



## Review Article

# Adherence support strategies for exercise interventions in people with mild cognitive impairment and dementia: A systematic review

Veronika van der Wardt <sup>a,\*</sup>, Jennie Hancox <sup>a</sup>, Dawid Gondek <sup>a</sup>, Pip Logan <sup>a</sup>, Roshan das Nair <sup>b</sup>, Kristian Pollock <sup>a</sup>, Rowan Harwood <sup>c</sup>

<sup>a</sup> Division of Rehabilitation and Ageing, School of Medicine, University of Nottingham, Nottingham NG7 2UH, United Kingdom

<sup>b</sup> Division of Psychiatry & Applied Psychology, School of Medicine, University of Nottingham, Nottingham NG7 2UH, United Kingdom

<sup>c</sup> Nottingham University Hospital NHS Trust, Nottingham NG7 2UH, United Kingdom

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## ABSTRACT

Exercise-based therapy may improve health status for people with Mild Cognitive Impairment (MCI) or dementia but cannot work without adherence, which has proven difficult. This review aimed to evaluate strategies to support adherence among people with MCI or Dementia and was completed in Nottingham/UK in 2017. A narrative synthesis was used to investigate the effectiveness or usefulness of adherence support strategies. Fifteen adherence support strategies were used including theoretical underpinning (programmes based on behavior change theories), individual tailoring, worksheets and exercise booklets, goal setting, phone calls or reminders, newsletters, support to overcome exercise barriers, information, adaptation periods, individual supervision, support for clinicians, group setting, music, accelerometers/pedometers and emphasis on enjoyable activities. Music was the only strategy that was investigated in a comparative design but was found to be effective only for those who were generally interested in participating in activities. A wide range of adherence support strategies are being included in exercise interventions for people with MCI or dementia, but the evidence regarding their effectiveness is limited.

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\* Corresponding author.

E-mail address: [v.vanderwardt@nottingham.ac.uk](mailto:v.vanderwardt@nottingham.ac.uk) (V. van der Wardt).

## 1. Introduction

Dementia is a syndrome caused by a variety of brain diseases leading to progressive impairments in memory, communication, planning and other cognitive functions. Mild Cognitive Impairment (MCI) is defined by measurable problems in cognition without significant impact on daily activities, and which may or may not progress to diagnosable dementia. Maintaining health and wellbeing among people living with dementia is an increasing priority, especially in the earlier stages when many are active and key abilities are still retained. Physical exercise interventions have been shown to be beneficial in improving function, mobility, cognition and mood (Hernandez et al., 2015; Rao et al., 2014; Forbes et al., 2015; Brett et al., 2016; Bossers et al., 2014; Barreto Pde et al., 2015). For people with MCI, a recent review (Rodakowski et al., 2015) reported beneficial effects of exercise on cognition but the benefits for functional abilities were unclear.

Adherence to the intervention is essential for a meaningful outcome (Rao et al., 2014). Adherence in this context refers to the degree to which behavior responds to the agreed recommendation according to the therapy protocol (Bollen et al., 2014). Adherence to exercise and physical activity interventions can be affected by fixed factors such as exercise history, ill health, education or environment and modifiable factors such as prompts, which can be supported through strategies included in the design of an intervention (Rhodes et al., 1999; Schutzer and Graves, 2004). For the purpose of this review, these adherence support strategies can encompass delivery modes, involvement of others, practical support, theoretical foundations or any other design features, which the study used to support adherence. We define adherence support strategies as plans included in the design of a study to achieve a high degree of behavior corresponding to the agreed study protocol. Therefore adherence support strategies need to be planned carefully to maximize the adherence with the intervention protocol.

Adherence to exercise and physical activity interventions in people with MCI and dementia varies widely between studies. For example, in a randomized controlled trial (RCT) including people with mild to moderate dementia adherence was 91% for a resistance and functional training programme twice a week for three months in a rehabilitation setting (Schwenk et al., 2014). In a three month home-based exercise programme, adherence was 72% to 79% (Steinberg et al., 2009), but only 33% in a 12 month exercise programme for nursing home residents (Rolland et al., 2007).

