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Exercise and physiotherapy for nursing home residents with dementia: practices and preferences

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Part 3

Chapter 7:

A 10-week physical therapist-supervised exercise program for nursing home residents with dementia: a single arm, observational feasibility study

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Abstract

Background: Evidence on the effectiveness of exercise interventions for nursing home residence with dementia is scarce with considerable practice variation with respect to their contents and dosage. This study aimed to evaluate the feasibility of an adequately dosed, personalized exercise intervention with respect to the assessment instruments, participants' adherence and the occurrence of serious adverse events (primary feasibility outcomes) and the participant recruitment and participants' and supervisors' participants' perceptions and experiences (secondary feasibility outcomes).

Design: Single-arm observational study.

Setting: Two nursing homes in Haarlem, the Netherlands.

Participants: Nursing home residents with a confirmed diagnosis of dementia who were able to walk 50 meters (with or without walking aid), without expected resistance to the intervention.

Intervention: 10-week program, with two group-based sessions including strength and balance exercises, and two individual exergaming cycling sessions per week. The sessions were tailored to the participant via standardized assessments and supervised by a physical therapist.

Results: Of 59 residents screened, 11 enrolled. Four of six clinical assessments were completed by all, and two by nine and ten participants, respectively. Nine participants completed both components, one only the individual exergaming part, and one participant dropped out. Adherence rates were 92% for the group and 87% for the individual sessions. Among 137 reported adverse events, nine were possibly related to the intervention, all minor and transient. The median participant appraisal score was 4.3 (out of five). Supervisors highlighted dementia-specific knowledge, individualized communication, and tailored approaches as facilitators, while scheduling conflicts posed challenges.

Conclusion: A 10-week, personalized, physical therapist-led exercise program for nursing home residents with dementia is feasible, with high adherence and positive evaluations. A pilot study to refine the recruitment and intervention procedures as well as pre-and post-intervention outcome measurements is needed prior to scaling up to a larger clinical trial assessing effectiveness.

Introduction

Dementia is highly prevalent among nursing home residents, with rates between 42% and 84% depending on country and facility type.[1–3] Beyond cognitive decline, dementia is associated with reduced mobility, strength, balance, and endurance,[4,5] leading to greater dependency in activities of daily living (ADL)[6] and an increased risk of falls.[7] Physical therapy, especially exercise-focused, is commonly used to address physical impairments in this population.[8,9] Physical therapists are considered the experts on exercise therapy, as endorsed by both physical therapists' professional organizations[10] and by patients.[11] However, exercise interventions vary widely in content and supervision, limiting their comparability.[12–16]

A recent review of physical therapist-supervised exercise interventions for residents with dementia included six studies: four multimodal, and two aerobic-only.[17] Aerobic interventions showed some benefits but had high bias risk. Multimodal programs showed mixed effects on performance and independence. Furthermore, the variation in outcome measures and inconsistencies in observed effects limited the strength of the conclusions. With the interpretation of the results, it must also be taken into account that none of the interventions met the recommendations from international guidelines on exercise and physical activity for nursing home residents[18] and older adults,[19,20] both suggesting the incorporation of aerobic, strength, flexibility and balance exercises, with a minimum duration of 20 minutes and frequency of 3 times per week. This raises questions about their therapeutic validity.[21]

Low adherence to exercise sessions is another concern. A meta-analysis found an average 62.3% adherence rate among residents with dementia.[22] Some high-quality programs achieved higher rates (73–75%)[23,24] but overall, suboptimal adherence may limit effectiveness. Exergaming, combining physical and cognitive stimulation through interactive games,[25] shows promise in improving engagement.[26] An example is the use of stationary bicycles with digital video images of the environment such as *Bike Labyrinth®*. A recent qualitative study[27] explored residents' preferences, revealing a preference for professional oversight, though not necessarily by a physical therapist at all times, provided safety and quality were maintained. Building on these findings, a future intervention could incorporate a flexible supervision model, combining professional supervision with trained non-professional support.

