

# Maintaining independence in the cognitively intact elderly care home population: a systematic review of intervention trials

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## Background

Over the last two decades, the care home sector has been a significant provider of long-term care for older people, with 11 500 homes providing care for 236 700 people across England and Wales. New admissions to residential care homes are increasingly older, aged 80 and over and have high levels of physical dependency, cognitive impairment and behavioural problems.<sup>2,3</sup>

With increases in life expectancy, care of the older person has become a prominent issue for public health policy. A major goal of UK health and social policy in old age is the maintenance of independence.<sup>4,5</sup> Although there is a body of literature that documents the health needs of older people in care homes and the effectiveness of public health nursing for community-dwelling elderly people,<sup>6</sup> no work has considered how existing primary health care services can work to improve older residents' health status. This mini-review aims to contribute to this limited research area by answering the question: What interventions by nurses are effective in maintaining independence in the cognitively intact elderly care home population?

## Method

The review is underpinned by the principles of the 'mini-review'.<sup>7</sup> This follows a similar format of a full systematic review.<sup>8</sup> Unlike a full review however, a mini-review tends to address a single focussed question and typically a single, as opposed to multiple, outcomes. Maintaining independence is the outcome measure of interest here. The review aimed to produce a systematic and

unbiased search of the literature that was explicit and replicable, and critically appraised those studies that met the search inclusion criteria.

## Search strategy

A facet analysis was conducted on the main search question, breaking it down into three components: population (two facets, (1) elderly and (2) care home); intervention (intention to maintain independence); and outcome (maintenance of independence). Each facet was analyzed to identify the keywords and index terms (Table 1) to be used in the database searches. Database searches were conducted on the Cochrane Library to ascertain if a review had already been completed on the area of interest, Medline (1966–2003), CINAHL (1982–2003) and Embase (1980–2003).

The keyword searching included only words or phrases identified in the facet analysis as describing the components of the question. The use of synonyms is considered as enhancing the sensitivity of the search.<sup>9</sup> For the population component, two facets were needed, one describing people aged over 65 years and the other the care home setting. Table 1 details their respective keywords. The population was also described as being cognitively intact. This was defined as people either with no history of cognitive impairment, or at the mild end of the dementia sequelae. At this early stage, it was considered that the search strategy needed to be sensitive to all elderly care home residents, rather than specific to the cognitively intact.

The intervention was not known. A broad statement of its intention to maintain independence was stated in the question analysis, but no keywords were used. This broad statement as to the intention of the intervention, combined with a stated outcome of independence, was considered sufficiently explicit to generate a sensitive search

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Table 1: Question component facet analysis and search terms

Population		Intervention	Outcome
Elderly	Care home	Intervention	Independence
Independence Elderly Old Frail elderly	Nursing home Residential facility Intermediate care Skilled care facility	Interventions by nurses that intend to maintain independence	Independence Activities of daily living Barthel Index Functional Independence Measure (FIM) Katz
Search terms (keyword and index terms)			
Elder\$*	A Care home\$	A	Independence\$
Or	N Or	N	Or
Aged	D Residential	D	Activities of Daily Living
Or	facilities/ or Nursing		Or
Old	homes/ Long-term		Barthel Index
Or	care		Or
'Aged, 80 and over'	Or		Functional Independence
or	Intermediate care		Instrument
Frail elder\$	facilities		Or
Or	Or		Katz
Frail Elderly	Intermediate care		
	facilities		
	Or		
	Nursing home\$		
	Or		
	Residential		
	facilities		
	Or		
	Skilled nursing care		
	facility\$		
	Or		
	Skilled nursing		
	facility/ A		

\$ Sign used as a truncation for free text keywords when more than one ending was possible.

strategy. Independence was described by using the term itself and three measures of function. Criteria for the inclusion of a function measurement scale were that it be widely used in either or both the UK and US and had been validated as a measure of disability or function with older people. The Barthel Index,<sup>10</sup> the Katz Index of Independence<sup>11</sup> and the Functional Independence Measure<sup>12</sup> met these criteria and were included in the search strategy.

