Supporting independence and function in people living with dementia

A technical guide to the evidence supporting reablement interventions.

Second Edition

COGNITIVE DECLINE PARTNERSHIP CENTRE

HammondCare Champion Life

Suggested citation: O'Connor CM, Poulos CJ, Gresham M, Poulos RG. *Supporting independence and function in people living with dementia, A technical guide to the evidence supporting reablement interventions* (2nd Edition). Sydney: HammondCare, 2019.

A catalogue record for this book is available from the National Library of Australia

ISBN 978-0-6483387-4-1

Cover design: Melissa Summers of SD Creative

Funding and acknowledgements

This project was funded by the National Health and Medical Research Council (NHMRC) Partnership Centre for Dealing with Cognitive and Related Functional Decline in Older People. The opinions reflected in this document do not necessarily reflect the views of the Funding Partners of the Partnership Centre. The project was a partnership between HammondCare, University of New South Wales, Brightwater Care Group, Helping Hand Aged Care, Dementia Australia, and the Department of Health. The team comprised a range of researchers, clinicians, policy makers, aged care providers, and also people impacted by dementia, both people living with dementia and the people supporting them. Collaboration with consumers has been an important element of the process, ensuring its relevance.

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BACKGROUND

Purpose of this *technical guide* and the accompanying *sector handbook*

This document, *Supporting independence and function in people living with dementia - A technical guide to the evidence supporting reablement interventions*, provides a detailed synthesis of the published research evidence on reablement interventions for people living with dementia. The *technical guide* also explains the methodology used in developing the reablement programs described, an overview of the included studies, and a full reference list.

The *technical guide* builds upon those sections of the Cognitive Decline Partnership Centre *Clinical Practice Guidelines and Principals of Care for People with Dementia*[1] that dealt with the evidence for interventions that could delay the onset of functional decline, or improve functioning and quality of life for people living with dementia. Also included are studies that post-dated the research reported in the CDPC publication.

The *technical guide* is particularly intended for the clinician who wants to understand the evidence behind the reablement programs that they might be considering. The accompanying *sector handbook* is directed more towards service providers, clinicians who want to gain a broad understanding of the types of reablement programs that could be offered to people living with dementia, and to policy makers. The *sector handbook* is also a resource for people living with dementia, and their family members and support persons. The *sector handbook* is cross-referenced to this *technical guide* for those who seek further information.

Also available is a *consumer information booklet*, which provides accessible information to assist people living with dementia, their family members and support persons to make better informed decisions around their care, and about reablement programs in particular.

The *technical guide*, *sector handbook* and *consumer information booklet* can be downloaded from **hammond.com.au/reablement**

To whom do the interventions apply

The interventions outlined in the *technical guide* and *sector handbook* are intended for people living with dementia who are able to participate in the programs described. The research on which these two documents are based included people across the mild, moderate and severe stages of dementia, but the majority of studies involved people living with mild to moderate dementia. Where described in the original research studies, the *technical guide* makes reference to the applicable stage of dementia when outlining the programs. Because it has been widely used in the literature, Mini Mental State Examination (MMSE) scores (when available) were used to rate dementia stage, as this was the most consistently used measure across the studies. The stages of dementia based on MMSE scores (rated out of 30) were: severe (0-10), moderate (11-20), mild (21-25), and questionable (26-29).[2]

The major types of dementia reported in the research included in the *technical guide* were: Alzheimer's disease, vascular dementia, mixed dementia, dementia with Lewy bodies, and frontotemporal dementia. The research studies included people with later onset (onset >65 years) and younger onset (onset <65 years) dementia. Some of the research also included family members/support persons or care support workers as participants. Where these cohorts were involved in the research, this was described in the relevant programs.

ABBREVIATIONS

ABC	Antecedent, behaviour, consequences
AD	Alzheimer's disease
ADAS-Cog	Alzheimer's Disease Assessment Scale – Cognitive
ADL	Activity of Daily Living
CDPC	Cognitive Decline Partnership Centre
CI	Confidence interval
EP	Exercise physiology/physiologist
IADL	Instrumental Activities of Daily Living
MMSE	Mini-Mental State Examination
Neuropsych	Neuropsychologist
NHMRC	National Health and Medical Research Council
OT	Occupational therapy/therapist
Psych	Psychologist
PT	Physiotherapy/therapist
RCT	Randomised controlled trial
RN	Registered nurse
SMD	Standardised mean difference
SP	Speech pathology/pathologist
SW	Social worker
WHO	World Health Organisation