In summary, while therapist-supervised exercise can improve function in residents with dementia, most studies fall short of guideline standards, and adherence strategies like exergaming remain underexplored. A well-designed, individualized intervention incorporating exergaming and flexible supervision may reveal its full potential, however

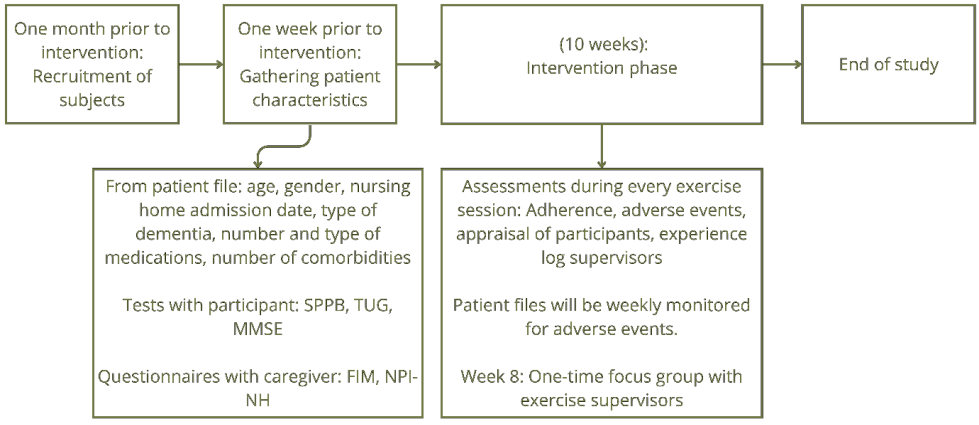
first its feasibility must be assessed. Therefore, this study aimed to assess the feasibility (assessment completion, session adherence, adverse events, recruitment, participant appraisal, and supervisor experiences) of a 10-week physical therapist-supervised exercise intervention for nursing home residents with dementia.

Methods

Study design

We conducted a single-arm, observational study at two sites of a nursing home care organisation. The study methodology was developed in accordance with the extended Consolidated Standards of Reporting Trials (CONSORT) criteria for feasibility studies.[28] Furthermore, the intervention was described using the Template for Intervention Description and Replication (TIDieR) checklist and guide.[29] The study duration and sample size was based on two previous feasibility studies involving exercise interventions for older adults with dementia.[30,31] The study planning is depicted in Figure 1. The primary feasibility outcomes were: administration and completion of assessment instruments, with an a priori threshold of >80%; adherence to the intervention, with a threshold of >75%; and absence of serious adverse events attributable to the intervention. The secondary feasibility outcomes were: participant recruitment, participants' appraisal of the intervention, and supervisors' experiences.

Figure 1: Study flow including recruitment, study length and study procedures



Study ethics

Ethical approval for the study protocol was obtained from the Medical Ethics Assessment Committee – Leiden Den Haag Delft (METC-LDD) [NL87232.058.24]. The study procedures were informed by existing literature on the ethical inclusion of individuals with dementia

in research.[32] Given the severity of cognitive impairment among the target population, all residents were deemed unable to read, comprehend, and provide informed consent for participation in medical research. Therefore, the legal representatives of potentially eligible residents were informed about the study and asked to provide written informed consent. While consent from the legal representative is legally sufficient, verbal assent from the residents was also sought to support their involvement in the decision-making process. All supervisors provided written informed consent.

Setting and Population

Participants were recruited and data was collected from two sites of a nursing home organization located in the urban area of Haarlem, the Netherlands during February June 2025. Both facilities share similar characteristics, including size, range of activities, staffing levels, and small-scale, homelike nursing wards. Each site has specialized units dedicated to residents with severe cognitive impairment, offering continuous supervision. Exercise therapy was provided by physical therapists or movement therapists (collectively referred to as physical therapists), who are professionals trained to promote and guide physical activity in particular for people who are dependent on supervision. Physical therapy services in these nursing homes were consistent with standard Dutch practice.[33]

Eligibility of participants

Eligibility for participation in the study exercise sessions was limited to residents diagnosed with dementia who resided in the designated wards and were not expected to return to independent living. The attending physician assessed eligibility based on the following inclusion criteria:

- A confirmed medical diagnosis of dementia documented in the patient's medical file
- Ability to walk at least 50 meters without human assistance (use of walking aids permitted)
- No anticipated resistance to participation in the intervention, as judged by the attending physician

Exclusion criteria included:

- Behavioral problems likely to interfere with participation in a group intervention, as determined by the physician
- Any other factors identified by the physician that could render participation inadvisable for the resident

Throughout the study period, participants were allowed to continue receiving any treatments deemed appropriate in consultation with their attending physician.