In the database searches, the keywords were entered as free text and with a truncation (e.g. elders, where more than one ending was possible). For each keyword, their index term (or medical subject heading (MeSH)) was searched for. Those that were synonymous with the keyword were

selected and exploded under all subject headings. For example, the population keyword 'care home' corresponded to the MeSH index headings 'residential facilities', 'nursing homes' and 'long-term care'. These were included within the search strategy. Results within each question component were combined using the Boolean operator 'or' to give a set of references that contained any or all of the terms. The Boolean operator 'and' was then used to combine each of the three components of the question to give references specific to the question. A RCT methodological filter was then applied to the saved subject search and combined, using the Boolean operator 'and', to give a specific set of references that reported on the effectiveness of interventions to maintain independence in the

#	Search History	Results	Annotations
1	Elder\$.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	87349	Truncated key terms and mapped index terms to describe the population aged over 65 years.
2	Aged/	1294706	
3	Old\$.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	431516	
4	exp 'Aged 80 and over'	236394	
5	frail elder\$.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	3043	
6	exp frail elderly	2566	
7	1 or 2 or 3 or 4 or 5 or 6	1631172	Boolean term 'or' combines terms
8	Care homes. mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	1654	Truncated key words and mapped index terms describing care homes
9	Exp residential facilities/ or exp nursing homes/ or exp long-term Care/	40439	
10	Intermediate care facilit\$.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	537	
11	exp Intermediate Care Facilities/	448	
12	Nursing home.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	21914	
13	Skilled nursing facility.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	3081	
14	Exp skilled nursing facilities	2730	
15	8 or 9 or 10 or 11 or 12 or 13 or 14	44758	

#	Search History	Results	Annotations
16	Independen\$.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	286827	Truncated key words and mapped index terms describing the independence outcome
17	Exp Activities of Daily Living/	23731	
18	Barthel index.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	920	
19	Functional independence measure\$.mp. [mp=title, abstract, cas registry/ec number word, mesh subject heading]	563	
20	Katz\$.mp. [mp=title, abstract, cas registry/ec number word, mesh Subject heading]	1076	
21	16 or 17 or 18 or 19 or 20	308328	Boolean term 'or' combines terms
22	7 and 15 and 21	2863	Boolean term 'and' combines components Methodological filter (sensitive)
23	Randomized controlled trial.pt.	173860	
24	Dt.fs.	932648	
25	Tu.fs.	1006109	
26	Random.tw.	258877	
27	or/23-26	1456782	
28	22 and 27	329	Boolean term 'and' combines search and filter
29	Limit 50 to (human and English language)	298	Limited to English and human studies

\*\$ sign used as a truncation for free text keywords when more than one ending was possible

Figure 1 Annotated copy of search strategy conducted on MEDLINE (1966 to May Week 2 2003).

elderly care home population. Figure 1 details an annotated example of the Medline search.

The search strategy yielded a reasonable number of references for each of the three electronic databases used (Medline 298, CINHAL 110 and Embase 156). To ensure the validity of the studies included in the review, inclusion criteria were developed stating that:

- The study needed to be a randomized controlled trial or a systematic review of randomized trials.
- The population consisted of people aged over 65 years living in a residential facility who were cognitively intact. Cognitively intact people were defined as those able to follow two simple commands. This meant the inclusion of a population with mild dementia and depression, but the exclusion of those with severe dementia.
- The population resided in an institutional facility that provided either or both residential, nursing or rehabilitative care, but was not an acute hospital unit.
- The intervention described needed to have the intention to maintain independence as one of its main outcome measures and
- The intervention should be within the remit of the role of a nurse.

The data to be extracted from the studies was specific to the outcome of maintaining independence. The extent to which an intervention maintained independence was to be assessed by extracting data from the functional status measures used in the studies. Because the question was concerned about continuing and enhancing independence, data on patient acceptability, the sustainability of the intervention and its continued effect would also be extracted in the form of participation rates and follow-up data.

## Findings of the review

### Study selection

From a review of the titles and abstracts, sixteen studies were initially identified from the electronic databases as meeting the search inclusion criteria. When all the papers in the studies had been reviewed, six were considered to meet the inclusion criteria. Table 2 tabulates their main design features, study populations and findings. Two papers by Mulrow *et al.*,<sup>13,14</sup> however, reported the

same study and were treated as a single study. Exercise programmes were the sole intervention in the five studies reviewed.