Several effective strategies to support adherence have been identified in the general older population including peer, family and physician support, interventions based on behavior change theories, prompts and music (Rhodes et al., 1999; Schutzer and Graves, 2004; French et al., 2014). However, for people with dementia, it is unclear which, if any, adherence support strategies are effective.

The aim of this review is to evaluate strategies implemented in the intervention design of exercise studies to support adherence.

## 2. Method

### 2.1. Protocol

The systematic review was based on a pre-defined protocol (PROSPERO registration no. CRD42015016507) to search and identify relevant research articles.

### 2.2. Eligibility

#### 2.2.1. Inclusion

Articles reporting original research regarding adherence strategies for exercise studies for people with MCI or dementia; no specific criteria for MCI or dementia diagnosis were required. We included studies with people with dementia and MCI as more than 40% of people diagnosed with this condition go on to develop dementia within

5 years (Roberts et al., 2014). Studies that assessed the effectiveness of adherence support strategies explicitly, as well as studies that included interviews or surveys asking participants to judge the usefulness of the adherence support were eligible. Both quantitative and qualitative studies were considered for inclusion.

#### 2.2.2. Exclusion

Studies reporting research regarding adherence in people with Parkinson's or Huntington's disease, musculoskeletal diseases, other neurodegenerative diseases (including Multiple Sclerosis), stroke, diabetes, obesity and learning disabilities were excluded even if these studies included some participants with MCI and dementia. Any studies including children and adolescents (under 18 years of age) or using pharmacological or neurological (e.g. using neuro-imaging) interventions were excluded. Literature reviews, editorials, discussion papers, comments and study protocols were also ineligible.

### 2.3. Information sources

The search was completed in CINAHL, EMBASE, MEDLINE, PsycINFO, and Web of Science.

### 2.4. Search

The search took place in May 2014 and was updated in August 2016. The search was limited to publications in the English language and to human subjects. No date limits were set. The search terms included older adults OR ageing OR elderly AND dementia OR cogn\* AND exercise AND adherence OR motivators OR compliance OR support OR self-efficacy. The search term 'exercise' has been chosen as it is a Medical Subject Heading (MeSH) term including the entry terms for a wide range of exercises (acute exercise, aerobic exercise, exercise training, isometric exercise, physical exercise and physical activity). The truncation cogn\* has been used to include the terms cognition, cognitive and cognitively. The search terms were entered as keywords or as multi-purpose (.mp) terms when selections were required for the OVID database platform.

### 2.5. Selection

Duplicates were removed. Once the electronic searches were completed by the first author, all abstracts and titles were screened in Endnote according to inclusion and exclusion criteria. Full texts for all potentially eligible articles were obtained, and assessed on the basis of the inclusion/exclusion criteria by independent reviewers (research assistants and research fellow). When there was uncertainty or no consensus after a discussion between reviewers, or from contacting the original author for clarification, a third reviewer assessed the publication in question and made the final decision (Fig. Fig. 1).

### 2.6. Data collection

As most studies included the evaluation of the adherence support strategy as a sub-study, main study design, sample characteristics (size, setting, mean age, sex and cognitive impairment), intervention, main outcome for the intervention were extracted and tabulated to present the context for the use of the adherence support evaluation. Adherence, method of evaluation to determine the effectiveness or usefulness of the adherence support strategy and the results of the evaluation were extracted and tabulated to enable an analysis of the strategies (see Table 1).

### 2.7. Analysis

Methods sections of papers were examined to identify the adherence support strategies. All features that were explicitly mentioned in