Recruitment

Nursing home residents

At each ward, the attending physician compiled a list of potential participants based on the study's eligibility criteria. The legal representatives of the eligible residents were contacted by the ward's physical therapist via telephone. If the legal representative expressed interest and agreed to receive further information, an informational leaflet outlining the study was sent. One week after the initial contact, a follow-up call was made to address any questions. Additional inquiries were managed by the study coordinator (DB).

If the legal representative remained interested, an informed consent form was provided. Upon receipt of the signed consent form, the attending physical therapist informed the resident about the study and sought verbal assent. Once verbal assent was obtained, the resident was formally enrolled in the study by the study coordinator.

Supervisors

Supervising physical therapists were selectively recruited based on their affiliation with the participating locations and wards, postgraduate training in dementia care as well as their interest in the study. Supervisors attended one introductory meeting and two training sessions to prepare for the intervention. In addition, four fourth year physical therapy students (University of Applied Sciences, Leiden) were selectively recruited to assist with supervision. These students participated in two theoretical sessions and two practical training sessions and attended one expert lecture on dementia. Before the study, the coordinator assessed and confirmed their competency to supervise the intervention.

Intervention

The intervention was designed by a team of physical therapists with experience in nursing homes and in clinical research, with its contents, dosage and mode of delivery being informed by recommendations of relevant professional guidelines,[18,19] a recent systematic review on physical therapy for nursing home residents with dementia,[17] two studies exploring the needs and preferences of nursing home residents and their family caregivers regarding physical therapy and exercise,[27,34] as well as clinical experience of members of the research team with this population. The program was individually designed regarding its contents and dosage according to the FITT-VP principle: Frequency, Intensity, Time, Type, Volume, and Progression.[35] The resulting intervention comprised four sessions per week: two group exercise sessions and two individual exergaming sessions. A detailed summary of the intervention is provided in Supplemental Table 1. In short, group sessions were 45 minutes long, held in the nursing home gym, and supervised by two physical therapists. They focused on strength, balance, and flexibility at moderate intensity, with exercises progressively adapted every two weeks. Individual exergaming sessions

involved 20 minutes of supervised cycling on a stationary ergometer (Tigo 562, Thera-Trainer®, Germany) equipped with personalized virtual routes using Bike Labyrinth® software [Version: V5.4.1]. These sessions were tailored to each participant's preferences and adjusted regularly for resistance and engagement.

Standardized clinical assessments for the individual design of the intervention

Six instruments were selected to assess physical functioning, cognition, neuropsychiatric symptoms of dementia, and ADL, that were administered one week prior to the start of the intervention (see Supplemental Table 1 for details). The assessment results were communicated to supervisors to enable personalization of the exercise sessions according to each participant's individual needs and abilities. The results were further used to contribute to the external validity of the intervention by providing detailed information on the participant characteristics. The physical functioning performance tests were administered by a physical therapist not involved in the intervention supervision (IP), the cognitive assessments by a psychologist (BW) and the instruments for independence in ADL assessments and neuropsychiatric symptoms by nursing home caregivers (supervised by BW and DB).

Feasibility Outcomes

Primary outcomes

Completion of the clinical assessments

For completion of the clinical assessments, the recorded test results were used. While there is no universally accepted threshold for determining the feasibility of a clinical instrument, in this study, an instrument was considered feasible if it could be administered and completed by at least 80% of participants. An attempt was considered valid if the participant understood the test procedure, even if they were physically unable to complete it. In addition, the number of attempts was recorded. This criterion was informed by the National Institute for Health and Care Research (NIHR) progression criteria [36] and the extended CONSORT guidelines for feasibility studies.[28]

Adherence to the intervention

Adherence was recorded dichotomously (yes/no) for session completion by the attending physical therapists using standardized exercise logs. Although, to our knowledge, no standardized cut-off value exists to define sufficient adherence, we considered adherence to be feasible when exceeding 75%, as this corresponds to completing, on average, at least three exercise sessions per week.