GLOSSARY

Term	What the literature says
Activities of Daily Living (ADLs)	ADLs are the varying tasks that we all complete on a daily basis. ADLs are made up of basic ADLs, referring to self-care activities such as bathing, dressing, toileting, and eating; and instrumental ADLs, referring to the more complex tasks we undertake such as organising finances, shopping, or cooking. The ability to engage in ADLs defines the level of independence we have to live in the community.[3, 4] ADLs may also be referred to as everyday living activities, everyday activities/abilities, daily activities. The term 'everyday living activities' is used in the *technical guide*, *sector handbook* and the *consumer information booklet* to describe ADLs.
Aged Care Assessment Team (ACAT) - NSW Aged Care Assessment Service (ACAS) – VIC	ACAT/ACAS teams consist of medical, nursing and allied health professionals. They provide assessment and assistance for older people to access appropriate community or residential services and support. An ACAT assessment is usually a once only visit. Outcomes of the ACAT/ACAS assessment include development of an individualised support plan, approval for appropriate level of community support services or residential care, and referral for services as appropriate.[5, 6]
Assistive technology; Enabling technology	Assistive technology refers to anything that helps a person to carry out their everyday activities more easily or more safely. Assistive technology can be low tech, for example a walking stick or shower chair, or high tech such as a GPS supported tracking device.[7]
Carer / caregiver	A carer is a person who provides unpaid care and assistance to a person who has limitations in their independence. A carer is often a family member, but may also be a friend or neighbour. The terms 'family member', 'support person', 'family carer', 'care giver' or 'informal carer' are sometimes used.[8, 9] 'Carer' is more commonly used in the research, however, in order to comply with the Dementia Language Guidelines (Dementia Australia), we have used the term 'family member' where possible.
Case manager / coordinator	A case manager assists their clients to access the appropriate services required to achieve their goals. Case management involves identification of goals, planning of care, coordination of services and monitoring and follow-up of progress.[10]
Cognition	Cognition refers to the mental processes of taking in information, understanding it, storing it, and then being able to use that information in everyday life. Cognition is an umbrella term that refers to a range of mental processes that are critical for everyday life; it helps us to understand and interact with the world around us. Cognition is made up of a range of cognitive functions. General cognitive tests usually cover a combination of these, e.g. attention, memory, language, visuospatial abilities. Another cognitive area that is commonly tested in dementia is executive function, which involves mental flexibility, planning, and inhibition.[11]
Cognitive rehabilitation	Involves the identification of personally meaningful goals, and uses a person-centred approach to implement strategies that address these goals. Usually conducted in an individual setting with the therapist and person with dementia, or may involve both members of the dyad (person with dementia and family member). Primarily uses a compensatory approach to address functional changes in order to improve or support everyday function.[12]
Cognitive stimulation	Involves a variety of different activities (e.g. group discussions on a varying topics/themes, word jumbles or picture puzzles) to stimulate a broad range of cognitive areas, rather than focusing on one specific cognitive function (see cognitive training). Usually involves group activities with a large focus on social engagement.[12]

Cognitive training	Involves the repeated practise of a set of standardised tasks with a focus on a specific cognitive function such as attention, memory or language. May be conducted in an individual or group setting, with computer-based or paper-pencil exercises. Task difficulty is selected according to the ability of the person.[12]
Commonwealth Home Support Programme (CHSP)	The CHSP is an entry-level program for older people who need assistance, aimed at providing support to maintain independence in the community and remain living at home.[13]
Communication	Communication involves the exchange of information via talking, listening, attitude, tone of voice, facial expressions and body language. Communication difficulties can occur when a person has dementia; these challenges may involve: finding the right words, making sense, articulating words/sentences, maintaining train of thought, understanding what is said to them, writing and reading, expressing emotions appropriately, knowing when to talk during a conversation, and speaking less often.[14, 15]
Consumer directed care (CDC)	Consumer directed care refers to the ability for consumers who receive a Home Care Package to take control over the types of services and care they receive, who provides them, and when. The aim of CDC is to give consumers more power in managing the services they receive, and ensure that service providers work collaboratively with consumers to develop and maintain individual care plans.[16]
Dementia	Dementia refers to a collection of symptoms that may be caused by a range of different conditions that affect the brain. The most common cause of dementia is Alzheimer's disease. Other causes may include vascular dementia, Parkinson's disease, or frontotemporal dementia, to name a few. Dementia results in changes to brain function, thinking, behaviour, and the ability to carry out everyday tasks. Dementia is often described as progressing over a range of stages: early/mild, moderate, and severe/advanced. Not all symptoms or stages occur for every person, and there may be overlap of symptoms between these stages. Nonetheless, considering the stages of dementia can often help with treatment and care planning.[17, 18]
Dyad	The term dyad refers to a pair of people. Most often in dementia research, a dyad refers to two people who are married.[19]
Enablement	The aim of enablement is to identify and support a person's capacities and provide opportunities for them to have and maintain control over their own life and experiences. The enablement process involves periodic provision of services (e.g. reablement, restorative care, rehabilitation) to regain lost function resulting from an illness or injury.[20, 21]
Environment	The environment refers to the factors around us that influence the way in which we are able to participate in daily activities. Environment is made up of a range of factors: • Physical: spaces and objects e.g. building design, lighting, sound, furniture • Social: social groups or ways of doing things e.g. social expectations, level of support available, people available to provide support (e.g. spouse or neighbour) • Cultural e.g. ethnicity, cultural norms • Economic e.g. service availability, funding[22-24]
Evidence-informed practice	Evidence-informed practice refers to using a range of information sources in a creative and flexible way to guide intervention development, whereas evidence-based practice requires a stricter adherence to specific research protocols.[25, 26]
Executive function	Executive functions refer to a collection of cognitive abilities used to coordinate other cognitive abilities and behaviours. They are made up of a range of cognitive processes including: attention, planning, problem-solving, flexibility of thinking, initiating actions, regulating emotions, reasoning and decision making.[27]