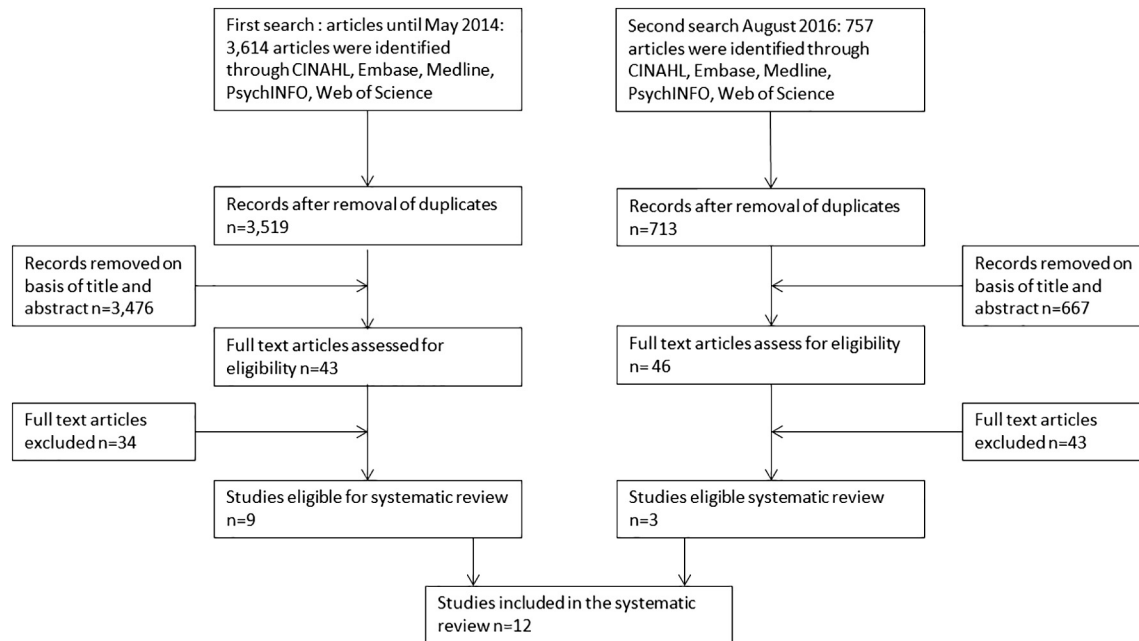


Fig. 1. Flow diagram of article selection process.

the context of supporting adherence were extracted. Results and discussion sections were screened for evidence of the effect of the adherence support strategies. A narrative synthesis was completed (Popay et al., 2006) that analyzed the strategies. A formal risk of bias analysis using risk of bias tools would have been appropriate for only two studies (Mathews et al., 2001; Phillips and Flesner, 2013), which included the adherence support strategy as main outcome. Therefore, the use of risk of bias tools was not deemed appropriate but the quality of the included studies was discussed in the results and limitations section.

### 3. Results

Initially, 4232 articles were screened, 4143 studies were excluded based on the abstract or title of the article. Eighty-nine full text articles were examined using the eligibility criteria, which led to the exclusion of a further 77 studies. Reasons for exclusion were not recorded. These reasons were often multiple or based on a lack of evaluation of the adherence support strategy.

In total, the review included 12 studies (see Table 1). The strategies included the use of behavior change theories to underpin exercise programmes (Cox et al., 2013; Resnick et al., 2009; Rosenberg et al., 2012; Wu et al., 2015), individual tailoring (Phillips and Flesner, 2013; Cox et al., 2013; Rosenberg et al., 2012; Frederiksen et al., 2014; Olsen et al., 2015), worksheets or exercise booklets (Cox et al., 2013; Vidoni et al., 2016), goal setting (Resnick et al., 2009; Rosenberg et al., 2012; Fairhall et al., 2012; Kerse et al., 2008), phone calls and reminders (Phillips and Flesner, 2013; Cox et al., 2013; Rosenberg et al., 2012; Frederiksen et al., 2014), newsletter (Cox et al., 2013), support to overcome exercise barriers (Rosenberg et al., 2012; Fairhall et al., 2012), information (Rosenberg et al., 2012; Frederiksen et al., 2014; Kerse et al., 2008), adaptation period (Frederiksen et al., 2014), individual supervision (Olsen et al., 2015; Lindelof et al., 2012), support for clinicians (Resnick et al., 2009), group setting (Phillips and Flesner, 2013; Rosenberg et al., 2012; Wu et al., 2015; Olsen et al., 2015; Lindelof et al., 2012), music (Mathews et al., 2001; Wu et al., 2015), accelerometer/pedometer (Rosenberg et al., 2012; Vidoni et al., 2016) and emphasis on enjoyable activities (Wu et al., 2015).