Adverse events

Adverse events are defined as any undesirable experience occurring in a participant during the study, regardless of whether it is related to the experimental intervention. Adverse events were assessed during each session through direct observation and by asking participants whether they experienced any negative effects from the exercise sessions. Additionally, the treating physical therapist monitored participants' patient files to identify any adverse events reported by nursing home staff. Adverse events were documented by means of a modified classification system based on a previous study involving nursing home residents with dementia,[37] and according to the Central Committee on Research Involving Human Subjects (CCMO).[38] Events were categorized into four types: 1) Minor and temporary, not requiring treatment by a physician or specialist, 2) Minor and temporary, requiring treatment by a physician or specialist, 3) Serious injury or illness, potentially life-threatening, 4) Death. All adverse events were discussed with the supervising physician. Adverse events classified under categories 3 and 4 were deemed serious adverse events and were handled in accordance to national guidelines.[38] In specific circumstances, an independent monitoring committee has the authority to terminate the intervention before its planned completion. The physician and the study coordinator determined whether the event was unrelated, possibly related, or most likely related to the intervention. We considered the absence of serious adverse events related to the intervention to be feasible.

Secondary outcomes

Participant Recruitment

To assess recruitment feasibility, we documented the number of residents screened, the number of eligible individuals approached, the number who consented to participate, and, when available, the reasons for non-participation.

Participants' appraisal of the intervention

Participants' appraisal of the exercise intervention was assessed at the end of each exercise session using a specifically for this study developed 5-point Likert scale. The scale is an adaptation of the End-of-Life in Dementia Satisfaction Scale (EOLD)[39] and the Smiley Face Assessment Scale.[40] The adaptation consisted of a printed page with the question: "How did you perceive the exercise session you just participated in?", answered on a 5-point Likert (1= Very unpleasant, 2=Unpleasant, 3=Neutral, 4=Pleasant, and 5=Very Pleasant). If a participant was unable to respond, a 3-point Likert scale consisting of the options Unpleasant, Neutral, and Pleasant in red, yellow, and green, respectively were provided.

Supervisor's experiences and acceptance

Supervisor's experiences regarding facilitators and barriers in the acceptance of the intervention were assessed using a mixed-methods approach:

- Logs documenting exercise observations: After each session, supervisors recorded their observations in the participant's report form. These notes included perceptions of participant engagement, challenges encountered, and any notable events during the session. Two persons (KS and JK) independently checked the notes and coded relevant information.
- Focus group discussion: In week 8 of the intervention, all supervisors participated in a structured focus group to further explore their experiences. The discussion was led by one of the physical therapy students (JK) and supervised by the study coordinator. The focus group was audiotaped with Microsoft Teams [Version 25153.1010.3727.5483], transcribed with [TurboScribe.ai] and checked for correctness by JK and BW. The focus group data were initially independently thematized by two persons (JK and BW), subsequently discussed jointly by them, and checked for correctness by the study coordinator.

In addition to the standardized assessments, the following characteristics of the participating residents were retrieved from medical records: age, gender, date of nursing home admission, dementia subtype, number and type of comorbidities, total number of prescribed medications and medication categories. The number of medications and comorbidities was collected cumulatively, meaning that individual participants could be presented with more than one medication or more than one condition within a given category (e.g., multiple musculoskeletal disorders).

Statistical analysis

Baseline characteristics of the participating residents were summarized using standard descriptive statistics, specifically medians and interquartile ranges for continuous variables and frequencies for categorical variables. An expert in geriatric medicine (SH) aided in categorizing the medical conditions and the medications used. Recruitment feasibility was summarized using descriptive statistics. Adherence to the intervention and completion of evaluation parameters were calculated as the number of sessions attended or instruments completed, divided by the total number of sessions or instruments planned. Adherence rates were calculated both overall and separately for the group exercise sessions and the individual exergaming sessions. Resident-reported experiences using Likert scales were analyzed using means and standard deviations. Supervisors' experiences as documented in the participant report forms were analyzed using thematic analysis.[41] The themes that emerged from this preliminary analysis informed the development of the

topic guide used in the focus group discussions. Focus group data were subsequently coded and organized into minor and subsequently major themes.

Results

Participant and supervisor recruitment

A total of 59 residents were screened for eligibility (Figure 1) of whom 14 (24%) were eligible for participation. All legal representatives agreed with participation (in 1 patient with the exception of the individual exercise sessions for logistical reasons), and 11 out of 14 (79%) participants provided verbal assent. Table 1 presents their characteristics. They had a median age of 84 years, 8 were female and 6 participants were diagnosed with Alzheimer's dementia, whereas the most common medical conditions were cardiovascular diseases and musculoskeletal disorders (Table 1).

