

## Home- and Community-Based Occupational Therapy Improves Functioning in Frail Older People: A Systematic Review

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**OBJECTIVES:** The objective is to assess the effectiveness of occupational therapy to improve performance in daily living activities in community-dwelling physically frail older people.

**DESIGN:** We conducted a systematic review and meta-analysis. We included randomized controlled trials reporting on occupational therapy as intervention, or as part of a multidisciplinary approach. This systematic review was carried out in accordance with the Cochrane methods of systematic reviews of interventions.

**MEASUREMENTS:** Meta-analyses were performed to pool results across studies using the standardized mean difference. The primary outcome measures were mobility, functioning in daily living activities, and social participation. Secondary outcome measures were fear of falling, cognition, disability, and number of falling persons.

**RESULTS:** Nine studies met the inclusion criteria. Overall, the studies were of reasonable quality with low risk of bias. There was a significant increase in all primary outcomes. The pooled result for functioning in daily living activities was a standardized mean difference of  $-0.30$  (95% CI  $-0.50$  to  $-0.11$ ;  $P = .002$ ), for social participation  $-0.44$  (95% CI  $-0.69$ ,  $-0.19$ ;  $P = .0007$ ) and for mobility  $-0.45$  (95% CI  $-0.78$  to  $-0.12$ ;  $P = .007$ ). All secondary outcomes showed positive trends, with fear of falling being significant. No adverse effects of occupational therapy were found.

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**CONCLUSION:** There is strong evidence that occupational therapy improves functioning in community-dwelling physically frail older people. *J Am Geriatr Soc* 65:1863–1869, 2017.

**Key words:** frail older people; primary care; occupational therapy; functionality; social participation

Greater longevity has increased the demand for chronic care. Care needs of people receiving chronic care encompass the overall functioning of a person in his or her environment and hence surpass medical care.<sup>1</sup> A part of this population is vulnerable. Frailty means there is a precarious balance between the assets maintaining health and the deficits threatening it. This balance can be disrupted by minor stressor events. The state of vulnerability results in an age-related decline in many physiological systems and in an increase of chronic diseases.<sup>2,3</sup> Many older people with chronic diseases experience limitations in physical activity and lose functionality.<sup>4</sup> Despite their vulnerable condition, most of these people wish to live independently. Maintaining functionality is not only important for being able to live independently, it also reduces the burden of the caregiver and it influences the well-being of both.<sup>5</sup> Interventions with a focus on activity, independence and successful aging have been shown to be more successful than those based on a dependency service provision model.<sup>6</sup> Occupational therapy (OT), the health profession that focuses on enabling persons to engage in their daily occupations, is important in this respect. OT aims to enable people to perform the occupations that foster health and well-being. Occupation refers to everything that people do during the course of everyday life.

The possible benefit of OT compared to service-based care differs as to the way the occupational therapists work and in the goals they establish. Occupational therapists enable engagement in everyday living through occupation, which means they enable engagement in meaningful

activities of everyday life. They empower the person and his environment. In order to achieve this, occupational therapists work in a client-centered way.<sup>7-9</sup> Hence, occupational therapists are part of the group of professionals that contribute to achieving the main goal of older people, living independently. Therefore, there is a need of strong evidence that proves the effectiveness of OT in community-dwelling frail older people.

## OBJECTIVE

The purpose of this systematic review is to assess the effectiveness of OT interventions as mono-disciplinary intervention or as part of a multidisciplinary approach, for community-dwelling physically frail older people.

## METHODS

### Search Strategy and Selection Criteria

The principles of the Cochrane manual were followed to conduct this systematic review.<sup>10</sup> Reporting is based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance.<sup>11</sup> Only completed randomized controlled trials were included. No review protocol has been preregistered.

Studies were excluded if: (1) the older people received any form of rehabilitation (institutionalized, day care or home based rehabilitation); (2) the main diagnosis was an acute problem; (3) there was a diagnosis of dementia or other progressive neurological disorder; (4) the older people were in an irreversible stage of being bedridden; (5) the older people were identified as in need of palliative care; or (6) they belonged to a native African, Asian, or Latin-American population, because of cultural differences.

