

The effect of complex interventions on supporting self-care among community-dwelling older adults: a systematic review and meta-analysis

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Abstract

Background: self-care is critical to enable community-dwelling older adults to live independently. Complex interventions have emerged as a strategy to support self-care, but their effectiveness is unknown. Our objective was to review systematically their effectiveness on both positive (increased scores in self-rated health, Activities of Daily Living, Instrumental Activities of Daily Living, quality of life) and negative aspects (increased incidence of falls, fear of falling, hospital and nursing home admission, increased depression score), and to determine which intervention components explain the observed effects.

Methods: CINAHL, MEDLINE, British Nursing Index, PsycInfo and Cochrane CENTRAL were searched from January 2006 to October 2016. Randomised controlled trials providing at least two of these components: individual assessment, care planning or provision of information were reviewed. Outcomes were pooled by random-effects meta-analysis.

Results: twenty-two trials with 14,364 participants were included with a low risk of bias. Pooled effects showed significant benefits on positive aspects including self-rated health [standardised mean difference (SMD) 0.09, 95% confidence interval (CI) 0.01–0.17] and the mental subscale of quality of life (SMD 0.44, 95% CI 0.09–0.80) as well as on the negative aspect of incidence of falls [odds ratio (OR) 0.60, 95% CI 0.46–0.79]. There was no significant improvement in ADL, IADL, overall quality of life, fear of falling, reduction in health service utilisation or depression levels. Meta-regression and subgroup analysis did not identify any specific component or characteristic in complex interventions which explained these effects.

Conclusion: based on current evidence, supporting self-care in community-dwelling older adults using complex interventions effectively increases self-rated health, reduces the occurrence of falls and improves the mental subscale of quality of life.

Keywords: community, older adults, complex interventions, meta-analysis, self-care, systematic review

Introduction

Self-care has been defined as an activity that individuals undertake on their own behalf in staying fit, maintaining good health and functioning, and preventing illness, with or without assistance [1, 2]. Previous studies have demonstrated that people who were less engaged in self-care tended to have unnecessary health services utilisation and psychological distress, such as depression [3–5]. When people are engaged in self-care, and are supported in doing so,

they are more likely to maintain functional status, improve quality of life and reduce negative outcomes such as increased disability and hospitalisation [3].

Supporting self-care requires a comprehensive approach [3, 6]. Complex interventions, described as containing a combination of several interacting components, can support self-care through identification of physical, psychosocial and environmental problems, development of individual care plans, and provision of information and education [8–12].

Multiple systematic reviews have evaluated the effects of these interventions on the physical functioning of older adults [13–16]; however, the trials included in these reviews are either disease or hospital based, and the main focus is on the curative rather than the maintenance aspects of care. Relatively healthy older adults are often excluded from clinical trials and reviews.

The goal of this review is to answer the following questions. (i) What are the effects of community-based complex interventions on maintaining Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL) and quality of life, and preventing falls, fear of falling and subsequent hospitalisation in comparison with usual care among community-dwelling older adults? (ii) Which study and intervention characteristics explain the observed effects?

Methods

Search strategy

The protocol of this systematic review is available from the authors upon request. We searched CINAHL, MEDLINE, British Nursing Index (BNI), PsycInfo and the Cochrane Central Register of Controlled Trials (CENTRAL) from January 2006 to October 2016. The search strategy used is shown in Supplementary data, Appendix 1, available in *Age and Ageing* online. The online search was supplemented by an extensive hand search of the literature through references identified from retrieved articles.

Selection criteria and outcome measures

Inclusion and exclusion criteria

This review considered randomised controlled trials that intended to support self-care among community-dwelling older adults by using complex interventions in comparison with usual care. The definition of self-care used in this review was associated with concepts of an activity in which individuals take action on their own behalf to promote or maintain health and functioning [1, 2]. Studies that focused on disease-specific self-management were outside the scope of this review, since these programmes involved disease-specific skill-based training and the support is often delivered after hospital discharge. A complex intervention is defined as containing a combination of several interacting components that include at least two of the following: individual assessment, care planning or provision of information.