Adherence rates ranged from 25% (lower estimate of adherence by physiotherapist) (Fairhall et al., 2012) to 90% (mean attendance rate across exercise sessions) (Frederiksen et al., 2014). The two studies

with high mean adherence rates (77% (21) and 90% (Frederiksen et al., 2014)), used multiple adherence support strategies, both included a tailored approach to the intervention, information for the participants and telephone support.

None of the studies evaluated the effectiveness of adherence support strategies using an RCT design and only one study (Mathews et al., 2001) used a single group, repeated measures design with a small sample size ( $n = 18$ ) to compare exercise phases with music to phases without music. The results of this study demonstrated that music had a significant positive effect on adherence for those who were interested in participating in activities but not in those who were less or not interested in activities.

Most of the studies used ratings of the experience of the strategies by the participants, focus groups or interviews to evaluate the perceived usefulness or acceptability of the adherence support strategies. Only phone calls, information regarding the study and group setting were assessed in more than one study. Details on the adherence support strategies used in the study were often limited as the strategies were not the main study intervention but an add-on to an exercise intervention.

Phone calls to support adherence were examined in two studies (Cox et al., 2013; Rosenberg et al., 2012) both demonstrated that most (80–93%) of participants rated phone calls as helpful or useful. Supporting information and step maps to increase daily activity levels was rated as useful by most participants (>80%) in one exercise study (Rosenberg et al., 2012), but additional information regarding the background and content of the study was identified as 'being insufficient' in a focus group discussing facilitators of another exercise intervention (Frederiksen et al., 2014).

The group format was identified as supporting adherence in five exercise studies by most of their participants (Phillips and Flesner, 2013; Rosenberg et al., 2012; Wu et al., 2015; Olsen et al., 2015; Lindelof et al., 2012). Goal setting achievements were not related to improvements in function (Kerse et al., 2008). Newsletters (Cox et al., 2013), handouts, pedometers and exercise logs were all rated as useful by over 80% of the participants, and progress charts by 72% or more depending on intervention group (Rosenberg et al., 2012). However, not everyone was comfortable using an accelerometer (Vidoni et al., 2016). Additionally, some focus groups and interviews revealed that planning and reminders (Phillips and Flesner, 2013) as well