Exercise	Exercise is planned, structured and repetitive physical activity (any body movement that uses the muscles and energy) engaged in for the purpose of maintaining or improving physical fitness.[28]
Exercise physiologist (EP)	Allied health professionals with expertise in the design, delivery and evaluation of safe and effective exercise interventions for people with a range of health/medical conditions.[29]
Fall	A fall is an unexpected event (e.g. a slip or trip) in which the person lost balance and ended up on the floor, ground or lower level.[30]
Functional ability	Functional ability refers to a person's ability to engage in everyday activities within a range of life situations. Functional ability is central to a person's independence and ability to participate in all contexts from family to community.[31, 32]
Functional exercise	Exercises designed to make it easier to do every day activities. Functional exercises involve whole body movements to simulate how the body would perform when doing a specific task, e.g. doing squats to improve the ability to transfer from sitting to standing.[33]
Home Care Packages (HCP)	A HCP provides a package of care, services, and case management to support older people to live independently in their own homes. A HCP provides more comprehensive services for people with higher needs than the Commonwealth Home Support Programme. In order to access a HCP, an ACAT/ACAS assessment is required to confirm the level of support required. There is flexibility in who you choose to deliver the care through your package (see 'consumer directed care').[34]
Home modification	As a person's abilities change (e.g. through ageing or conditions such as dementia), changes to the home may be necessary to support that person in remaining independent and living in their own home. Home modifications vary depending on the individual needs of each client, but may range from simple changes such as moving furniture or installing grab rails, to more complex modifications such as making changes to bathrooms or installing ramps. Home modifications are usually based on a detailed occupational therapy assessment, with the modifications carried out by a building contractor. In some cases home modifications may need to be self-funded, while in other cases, funding assistance may be accessed through Government schemes such as the Commonwealth Home Support Programme or the National Disability Insurance Scheme.[35]
Implementation fidelity	Implementation fidelity refers to ensuring an intervention or program is provided in the way it was intended to be delivered. Appropriate monitoring procedures are important to ensure implementation fidelity is maintained.[36]
Independence	Independence refers to being autonomous and self-reliant. It is a personal construct that is made up of an interplay between personal and environmental factors. Personal factors include autonomy, control, function, and personal attributes, while environmental factors include culture, safety, context and environment.[37, 38]
Intervention	An intervention is a strategy or collection of strategies implemented with the aim to maintain, improve, promote or modify a person's functioning or health. Depending on the aim, an intervention may be conducted by a broad range of professionals.[39]
Memory	Memory refers to the storing of information (e.g. about recent or past events) that can later be accessed/retrieved as required. This is called episodic memory, but there are also other types of memory, such as semantic memory (general knowledge and facts about what things are), working memory (the process of using memory to carry out a task such as remembering a phone number or to hold onto a piece of information in the short term), or procedural memory (the ability to learn how to do tasks such as tying shoelaces). Dementia can affect these different memory processes, with some types of dementia more commonly associated with difficulties in specific areas, for example, people with Alzheimer's often have difficulty with short-term episodic memory early in the disease.[40]

Mild cognitive impairment (MCI)	Changes to mental function and/or memory that are greater than would be expected with normal ageing, but are not severe enough to interfere with everyday activities. Some people with MCI progress to developing dementia, while others do not.[41, 42]
Multidisciplinary team	A multidisciplinary team involves professionals from a range of health disciplines working together to deliver a comprehensive approach to care. Multidisciplinary teams allow for improved outcomes for the client as their needs may be more holistically met, and better use of resources for service providers.[43, 44]
National Aboriginal and Torres Strait Islander Flexible Aged Care (NATSIFAC)	A funding program for organisations to provide quality culturally appropriate care to older Aboriginal and Torres Strait Islander people near to their home and communities. The program allows for flexible care through a range of home care and residential care services depending on the needs of the community.[45]
National Disability Insurance Scheme (NDIS)	The NDIS aims to support people younger than 65 with a permanent and significant disability to live 'an ordinary life'. The program assists with personal care and support, community access, therapy services and equipment.[46]
Occupational therapist (OT)	Allied health professionals with expertise in helping people to participate in their activities of daily life. These activities may range from work, hobbies, or social events, to everyday activities such as bathing, dressing or toileting. OTs work in a person-centred manner adjusting environments, tasks, or helping clients develop skills required to achieve their goals.[47]
Physical functioning	Physical functioning involves aspects of a person's physical performance such as strength, mobility, balance, coordination, endurance, walking speed and range of movement.[48, 49]
Physiotherapist (PT, physio)	Allied health professionals with expertise in helping people to get better from a wide range of movement disorders and health conditions. PTs assess, diagnose and treat people to help repair damage, reduce pain and stiffness, increase mobility and improve quality of life.[50]
Program	A collection of strategies or interventions designed to address a specific aim.[51]
Psychologist (psych)	Allied health professionals with expertise in assessing, diagnosing and developing strategies/treatments for a range of problems, which may include those associated with mental processes, cognition or behaviours. Psychologists offer support and guidance across a wide range of public and private settings.[52]
Reablement	"Reablement involves time-limited interventions that are targeted towards a person's specific goal or desired outcome to adapt to some functional loss, or regain confidence and capacity to resume activities."[53]
Regional Assessment Service (RAS)	The RAS conduct in-home assessments to determine eligibility of people to access Commonwealth Home Support Programme (CHSP) services. RAS Teams operate in regional areas across Australia (except WA until WA comes under the CHSP Programme on 1 July 2018). Outcomes of the RAS assessment include a goal-oriented support plan for the client, and referral to appropriate services.[5]
Registered nurse (RN)	Allied health practitioners who provide nursing care. RNs are university qualified and have met the standards for registration with the relevant national standards registration board.[54]
Rehabilitation	Process of helping people to recover from an incident such as injury, illness, surgery, or an ongoing health condition. The goals of rehabilitation are based on each individual person, and therapy may be provided by a range of professionals as appropriate.[55]
Restorative care	"Restorative care involves evidence-based interventions led by allied health workers that allow a person to make a functional gain or improvement after a setback, or in order to avoid preventable injury."[53]
Short Term Restorative Care (STRC)	STRC is a time-limited service (provided over 8 weeks) that aims to support older people to continue living independently in their homes and delay the need for long-term care. The program provides a range of