Ten papers were excluded (see Table 3), seven<sup>15-21</sup> because the majority of their population was cognitively impaired at the severe end of the dementia sequelae. A further two by Blair<sup>22, 23</sup> used a quasi-experimental design to test two nursing approaches and their effect on residents' ability to self-care. The study groups were formed from two selected units in a nursing home. Non-randomization can result in selection bias because the study population does not have equal opportunity to be in either group.<sup>24</sup> A third paper by O'Hagan *et al.*<sup>25</sup> on exercise classes in rest homes was found from examining the reference lists of the studies reviewed. The maintenance of independence was not one of the main outcome measures in this study and a case-control design was used. The paper was hence rejected.

### Critique of the studies included

The five studies in the review all used an RCT design to test the effectiveness of exercise with elderly care home residents; one of their main outcome measures was independence. Study results on independence will be the focus of the critical appraisal. Requisite components of an RCT are used to structure the critique, namely: randomization; sample size; blinding; and duration and completeness of follow-up.<sup>9</sup> The findings of each study are then presented.

Random allocation of a sample population to the study groups is important to avoid systematic bias.<sup>9</sup> Four of the studies<sup>14, 26-28</sup> randomized the sample population to the study groups at gold standard level, using sealed envelopes and random numbers.<sup>24</sup> A fourth study by McMurdo *et al.*<sup>29</sup> randomly sampled the local care home population ( $n=12$ ), selecting and randomly allocating four homes to the study groups, again at gold standard level. Selective sampling was used by the remaining four studies. This increases the risk of selection bias and needs to be considered when reviewing the studies' conclusions and their application to practice. Once randomized into their study groups, the five studies presented a statistical baseline analysis. This enabled consideration of the validity of each study.<sup>24</sup>

Sample size calculations were detailed in two studies.<sup>26, 28</sup> Sufficient sample size is required in

**Table 2** Description of the main studies included in the review

Author/year	Study focus+ & intention	Study Design	Sample size	Population (mean age)	Follow-up to	Intervention (Prof providing intervention)	Control	Outcome
Baum <i>et al.</i> 2003	Exercise & function	RCT (cross over)	N=20 elders 1 LTC <sup>1</sup> facility including AL <sup>2</sup> and NH <sup>3</sup>	Frail residents	Crossover, 6 month post-intervention follow-up	1 hr group exercise 3 x a week (exercise physiologist & staff)	Recreational therapy (art therapist/social worker)	3 function measures (CI) TUG (12, .95); PPT (.002, .80); Berg (-.09, .74), p=0.068 (no CI). Include cognitive measure p=.013 (no CI).
Lazowski <i>et al.</i> 1999	Exercise & function	RCT	N=96 5 LTC <sup>1</sup>	High & low mobility residents (80 yrs)	Completion of intervention at 4 months	FFLTC <sup>4</sup> Program For 45 mins, 3 x wk, 4 months (trained LTC institution staff)	Range of motion exercises	FFLTC FIM score maintained (114.8, CI 111.9-117.7); declined (8%) ROM group (105.2, CI 99.6-110.8) (p=0.05)
McMurdo <i>et al.</i> 1993	Exercise & function	RCT	N=49 4 LA <sup>6</sup> residential homes	Residents (81 yrs)	Completion of intervention at 7 months	45 min seated exercise 2 x wk for 7 months (physio)	45 min 2 x wk reminiscence for 7 months (physio)	Barthel Index, 1-point increase vs. 1-point decline (p=0.05, CI 0.1 to 3.8). Chair-to-stand-time (p=0.001, CI -1.5 to -0.5)
Meuleman <i>et al.</i> 2000	Exercise & function	RCT	N=78 2 nursing home; 1 rehab unit	Residents impaired >1 physical ADL (75 yrs)	12 months post-intervention	Resistance (3 x wk) & endurance training (2 x wk) For 4 to 8 wks (physical therapist)	Usual care	PADL, IADL and combined scales +ve non-sig. change (p=.13, .19 and .10) Stratified high dysfunction group 2.7 difference in ADL score (p=.042). No CI Relationship between strength and ADL
Mulrow <i>et al.</i> 1993, 1994	Physical therapy & function	RCT	N=194 9 nursing homes	Residents dependent >2 ADL (80.5) yrs	Completion of the intervention at 4 months	1:1 PT <sup>5</sup> 3 x wk for 4 months 6 physical therapists	Friendly visits 3 x wk for 4 months	-ve Katz ADL outcome (p=.80, CI -4.6 to 3.7), but +ve PDI mobility outcome p=0.1, CI 6.4 to 24.7