Studies were reviewed that included older adults aged 65 years or over, living independently in their own home, male or female, and with or without chronic diseases. Studies that focused on cognitively or functionally impaired older adults who were unable to perform self-care were excluded.

Outcomes

The outcome measures of interest were divided into positive and negative aspects. For positive aspects, self-rated

health, ADL, IADL and quality of life were measured. For negative aspects, health service utilisation (hospital and nursing home admission), falls (incidence and fear of falling) and depression level were measured. Articles that included at least one of these outcomes were included.

Data extraction and quality assessment

Two authors (K.W. and J.Y.) worked independently in selecting trials, assessing quality and extracting data. Identified studies were assessed for relevance according to abstract, title and body text. Those identified in the hand search were assessed for relevance on title only. A full report of each relevant study was then retrieved and read in detail to assess whether or not it met the inclusion criteria. Disagreements regarding the extracted data were resolved through discussion.

For each article included in the review, information about the methods (study design, ethics and informed consent), participants (setting, country, reason provided for selection of the intervention community, total number of participants, age, inclusion and exclusion criteria), interventions (name of the intervention, theory, provider, intervention group, control group and duration) and outcomes (outcome, time point, data collector and measurement tool) were extracted. This information was then compared and analysed.

The potential risk of bias in the included studies was assessed by the Cochrane Collaboration's tool for assessing risk of bias according to the Cochrane Handbook for Systematic Reviews of Interventions [17]. Discrepancies were resolved through discussion between two authors or consultation with a third author. Contacting the principal researchers to identify and clarify missing information was one way to deal with missing data.

Statistical analysis

Meta-analyses were conducted using Review Manager (version 5.3). We decided to use random-effects meta-analysis *a priori* due to the foreseeable complexity and multi-component nature of complex interventions. In order to ensure that it was the correct method, the presence of heterogeneity was tested by the standard χ^2 test and the inconsistency index ($I^2 > 50\%$). The standardised mean differences (SMDs) and their 95% confidence intervals (CIs) were calculated from post-intervention outcomes for continuous data, while the odds ratio (OR) was obtained for dichotomous data. Pooled ORs (95% CI) were calculated, and a two-sided P -value < 0.1 was considered to indicate statistical significance [17].

Publication bias was checked using a funnel plot if there were at least 10 studies reporting the same outcome [17]. Sensitivity analysis was used to test the robustness of the results of the review. The effect of including or excluding trials that showed an unclear or ambiguous definition of interventions or outcomes was examined.

Meta-regression was performed using R (version i386 3.3.2). The factors that were used to explain the between-trial heterogeneity were age, duration, delivery format (home visit, telephone follow-up, both home visit and telephone follow-up, group training and community centre follow-up), provider (single-discipline or multi-disciplinary team) and components of complex interventions (individual assessment, care planning and provision of information) when the number of trials included was >10 [17].

Results

Results of the search

We identified 22,132 publications in our literature search after removing duplicates. A total of 21,908 publications were excluded based on title and brief abstract evaluation. The remaining 224 publications were assessed for eligibility, 22 of which met our inclusion criteria and were included in our meta-analysis (Figure 1). Consensus between the two independent reviewers was reached for 92% of publications.

Study characteristics

Among the 22 studies, 14,364 participants were included, ranging from 40 [37] to 3,326 [21], with a median sample size of 320 per study. The mean age of the participants in years ranged from 71 [20] to 86 [39]. Studies were conducted in a mix of countries between 2007 and 2016.