	services to assist people with completing everyday activities e.g. speech therapy, podiatry, dietetics, nursing, continence management, occupational therapy, physiotherapy etc. STRC is subsidised by the Australian Government, but if you are able, you are expected to contribute to the cost of the services. Services may be provided by a range of providers across all Australian states and territories, which are listed on the My Aged Care website: https://www.myagedcare.gov.au/short-term-restorative-care/accessing-short-term-restorative-care [56]
Social worker (SW)	Allied health professionals with a focus on improving human wellbeing by addressing any external factors that may limit the person's wellbeing at both a personal and social level. Social workers may undertake a range of roles such as case management, advocacy, counselling, community engagement and development.[57]
Speech pathology (SP)	Allied health professionals with expertise in diagnosing and treating communication disorders, ranging from difficulties with speaking, understanding language, methods of communication, and swallowing.[58]
Support worker / care worker / Care staff	Provide direct care to people who need support with their everyday living activities. Care support workers can work with people living at home in the community or living in residential care, in tasks ranging from shopping to personal care.[59, 60]
Transition Care	Transition care provides short term care after a stay in an acute hospital that aims to assist older people in recovery and to provide support in decisions regarding long-term living arrangements. Transition care focusses on individual goals and provides access to a package of services e.g. physiotherapy, nursing, personal care and social work.[61]
Wellness	"Wellness is an approach that involves assessment, planning and delivery of supports that build on the strengths, capacity and goals of individuals, and encourage actions that promote a level of independence in daily living tasks, as well as reducing risks to living safely at home."[53]

Interpreting the research and terminology

Each program within the *technical guide* is based on a detailed review of the evidence from systematic reviews, meta-analyses and randomised controlled trials. Where aspects of 'effective' interventions are reported, this refers to interventions from studies that showed statistically significant positive results.
For further information on the outcome measures described in the included research studies, refer to Appendix 2: List of assessments used across the research.

A brief guide to some of the statistical terminology:

Term	Explanation
Bias	Bias in research refers to any factor that may influence the outcomes to generate false or misleading conclusions. Bias may be introduced at any phase of the research, from study design, data collection, analysis, interpretation, and publication. Bias is nearly always present in published research to some degree, therefore it is up to the reader to recognise the level of bias that may be present within a study, and to interpret the research findings accordingly. Refer to p.13 of the *technical guide* for further details on the bias assessment process.[62-64]
Confidence Interval (95% CI)	A range of values that encompass the true value of the result. The CI is usually set at 95%, meaning that we can be reasonably certain that the true value of the result falls within this interval, with 5% chance of being wrong. A narrower confidence interval suggests a more significant result, while a wide confidence interval suggests more uncertainty in the result.[65, 66]
Effect size	Effect size represents how big the difference is between two groups.[67, 68]
I^2	Provides an indication of the variation between studies. A high I^2 (i.e. > 50%) could indicate substantial heterogeneity between studies, meaning pooled results could be impacted by imprecision.[69]
Meta-analysis	The process of combining and analysing analyses from a range of smaller studies to generate a better understanding of the effect of the intervention or variable of interest.[70, 71]
Randomised Controlled Trial (RCT)	An RCT is a research study designed to test the effects of a particular treatment or intervention in a population, by comparing the intervention group with a control group that has not received the intervention.[72]
Statistical significance, p-value	The p-value is the result of a statistical test. If the p-value falls below a pre-defined limit (usually $p<.05$), the results are deemed to be 'statistically significant'. The p-value informs whether there is a difference between groups, and the 'effect size' provides information on how big the difference between groups is.[65, 68]
Standardised Mean Difference (SMD)	A measure of effect size used to determine the size of difference between two groups. Calculated by comparing the amount of change or improvement post intervention between groups. The two most common statistics used to calculate SMD are Cohen's d and Hedges g. Calculating SMD for different studies means that they can be directly compared using the SMD values, i.e. an SMD from a specific outcome in one study is directly comparable to an SMD from that same outcome from another study. The following have been suggested as guidelines for interpreting SMD values: SMD = 0.2 (small effect), SMD = 0.5 (medium effect), SMD = 0.8 (large effect).[67, 73, 74]
Systematic review (SR)	The process of collating evidence from a range of studies that fit within pre-specified criteria to answer a defined research question. A SR involves a systematic search of the evidence with the aim of identifying all existing studies that fit within the pre-specified criteria, a systematic assessment of the research quality, synthesis and presentation of the data. The aim is to minimise bias and provide more reliable findings than could be taken from the individual studies alone.[71, 75]

METHODOLOGY

The *technical guide* was developed following the publication of the *CDPC Clinical Practice Guidelines and Principals of Care for People with Dementia ('CDPC Guidelines')*.[1] The aim of the *technical guide* was to 'operationalise' the evidence on reablement for service providers, policy makers, and people living with dementia and their support persons. The *technical guide* was developed through a comprehensive process involving review of existing systematic reviews included in the *CDPC Guidelines*, updating of the evidence where available, assessment of the quality of the evidence, consultation with the project team and consumers, and synthesis of the research to form evidence-informed reablement program recommendations.

The evidence-base for reablement interventions for people with dementia is still in its infancy. Consequently, the evidence in support of a number of reablement interventions is of low quality or remains inconclusive at this time, and more high quality trials are called for. A summary of the current state of the evidence for each reablement intervention is provided in the *technical guide* under the heading '*What does the research tell us?'*

However, for service providers and for people living with dementia, guidance on what might be beneficial is being sought now. Therefore, the programs in the *technical guide* are described as 'evidence-informed' rather than evidence-based, as each program is a synthesis of the best-quality available evidence from a range of studies that have shown statistically significant positive results. Evidence-informed practice refers to using a range of information sources in a creative and flexible way to guide intervention development, whereas evidence-based practice requires a stricter adherence to specific research protocols.[76, 77] Of course, as new evidence comes to light, modifications to the programs within the *technical guide* (and the *sector handbook*) may become necessary.

Program selection

The aim of the *technical guide* is to present practical, evidence-informed reablement programs to improve function in people living with dementia. The CDPC Guidelines were searched, and relevant recommendations pertaining to maintaining or improving function were extracted. Consultation with the project team and consumer consultants drove the selection of the final eight programs included in the *technical guide*. At the beginning of each program, relevant recommendations from the CDPC Guidelines are also shown, and the updated evidence base described.

