </ul>
<p>Krampe et al., [21]  <a href="https://doi.org/10.1097/NAQ.0b013e3181d91851">https://doi.org/10.1097/NAQ.0b013e3181d91851</a></p>	<p>Level 3B                  Quasi                  experimental                  design, non-                  randomized                  cohort study                  with a pre/                  post test</p>	<p>n=11 Participants                  7 women, 4 men                  Mini-Mental State                  Examination score of 23                  or more, attending PACE                  on Monday, Wednesday,                  and Friday, and able to                  stand with or without                  assistance.</p> <p>Setting: Alexian Brothers                  Community Services                  PACE, St Louis, Missouri</p>	<p>18 doses of dancing, 3x/                  week for 6 weeks. 45                  minutes of dancing each                  session.</p> <p>Control Group:                  No control group.</p>	<p>-Functional Reach Test                  -TUG Test</p>	<ul style="list-style-type: none"> <li>Improvements were found in the</li> <li>Functional Reach Assessment</li> <li>TUG Test</li> <li>No trends in long-lasting effects at the 6-week post-intervention measurements.</li> <li>Clients reported improvement in balance, gait, and enjoyment of social activity.</li> <li>Functional Reach score divided by TUG score showed global improvement of about 50% from baseline.</li> <li>50% self-reported that their balance and gait improved.</li> </ul>

**Table 5:** Evidence Table.

Note: Abbreviations are as follows. Mini Mental State Examination (MMSE). Young Christian Men’s Association (YMCA). Late Life Function and Disability Instrument (LLFDI). Physical Working Capacity 130 Test (PWC 130). Beck Depression Inventory (BDI-II). Verbal Short- and Long-term Memory Test (VLMT). Test of Attentional Performance (TAP). Voxel-based morphometry (VBM). Self-Evaluation of Life Function Scale (SELF). International Physical Activity Questionnaire Short Form (IPAQ-SF). Center for Epidemiologic Studies on Depression Scale (CES-D). Durable medical equipment (DME). Timed Up and Go Test (TUG). Senior Fitness Test (SFT). Trail Making Test (TMT). The Montreal Cognitive Assessment (MOCA).

participants’ physical capabilities in those who received the intervention versus controls [14]. A Level 2B randomized control trial found that the intervention group had significant improvements in IADLs and mobility [17]. Moreover, the control group from the Level 1B study had a statistically significant decrease in mobility compared to the intervention group. No statistical significance was found in the change in ADLs between the two groups of the studies. However, the impact of decreased mobility was less severe in the experimental group [14]. An additional Level 1B study with a high risk of bias examined 17 participants in a 4-week range of motion (ROM) dance program and found only statistical improvements in the frequency of exercise in the ROM dance program. The outcome measures relied heavily on clinician reasoning due to observations of ROM and client self-reporting on ADLs using the SELF Assessment [17].

A Level 3B study showed improved postural balance and reduced risk of falls after participating in a ballroom dancing program among sedentary frail older adult populations with cognitive impairment residing in long-term institutions. Over a 12-week period of three 50-minute weekly sessions, the experimental group (n=30) of 59 total participants showed a significant difference in the distribution of limb weight-enhancing motor performance in ADLs. The Level 3B study found that line dance intervention twice a week for 12 weeks resulted in improved movements related to upper extremity ADLs (showing, dressing, feeding, etc.) among low socioeconomic status (SES)

African American women. The effects of the study were sustained after an 18-week re-assessment. Late-Life Function & Disability Instrument (LLFDI) outcomes showed increased motor performance after participating in the dance intervention [16].

### Functional mobility

Four studies examined the outcomes of dance on lower extremity function and performance in frail older adults [12,19-21]. Each study shows a positive impact of dance on aspects of functional mobility. The four studies examined aspects of mobility and gait that impact an individual’s participation in their desired occupations using the TUG, the BORG Rate of Perceived Exertion (BORG), measurements of walking speed, stride length, and cadence, and through analyzing participant’s reports of their perceptions of their performance.