Studies used varying channels, numbers of visits, durations and providers to deliver interventions to community-dwelling older adults. Regarding the delivery channel, 11 (50%) trials used home visits only, 7 (32%) used home visits and telephone follow-up, 2 (9%) used home visits and group training, 1 (4.5%) used group training and 1 (4.5%) provided visits at a community centre. Participants received an average of 7.7 visits per study. Two studies provided one visit per participant [35, 39], and one study provided an average of 49 visits per participant over 2 years [20]. The duration of the intervention period was reported to be between 6 months and 2 years. Twelve (55%) reported an intervention period of 1 year or less, and 10 (45%) reported an intervention period of more than 1 year. All of the complex interventions were professionally led. The nurse was the main care provider in eight studies (36.4%); seven

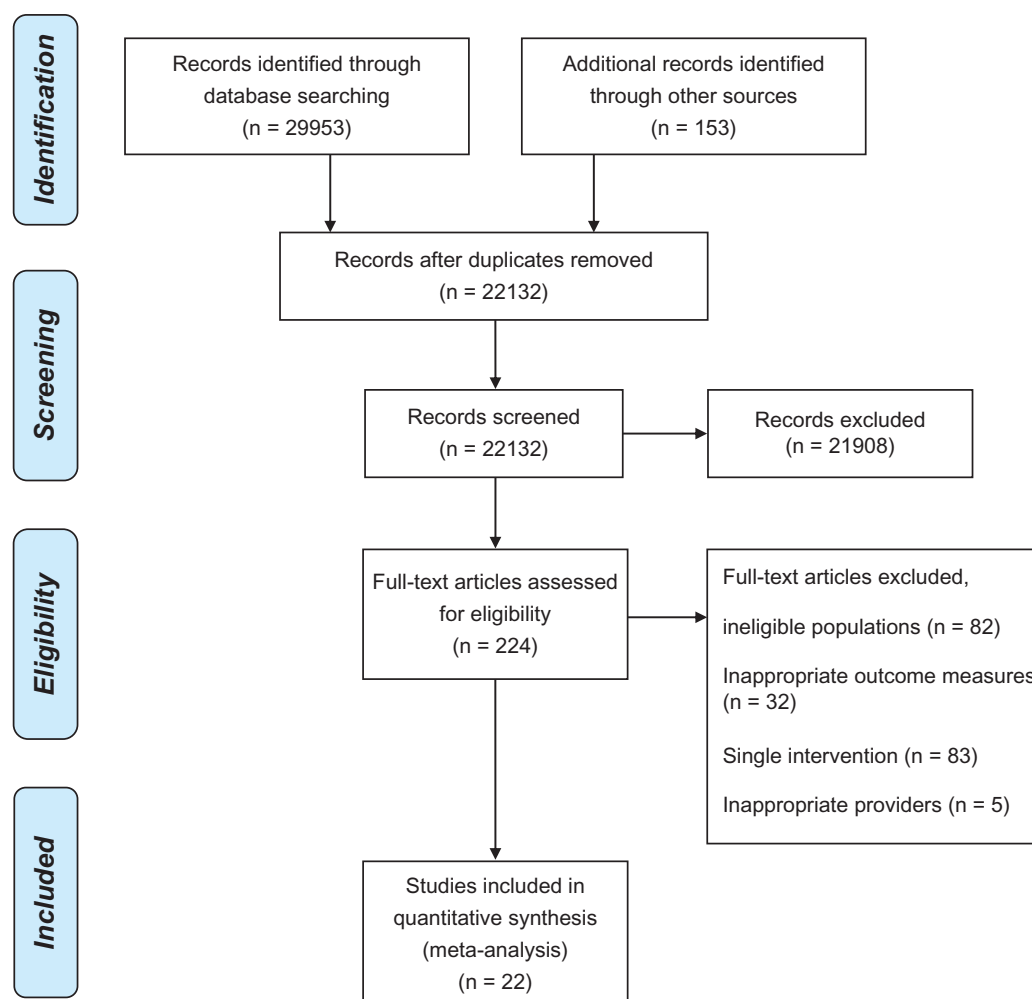


Figure 1. Search result (PRISMA).

studies (31.8%) had two providers and one study had a total of five healthcare providers, comprising a nurse, a geriatrician, a dietician, a physiotherapist and an occupational therapist [22]. A summary of the study characteristics is displayed in Table 1 (the full Table is available in available in *Age and Ageing* online).