Figure 2: Flowchart of participant recruitment and completion of the intervention

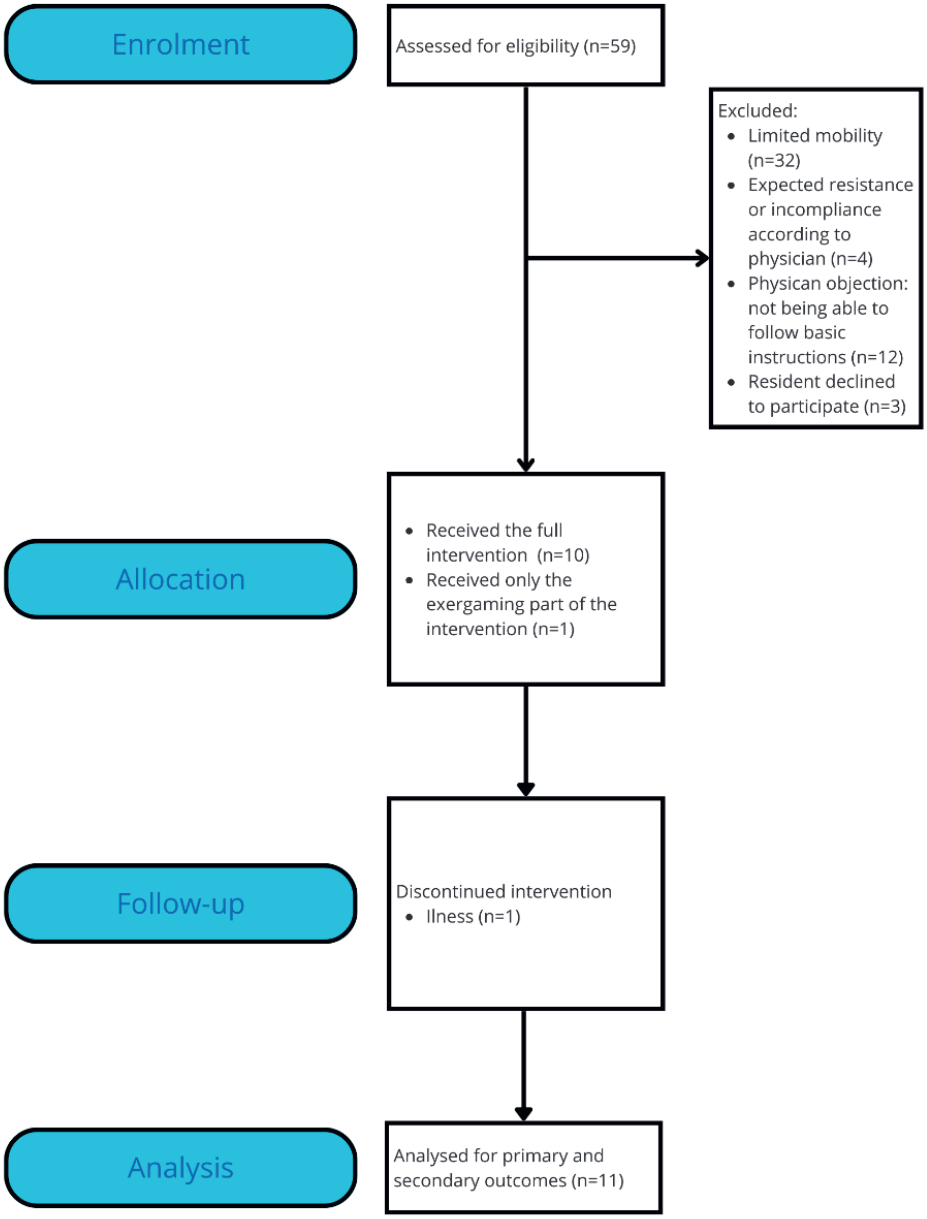


Table 1: Characteristics of eleven nursing home residents with dementia participating in an observational study on a 10-week exercise program.