Two studies, a Level 1B and Level 3B, utilized the TUG to observe the effects dance movement therapy has on the patient’s ability to ambulate [19,21]. Results of both studies showed a decrease in falls, improved balance, and improved mobility following the interventions. An additional Level 1B study measured patients’ perceived exertion with the BORG Scale, which showed improved balance and decreased falls after intervention [12]. In a Level 3B study, cadence, walking speed, and stride length were measured before and after an Iranian dance intervention group and showed an increase in gait performance and gait quality after the intervention [20].



## Physical Performance Factors that contribute to Occupation

Physical performance factors include factors that contribute to reduced participation in several occupations. In this systematic review, factors in this category included slowness, weakness, physical activity, exhaustion, and decreased range of motion (ROM) [15,16,18]. These performance factors can limit engagement in occupations, as they are skills that contribute to successful motor performance skills. Slowness, weakness, physical activity, and exhaustion directly affect occupations of physical activity, safety, and functional mobility. These performance factors may also affect any occupations requiring mobility or standing, such as showering, dressing, food preparation, and home maintenance [6] Limitations in these areas would decrease the quality and quantity of occupational engagement.

Slowness, weakness, physical activity, and exhaustion were measured in a Level 2B study before and after participation in dance sessions [15]. Slowness was assessed using a 6-meter gait speed test, weakness was measured by handgrip strength using a hand-held dynamometer, and physical activity was evaluated according to the International Physical Activity Questionnaire Short Form (IPAQ-SF). These three physical performance factors significantly decreased, but there were no differences in exhaustion as measured by two questions derived from the Center for Epidemiologic Studies on Depression (CES-D) scale.

Lower extremity ROM assists with a client's mobility. Among four studies conducted by Meng et al., on dance therapy's impact on upper extremity ROM, improvement was seen in only one of the studies [15]. Dance's impact on physical function and physical working capacity was measured in two Level 3B studies [16,18]. Physical working capacity, the ability to perform maximum physical work, was measured with the Late Life Function and Disability Instrument (LLFDI), and the physical working capacity was measured with the Physical Working Capacity 130 Test (PWC 130). Both studies showed that therapeutic dance participants increased physical function and working capacity. The performance factors shown to improve were slowness, weakness, and physical activity, while those that did not improve with a dance intervention were exhaustion and ROM. Improvement of physical performance factors through dance intervention suggests improvement in occupational engagement, impacting frail older adults' daily participation in desired activities.

## Socioemotional factors

Although some articles did not use social participation in their outcome measures or intervention, they used it as a form of motivation and support participation in the intervention. Study results indicated that participants were entertained during the dancing sessions [13-16,21-23]. One Level 3B study evaluated the effectiveness of therapeutic dancing for social interaction and how this intervention is a source of emotional support. The participants used the intervention as an opportunity to share stories and reflect on the music and dance. The NIH loneliness questionnaire was used to measure the outcome of dance. The pre-intervention score was 7+/-7 (5,15), and the post-intervention score was 5+/-8 (5,13), reporting that there was an improvement in feeling less alone [22]. A Level 3B study used a depression scale as an outcome measure, which contained 20 items to be scored on a 4-point Likert scale, with 0 being rarely depressed and 3 being depressed most of the time [16]. At pre-test patients reported severe depression (M =20.0, SD = 12.4), while post-test results

showed that dance intervention significantly decreased depression ( $t = 6.11, p < .001$ ). The same article defined disability as the inability to perform socially defined life tasks, such as personal maintenance, social community activities, and participation in economic activities and utilized the disability instrument to assess the impact of disability in community-dwelling older adults. They rated 16 major life tasks on a Likert scale ranging from 1 (completely limited) to 5 (not at all). The participant's level of disability improved from (M = 65.7, SD = 14.9) to significantly increased physical function ( $t = -2.74, p = .013$ ) after completing the dance intervention for 12-weeks [16].