The impact of OT on people with dementia was studied by Graff,<sup>12-14</sup> the impact of OT on people with Parkinson Disease by Dixon,<sup>15</sup> therefore we decided not to focus on people with cognitive deficits. We included investigations that studied community-dwelling physically frail older people, living alone or together who received home- and community-based mono-disciplinary OT interventions or multidisciplinary interventions that included OT, compared with regular interventions or no interventions. We only included studies if the components of the intervention were presented. The primary outcome measures were mobility, functioning in activities of daily living (ADL), and social participation. The secondary outcome measures were fear of falling, cognition, disability, and number of falling persons.

The outcome measures of this study were based on the scope of OT, which is empowering people to participate and engaging them in their occupations of everyday life. The International Classification of Functioning, Disability, and Health (ICF) was used to frame the outcome measures. The ICF is a framework for measuring functioning and disability. It focuses on health condition, body structures and functions, activities, participation, environmental factors, and personal factors<sup>16</sup> (Figure S1).

Primary outcome measures were related to the ICF-components "activity and participation." These are operationalized in mobility, functioning in ADL, and social participation. ADL includes basic (e.g., personal care and

eating) and instrumental (e.g., cooking and cleaning) activities of daily living. We included instrumental activities of daily living (IADL) in this study since these require a higher degree of performance. If no IADL data were available, we included basic activities of daily living (BADL) outcomes. Participation describes involvement in a life situation.<sup>16</sup>

Secondary outcome measures concerned the other ICF-components, fear of falling (component personal factor) and cognition (component body functions and structures). We considered that it could be worthwhile to study cognition in case of active aging. We also studied disability and the adverse outcome number of falling persons. Disability describes the extent to which one feels limited.<sup>17</sup>

To identify the studies of interest, a search from inception of the database to June 2015 was conducted in 6 electronic databases (MEDLINE, EMBASE, The Cochrane Library, CINAHL, PsycINFO, and OTseeker database). The selection of the search terms was based on the inclusion criteria and an exploratory search of relevant literature.

Subject indexing terms as well as free text words were combined as search terms. A hand-search in the reference lists of the included articles was conducted to identify possible additional studies of interest. No language or time restrictions were used (Appendix S1).

All references were downloaded in Reference Manager 12, and duplicates were removed.

Next, 2 review authors independently assessed titles and, where necessary, abstracts of the records identified from the electronic searches, and excluded obviously irrelevant studies. Subsequently, the authors assessed the full text of all remaining studies and screened their eligibility based on the inclusion and exclusion criteria.

If information on population, intervention or outcomes was missing, a search was conducted to identify the study protocols. If there were still data missing, the authors were contacted. If the authors did not respond, the studies were excluded due to missing data. Disagreements were resolved at a consensus meeting.

The data were extracted from the included studies by one of the reviewers. In case of uncertainties another researcher was consulted.

### Assessment of Risk of Bias

Two reviewers independently assessed the methodological quality of each individual study. Discrepancies were resolved through discussion. Risk of bias was assessed both on a study and an outcome level, based upon the Cochrane Collaboration's risk of bias assessment tool.<sup>10</sup> All 6 domains were assessed as having a high, low, or unclear risk of bias using the description as used in the Cochrane Handbook.

Results of the quality assessment were reported using Review Manager 5.3 Software of the Nordic Cochrane Centre, the Cochrane Collaboration, Copenhagen.

### Data Synthesis and Statistical Analysis

Results of multiple studies were pooled where studies were considered to be similar in population, intervention, and outcome measures. For continuous data, we combined the

estimates for each study using the mean difference. For dichotomous data, we combined the estimates for each study using the risk ratio (RR). Binary and continuously outcomes were analyzed with a random-effects model.

No cross-over trials were included. Where a trial comprised more than one target group (e.g., Burton<sup>18</sup>), we only included the group that met the inclusion criterion of the intervention.

Because the outcome measures were based on various assessment tools, we analyzed the assessment tools and drew tables to compare them. Only assessment tools with a comparable outcome measure were used. If results were presented at several points in time, we used the time closest to the end of intervention to pursue maximum congruence.