The eight programs are grouped according to three outcomes – i.e., supporting everyday living; supporting mobility and physical function; and, supporting cognition and communication. The following programs form the content of the *technical guide* and *sector handbook*:

Supporting everyday living activities through:

1. an occupational therapy program
2. an exercise program
3. a cognitive program

Supporting mobility and physical function through:

4. a falls prevention program
5. an exercise program

Supporting cognition and communication through:

6. an exercise program
7. a cognitive program
8. a communication program

Review of the literature

The CDPC Guidelines were developed through a comprehensive systematic review process including data until 2014. A further review of the literature for relevant studies not included in the CDPC Guidelines and of more recent studies, was conducted to update the evidence. The review protocol was set to only include data from the highest level evidence available (according to the NHMRC evidence hierarchy[78]), including systematic reviews, meta-analyses, and randomised controlled trials (RCTs) that fit within the scope of the project. Where an evidence-based recommendation from the CDPC Guidelines was directly associated with a program from the *technical guide*, a new search was conducted for studies published between 2014 and 2017. For programs that did not directly relate to an evidence-based recommendation from the CDPC Guidelines, a search was conducted for the most recent and highest quality systematic reviews. Once identified, the systematic reviews were assessed for quality using the AMSTAR tool,[79] and an updated search was then conducted to locate any more recent studies not included in that systematic review search period.

Inclusion and exclusion criteria

Inclusion and exclusion criteria used for the data collection comprised the following:

- The highest level of evidence according to the NHMRC evidence hierarchy[78] was included: meta-analyses, systematic reviews, and RCTs.
- Studies investigating an intervention aimed at improving function (i.e. physical function, everyday function, cognitive function, communication) were included.
- Studies that involved people with a diagnosis of dementia were included.
- Studies solely investigating healthy older adults, people with mild cognitive impairment or delirium were excluded.
- Studies based in hospital, and acute or formal rehabilitation settings were excluded.
- Studies involving solely a pharmacological intervention were excluded.

Search terms and search strategies

A range of electronic databases were searched: Medline (via Ovid), Cinahl (via Ebsco), Embase (via Ovid), PsychINFO (via Ovid), and the Cochrane database for systematic reviews. The evidence update included studies published between 2014 and 2017, but the specific date range varied according to each program and the years included in the respective systematic reviews.

Different combinations of MeSH terms and keywords were used depending on the database being used. The range of search terms used were as follows:

Model of intervention (searched with OR) MeSH terms: rehabilitation, transitional care, subacute care, wellness, enabling Keywords: reablement, restorative care, enablement, wellness, intermediate care, subacute care, transition care, rehabilitation
Dementia (searched with OR) MeSH terms: dementia, Alzheimer disease, Alzheimer's disease, vascular dementia, dementia vascular, dementia multi-infarct, multiinfarct dementia, frontotemporal lobar degeneration, Pick disease of the brain, Pick presenile dementia, Pick's disease, frontotemporal dementia, primary progressive nonfluent aphasia, aphasia primary progressive, semantic dementia, corticobasal degeneration, Huntington disease, Huntington chorea, Kluver-bucy sundrome, dementia with Lewy bodies, Lewy body disease, diffuse Lewy body disease, Lewy body dementia, senile dementia, presenile dementia

Therapy (searched with OR)
MeSH terms: ability level, activities of daily living, activity level, assistive technology, brain training, cognitive ability, cognitive impairment, cognitive rehabilitation, cognitive remediation, cognitive stimulation, cognitive therapy, consumer participation, daily activities, daily life activity, exercise, exercise physiology, exercise therapy, functional status, independence, intervention, kinesiotherapy, memory training, motor activity, occupation (human), occupational therapy, participation, physical activity, physical therapy, physical therapy modalities, physiotherapy, psychological engagement, psychosocial rehabilitation, psychosocial support systems, therapeutic exercise, rehabilitation cognitive, rehabilitation psychosocial, self-help devices, self care, self-care skills, support psychosocial

Keywords: activity, activity limitation, ADLs, assistive technology, cognitive management, cognitive rehabilitation, cognitive retraining, cognitive stimulation, cognitive strategy, cognitive support, cognitive training, engagement, exercise physiology, exercise therapy, function, functional ability, independence, intervention, intrinsic capacity, memory aid, memory management, memory rehabilitation, memory retraining, memory stimulation, memory strategy, memory support, memory therapy, memory training, non-pharmacologic, participation, physical therapy, physiotherapy, psychosocial.

The three search term groupings were then combined with AND for the final search i.e. Model of Intervention AND Dementia AND Therapy.

Data extraction

Searches were performed by one reviewer who independently assessed the titles and abstracts to identify eligible studies. Systematic reviews were assessed using the AMSTAR tool[79], and the 'best' quality and most recent reviews were identified. The papers within each systematic review were located and the data on intervention and outcome systematically extracted into evidence spreadsheets using Excel. These were used to sort and analyse the information. Additional studies published since the included systematic review search dates were then added to update the evidence. Studies were sorted according to whether the intervention had been effective i.e. if there was a significant result for the study outcome measure/s that pertained to a program. Studies that showed no significant outcomes were then excluded and not synthesised into programs. Findings from the remaining studies were then incorporated into the Excel evidence spreadsheets to outline the study participants, intervention implemented, dose, outcome measures used, study results, and any adverse events. A second reviewer checked data extraction for 25% of programs. There was a high level of agreement between reviewers.