Risk of bias in included studies

Agreement between the two independent reviewers was higher than 90% on all aspects of quality assessment of the studies. The identified studies were heterogeneous in quality, though most had a low risk of bias. Most studies described the randomisation sequence adequately. Three studies [28, 35, 37] did not report the sequence generation, which may have resulted in selection bias.

The most common methodological limitation of these studies was the issue of blinding of participants and the personnel who obtained the outcome measures. Three studies [21, 27, 29] did not blind the participants or the personnel involved in collecting data, but the impact of non-blinding was unclear. Two studies [19, 26] did not provide information on whether the participants or outcome assessors were blinded. However, the occurrence of falls and health service utilisation were not likely to be affected by the subjective reporting of outcome assessors. Biased reporting or assessment may be more influential for outcomes such as activities of daily living and quality of life of participants.

Most studies reported the attrition rate and the method of handling missing data. Five studies [20, 23, 25, 32, 35] reported the drop-out rate but did not mention how to handle missing data. One study [37] used modified intention-to-treat analysis, which excludes participants who are not available for follow-up. All other studies performed intention-to-treat analysis to handle missing data.

The protocol was not found in one study [29]. It is unclear whether all pre-specified outcomes in this study were reported. About half of the studies (41%) were not reported in sufficient detail to judge the risk of other biases. No evidence of publication bias or small study effects was found using funnel plots. Sensitivity analysis revealed that the finding was not affected after excluding studies that had a higher risk of result bias. Details can be found in Table 2.

Quantitative synthesis

The effects of complex interventions on outcomes are shown in Supplementary data, Figure S1, are available in available in *Age and Ageing* online.

Positive aspects

Self-rated health Seven studies (32%) involving 5,684 participants included the outcome of self-rated health. The heterogeneity test indicated use of the random-effects model ($I^2 = 44\%$, $P = 0.11$). Data showed an overall benefit for community-dwelling older adults in receipt of complex interventions (SMD 0.09, 95% CI 0.01, 0.17, $P = 0.03$).

Activities of daily living Eleven studies (50%), including 4,218 participants, evaluated their ADL status before and after the implementation of complex interventions. These 11 studies were found to be significantly heterogeneous ($\chi^2 = 20.43$, $I^2 = 51\%$, $P = 0.03$); thus, a random-effect model was adopted. A funnel plot did not give any indication of small study effect or publication bias in the studies included in the analysis. The results showed that the difference was not statistically significant (SMD 0.04, 95% CI -0.05, 0.14, $P = 0.39$). Meta-regression did not identify any effects for age, duration of study, number of visits, delivery modes, settings or providers.

Instrumental activities of daily living Six studies (27%) out of 22 reported the IADL status of community-dwelling older adults. As with the previous outcomes, the results of IADL were heterogeneous ($\chi^2 = 7.81$, $I^2 = 36\%$, $P = 0.17$), and the SMD was not statistically significant (SMD 0.02, 95% CI -0.09, 0.12, $P = 0.76$).

Quality of life The majority of studies ($n = 6$) used the SF-36 to measure quality of life. In a meta-analysis of 10 studies (46%) with 7,124 participants, the pooled SMD of the overall score for quality of life was not significantly different (SMD 0.52, 95% CI -0.16, 1.21, $P = 0.13$). The results were found to be significantly heterogeneous ($\chi^2 = 147.03$, $I^2 = 97\%$, $P < 0.001$); thus, sensitivity analysis was used. We excluded two studies [25, 33] from the meta-analysis to eliminate the risk of their direction and magnitude affecting the pooled estimation. The results showed no significant difference between the intervention and control groups (SMD = -0.02, 95% CI -0.17, 0.12, $P = 0.76$).