**Table 1**  
Identified studies.

Author; year of publication; country	Study design	Sample Characteristics at baseline (setting, sample size, mean age, sex, cognitive impairment)	Intervention	Main outcomes for intervention	Adherence support strategies provided	Adherence rates, method of evaluation to determine usefulness or effectiveness of the adherence support strategy and results of evaluation
Vidoni et al. (2016); USA	Feasibility study using a cross-over design	Community setting; total $n = 30$ ; $n = 21$ with cognitive impairment; mean age 72.3 (SD = 5.2); 9 women; and $n = 9$ without cognitive impairment; mean age 69.6 (SD = 5.8); 8 women;	8 weeks of exercise intervention to progressively increase weekly step count; intervention included exercise prescription booklet with daily goals	Feasibility and safety; wkly steps taken, self-efficacy, walking speed, QoL;	Exercise booklet with daily goals increasing goal step count by 20% each week; accelerometer (internet-connected) to determine daily step-count with a manual developed for older people;	Adherence: n/a; Evaluation: number people completing accelerometer study: 2 out of 21 participants withdrew from the study because they were not comfortable with accelerometers and had problems with the set-up of them.
Olsen et al. (2015); Norway	Interview study following a pilot RCT	Nursing home setting; $n = 8$ ; age range 69–92 years; 7 women; mild to moderate dementia	10 wks of 3 times per wk. exercise programme of the related RCT was conducted in small groups, individually adapted and supervised by a PT; the exercises were designed to be challenging	Muscle strength, balance	Individually tailored, small group sessions, PT supervision	Adherence: n/a; Evaluation: interviews: exercises were not perceived as intense (although designed to be challenging); voluntary nature of participation was important; feeling of being useful and invested in is important; relationships with other residents and with PT facilitated exercise participation; PT's knowledge about older people was considered important; the possibilities the study for exercise were appreciated by the participants;
Wu et al. (2015), USA	Qualitative analysis of field notes and phone calls and video-recordings of a linked cross-over study	Day care setting; Total $n = 11$ ; mean age = 84 (range 78–96); 9 women; mild to moderate dementia (ADAS-Cog score mean 22.9 (range 13.3–34.6)	18 weeks of a 3 times per week 40 min exercise programme in groups. Participants also received four home visits to provide targeted exercise and determine goals	Field notes, narrative reports prepared by instructors after every class and home visit, notes from weekly phone calls with carers, video-recordings of three groups sessions, written observations of participants' behavior during assessments at week 0, 18 and 36	Inclusion of several teaching principles (repetition with variation, progressive, functional movements, slow pace and responsive, step-by-step movements, goal setting/orientation, body awareness (instructors guided participants to attend to their bodily sensations), social interaction, positive emotions), music, playful activities	Adherence: n/a; Evaluation: qualitative analysis of field notes, phone calls and video-recordings; increased body awareness led to increase in awareness of physiological improvements; development of motor memory observed by instructors; positive behavior changes (more relaxed, socially engaged); development of positive attitudes towards exercise class;
Frederiksen et al. (2014), Denmark	Single-group repeated measures study	Community setting; total $n = 8$ ; mean age = 71.9 (SD = 5.4); 75% women; mean MMSE = 24.3 (SD = 4.4)	14 wks of 1 h group based exercise 3 × wk. led by an experienced physiotherapist	Feasibility outcomes; cognition; depression; physical performance; functional performance	Information regarding background and content of study; 2 wks adaptation period (included in the 14 wks); exercise tailored to individual heart rate and exercise preferences; participants were encouraged to use a range of exercise machines; phone calls to remind participants if needed; support (instructions and supervision) tailored to needs	Adherence: mean attendance rate of exercise groups was 90% (75% - 100%); Evaluation: focus groups to discuss adherence facilitators and barriers: participants indicated that they would have liked more information regarding study, risk of injuries and exercise program as well as a longer adaptation period; possible barrier might be intensity of intervention in terms of time and that participants had to reduce other activities; authors reported that high attendance rate was likely

(continued on next page)

Table 1 (continued)