Table 3 Description of studies excluded from the review

Author/year	Study focus	Design	Sample size	Population (mean age)	Intervention
Beck <i>et al.</i> 2002	Behaviour & disruptiveness	RCT 3 treatment and 2 control groups	N=179 7 nursing homes	Cognitively impaired residents	ADL <sup>8</sup> or PSA <sup>9</sup> or combined ADL/PSA intervention for 12 weeks to reduce disruptive behaviour.
Chae 1993 (PhD)	Behaviour & grooming	Quasi-Experimental 2 groups	N=6 1 LTC <sup>1</sup> facility	Severely ( <i>n</i> =3) and mildly cognitively ( <i>n</i> =3) impaired residents	Systematic prompting and reinforcement of grooming (wash hands, face, teeth and comb hair). 10 sessions over 2 weeks
Colling <i>et al.</i> 1992	Training & continence	RCT	N=154, 4 nursing homes	Cognitively &/or physically impaired residents (85 years)	Staff 4 hr training & individual pattern toileting
Coyne & Hoskins 1997	Behaviour & eating	RCT (pilot) (PhD)	N=24 Nursing home (dementia unit)	Residents with dementia	Prompted eating for 9 consecutive meals
Proctor <i>et al.</i> 1999	Behavioural management	RCT	N=120 elders in 12 care homes (2 nursing & 10 residential)	Cognitively impaired residents (83.5 years)	7 1 hr seminars Weekly support from RMN.
Schnelle <i>et al.</i> 1989	Behaviour & continence	RCT	N=126	Severely debilitated	Toilet prompting & reinforcement
Tappen <i>et al.</i> 1994	Skill training & function	RCT (3 groups)	N=63	Residents with dementia	Skill training or stimulation
Blair 1999	Nursing approaches & ADL	Quasi-Experimental	N=20 elders 1 nursing home	Physically and cognitively intact residents	Education – system & behaviour modification
Blair 1995	Behaviour modification & physical dependence	Quasi-Experimental	N=79 3 nursing homes	Frail residents (80 yrs)	Behaviour modified & goal-setting
O'Hagan <i>et al.</i> 1994	Exercise classes & physical function	Case control	N=68 4 nursing homes	Frail elderly	Exercise class 3 x week

Definition of terms: 1. LTC: long-term care facility; 2. AL: assisted living; 3. NH: nursing home; 4. FFLTC: Functional fitness for long-term care; 5. PT: physical therapy; 6. LA: local authority; 7. FIM: Functional Independence Measure; 8. ADL: Activities of daily living; 9. PSA: psychosocial activity

a study to ensure the sample is large enough to ascertain differences between the study groups.<sup>9</sup> Baum *et al.*<sup>26</sup> calculated the sample size after sample recruitment, to justify that a semi-crossover design with a small sample of 20 residents could give 80% power at  $\alpha = 0.05$ , with 0.5 standard deviation effect size. Meuleman *et al.*<sup>28</sup> calculated that 43 participants were needed in each study group (allowing for 30% dropout) to give 80% power at  $\alpha = 0.05$  with a 2 point differential in the functional assessment scale. Fifty-eight participants comprised the final study population, but only 42% ( $n=24$ ) of those completed the 12-month post-test. The study was therefore underpowered.

Mulrow *et al.*<sup>14</sup> stated that a posterior power calculation demonstrated that the sample size of 194 was adequate to detect clinically significant results with 80% power at  $\alpha=0.05$ . The calculation was not described but, given the large sample size and high participation rate (93%), the study was viewed as sufficiently powered. Lazowski *et al.*<sup>27</sup> provided no sample size calculation. With a reasonable sample size ( $n=96$ ) and participation rate (82.5%), the study was considered sufficiently powered. However, both these studies reported inconclusive differences in the independence outcome measures between the study groups. This raises questions about their power. McMurdo *et al.*<sup>29</sup> also provided no sample size calculations. Although with a smaller sample size ( $n= 49$ ) but good participation rate (83.6%), the study was considered sufficiently powered. Significant differences were reported between the two arms of the trial.