No significant difference was found in the physical subscale (SMD 0.26, 95% CI -0.02, 0.53, $P = 0.06$). Inconsistency across studies was high ($\chi^2 = 45.83$, $I^2 = 89\%$, $P < 0.001$). A significant SMD of 0.44 (95% CI 0.09, 0.80, $P = 0.01$) was obtained for the mental subscale. High inconsistency was also indicated in this subscale ($\chi^2 = 107.17$, $I^2 = 94\%$, $P < 0.001$). For the social functioning subscale, it did not significantly differ between groups (SMD -0.01, 95% CI -0.17, 0.15, $P = 0.89$). The I^2 statistics reflected homogeneity among the studies ($\chi^2 = 1.77$, $I^2 = 0\%$, $P = 0.41$).

Negative aspects

Incidence of falls Two studies (9%) examined the number of older adults who fell, with one reporting a fall rate of 6.2% (intervention, $n = 562$) versus 9.0% (control, $n = 1,300$) and the other 32.0% (intervention, $n = 231$) versus 46.5% (control, $n = 230$). The pooled summary statistics were observed as OR = 0.60 (95% CI 0.46, 0.79, $P < 0.001$), indicating a significant reduction of 40% in falls in the intervention groups in which complex interventions were used. These two studies had a low risk of bias overall.

Fear of falling Three studies, including 845 participants, reported fear of falling using the short fall efficacy scale. Fear of falling measures concern about falling in older

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Table 1. Summary of included studies.

Study	Participants	Intervention components	Control group	Providers	Duration	Outcome measures
Boult <i>et al.</i> [18]	<i>n</i> = 904 (I: 485, C: 419) Mean age: 78	Assessment, create care plan, promote self-management, case management	Usual care	Registered nurses	2 years	Hospital admission Nursing home admission
Bouman <i>et al.</i> [19]	<i>n</i> = 330 (I: 160, C: 170) Mean age: 76	Assess health problems and risks by interview, advice given, case management	Usual care	Home nurses, public health nurse	18 months	Self-rated health ADL IADL QOL Mental component of QOL Social component of QOL Depression Hospital admission Nursing home admission
Counsell <i>et al.</i> [20]	<i>n</i> = 951 (I: 474, C: 477) Mean age: 72	Comprehensive Geriatric Assessment, develop individualised care plan, case management	Usual care	Nurse practitioner and clinical social worker	2 years	Physical component of QOL Mental component of QOL ADL IADL Hospital admission
Dapp <i>et al.</i> [21]	<i>n</i> = 3326 (I: 878, C: 2448) Mean age: 72	Comprehensive assessment, computer-generated feedback, check adherence to the recommendations	Usual care	Geriatrician, nutritionist, physiotherapist, social worker, nurses	9 months	Self-rated healthFalls
Ekdahl <i>et al.</i> [22]	<i>n</i> = 382 (I: 208, C: 174) Mean age: 83	Comprehensive Geriatric Assessment, home or ambulatory visits, telephone calls, training programmes	Usual care	Nurse, geriatrician/resident physician, municipal care manager, occupational therapist, physiotherapist, dietician, administrative assistant	2 years	Overall QOL
Godwin <i>et al.</i> [23]	<i>n</i> = 236 (I: 121, C: 115) Mean age: 86	Assessment, develop plan with goals, assist in meeting goals	Usual care	Primary care nurse specialist	12 months	Overall QOL Social component of QOL Hospital admission
Imhof <i>et al.</i> [24]	<i>n</i> = 461 (I: 231, C: 230) Mean age: 85	Comprehensive assessment, develop action plan with concrete activities and strategies	Usual care	Advanced practice nurses	9 months	Falls Hospital admission
King <i>et al.</i> [25]	<i>n</i> = 186 (I: 93, C: 93) Mean age: 80	Comprehensive assessment, set goals, develop individualised support plan	Usual care	Registered nurses	12 months	Overall QOL Physical component of QOL Mental component of QOL ADL
Kono <i>et al.</i> [26]	<i>n</i> = 323 (I: 161, C: 162) Mean age: 80	Structured multi-dimensional assessments, recommendations given)	Usual care	Community health nurses, care managers or social workers	2 years	ADL IADL Hospital admission Nursing home admission Depression
Lewin <i>et al.</i> [27]	<i>n</i> = 750 (I: 375, C: 375) Mean age: 82	Promotion of active engagement in a range of daily activities	Usual care	Physiotherapists, occupational therapists, registered nurses	1 year	Hospital admission
Li <i>et al.</i> [28]	<i>n</i> = 310 (I:152, C:158) Mean age: 79	Comprehensive Geriatric Assessment, followed by intervention programme based on assessment results	Screening evaluation	Nurses, geriatricians	6 months	ADL
Markle-Reid <i>et al.</i> [29]	<i>n</i> = 288 (I: 144, C: 144) Mean age: 84	Health assessment, identifying and managing risk factors for functional decline, providing health education case management	Usual care	Registered nurses	6 months	Physical component of QOL Mental component of QOL Depression