As a result of the clinical diversity between the studies (intensity and duration of exercise programs, variety in measure instruments), we chose to use a random-effects model. The impact of the type of control intervention (regular intervention and no intervention) was assessed using sensitivity analysis.

For feedback on the content, the pre-final version of the introduction, conclusion and discussion has been presented to experienced experts. Their feedback has been incorporated in these sections.

## RESULTS

### Description of Studies

The results of the search in the 6 databases are outlined in a PRISMA diagram (Figure 1).

### Results of the Search

The electronic search resulted in 10,137 hits. Potentially eligible papers from the electronic search and papers retrieved by hand-searching resulted in 10,140 records, of which 73 were potentially relevant, based on title and abstract. Seventy-three full papers were screened for eligibility and explored on missing data. The main reason for excluding studies was absence of the components of the OT intervention or no OT included. Twelve articles were selected, of which 5 included all the required data. For 4 articles more data was found and explored in a separate study protocol. For 3 articles the required additional information was not found. For these, the authors were contacted. All authors responded. In 2 of these researches, OT was not included or the occupational therapist was only marginally involved. One researcher sent additional

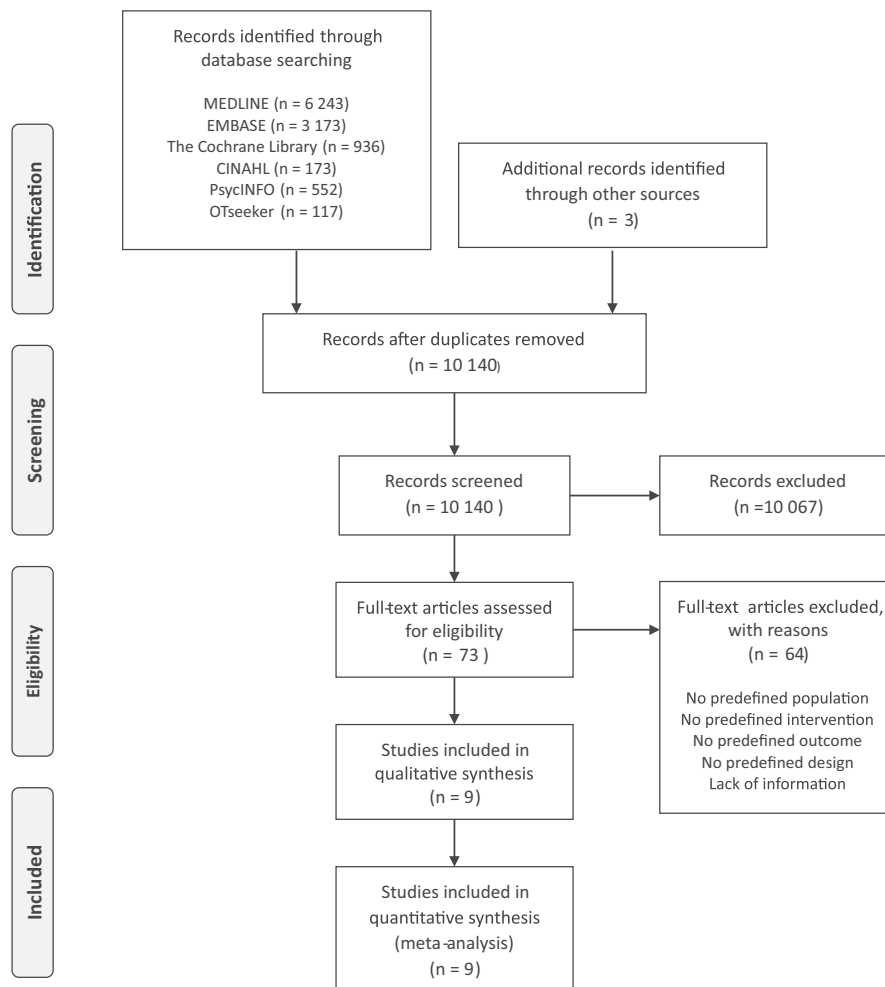


Figure 1. Flow chart of search for relevant Randomized Controlled Trials.

information, but this did not include the necessary data. Finally, 9 studies met all inclusion criteria (Appendix S2).