Characteristics	Median and range	Number (%)
Age	84 (71-96)	
Gender (female)		8 (84.2%)
Length of stay (months)	16 (2-95)	
Dementia type		
Alzheimer's disease		6 (54.5%)
Vascular		1 (9.1%)
Mixed Alzheimer's disease and vascular		1 (9.1%)
Other		3 (27.3%)
Medical conditions (total number in all 11 participants)		
Cardiovascular disease		22
Vitamin deficiency		2
Dermatological disorder		12
Ear, Nose and Throat disorder		1
Gynaecological disorder		2
Intestinal disorder		4
Metabolic disorder		6
Musculoskeletal disorder		20
Neurological disorder (excluding dementia)		11
Ocular disorder		3
Psychiatric disorder		5
Pulmonary disorder		1
Rheumatic disorder		5
Surgical treatment		2
Urological/nephrological disorders		11
Medication (total number in all 11 participants)		
Analgesics		11
Anticoagulations		6
Anticonvulsants		1
Antidepressants		3
Antihypertensive		12
Antipsychotics		3
Benzodiazepine		4
Cholesterol lowering agents		1
Cholinesterase inhibitor		2
Dermatological cream		2

Table 1: Characteristics of eleven nursing home residents with dementia participating in an observational study on a 10-week exercise program. (*continued*)

Characteristics	Median and range	Number (%)
Diuretics		4
Eye drops		2
Hormonal treatment		1
Inhalers		1
Laxative		4
Metabolic medicine		1
Nasal spray		2
Stomach acid reducer		3
Vitamin D and calcium supplement		11
Use of walking aid (yes)	3 out of 11	
Rolling walker	3 (100%)	

Regarding the supervisors, eight were approached, of whom all eight agreed to participate and take part in the mandatory training. They were four physical therapists and four physical therapy students. Each supervisor guided at least 70% of the planned group or individual training sessions.

Completion of the assessment instruments

Table 2 presents the completion and outcomes of the clinical assessment instruments. Five of these, i.e. the balance test, the 4-meter walk test at a comfortable pace, the TUG test and the MMSE were completed by all 11 participants, while the FIM and the NPI were completed for all 11 participants by their professional caregiver. The SPPB was completed by 9 participants, due to the inability of 2 participants to complete the 5-times chair test component. In addition, 1 participant could not complete the 4-meter walk test at their fastest pace. In some patients, multiple attempts were needed, in particular for the balance part of the SPPB and the TUG test.

Table 2: Feasibility of 6 assessment instruments administered in 11 nursing home residents with dementia

	Number of participants completing assessments	Number of attempts (median and range)	Score (median and range
Short Physical Performance Battery (range 0-12)			8 (2-12)
- Balance (range 0-4)	11	2 (1-4)	2 (0-4)
- 4 meter walking speed, comfortable (meter/seconds)	11	1 (1-1)	5.9 (4.5-8.5)
- 5 times chair stand test, (seconds)	9	1 (1-3)	15.7 (10.1–20.4)
4 meter walking speed, fastest (meter/seconds)	10	1 (1-2)	3.9 (2.3-7.7)
Timed Up and Go test (seconds)	11	2 (2-6)	12.7 (5.9-52.1)
Mini Mental State Examination (Range 0-30)	11	1 (1-1)	12 (7-22)
Neuropsychiatric Inventory – Nursing Home version Range (0-144)	11	1 (1-1)	7 (0-25)
Functional independence Measure (Range 18-126)	11	1 (1-1)	93 (55-107)

Adherence

As one participant did not engage in the combined group exercise sessions, ten residents completed the intervention. The overall adherence rate to the intervention was 89%. Participants attended 179 of the 194 planned group exercise sessions (92%) and 186 of the 214 planned individual exergaming sessions (87%). Two participants had an overall adherence rate under 75% (63% and 71%), and three participants completed all sessions (100% adherence rate). Documented reasons for non-adherence included lack of willingness to participate (n=24), medical reasons (n=13), and participant absence from the facility at the time of the session (n=6).

Adverse events

Table 3 presents the occurrence of adverse events. A total of 137 adverse events were identified, all classified as minor and temporary, with nine requiring treatment. None of these latter nine events were considered likely related to the intervention (pain caused by pressure ulcers (n=6), nighttime falls from bed (n=2) and depressive symptoms requiring further examination to rule out underlying causes (n=1)). Nine of the128 adverse events that did not require treatment were classified as possibly related to the intervention, all described as fatigue or tiredness, with six occurrences reported at least one day after participation in an exercise session (details in Supplemental file 2). The highest number

of reported adverse events for one resident was 21, whereas one participant had no reported adverse events.