Author; year of publication; country	Study design	Sample Characteristics at baseline (setting, sample size, mean age, sex, cognitive impairment)	Intervention	Main outcomes for intervention	Adherence support strategies provided	Adherence rates, method of evaluation to determine usefulness or effectiveness of the adherence support strategy and results of evaluation
Cox et al. (2013), Australia	RCT	Community setting; control group: $n = 85$ ; mean age 68.7 (SD = 8.5); 52% women; mean MMSE = 27.5; physical activity group: $n = 85$ ; mean age 66.5 (SD = 8.7); 51% women; mean MMSE = 28.2	6 months home based telephone monitored exercise programme with a target of at least 150 min/week moderately intense physical activity	Adherence; physical activity; self-efficacy; injury; illness; body mass index; cognition	Individual counselling sessions based on social cognitive theory; individually tailored; a manual including worksheets; 4 newsletters; 6 scheduled phone calls to encourage participants to continue (in wk. 2, then 4-wkly); simple wording and pictures were used to illustrate ideas;	due to caregivers' support (transport, reminders) Adherence: mean adherence in intervention group was 41.4% with highest completion within first 6 weeks All participants received the counselling sessions; Evaluation: rating of strategies: 93% rated phone calls as helpful; 95% rated newsletter as helpful
Phillips and Flesner (2013), USA	Focus group study	Residential care and assisted living community setting; total $n = 47$ ; mean age = 85.4 (SD 7.2); 89% women; no or minimal cognitive impairments	Continuous; all communities offered chair based exercises in a frequency between twice a day to twice a wk.; 2 of the 6 communities also offered a structured walking programme 2–3 times a wk	Individual and situational factors influencing physical activity	Group setting, reminders from staff and through centrally located bulletin board, planning of exercise to fit into daily routine, tailoring and supervision discussed	Adherence: n/a Evaluation: focus groups: group setting desirable as it also provided the opportunity to socialize; planning exercise and using reminders seen as important; individualized home exercise and supervision with a motivational leader desirable; most preferred type of exercise was walking
Fairhall et al. (2012), Australia	RCT	Community setting; intervention group: $n = 120$ ; mean age = 83.4 (SD = 5.8); 67% women; mean MMSE = 26.6 (SD = 2.6)	12 months multifactorial interdisciplinary and individually tailored intervention targeting frailty. This included 10 home based 45–60 min physiotherapy sessions	Mobility related disability in terms of satisfaction and performance	Goal setting and ongoing review of goals by PT for mobility goals; assessment of barriers to goal attainment; PT identified barriers and organized additional services to help overcome barriers; components to achieve goals were practiced at home, then in target environment with decreasing degree of assistance	Adherence: median global level of adherence as estimated by the physiotherapists: 25%–50% of intervention program; Evaluation: percentage of participants completing goal focused aspect of intervention: 50%; physiotherapist organized additional services depending on barriers such as provision, modification or advice about equipment (for 40% of participants), referral to services for care of older people (for 41% of participants) or to medical care (for 30% of participants)
Lindelof et al. (2012), Sweden	Qualitative, Interviews	Residential care setting; total $n = 9$ ; mean age = 89 (73–91); 66% women; MMSE 23 (Phillips and Flesner, 2013; Cox et al., 2013; Resnick et al., 2009; Rosenberg et al., 2012; Wu et al., 2015; Frederiksen et al., 2014; Olsen et al., 2015; Vidoni et al., 2016; Fairhall et al., 2012; Kerse et al., 2008; Lindelof et al., 2012; Smith et al., 2017); 3 diagnosed with dementia	3 months of high intensity group based exercise intervention with 5 sessions lasting 45 min each held in every 2 week period prior to the interviews	Views on participating in the exercise, motivation; experience of positive and negative effects of the exercise	Support from exercise supervisor (close supervision for exercises by 2 PTs); group setting;	Adherence: n/a Evaluation: interviews: supervisors were perceived as confidence inspiring and encouraging and therefore seen as exercise facilitators; group exercise provided opportunity to socialize, which subsequently increased self-confidence – created a “sense of togetherness”
Rosenberg et al. (2012), USA	Feasibility study using a single cohort design	Retirement facility setting, total $n = 87$ ; mean age = 84.1 (range 69–98); 76% women; included people with dementia	3 months of biweekly standard (SI) or enhanced (EI) walking intervention; EI included psychological and built-environment	Step count; ADL; environment related variables; physical function; depression; cognition; satisfaction;	Printed materials including a map with 3 walking routes and handouts with step counts to local destinations;	Adherence: 77% overall; 57% attended 5 or more sessions (out of 8); Evaluation: rating of support strategies: in EI

Table 1 (continued)