**Risk of Bias in Included Studies**

The risk of bias for the individual studies is shown in the “Characteristics of included studies” figure (Figure S2). Overall, the studies were of reasonable quality with low risk of bias, except for performance bias.

Random sequence generation and allocation concealment was done in all studies with good quality. Only one study received a moderate score on random sequence generation, because of limited information on how randomization was performed.<sup>19</sup> Blinding of outcome assessment was well performed in 7 of the 9 studies. In one study, the researcher who did the follow-up also opened the envelope containing the information regarding group allocation.<sup>18</sup> In another study, the follow-up was done by post survey. In this study, there was no description of blinding of the researchers who sent the questionnaire.<sup>20</sup> The reliability of outcome measures was adequate for 6 of the studies.<sup>18,20-24</sup> In 1 study, the cause of withdrawal was given, but not separately for the control and the intervention group.<sup>19</sup> In another study, the number of withdrawals was mentioned, but not the cause.<sup>25</sup> Reporting reliability was good in 8 of the studies. The study of Close<sup>20</sup> received a moderate score because of incomplete registration of the cause of falling. No other potential sources of bias were found.

**Population**

The included studies randomized a total of 3,163 participants. Study size in accordance with the included outcomes varied from 76<sup>18</sup> to 741<sup>25</sup> participants.

The included population consisted of community-dwelling older people suffering from chronic disabilities. The lower age boundary was 60 years in 1 study, 65 in 4 studies, 70 in 3 studies and 75 in 1 study. One study limited the upper age boundary to 95 years.<sup>21</sup>

The studies clustered the limitations in functionality in “having difficulties with ADL, having a fall risks or both.” Gitlin<sup>26</sup> described the included population as older people in “need for help or difficulties with two IADLs or one or more BADLs.” Markle-Reid<sup>24</sup> described the included population as “eligible for home support services.” Being an older person at risk for falls, was a criterion to be eligible for home support services.

**Intervention**

Seven of the included studies contained multidisciplinary interventions, OT among them. Apart from an occupational therapist, the multidisciplinary team in the primary health care setting included physiotherapists, registered nurses, registered dietitian, social workers, general practitioners, geriatricians, and/or case managers. One study contained a mono-disciplinary OT intervention.<sup>21</sup> In one study, the team only consisted of an occupational therapist and a general practitioner.<sup>20</sup>

The frequency of interventions differed. Four programs kept to a predetermined number of sessions. The “Stepping on” program consisted of 7 OT interventions of 2 hours, 1 follow-up and 1 booster session.<sup>19</sup> The “Life” approach consisted of 5 OT home visits, 2 booster visits, and 2 follow-up phone calls.<sup>22</sup> The OT intervention of the PROFET-study was limited to one OT intervention within seven days after a fall.<sup>20</sup> The study of Gitlin<sup>26</sup> consisted of 5 OT visits of 90 minutes and 1 follow-up phone contact. Three other programs were tailored.<sup>18,21,24</sup> The median number of visits in the study of Markle-Reid<sup>24</sup> was 4. The studies of Counsell<sup>25</sup> and Davison<sup>23</sup> did not specify the number of OT interventions.

All the OT interventions were individual interventions at home, whether or not supplemented with a group session. Individual OT interventions consisted of assessment, education and information, prevention strategies, exercises, use of assistive technology, home hazard modification, advice on aids and services, coaching, and/or follow up session (Table S1).

The OT approach was characterized by client-centeredness, empowerment, education/information, embedding within meaningful activities, and collaboration (Table S2).

**Effects of Interventions**

The number of analyzed studies per predefined outcome depended on the availability of data for that specific outcome measure.

“Functioning in ADL” was reported in 6 studies.<sup>18-20,22,25,26</sup> If both BADL and IADL records were available, the IADL data were selected because IADL requires a higher level of performance. Functioning in ADL scores were available for 1841 participants.

The pooled Standardized Mean Difference (SMD) for functioning in ADL was -0.30 (95% CI -0.50 to -0.11). There was considerable heterogeneity in this analysis ( $I^2 = 74\%$ ).