## Cognition

One Level 3B study administered the Verbal Short- and Long-term Memory Test (VLMT) and the Attention Test Battery-Test of Attention Performance (TAP). The results showed significant improvements in the post hoc test comparison from baseline to 18 months and 6 to 18 months in all three VLMT subcategories in both groups. The TAP group also significantly improved compared to the baseline to the 18-month data in both groups [18]. One Level 2B study used intervention in which cognitive skills were needed. Although previous research showed that gait performance was improved using cognitive activities, further research still needs to be done on the cognitive effects on older adults' performance [20].

One Level 1B studies examined the effects of cognitive function in therapeutic dancing and administered the Montreal cognitive assessment (MoCA) to 60 participants [19]. This study utilized the MoCA as an outcome measure for the dance intervention and the results failed to show a statistically significant difference between groups for both measures of cognitive function. The study additionally administered the Trail-Making Test to test cognitive levels, but the test failed to show any cognitive improvement.

## Discussion

Findings indicate that dance is a beneficial intervention to increase occupational participation in FPF older adults. The performance factors improved through dance that led to an increase in occupational participation in the FPF older adult population were speed and quality of gait, cadence, balance, range of motion, and reduced fall risk [12,19,20]. In addition to increasing performance factors, dance increases motivation, social connectivity with others, the overall enhancement of quality of life, and decreases depression [13,16,22]. Additional findings indicate a potential for increased brain activity in areas related to spatial memory and motor skills through participation in a dance intervention [20]. The data concludes that dance programming has multifaceted benefits as it impacts general physical performance, cognition functioning, and social behaviors.

As seen by Clifford et al., [22], participants found the dance intervention beneficial as an opportunity to share stories and reflect on the music and dance. The participants found dance intervention was not exclusively beneficial for their physical health, but for their feelings of social connectivity.

Valentine-Garzon et al., [17] found no significant difference in ADL independence, ROM, or self-esteem following dance intervention when compared to the control group. Reasons for this could potentially be the small sample size of 17 participants, but it was found to have high quality and a low level of bias. Although the participants did not demonstrate a difference when compared to the control group, the experimental group reported finding the ROM dance program as

beneficial, enjoyable, and performed with greater frequency than the control group. This study reveals a limitation of a short time period, two, 30 minute dance sessions per week, for four weeks, and stated that most exercise programs yield results after months to years of implementation. The short time period could be an explanation as to why no significant difference was shown between the two groups.

Franco et al., [19] examined the impact of dance intervention on balance, safety for falls, overall mobility, and cognitive levels in 82 older individuals. The participants' cognition did not improve in the experimental group after participation in a folk music dance intervention. This study was determined to have a low level of bias but had a small sample size of 41 participants in the experimental group. There was no difference between the experimental and control groups. In the cognitive tests, baseline cognition was measured through the MMSE, MOCA, or the Trail Making Test and participants' baseline scores were within the average for normal cognitive function. There was no significant difference between the experimental and control groups in these cognitive tests.

### Strength of evidence

Strong evidence supports improved overall factors that enable occupational engagement from dance as an intervention for FPF older adults [24]. Strong evidence supports dance as an effective intervention to improve ADLs, functional mobility, and socioemotional factors, while moderate evidence supports cognition and physical performance factors that contribute to occupation. Two level 1B, one level 2B, and one level 3B study of overall strong evidence addressed ADLs [12,14,16,17]. Two level 1B and two level 3B publications of strong overall evidence were examined for functional mobility [12,19-21]. One level 2B and two level 3B articles of moderate overall strength of evidence examined physical performance factors that contribute to occupation [15,16,18]. The research regarding socioemotional utilized four level 3B and two level 1B articles of strong overall evidence [13-16,21-23]. The research regarding cognition used one level 1B and two level 3B articles showing a moderate overall strength of evidence [18-20].