Continued

Table 1. Continued

Study	Participants	Intervention components	Control group	Providers	Duration	Outcome measures
Melis <i>et al.</i> [30]	<i>n</i> = 155 (I: 88, C: 67) Mean age: 82	Nursing assessment, co-ordination of care, therapeutic monitoring	Usual care	Primary care physician, geriatric specialist nurse	6 months	Physical component of QOL Mental component of QOL ADL
Metzelthin <i>et al.</i> [31]	<i>n</i> = 346 (I: 193, C: 153) Mean age: 77	Multi-dimensional assessment, treatment plan, motivational interviewing	Usual care	General practitioner and practice nurse, occupational and physical therapists	2 years	Fear of falling ADL IADL Depression
Monteserin <i>et al.</i> [32]	<i>n</i> = 620 (I: 308, C: 312) Mean age: 80	Health promotion, develop individual care plan, disease prevention and self-care	Usual care	Nurse	18 months	Nursing home admission
Parsons <i>et al.</i> [33]	<i>n</i> = 205 (I: 108, C: 97) Mean age: 78	Assessment, goal-setting, develop support plan	Assessment	Home care aides, registered nurses	6 months	Overall QOL Physical component of QOL Mental component of QOL
Ploeg <i>et al.</i> [34]	<i>n</i> = 719 (I: 361, C: 358) Mean age: 81	Comprehensive assessment, collaborative care planning, health promotion, and referral to community health and social support services	Usual care	Home care nurses	12 months	Self-rated health ADL
Sherman <i>et al.</i> [35]	<i>n</i> = 438 (I: 176, C: 262) Mean age: 75	Assessment of health, planning, diagnosis of health needs, nursing interventions and evaluation of nursing care	Usual care	District nurses	12 months	Self-rated health
Stuck <i>et al.</i> [36]	<i>n</i> = 2284 (I: 874, C: 1410) Mean age: 75	Health risk assessment, individualised computer-generated feedback reports, nurse and primary care physician counselling	Usual care	Primary care physician, nurse counsellors	2 years	Self-rated health Nursing home admission
Szanton <i>et al.</i> [37]	<i>n</i> = 40 (I: 24, C: 16) Mean age: 78	Assessment, education, interactive identification of barriers to function with joint discussion of possible retraining and solutions	Reminiscence and sedentary activities of their choice	Occupational therapist, registered nurse and handyman	6 months	Overall QOL Fear of falling ADL IADL
Van Hout <i>et al.</i> [38]	<i>n</i> = 651 (I: 331, C: 320) Mean age: 81	Assessment, tailored care plan, nurse visits	Usual care	Community nurses	18 months	Physical component of QOL Mental component of QOL ADL IADL Hospital admission
Ziden <i>et al.</i> [39]	<i>n</i> = 459 (I: 174, C: 285) Mean age: 86	Assessed health problems, offered information, Health promotion	Usual care	Occupational therapist, physical therapist, nurse (RN), social worker	2 years	Self-rated health Fear of falling ADL

QOL, quality of life; I, intervention group; C, control group.