Table 3: Frequency of adverse events of a 10-week exercise program for nursing home residents with dementia, categorized according to severity and with possible relation with the intervention

	Not related to the intervention	Possibly related to the intervention	Likely related to the intervention
CAT 1 Minor and temporary, not requiring treatment by a physician or specialist	119	9	0
CAT 2 Minor and temporary, requiring treatment by a physician or specialist	9	-	-
CAT 3 Serious injury or illness, potentially life-threatening	-	-	-
CAT 4 Death	-	-	-

Participants' appraisal of the intervention

The appraisal instrument was administered after 361 of the planned 408 sessions (88%) and was completed on 361 occasions (100%). On 359 occasions the 5-point Likert scale was used, whereas the simplified 3-point Likert scale was used twice, due to incomprehension of the participant of the 5-point Likert scale. The median scores of the group and individual exercise sessions were 4.4 (range 1-5) and 4.3 (range 1-5), respectively, with 321 of the 359 scores (90%) being 4 or 5 (pleasant or very pleasant) and 8 scores (2%) being 1 or 2 (very unpleasant or unpleasant).

Supervisor experiences

All eight supervisors participated in the focus group discussion, resulting in four major themes (details in Supplemental File 3):

1. Motivation of residents:

According to the supervisors, participants were primarily motivated by the perceived health benefits of the intervention and the enjoyment of engaging in structured activities. Their own encouragement was found to play an important role in shaping participants' positive appraisals of the sessions, as well as adherence to the protocol and the intended intensity levels. Communication techniques were considered particularly important when inviting participants to the sessions. Supervisors reported that most residents required repeated explanations about the purpose of the exercise sessions each

time they were approached. A calm and reassuring manner was found to be effective in encouraging participation.

- Supervisor 1: *"Their motivation seems to come from the general idea that being active is good for their health."*

2. Social interaction during group exercises:
Social interaction was found to have both positive and negative effects on participation. On the one hand, seeing others exercise and receiving personal attention were perceived as motivating factors. On the other hand, excessive conversation occasionally distracted participants and disrupted exercise routines. According to the supervisors, this did not hinder adherence to the sessions or the appraisal of the participant, but distractions did cause exercises to be performed at a lower intensity level.

- Supervisor 1: *"But sometimes it's so distracting that they just stare at each other. They laugh, and then nothing happens for like 30 seconds."*

3. Physical Environment and Setup:
Environmental factors such as the availability and design of equipment, the spatial layout, and sensory stimuli (e.g., lighting, noise) were considered to influence participation. The exergaming equipment was perceived as a facilitator of engagement, whereas environmental factors such as under-stimulation (e.g., dimly lit rooms or hallways) and over-stimulation (e.g., excessive ambient noise) were identified as barriers to participation. Additional factors included encouragement from relatives or caregivers and convenient scheduling. Conflicting activities scheduled at the same time were noted to reduce participation.

- Supervisor 2: *"If a different activity was happening at the same time, the participants sometimes found it hard to choose between the other activity and the exercise session."*

4. Supervisory knowledge and experience:
According to the supervisors, their general knowledge of dementia care but also the ability to adapt communication and interaction styles to the individual needs of each resident positively influenced the motivation of the participants. A person-centered approach was seen as essential for fostering engagement and success during sessions.

- Supervisor 3: *"To one participant we'll say 'we're coming for you.' And then you can see her smile she'll say, 'oh yeah.' And right at that moment, she's on board and comes along."*

Discussion

This study evaluated the feasibility of a 10-week, physical therapist-supervised exercise intervention in 11 nursing home residents with dementia. Participants constituted one-quarter of screened residents. Over 80% of the planned clinical assessments and exercise sessions were completed, and few adverse events were possibly related to the intervention, all of which were mild and transient. The intervention received a positive average rating from participants. Supervisors identified scheduling conflicts as barriers.

The clinical assessment instruments were largely feasible, consistent with prior validation in this population.[51] Some participants required multiple attempts for the SPPB balance test [42], fastest 4-m walk, and TUG, [43] due to apraxia, fear of falling, or cognitive limitations. While the 4-m walk test in the SPPB is usually administered at a comfortable walking speed, the fastest-speed version is considered a more sensitive indicator of physical performance.[44] Taking preventive measures, such as walking alongside the participant without influencing their pace, may improve the feasibility of the fastest 4-m walk test. Positioning the physiotherapist at the turning point and providing an additional instruction to pivot, walk back to the chair, and sit down helped participants complete the TUG with fewer difficulties.