### Strengths and Weaknesses of the Studies

Limitations of the research include limited gender diversity, limited demographic data, low participant numbers, a high risk of bias, and many environmental barriers. Many of the studies had a high rate of female participation [20,21,23]. Frailty was shown in 5.4% of males and 8.8% of females revealing that the population assessed was not representative of the true population due to the limited male participation in dance interventions [26]. The most current research did not include specific demographics of dance participants. Only one study included socioeconomic status [16]. The lack of demographic information limits the ability of the researcher to generalize the results of the studies to the full American population. Additionally, the sample sizes were small, and a few studies had high attrition rates, negatively affecting the quality of the studies [22,21,17]. The risk of bias was assessed for each article. Outcome measures for multiple articles did not include a pre and post-test indicative of measurement bias [22,19]. All the studies required voluntary participation from older adults and nonrandomized bias of participation could have affected the selection bias of the populations participating in the studies. Only participants who were willing to complete dance intervention were included in the studies, which could lead to selection bias.

### Strengths and weaknesses of review

Weaknesses of this review were the omission of articles not written or translated into English and articles that exclusively addressed specific conditions such as cancer and cardiovascular disease. In addition, unpublished or private studies were excluded, which limits the exhaustiveness of our review.

Strengths of our review included the wide variety of data on dance's overall effect on occupational performance among the studies. Each study examined different aspects of an occupation, such as physical factors, ADL factors, psychosocial factors, and cognitive abilities. The studies took place in multiple geographic locations providing many perspectives and cultural motivations for the therapeutic intervention. Various forms of dance were used as an intervention, such as the cha-cha, aerobic dance, line-dance, and Iranian dance [13,16,20]. Having several dance genres strengthened the systematic review by investigating the impact of dance as a whole rather than the impact of one form of dance. The impact of dance as an intervention was assessed using various standardized assessments, which increased the validity of the results and studies [12,15-17]. In addition to the strengths of the research, a strength of this review was that the assistance of a reference librarian was used to obtain data from 10 databases to find articles relevant to our topic. Another strength was Rayyan, an online resource for rating research articles, which was utilized to streamline the article selection process and reduce rater bias.

### Recommendations for future research

The emergence of using dance as an intervention to address occupational engagement is an area that needs to be more thoroughly researched for clinical relevance. Most of the research studies assessed performance factors rather than specifying their impact on ADL performance, revealing a need for more research on how the functional or performance-based outcome measures relate to ADLs. Additionally, research on the effects of dance on functional cognition and potentially exploring what parts of the brain are activated and maintained post-intervention would be beneficial for the future of cognitive therapeutic interventions. More evidence is needed to evaluate the effect of dance on an individual's cognition [20]. One of the articles mentioned that there was no improvement in cognition when using dance as an intervention for frail older adults [19]. Future studies will need to target the diverse experiences of different groups, including socioeconomically disadvantaged individuals and sexual and gender minority groups to ensure a broad representation of the diversity of the population. Finally, it is recommended that research comparing specific styles of dance, such as ballroom, cultural dance, or aerobic dance, should be conducted to identify which dance style shows the most improvement in FPF older adult participants.

### Conclusion

The results of the studies have the following implications for occupational therapy practice:

- Occupational therapists can utilize dance as an intervention to promote ADLs/IADLs by improving upper and lower extremity function, all while incorporating cognitive skills required to complete the tasks.
- Dance is a motivating intervention that can be used in practice to encourage social participation and decrease isolation.

- Current research reveals that dance as an intervention has promising results in reducing physical and cognitive symptoms associated with frailty. Further studies from occupational practitioners are needed to investigate the impact of engagement in occupations.

Evidence suggests that occupational therapists and other health professions can implement dance as a valid and reliable intervention to assist frail and prefrail older adults in occupational performance. Our review indicates that dance as a beneficial intervention for older adults with cognitive deficits, limited physical performance and mobility, and ADLs. Therefore, dance can be used as an intervention to increase participation in occupation by frail and prefrail older adults.

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