Author; year of publication; country	Study design	Sample Characteristics at baseline (setting, sample size, mean age, sex, cognitive impairment)	Intervention	Main outcomes for intervention	Adherence support strategies provided	Adherence rates, method of evaluation to determine usefulness or effectiveness of the adherence support strategy and results of evaluation
			elements to increase wkly step count	adherence	pedometer; biweekly group sessions with discussions about how to increase step count; intervention based on social cognitive theory and ecological models; individual tailoring; goal setting; problem solving through phone based counselling	and SI group, more than 80% of participants rated handouts, step log and pedometers as useful or helpful. In EI group, progress charts, group setting, step count information sheets and phone calls were rated as useful/helpful by over 80% of participants.
Resnick et al. (2009), USA	RCT	Residential setting; intervention group: $n = 255$ ; mean age = 83.7 (SD = 8.1); 77% women; mean MMSE = 20.8 (SD = 5.4)	6 week training of nursing assistants (NA) in restorative care incl. Encouraging physical activity and improving self-efficacy. This was then applied to intervention group with follow-up assessments at 4 and 12 months	ADL4; QoL; self-efficacy for functional ability outcome expectations; strength; mobility	Intervention based on self-efficacy theory, short- and long term goal setting facilitated by restorative care nurse; provision of ongoing encouragement and support for NAs to apply restorative case	Adherence: n/a Evidence: Self-efficacy for functional Ability scale: no sig. Change in self-efficacy; authors suggested that combination of changing how NAs approach residents and use of self-efficacy strengthening techniques might motivate residents to engage in functional and physical activities
Kerse et al., 2008, New Zealand	RCT	Low dependency residential setting; intervention group: $n = 330$ ; mean age 84.4 (SD = 7.2) 73% women; AMTS = 7.4 (SD = 2.3)	6 months of individually tailored 1:1 physical activity intervention with daily exercises delivered by healthcare assistants following a prescriptive plan promoting independence	Global cognitive function; QoL; falls	Goal setting: participant set goal with support of gerontology nurse. Goal had to be meaningful and promote increase in physical activity; prescriptive exercise plan based on goals to promote independence (placed on wall and in resident folder)	Adherence: 44% of participants completed few or no activity sessions (as per report by intervention nurses); Evaluation: percentage of participants who achieved their goal (57%) and comparison of those who achieved goals to those who did not (no significant difference in adherence was found); use of prescriptive plan was not evaluated;
Mathews et al. (2001), USA	Single-group repeated measures study	Residential care facility, total; $n = 18$ included in final analysis; mean age = 85 (range 74–97); 94% women; MMSE score between 0 and 23.	25 wks of wkly exercise sessions conducted in phases with and without music support	Participation as observed using a data collection checklist; attendance; general activity level	Music (instrumental music, digitally recorded, different styles with rhythmic beat); each exercise had its own music to reflect movements;	Adherence: average attendance rate was 67% across sessions; attendance remained constant within sessions independent of music or non-music phases for total group. Evaluation: repeated measures design based on participation: participation in the sessions (adherence): 53% participated in baseline phase without music, 69% participated in the first phase with music, 41% in phase without music, 68% in phase with music; a 2 factor repeated measures ANOVA showed a significant interaction effect between treatment (music) and general activity level ( $F(1,16) = 6.6$ ; $p = 0.02$ )

ADAS-cog: Alzheimer's Disease Assessment Scale–cognitive; ADL: activities of daily living; AMTS: Abbreviated Mental Test Score; ANOVA: analysis of variance; EI: enhanced intervention; MMSE: Mini Mental State Examination; NA: nursing assistant; PT: physiotherapist; QoL: quality of life; RCT: randomized controlled trial; SD: standard deviation; SI: standard intervention; Wk: week; Wkly: weekly.

as tailoring (Phillips and Flesner, 2013) would have been helpful. One study encouraged body awareness, which the authors of this study suggested might have helped participants to identify physiological improvements (Wu et al., 2015).

A two week introductory period for an exercise program was seen as useful but not sufficient in focus groups, as participants and carers expressed the need for a longer adaptation phase (Frederiksen et al., 2014). Interviews also revealed that in nursing homes it was important to participants that taking part was voluntary. The offer of exercise classes made them feel appreciated and invested in (Olsen et al., 2015). The interviews also suggested that supervision by a physiotherapist with knowledge of older people and the tailored approach facilitated participation (Olsen et al., 2015).

In addition to the adherence support strategies, one study reported a possible barrier to adherence: focus groups identified time-intensive interventions as problematic as they might reduce the time participants had for other activities (Frederiksen et al., 2014).

#### 4. Discussion

The review identified a wide range of adherence support strategies used in exercise studies for people with dementia and MCI. Most studies employed multiple strategies to support adherence to the intervention.

The review showed that exercise interventions for people with dementia should be individually tailored, include a learning or adaptation period, provide sufficient information and use phone calls, pedometers, exercise logs and/or reminders as well as supervision and planning to support adherence to the intervention. Group-based interventions were seen as desirable. Music was the only adherence support strategy that was investigated in a comparative study design but was found to be only effective for those who were interested in participating in activities. For nursing home residents, it was important that the exercise group participation was voluntary and that the exercise was supervised by a physiotherapist who had experience with working with older people. The effectiveness of goal setting as an adherence support strategy remained unclear. One study suggested that improving body awareness, which was embedded in the exercise teaching principles, might help participants to be more conscious of physiological improvements (Wu et al., 2015). This in turn might improve their self-efficacy and therefore support exercise adherence (Schutzer and Graves, 2004).