Follow-up rates of participants entering the studies were over 80% in the five studies reviewed. It is an indication of methodological quality that the majority of the participants were accounted for. Single- and double-blinding as a measure of quality was, however, harder to ascertain. Lazowski *et al.*<sup>27</sup> and Baum *et al.*<sup>26</sup> both stated blinded observers had been used for all outcome measures. Mulrow *et al.*<sup>14</sup> and Meuleman *et al.*<sup>28</sup> however, used blinded observers, but the activities of daily living (ADL) outcome measures (Katz and PADL/IADL, respectively) were either completed, or confirmed by the participants' primary care nurse, who was not blinded as to their study group. Baum *et al.* maintained observer-blinding by using a simulated independence outcome measure (7-point Physical Performance Test

(PPT))<sup>30</sup>; Lazowski *et al.*<sup>27</sup> used their own trained observers. These were also the only double-blind trials. Baum *et al.*<sup>26</sup> blinded their participants by comparing two different exercise programmes, and Lazowski *et al.*<sup>27</sup> used a crossover design. McMurdo *et al.*<sup>29</sup> was the only study with a non-blind observer. Observer bias is likely, causing possible systematic differences in outcome assessment.<sup>9</sup> Conclusions drawn from the study needed to be treated cautiously.

Duration of follow-up went beyond completion of the intervention in three studies.<sup>14, 26, 28</sup> Demonstration of the sustained effect of the intervention on maintaining independence was of particular interest in the review. It is unfortunate that this data is limited and is further hampered by the high loss of participants, in particular in the study of Meuleman *et al.*,<sup>28</sup> with 58% dropout at 12 months.

## Results

In randomized controlled trials, any measure of outcome between the arms of the study is ideally accompanied by a 95% confidence interval (CI). This is when authors state the probability (or  $p$  value) that a particular outcome would have occurred by chance; the confidence interval of the highest and lowest point of the measurement spread is stated.<sup>9</sup> The size of the confidence interval and whether it crosses zero gives an indication of the certainty of the findings and their positive or negative nature.<sup>9</sup> The outcome of interest here is the effect of the intervention on maintaining independence as measured by a functional or disability scale. The results are presented in Table 2.

### Baum *et al.* (2003)

Baum *et al.*<sup>26</sup> recruited 21 residents from a single 50-bed long-term care (LTC) facility who met their eligibility criteria. This excluded those who were acutely unwell, unable to follow a two-step command, had assaultive behaviour patterns or were currently receiving physical therapy. Twenty residents participated in the study, five from the nursing home and 15 from the residential care unit. The intervention comprised one hour-long seated exercise sessions three times a week for six months, delivered by an exercise physiologist and trained LTC staff. Recreational sessions (e.g. painting) were given to the control group for the



same duration. At the end of six months, the groups crossed over. This was non-random and there was no separating period without treatment. On completion of the crossover, participants were followed up for six months.

Three measurement scales were used to measure functional outcomes: the timed Get-up-and-Go (TUG)<sup>31</sup>; Berg Balance scale<sup>32</sup>; and Physical Performance Test (PPT).<sup>30</sup> A functional independence scale (FIM)<sup>12</sup> was used for group baseline analysis, but not as an outcome measure. The FIM needs to be administered by trained staff, in this case the nurses, who could not be blinded. The results are presented as *overall effects*. Raw measurements are presented at the six-month crossover, but not the nine- and 12-month post-tests. In the *overall effects* data, positive differences between the study groups were reported for the TUG (CI: .12, .95) and the PPT (CI: .002, .80); a negative effect was seen for the Berg scale (CI: -.09, .74). No *P* values were stated. The spread of all three CIs were wide, casting doubt on the certainty of the findings. This may in part be because of the small sample size, and likely underpowering of the study. The authors acknowledge the small sample size as a limitation of the study, but assert that their findings are significant because the *P* value for the global test (all function measures and cognition measure combined) was 0.013. No CI is presented for this *P* value. If the cognitive outcome measure is excluded, the *P* value of the three functional measures alone is 0.068. No CI is given. The study's conclusion that exercise causes a significant and positive effect on function in elderly care home residents is treated cautiously.