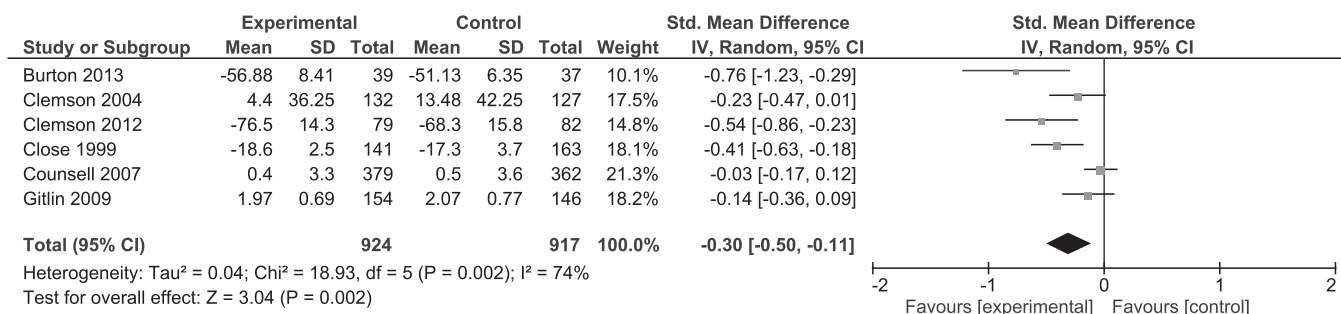


Figure 2. Forest plot of comparison “functioning in activities of daily living.”

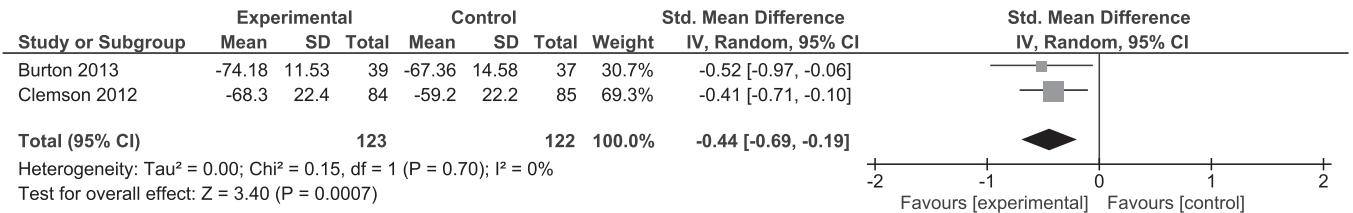


Figure 3. Forest plot of comparison “social participation.”

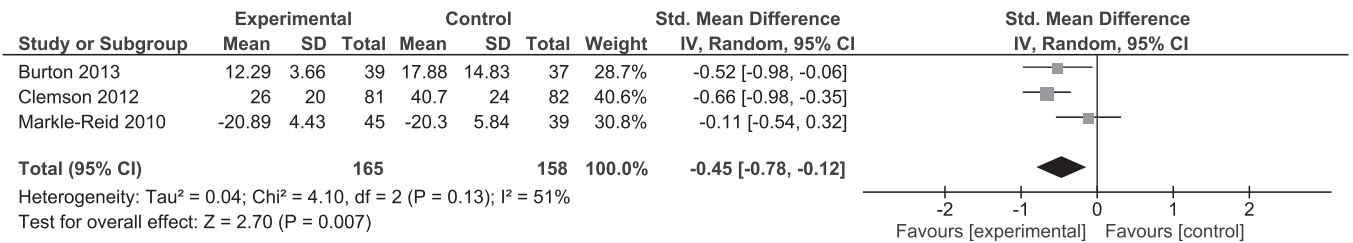


Figure 4. Forest plot of comparison “mobility.”

In the study of Counsell,<sup>25</sup> an occupational therapist was only included in case of reporting fall(s) at baseline. Excluding this study results in an improvement of the pooled SMD to  $-0.36$  (95% CI  $-0.55$  to  $-0.18$ ). Heterogeneity decreased to 55% (Figure 2).