The full version of this Table is available in *Age and Ageing* online.

adults when they have to perform different daily activities, such as bathing and dressing [40]. Consistency across studies was low, with $I^2 = 87\%$ ($P < 0.001$). The overall improvement in fear of falling was modest and not statistically significant, with an SMD of -0.2 (95% CI $-0.66, 0.26$, $P = 0.40$).

Health service utilisation

Hospital admissions Hospital admissions were reported as the outcome in eight studies (67%), with 4,497 participants.

Moderate heterogeneity was found among these studies ($\chi^2 = 13.75$, $I^2 = 49\%$, $P = 0.06$). The number of hospital admissions in complex interventions group and control group participants was 1,038 of 2,273 (45.7%) and 1,044 of 2,224 (46.9%), respectively. No significant difference was found for the number of hospital admissions between groups (OR 0.97, 95% CI 0.80, 1.18, $P = 0.79$).

Nursing home admissions Five studies (23%), including 4,188 participants, reported nursing home admissions. This result showed that the number of hospital admissions was not

Table 2. Risk of bias in included studies.

Study	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Boult <i>et al.</i> [18]	Low	Low	Low	Low	Low	Low	High
Bouman <i>et al.</i> [19]	Low	Unclear	Unclear	Unclear	Low	Low	High
Counsell <i>et al.</i> [20]	Low	Unclear	Low	Low	Unclear	Low	Unclear
Dapp <i>et al.</i> [21]	Low	Low	Unclear	Unclear	Low	Low	High
Ekdahl <i>et al.</i> [22]	Low	Low	Low	Low	Low	Low	High
Godwin <i>et al.</i> [23]	Unclear	Unclear	Low	Low	Unclear	Low	Unclear
Imhof <i>et al.</i> [24]	Low	Low	Low	Low	Low	Low	High
King <i>et al.</i> [25]	Low	Low	Low	Low	Unclear	Low	Low
Kono <i>et al.</i> [26]	Low	Unclear	Unclear	Unclear	Low	Low	High
Lewin <i>et al.</i> [27]	Low	Low	High	High	Low	Low	Unclear
Li <i>et al.</i> [28]	Unclear	Unclear	Low	Low	Low	Low	Unclear
Markle-Reid <i>et al.</i> [29]	Low	Unclear	High	High	High	Unclear	Unclear
Melis <i>et al.</i> [30]	High	Unclear	Low	Low	Low	Low	Low
Metzelthin <i>et al.</i> [31]	Low	Unclear	Low	Low	Low	Low	Unclear
Monteserin <i>et al.</i> [32]	Low	Low	Low	Low	Unclear	Low	High
Parsons <i>et al.</i> [33]	Low	Low	Low	Low	Low	Low	High
Ploeg <i>et al.</i> [34]	Low	Low	Low	Low	Low	Low	High
Sherman <i>et al.</i> [35]	Unclear	Low	Low	Low	Unclear	Low	Unclear
Stuck <i>et al.</i> [36]	Low	Unclear	Low	Low	Low	Low	Low
Szanton <i>et al.</i> [37]	Unclear	Low	Low	Low	High	Low	Unclear
Van Hout <i>et al.</i> [38]	Low	Low	Low	Low	Low	Low	Unclear
Ziden <i>et al.</i> [39]	Low	Low	Low	Low	Low	Low	Low

statistically different between groups after complex interventions (OR = 0.89, 95% CI 0.64, 1.24, $P = 0.49$).

Depression

In a meta-analysis of four studies with 1,190 participants, the overall depression score in the intervention groups was not significantly different from that of the control group (SMD = -0.02, 95% CI -0.14, 0.09, $P = 0.72$).

Discussion

Based on the findings, it was apparent that complex interventions were potentially effective and beneficial to help prevent negative outcomes such as the incidence of falls, and to increase positive outcomes such as the self-rated health and mental subscale of quality of life. However, this meta-analysis provided limited evidence of effectiveness in improving ADL, IADL, overall quality of life and fear of falling, and reducing health service utilisation and depression levels.