Intervention adherence exceeded that of prior meta-analyses (62.3%) [22] and therapist-led programs (73–75%). [23,24] Although the study was not designed to compare adherence or enjoyment between exergaming and standard group exercise, supervisors suggested that participants were interested in the exergaming component. The adherence rates were not higher during exergaming than during the conventional exercise sessions, but nevertheless suggest that exergaming is acceptable to participants. While preliminary evidence suggests that exergaming may have beneficial effects on physical, cognitive, and emotional outcomes,[25] whether exergaming enhances adherence or outcomes warrants further study. No serious adverse events occurred. Of all reported mild adverse events, fewer than 10% were deemed possibly related to the intervention, mainly fatigue reported by one participant. Whether fatigue qualifies as an adverse event is debatable, as it is a common and expected response to moderate-intensity exercise.[45]

The recruitment rate in this study was comparable to that reported by Toots et al.,[23] who targeted a similar population using the same selection criteria. Main barriers were logistical: insufficient residents at one site and the requirement to walk 50 m, which prevented attainment of the planned 24 participants. For a future study, expanding the screening pool (e.g., by involving additional nursing homes) would help achieve the desired sample size. Furthermore, because most intervention components can be performed with limited mobility, modifying the inclusion criteria to require only the ability to transfer from

sit to stand without assistance may improve accessibility and recruitment feasibility. Most sessions were rated pleasant or very pleasant, consistent with earlier findings that residents with dementia enjoy moderate-intensity exercise.[46] The use of brief feedback tools, tailored to the cognitive abilities of this group, may warrant further development and validation.

The experiences of the intervention supervisors underscored several facilitators and barriers influencing participant acceptance of the intervention. Positive encouragement from supervisors and family members was perceived as a key facilitator, consistent with existing literature on motivation and adherence among individuals with dementia.[47,48] Additionally, supervisors reported logistical challenges in scheduling exercise sessions without conflicting with other planned resident activities. This finding appears to contrast with previous studies, which more commonly cite a lack of available activities or infrequent family visits as limiting factors.[49,50] The reported scheduling difficulties may be specific to the Dutch long-term care context, where recent policy changes have introduced dedicated funding to expand meaningful daily activities for nursing home residents.[51]

A strength of the study design was that feasibility was systematically assessed across multiple domains, including recruitment, adherence, safety, acceptability, and implementation, allowing for well-founded recommendations for the design of a future larger-scale trial. A limitation of the study was that it involved a relatively small sample size. Therefore, the results must be interpreted with caution. Moreover, no assessments were conducted at the end of the intervention. Thereby, the ability of the assessment instruments to determine changes over time or could not be ascertained and no estimations of effect sizes to be used in power calculations could be made for those instruments that could possibly be used as outcome measures in a future clinical trial.

Although the intervention required considerable time investment and effort from both the residents and nursing home staff, the associated burden was limited and considered proportionate to the knowledge gained. The absence of serious adverse events, combined with the majority of sessions being appraised as pleasant or very pleasant by the participants, suggests that the intervention was experienced more as an enjoyable activity than as a burden. In addition, the supervisors were trained in dementia care in accordance with the study protocol, which not only benefited the intervention itself, but was also beneficial for the supervisors in their broader clinical practice. To the best of our knowledge, this is also the first study to meet the recommendations from international guidelines on exercise and physical activity for nursing home residents[18] and older adults. [19,20] Together, these findings support the rationale for the conduct of a pilot study including pre- and post-intervention outcome assessments, to allow estimation of

change and variability to calculated the sample size and further justifying the required investment of time and effort from staff.

Conclusion

This study showed that recruitment for a 10-week physical therapist-led exercise program for nursing home residents with dementia was challenging, but the intervention proved to be feasible with respect to execution, adherence, safety and satisfaction. Supervisors suggested various factors affecting adherence and exercise intensity. All of these insights are valuable to improve recruitment, supervision, and personalization in future research evaluating the cost-effectiveness and long-term benefits of the intervention.

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