The outcome “social participation” was present in two articles, resulting in 245 participants.<sup>18,22</sup> Records of the Long Life Disability Index—subtest limitation and of the Life Space Index were used.

The pooled SMD for “social participation” was  $-0.44$  (95% CI  $-0.69$ ,  $-0.19$ ). There was no heterogeneity in this analysis ( $I^2 = 0\%$ ) (Figure 3).

Three studies reported on the primary outcome “mobility,” resulting in 323 participants.<sup>18,22,24</sup> If trials recorded the Tinetti Performance Oriented Mobility Assessment (POMA), this was used for analysis. If this test was not available, an alternative scale that could be linked to the subtest “gait” of the POMA was accepted.

For the outcome “mobility” the pooled SMD was  $-0.45$  (95% CI  $-0.78$  to  $-0.12$ ). There was moderate heterogeneity in this analysis ( $I^2 = 51\%$ ) (Figure 4).

The secondary outcome measures were fear of falling, cognition, disability and the number of falling persons.

“Fear of falling” was included in 5 studies, resulting in 1,008 participants. If trials recorded the (Modified) Falls Efficacy Scale (FES) for measuring fear of falling, this was used for analysis.<sup>18,19,23,24,26</sup> In one study, the Activities Specific Balance Confidence scale (ABC) was used.<sup>23</sup>

The pooled SMD for “fear of falling” was  $-0.17$  (95% CI  $-0.29$  to  $-0.05$ ). There was no heterogeneity in this analysis ( $I^2 = 0\%$ ) (Figure S3).

Cognition was measured by 2 studies, with a total of 445 participants. To measure cognition the subpart “delayed recall” of the Consortium to Establish a Registry of Alzheimer’s Disease or the Standardized Mini Mental State Examination was used.<sup>21,24</sup>

The pooled SMD for cognition was  $-0.09$  (95% CI  $-0.28$  to  $0.09$ ). There was no heterogeneity in this analysis ( $I^2 = 0\%$ ) (Figure S4).

Disability scores were available for 235 participants from 2 trials.<sup>18,22</sup> The Late Life Disability Scale recorded the degree of disability.

The pooled SMD for disability was  $-0.19$  (95% CI  $-0.45$  to  $0.06$ ). There was no heterogeneity in this analysis ( $I^2 = 0\%$ ) (Figure S5).

It is not desirable to pool the outcome “number of persons who fell at least once” because of substantial difference in interventions. Both Close<sup>20</sup> and Davison<sup>23</sup> report a reduction in the risk of falls, with a substantial risk reduction in falls of 38% and a risk reduction of 11% (Figure S6).

## DISCUSSION

### Summary of Main Results

This review summarizes the evidence on effectiveness of a home- and community-based approach including OT for frail older people. It shows that OT contributes to the improvement of functioning in ADL, social participation and mobility. Fear of falling was decreased through an approach that included OT. Studies on OT interventions reported beneficial effects of empowerment and the use of meaningful activities.<sup>21,22</sup>

These results are tentative because the types of interventions reported in the studies varied considerably. However, this is inherent to OT because a high quality OT intervention takes into account a number of characteristics of which “client centered” and “tailored made” are two. For this reason OT interventions will vary because they are tailored to the personal and environmental characteristics and will therefore rarely be rigidly prescribed.

Given that the older population increasingly prefers to remain in their home environment as long as possible it may be worthwhile investing more in home- and community-based OT. Besides the positive impact on autonomy and wellbeing of the older people, Beland showed that an

integrated approach, with the occupational therapist as one of the actors, is also advantageous in that it reduces costs of hospitalization and residential care.<sup>27</sup>

The most effective outcomes were related to the ICF-components "activity and participation." Increased social participation and increased ADL are also clinically relevant. Social participation has been associated with a range of health and socio-economic factors, such as the number of peripheral joint pains, the number of health problems, cognitive impairment, anxiety, and depression.<sup>28</sup> Independence for preparing meals improved by more than 50% in the intervention group versus the control group and independence in bathing by nearly 50%.<sup>26</sup>