Recent reviews have provided inconsistent findings on the effects of preventive health programmes to older adults [41–43]. Interventions that included comprehensive assessment and corresponding health education to community-dwelling older adults did not have a significant effect on both positive and negative outcomes including quality of life, mortality, morbidity and institutionalisation [41, 42]. In contrast to these findings, negative outcomes such as hospital admission and falls were prevented when the same interventions were applied to older adults who are at risk for hospital admission or in great need of health services [43]. There is evidence that frailty and functional disabilities

may benefit more from the potential value of preventive health programmes [43].

Our results are similar to those of previous studies, but they differ in some ways. We confirmed that preventive health programmes targeting older adults who live in the community but are not necessarily at high risk or who have multi-morbidities do not have significant effects on negative outcomes such as hospitalisation. However, since the aim of our review was to examine trials that support self-care for community-dwelling older adults, we stringently included interventions that promoted active engagement in a range of daily activities, such as developing an action plan with concrete activities and strategies, and monitoring adherence to recommendations. This might explain our positive findings in terms of incidence of falls and quality of life.

Although no statistically significant effects were found in terms of physical functioning and hospital utilisation, the beneficial effects of self-rated health, the number of falls and the mental subscale of quality of life were obvious. Our review differed from others in that we selected studies that targeted the positive aspects such as self-rated health and the mental subscale of quality of life, which were not presented in previous reviews. There is evidence to show that poor self-rated health and mental quality of life are associated with functional decline [44, 45], increased depression level [46] and mortality rate [47, 48]. Individuals with unfavourable measures of these associated factors tend to use less preventive health services [49] and have a higher chance of institutionalisation and healthcare expenses [50]. In contrast, positive findings of self-rated health and mental quality of life contribute to building confidence in a person to accomplish tasks [51]. It has been argued that confidence

in self-care behaviours is one of the key factors determining adherence to and compliance with self-care [41, 52]. It is uncertain whether self-care behaviour can be maintained when interventions cease. However, studies have shown that interventions can have a sustained effect on self-efficacy, i.e. the confidence in one's ability to manage one's own health [53]. Future studies may extend our knowledge of the effectiveness of complex interventions by further analysis of these outcomes, such as self-efficacy, self-competence and activation level.

One major strength of our review is that we specifically address the care needs of relatively healthy older adults. Many systematic reviews and meta-analyses have targeted frail older adults in the community [54], older adults at risk of hospital admission [16] and those just discharged from hospital [13–15]. The older adults in this review may have had no specific medical problems but encountered health and social issues in the community. Supporting self-care can eventually help them to age in place. Also, this review showed the beneficial effect of providing complex interventions to these older adults.

Limitations

Because of the limited number of included trials, meta-regression was not performed in most of the outcomes. It was unclear from the included trials which characteristics in the complex interventions were more effective than others to achieve a specific outcome to support self-care in community-dwelling older adults.

Conclusion

Complex interventions are now commonly used and will continue to be promoted as a mechanism for supporting self-care for community-dwelling older adults. Based on the current evidence, these interventions can effectively increase the positive outcomes including self-rated health and the mental subscale of quality of life, and reduce the negative outcome of falls.

Key points

- Complex interventions can improve self-rated health, the mental subscale of quality of life and the fall rate of older adults.
- It is difficult to identify the effective components in complex interventions.
- Further research is required to explore factors that determine adherence to self-care behaviour in older adults.

Supplementary Data

Supplementary data are at *Age and Ageing* online.

Conflict of interest

None.

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PLEASE NOTE: The very long list of references has meant that only the most important are listed here. The full list of references is available in *Age and Ageing* online.

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Frailty index as a predictor of mortality: a systematic review and meta-analysis

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Abstract

Background: two popular operational definitions of frailty, the frailty phenotype and Frailty index (FI), are based on different theories. Although FI was shown to be superior in predicting mortality to the frailty phenotype, no meta-analysis on mortality risk according to FI has been found in the literature.