#### Lazowski *et al.* (1999)

Lazowski *et al.*<sup>27</sup> approached 96 elderly residents from five LTC institutions that met their eligibility criteria. This excluded persons with medical contraindications to exercise, but not those with dementia. However, those cognitively unable to follow the exercises (*n*=3) dropped out of the programme. Twenty-eight residents in total dropped out at baseline. They were all accounted for. Sixty-eight residents completed the study. These were randomized to receive either the Functional Fitness for Long-Term Care (FFLTC) Program or Range of Motion (ROM) exercises. The programmes were

provided by LTC staff who had completed the Long-Term Care Physical Activity Workshop. Sessions lasted for 45 minutes, three times per week for the four-month evaluation period. Attendance rates for the FFLTC (86%) and ROM (79%) were high. Functional ability was assessed by specially trained and blinded personnel using the FIM.<sup>12</sup> FIM scores can range from 18 to 126; higher scores indicate higher function.

Baseline FIM scores were high in both groups (FFLTC, 114.7, SD 8.9; ROM, 110.4 SD 15.4). FIM scores in the FFLTC (*n*=34) were maintained (114.8, CI 111.9-117.7) and declined by 8% in the ROM (*n*=31) group (105.2, CI 99.6-110.8). The difference between the two groups was significant at the *p*=0.05 level. The high functional level at the start of the programme, maintenance of this in the FFLTC condition and decline in the ROM would indicate a positive effect of the FFLTC intervention over ROM in maintaining independence. The small CI effect however, indicates the need for more research to demonstrate a clinically significant effect. A longer follow-up period to demonstrate sustained effect and continued patient acceptability is also indicated.

#### McMurdo *et al.* (1993)

McMurdo *et al.*<sup>29</sup> is the only UK study reviewed. The authors recruited 49 elderly residents from four local authority care homes; each home was randomized to receive either twice weekly 45-minute exercise sessions, or reminiscence sessions of an equal duration. Residents with communication difficulties were excluded. Forty-one completed the seven-month project. All participants were accounted for. Attendance at both the exercise (91%) and reminiscence groups (86%) was high. The Barthel Activities of Daily Living (ADL) Index<sup>10</sup> and chair-to-stand time(s) were the independence outcome measures. ADL characteristics were not included in the baseline data presented. The seven-month follow-up data reported a one-point (2.8) increase in the exercise groups' ADL score, compared to a one-point (2.8) decline in that of the reminiscence groups (*p*=0.05, CI 0.1 to 3.8). Quite a wide CI spread casts uncertainty over the clinical significance of the results. Chair-to-stand-time gave a more definitive outcome measure of difference between the study groups (*p*=0.001, CI -1.5 to -0.5, NB: -ve finding = +ve result).

**Meuleman et al. (2000)**

Meuleman *et al.*<sup>28</sup> recruited elderly subjects from three care home sites: (1) a Veterans Affairs (VA) nursing home, (2) a rehabilitation unit and (3) a community nursing home. Fifty-eight of the 78 volunteers met the inclusion criteria. Participants were selected if they needed help with one or more Physical Activities of Daily Living (PADL),<sup>33</sup> and had potential for improvement. The principal investigator, who knew the residents, ascertained subject eligibility based upon their PADL score, duration of disability and coexistent medical problems. The inclusion of subjective eligibility criteria may mean the non-randomization of all eligible patients. Participation in the trial may only be offered to people considered likely to respond well to the intervention.<sup>9</sup>

The training group ( $n=26$ ) received thrice-weekly resistance training and twice weekly endurance training conducted in groups of two, with a physical therapist and aide for eight weeks. The control group ( $n=32$ ) received usual care. Two functional status measures were used (PADL and the Instrumental ADL, (IADL)).<sup>33</sup> At the initial eight-week post-test, the training groups PADL, IADL and the two scales combined, improved by 0.9, 0.6 and 1.5 compared to the controls. These were not significant ( $p=.13$ ,  $.19$  and  $.10$ ). No CIs were given. By stratifying the study groups into those with high dysfunction (score  $<13/26$ ) (training,  $n=17$ ; control,  $n=16$ ) and low dysfunction (score  $>13/26$ ) a 2.7 ADL score difference was seen between the study groups with high dysfunction ( $p=.042$ ). No CI is given. The differences were stated as not sustained at the six- and 12-month post-test measures (no figures are given). The ADL item of 'Can you walk?' was reported in the initial post-test as showing the most improvement. Again, only the  $p$  value of  $.021$  is stated. The Spearman correlation coefficient test was used to ascertain a relationship between change in strength and change in combined ADL score ( $n=58$ ). An association was seen with the isometric ( $.32$ ,  $p = .016$ ), concentric ( $.21$ ,  $p = .108$ ) and eccentric ( $.36$ ,  $p = 0.006$ ) measures. No CIs were given. Given the otherwise comprehensive nature of the study's findings, the unpublished raw ADL data could be requested from the authors if time and resources allowed.