We found positive results for the secondary outcomes of cognition and disability, and on the number of falling persons. However, these differences did not reach statistical significance. This may be due to a lack of power as only two studies reported these outcomes. Also for the outcome cognition, the outcome measure may lack sensitivity for this population. A longitudinal study of the MMSE in normal aging concluded that the MMSE score declined very slightly in persons not suffering from dementia. The MMSE is also more prone to ceiling effects than, for instance, the Montreal Cognitive Assessment or Brief Cognitive Rating Scale.<sup>12,13,29,30</sup> Using the MMSE might not be the best choice to detect changes in cognition on short term or to determine changes in cognition at a younger age. It makes sense to select a more sensitive test to measure changes in cognition on short term and in young old.

### Quality of the Evidence

While the methodological quality of the included trials was generally good, trials of OT interventions are subject to several potential methodological limitations. A common problem in research on OT interventions is the inability to blind therapists and patients. OT interventions, such as home adaptations, are always visible to patients receiving the intervention. For this reason, blinded studies of this type of intervention are not available.

A second problem concerns the complexity of approaches to chronic diseases. Köpke and McCleery<sup>31</sup> have pointed out that there is complexity in the intervention components as well as in the theoretical background of the intervention, the implementation context, and the targeted outcomes. For those reasons, it is a real challenge to accumulate the evidence for complex interventions.<sup>32</sup> Occupational therapists most often work in a complex chronic care context, such as treating frail older people.

This study included only high-quality trials and for this reason, some outcomes were underrepresented.

### Potential Biases in the Review Process

Lack of information in the studies was supplemented with information from the retrieved study protocols. If these were not available or if insufficient information was given, the author was contacted. If it was not possible to retrieve the missing data, the article was excluded.

## CONCLUSION

This systematic review provides strong evidence that OT moderately improves functioning in community-dwelling physically frail older people.

### Implications for Practice

The issue of the physically frail older person mostly requires an inter-professional approach. In this review, inter-professional collaboration was embedded in 8 out of 9 interventions.

Client-centeredness was embedded in 7 out of 9 interventions. The frail older person and their caregivers should be consulted during the different phases of the intervention. To support frail older persons and their caregivers in making the right decision, they need to be informed and, if necessary, trained. Shared decision-making involves both goals and interventions. Objectives and treatment plan should be decided on together with the frail older person and his environment. Proposed activities should be meaningful. A shared decision-making process should ensure empowerment of the frail elderly and their environment, as well as increased compliance.

### Implications for Research

A large-scale trial on OT for complex chronic interventions is recommended. Further research is required to elucidate the barriers, facilitators and preconditions for implementing such a complex approach. To gain insight in this goal, the outcome of this research will be used to study the perception of older people on their functioning. Gaining this insight might help the occupational therapist in order to increase adherence, which is a big issue in the approach of complex chronic diseases.

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**Conflicts of Interest:** All authors got no support from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

**Author Contributions:** LDC was responsible for the study concept and design, wrote the review protocol, reviewed articles for inclusion, performed a critical appraisal of the included articles, carried out the data extraction, and drafted the manuscript under supervision of the other authors. GEB provided statistical support, contributed to the analysis, interpretation and presentation of data, and conducted a critical revision of the manuscript. LB reviewed the articles for inclusion as a second independent researcher. AD contributed to the critical revision of the

manuscript. MJLG performed a critical appraisal of the included articles as second independent reviewer and contributed to the critical revision of the manuscript. BA contributed to the study design, presentation of the data and performed a critical revision of the manuscript. All people contributed to the work have been listed.

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**Transparency Declaration:** The lead author (the manuscript's guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

**Appendix S1.** Search strategy.

**Appendix S2.** Excluded articles with reason for exclusion.

**Table S1.** Components of the intervention.

**Table S2.** Occupational therapy approach.

**Figure S1.** ICF-framework of WHO.

**Figure S2.** Qualitative appraisal of included articles.

**Figure S3.** Forest plot of comparison “fear of falling.”

**Figure S4.** Forest plot of comparison “cognition.”

**Figure S5.** Forest plot of comparison “disability.”

**Figure S6.** Forest plot of comparison “number of persons who fell at least once.”

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