The findings of this review reflect adherence support strategies identified for the general older population. Prompts and music have been shown to work as motivators for exercise for older people (Schutzer and Graves, 2004), and knowledge about exercise has been identified as a factor facilitating exercise in older people (Rhodes et al., 1999). The results of this review indicated that these strategies are equally important in people with dementia. People with mild cognitive impairment and dementia are likely to rely more on adherence support strategies such as prompts and reminders compared to the general population as their deteriorating memory makes regular completion of the exercises or attendance of exercise groups more difficult. The effect of cognitive impairment on adherence has been well established in medication studies (Smith et al., 2017), which confirmed that prompts might support adherence (Arlt et al., 2008). An analysis of behavior change theories for physical activity behavior in older adults (French et al., 2014) showed that while interventions increased self-efficacy scores, goal setting was not effective. In line with the outcome of that review, one study (Kerse et al., 2008) in our review indicated that goal setting might be ineffective in people with dementia, but contrary to French et al.'s findings (French et al., 2014), self-efficacy did not change in people with dementia (Resnick et al., 2009).

No modern technologies had been used to support adherence in the reviewed studies. A wide range of assistive technologies for people with dementia has emerged over the last decade, and other

modern technologies such as smartphones, wearable fitness trackers or game consoles could be investigated to support exercise and physical activity interventions in people with dementia. With appropriate support, learning to use new technologies is achievable in people with dementia (Rosenberg and Nygard, 2014) and very soon the use of smartphones, apps and similar technologies may become the norm as they are likely to be used by most people on a regular basis. Consequently, older people with dementia may then be familiar with such devices.

##### 4.1. Strengths and limitations

This review provides a comprehensive overview of adherence support strategies used to date in empirical studies to support exercise interventions, and analyzed their perceived usefulness and/or effectiveness for people with MCI or dementia. It also identified the lack of research comparing different strategies to find those that are effective in this population. None of the studies used an RCT design and only one study had a comparative design. Therefore, no firm conclusions regarding the effectiveness of the adherence support strategies can be drawn and the evidence is weak. The relationship between use of strategy and adherence rates could not be analyzed.

The search terms limited the studies to those that could be found with the keywords 'adherence', 'motivators', 'compliance', 'support' or 'self-efficacy' and 'exercise'. The description of some strategies such as providing additional information about the background and the content of the study (Frederiksen et al., 2014), contained limited detail. It was unclear how much information was given and if this exceeded the regular patient information letters that are part of informed consent. Other exercise studies including people with MCI or dementia might have included adherence support strategies but not have incorporated these keywords and therefore been missed. This might particularly be the case if an adherence support strategy was implicitly included as part of the study design but did not explicitly address adherence. However, a wide range of strategies was identified and it seems unlikely that studies that evaluated the use of their adherence support strategy would have been missed. Due to the varying range of degree of cognitive impairment included in the studies, a separate analysis for people with MCI and people with dementia was not possible but should be considered in future studies.

It is likely that the effectiveness of adherence support strategies varies between people. More evidence is needed to evaluate what works for whom under what circumstances and why. Traditional systematic reviews are unlikely to answer the question, the adoption of a realist epistemology would be recommended.

##### 4.2. Clinical/research context

The results of this review will support exercise and physical activity researchers to choose adherence support strategies that have been shown to be preferred, acceptable and/or effective for people with MCI and dementia. Furthermore, some of these strategies can be employed in public health programmes to facilitate engagement in exercise classes or physical activity programmes for this population group. For example, pedometers, appropriate information material (large print, simple descriptions) and exercise logs can be made available at low cost with potentially high impact to support physical engagement in this group. However, considering the weak evidence base, this should remain an area of active research, adherence support strategies should be investigated systematically, and trials of different strategies should be considered in this population to clarify the effectiveness. Furthermore, the development of new strategies should be explored in collaboration with people with MCI and dementia as well as their carers.

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## Conflict of interests

None of the authors have any conflicts of interest that might bias this work.

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