Assessing the quality of the research and risk of bias

As mentioned, the AMSTAR tool[79] was used to assess the quality of included systematic reviews. To assess the quality of individual RCTs, the Cochrane Risk of Bias Tool was used.[62, 80] Using this tool, bias was assessed across the following variables: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, and selective reporting. In cases where the systematic review included an assessment of included studies, these ratings were used and those studies were not reappraised. Assessing risk of bias is important to help the reader deduce how much the results of the study should be believed. Further, understanding the different sources of potential bias is important for interpreting study results as some may have different implications compared to others.[62] For example, while it is important to recognise the potential limitations around un-blinded participants, this may be less concerning than if the study selectively reported some results and chose not to report others.

Risk of bias for each item on the Cochrane Risk of Bias Tool was rated as either: 'low' (plausible bias unlikely to seriously affect the results), 'unclear' (plausible bias that raises some doubt about interpreting the results), or 'high' (plausible bias that seriously reduces confidence in the results).[62] A study was considered to be at 'low' risk of bias if all items from the Risk of Bias Tool were rated as low. A study was considered to have 'unclear' risk if some key items from the Risk of Bias Tool were rated as 'unclear' risk. A study was considered to be at 'high' risk of bias if one or more key items from the Risk of Bias Tool rated as high risk. Due to the nature of non-pharmacological intervention studies aimed at improving function in people living with dementia, it is not usually possible to blind participants or staff involved in the intervention arm. Therefore, in cases where this item on the Cochrane Risk of Bias Tool was rated as high or unclear, but all other items were rated as low risk of bias, the study was given a rating of 'moderate' risk of bias. Similarly, if this item was rated as high/unclear risk of bias, and other items were rated as unclear, the study would be given a rating of 'unclear' risk of bias. As with the data extraction, a second reviewer checked bias ratings for 25% of programs. There was a high level of agreement between reviewers. Refer to Appendix 1 for the risk of bias ratings for each study and the risk of bias graphs illustrating the proportion of bias risk over each of the Cochrane Risk of Bias Tool items across studies included in each program.

Synthesising the data to formulate the programs and 'plans'

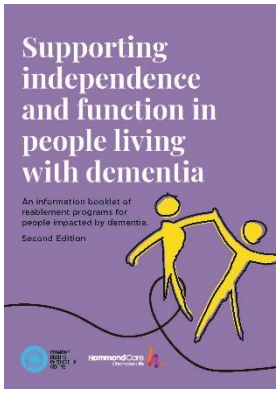
Each of the eight programs contain one or more composite intervention **'plans'** that have been generated from the highest quality available evidence that demonstrated a significant result for that outcome (i.e. improved ADL function). Studies that showed a significant result were sorted according to the level of bias as rated using the Cochrane Risk of Bias Tool.[62] Where there were sufficient studies with 'low' or 'moderate' risk of bias, these were used to generate each illustrated plan. In cases where there were insufficient 'low' and 'moderate' risk of bias studies to generate a plan, studies at 'unclear' or 'high' risk for bias were also included as required. In order to preference the highest level of evidence available, bias ratings for each study were analysed, and those with fewer 'unclear' risk items were included over studies with predominantly 'unclear' or 'high' risk items as rated on the tool. The level of bias of included studies is stated at the beginning of each plan within the programs.

In order to facilitate development of each plan, studies were sorted according to different variables, the most common of which were the setting (i.e. community versus residential care) or the function that the interventions significantly impacted (e.g. general cognition versus executive function). The intervention approaches used across the studies were then reviewed and the elements synthesised to form one comprehensive plan.

Specifics such as the range of ‘doses’ (i.e. session time, number of sessions, and duration of intervention), interventionists, and format (i.e. individual or small group) were also recorded to demonstrate the flexibility that may be employed when planning a program.

As well as the synthesised plans, a number of common elements are presented within the format of each program to provide a comprehensive overview of the research as well as practical information pertaining to an intervention approach. This format includes:

- the associated recommendation from the *CDPC Clinical Practice Guidelines and Principals of Care for People with Dementia*[1]
- an overview of the research
- an overview of the elements from effective intervention studies included in the program
- a detailed overview of each effective study included from the research
- plan/s synthesised from the research
- an overview of what costs may be involved—this table includes an overview from the studies included in the generated plans
- an overview of who may be involved in the intervention i.e. clinicians, person living with dementia, family members, care workers
- an overview of whether there have been any negative/adverse effects associated with the interventions included in the plans.



It is recommended that health practitioners routinely provide a copy (or link - **hammond.com.au/reablement**) of the *consumer information booklet* for all people impacted by dementia involved in a reablement program.

PROGRAMS

Programs are usually presented as approaches to promote function in a specific area, as this is how they were mostly described in the research (e.g. supporting cognitive function through exercise). There is evidence that providing combined interventions, such as cognitive and physical exercise, may also have benefit.[81] A list of the eight programs and associated plans is included below:

1: Supporting everyday living activities through an occupational therapy program

- 1.1 A plan delivered at home or in the broader community

2: Supporting everyday living activities through an exercise program

- 2.1 A plan delivered at home
- 2.2 A plan delivered in the broader community
- 2.3 A plan delivered in residential care

3. Supporting everyday living activities through a cognitive program

- 3.1 A cognitive rehabilitation plan delivered at home or in the broader community
- 3.2 A cognitive stimulation plan delivered in the broader community
- 3.3 A general cognitive plan delivered in residential care

4. Supporting mobility and physical function through a falls prevention program

- 4.1 A multicomponent plan delivered at home
- 4.2 An exercise plan delivered at home
- 4.3 An exercise plan delivered in the broader community

5. Supporting mobility and physical function through an exercise program

- 5.1 A plan delivered at home
- 5.2 A plan delivered in the broader community
- 5.3 A multicomponent plan delivered in residential care
- 5.4 An aerobic plan delivered in residential care

6: Supporting cognitive function through an exercise program

- 6.1 A plan to support general cognitive function delivered at home
- 6.2 A plan to support general cognitive function delivered in the broader community
- 6.3 A plan to support general cognitive function delivered in residential care
- 6.4 A plan to support executive function delivered at home
- 6.5 A plan to support executive function delivered in the broader community
- 6.6 A plan to support executive function delivered in residential care

7: Supporting cognitive function through a cognitive program

- 7.1 A plan to support general cognitive function delivered in the broader community
- 7.2 A plan to support general cognitive function delivered in residential care
- 7.3 A plan to support executive function delivered in the broader community
- 7.4 A plan to support executive function delivered in residential care

8: Supporting communication through a communication program

- 8.1 A plan for the person with dementia to support their communication and engagement
- 8.2 A plan for care workers or family members to support communication in the person living with dementia
- 8.3 A plan for care workers or family members to improve their own communication skills, knowledge and reduce stress.