**Mulrow et al. (1994)**

In this study,<sup>14</sup> 194 elderly residents were recruited from nine nursing homes. All were dependent in at least two ADL. Participants received either one to one physical therapy or friendly visits three times a week for three months. The Katz ADL<sup>11</sup> was used as the measure of functional capacity. A negative main ADL outcome measure was seen ( $-0.4\%$ ,  $p= .80$ , CI  $-4.6$  to  $3.7$ ). The only positive result was in a 15% improvement in the mobility subscale of the Physical Disability Index (PDI)<sup>34</sup> ( $p= 0.1$ , CI:  $6.4$  to  $24.7$ ). Although the wide CI means uncertainly about the findings, what is interesting is that no differences between the study groups were seen in the individual ADL that assessed mobility and transfers. The ADL data was taken from participants' records, completed by their nurse. This raises questions about the accuracy of ADL data collated by institution staff.

**Discussion**

The review sought to answer what interventions by nurses were effective in maintaining independence in the cognitively intact older care home population. The limitations of the studies to answering this question were grouped into three main categories :

- 1) The identification of a single intervention type of exercise programme
- 2) The validity of the functional scales and sample size, particularly in the follow-up data
- 3) Sample populations comprising cognitively intact older residents

The evidence to answer the question is limited to exercise. Methodological difficulties hampered the validity of the functional status measures used, most notably, the Barthel index. McMurdo *et al.*<sup>29</sup> questioned its sensitivity to differing levels of mobility, and commentators, its reliability to detect change over time.<sup>35</sup> Moreover, the need for trained personnel to administer functional status measures resulted in three studies using non-blinded observers.<sup>14, 28, 29</sup>

Only two studies<sup>26, 28</sup> incorporated post-test measures after completion of the intervention in their study design. The data of Meuleman *et al.*<sup>28</sup> was hampered by high dropout rates at six months ( $n=24/58$ ) and 12 months ( $n=6/34$ ). Data on only 42 % ( $n=24$ ) of the sample was available at 12 months. The authors did not present this

post-test data. Baum *et al.* did not present their nine-month and 12-month post intervention data, preferring to use an overall effects data analysis. The evidence available to the review cannot comment on the sustainability of the intervention in the maintainance of independence. Both these issues highlight methodological challenges when conducting research in an area of limited knowledge and with a population who frequently have complex health and social care needs.

The main limitation of the review was the inclusion of only cognitively intact study populations. This may enable older people with severe dementia to be viewed as having special needs,<sup>27</sup> but ignores the UK practice reality that 61% of the care home population have a degree of cognitive impairment.<sup>3</sup> This limits the applicability of the findings to practice. Table 3 gives an overview of these studies. The overall limitation is, however, the lack of data synthesis. This was not possible because limited resources and time precluded synthesizing outcome data from the eight different function scales used in the studies. Instead, the pattern of the results was presented.

In answering the critics' question of 'What interventions are effective in maintaining independence in the care home population?' a positive direction of the effectiveness of exercise programmes in maintaining ADL was evident, except for Mulrow *et al.*,<sup>13</sup> who reported a negative effect. These findings however, may be related to a systematic bias with non-blinded LTC staff collecting the Katz ADL data. With the wide confidence intervals reported in the five studies and limited statistical significance, the overall results did not demonstrate a clinically significant effect, rather the need for more research in the area. Future studies could usefully develop the findings of a greater effect of exercise on elderly persons with high dysfunction<sup>28</sup> compared to those with low dysfunction,<sup>27</sup> and the benefit of strength training on the lower body,<sup>28</sup> rather than reparation of movement.<sup>13, 27</sup>

## Conclusions

For practice, it is evident that the introduction of exercise in the care home setting could have positive benefits for the residents. The programme needs however, to be designed specifically for frail elders, to be able to be delivered in a care home setting and be provided by suitably trained indi-

viduals. A future area of primary research would be how to develop this type of intervention in the UK using existing primary care and care home staff to deliver the programme.

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