1: Supporting everyday living activities through an occupational therapy program

Clinical Practice Guidelines for People with Dementia evidence statement[1]:

Number	Classification	Recommendation
67	Evidence Based Research (Low)	People with dementia living in the community should be offered occupational therapy interventions which should include: environmental assessment and modification to aid independent functioning; prescription of assistive technology; and tailored intervention to promote independence in activities of daily living which may involve problem solving, task simplification and education and skills training for their carer(s) and family.

What does the research tell us?

- Occupational therapy is beneficial to support independence in ADL functioning for people with dementia.[1]
    - Pooled results from four randomised controlled trials found a small, but positive effect of occupational therapy on ADL functioning for people with dementia.
    - Results from these four trials were inconsistent (i.e. one found no change to ADLs after intervention) and some studies were at risk of bias, therefore this is considered as 'low' quality evidence.[82]
    - This means that our confidence in the effect of occupational therapy on ADL function is still limited and that larger, rigorous trials are still needed to provide confirmatory evidence for the role of OT to support ADL functioning in people with dementia.[69]
- In order to ensure that the most up-to-date evidence was included in this *technical guide* at the time of publication, a search was conducted to identify any studies that have been published since the systematic review was completed for the *Clinical Practice Guidelines and Principles of care for People with Dementia.*[1] No further randomised controlled trials were identified as at April 2017.

Elements from effective OT interventions for improved ADL function in mild-moderate dementia:

Strategies for the person with dementia	• Assessment of abilities. • Practise ADLs to support continued functioning. • Compensatory strategies to adjust to changes in abilities to support optimum ADL functioning.
Collaborative learning with the family member	• Education on dementia, symptoms, and the role of the environment on function. • Understanding the abilities of the person with dementia.
Family member skills training	• Problem-solving. • Strategies for supporting participation (e.g. activity simplification, environment modification, cueing, communication). • Coping strategies.
Environmental assessment, modification	• Environmental simplification (e.g. decluttering, enhanced lighting, reduced noise pollution) to support participation.
OT-prescriptions	• Provision of written support plan. • Referral to community resources and support. • Prescription of assistive devices/environmental modifications.

What should we hope to achieve and how to measure it?

Studies reporting effective occupational therapy at home to improve ADL function have varied in intervention length (5 weeks to 16 weeks).

Study (place, number of participants, average dementia stage); Length of intervention (sessions/ time frame)	Intervention (ADL measure)	Outcome
Gitlin et al. 2001[83] (USA; n=171) 5 sessions over 3 months	Home environment intervention: • Family member: education on dementia and impact of environment, community support/resources, problem solving issues, and implementing solutions (activity and environment simplification, and involving other support). Functional Independence Measure – basic ADLs and instrumental ADLs	**Less decline in instrumental ADLs at 3 months** compared to control group (p=.03).
Graff et al. 2006[84] (Netherlands; n=135) 10 sessions over 5 weeks	Home-based OT program: • Person: training and rehabilitation (compensatory strategies, adaptations in physical and social environment) • Family member: skill development in problem solving and practical aids. AMPS process; Interview of Deterioration in Daily activities in Dementia – basic ADLs and instrumental ADLs	**Improved ADL functioning at 5 weeks** and still better than controls at 3 months.
Gitlin et al. 2010[85] (USA; n=237) 10 sessions over 4 months	Care of Persons with dementia in their Environments (COPE) intervention: • Family member education: abilities of the person and understanding the impact of medical conditions • Family member training: problem-solving, communication, simplifying tasks, and engaging the person in activities. Functional Independence Measure – basic ADLs and instrumental ADLs	**Improved ADLs (<.02) and instrumental ADLs (<.007) at 4 months** (no difference between OT with controls at 9 months).

What could an evidence-informed <u>community OT plan</u> look like?

These studies primarily involved people with moderate stage dementia (mean MMSE 13.4 – 19.0). Two of these studies were at moderate risk of bias, and one study was at higher risk for bias[a].

Plan 1.1	Sessions 1-2 (up to 4)	Assessment	• Interests and roles of the person with dementia.
			• Abilities of the person with dementia e.g.
			  ○ Assessment of functional cognition
			  ○ Assessment of task performance.
			• Environment.
			• Family member skills (e.g. communication) and knowledge (i.e. about dementia and symptoms).

		Family member education	• Dementia (i.e. disease process, symptoms and progression).
			• Understanding the abilities of the person with dementia e.g.
			  ○ More regular rest breaks may be necessary
			  ○ If assisted with setting up and beginning an activity, the person may be able to participate independently.
			• Environments and potential impact on person with dementia e.g.
			  ○ A cluttered table may be visually confusing
			  ○ A noisy dinner party may be overwhelming.

		Goal setting / priorities for treatment	• Meaningful activities and goals for the person with dementia. • Meaningful goals for the family member.

	Sessions 3-8	Intervention: person with dementia	• Practise ADLs to retain functional skills/assist person to remain engaged in familiar activities e.g.
			  ○ If person has been the main cook in the family: adjust dinner preparation as required to facilitate continued participation (e.g. assist with selection/planning of meal; reduce steps required, for example, the person chops ingredients while the family member cooks).
			• Learn compensatory skills e.g.
			  ○ Use environmental adaptations e.g. diary for daily schedule clarification
			  ○ Respond to cues e.g. clothes laid out on bed in sequential order
			  ○ Interpret communication strategies implemented by family member.
			• Prescription of assistive devices/environmental modifications.

		Intervention: family member	• Continued education on dementia and environments.
			• Provision of written support plan outlining:
			  ○ Abilities of person with dementia
			  ○ Goals of intervention
			  ○ Strategies to trial
			  ○ Dosage of strategies (i.e. how many times per week and for how long).

[a] Refer to 'Interpreting the research' on p. 10 of this *technical guide* for a definition of research bias.

		• Problem-solving skills.
		• Interactive skills training:
		  ○ Communication strategies
		  ○ Environmental adaptation
		  ○ Activity modification/simplifying tasks
		  ○ Supporting activity engagement e.g. cueing.

Sessions 9-10	Closure	• Generalisation of family member skills for future care situations. • Referral for community support programs.

Where the research studies reported data for minimum requirements for benefit:

At least 4 sessions with a minimum of 50% adherence to provided strategies.[83]

What costs are involved?

Staff training in the included OT interventions ranged from 20-80 hours.
OT sessions range from 60-90 mins in length.

OT Visits	Hours	Other important costing considerations
Visit 1	60-90 mins	Travel Session preparation Administration hours
Visits 2-10	60-90 mins each	
Total for 10 visit program	10-15 hours	

Who is involved?

Clinician	Occupational therapist
Person with dementia	What stage of dementia? • Evidence from effective interventions has only involved people with mild-moderate dementia. • More research is needed to understand the benefit of occupational therapy for people with severe stage dementia. What if living alone? • Evidence from effective interventions involved a mix of people with dementia living alone or with their family member.
Family member	Family members were involved in each of the intervention studies for education and skills training.
Venue	Evidence from effective interventions has been conducted in the person's home. More research is needed to understand the benefit of occupational therapy conducted in residential care or in centre-based environments.

Have there been any negative effects reported from occupational therapy interventions to improve ADL function in people with dementia?

No adverse events have been reported in association with any of the studies included in the systematic review that report on effective occupational therapy interventions.

2: Supporting everyday living activities through an exercise program

Clinical Practice Guidelines for People with Dementia evidence statement[1]:

Number	Classification	Evidence statement
68	Evidence Based Research (Low)	People with dementia should be strongly encouraged to exercise. Assessment and advice from a physiotherapist or exercise physiologist may be indicated.

What does the research tell us?

- The Guideline Adaptation Committee[86] and a recent Cochrane review[87] identified six RCTs reporting on the impact of exercise interventions on ADL function for people with dementia. Both of these reviews found that exercise was associated with statistically significantly greater levels of ADL independence when compared to controls.
- A literature search up until April 2017 identified one more recent systematic review and eight additional RCTs (not included in the systematic reviews) reporting on the impact of exercise interventions to improve ADL function for people with dementia.
- The systematic review[88] examining long-term home and community-based exercise found that exercise statistically significantly improved both Basic ADLs and Instrumental ADLs when compared with a non-exercise control.
- Results across the eight recent RCTs varied, with some studies showing positive effects of exercise on ADL function and others showing no difference between exercise and control groups. Limitations and inconsistencies exist across the eight RCTs (e.g. potential for bias; variable intervention lengths), which limit the evidence.

Elements from effective exercise interventions for improving/supporting ADL function in dementia:

Exercise intervention features	• Individually tailored exercises to the person's abilities.
	• Small group or one-to-one.
	• Range of exercises including:
	  ○ Aerobic e.g. walking, cycling
	  ○ Strength/resistance e.g. squatting, elastic bands
	  ○ Balance e.g. one or two leg balance exercises
	  ○ Coordination e.g. tossing/catching a ball
	  ○ Functional exercises e.g. stepping over an obstacle.
	• Intensity increased over time.

Supporting features of the program	• Exercises led by physiotherapists (PTs), exercise physiologists (EPs), occupational therapists (OTs) or by carers (family or professional). • Music, sing-alongs, dance and games incorporated to support exercise. • Peer support in group training from other persons with dementia.
Exercise locations	• Home, residential care home, gym, community (e.g. neighbourhood walking).

What should we hope to achieve and how to measure it?

Studies reporting effective exercise interventions have varied in intervention length (7 to 52 weeks). Measurement of exercise effectiveness varied across studies depending on the ADL scale that was used.

Study (place, number of participants, average dementia stage); Length of intervention (sessions/ time frame)	Intervention (ADL measure)	Outcome
Forbes et al. 2015[87] (Systematic Review-Canada) AND Laver et al. 2016 (Systematic Review-AUS) 7-52 weeks	5 multicomponent exercise trials including: walking, strength, balance, coordination, flexibility and functional weight-bearing exercises; and one walking program. Barthel Index; Katz Index; Changes in Advanced Dementia Scale	**Exercise associated with better ADL independence** versus control (Standardised mean Difference – SMD) 0.68; 95%CI 0.08 – 1.27, p=.03; I^2=77%).
Lewis et al. 2017[88] (Systematic Review-AUS) 4-12 months	5 multicomponent exercise trials including: stretching, strengthening, aerobic and balance exercises; one treadmill walking program; and one chair-based exercise program. "Basic ADLs"; Chinese Disability Assessment for Dementia; Functional Independence Measure	**Exercise associated with better basic ADL function** versus control (SMD 0.77; 95%CI 0.17-1.37; I^2=87%), **better instrumental ADL function** versus control (SMD 0.44; 95%CI 0.03-0.86; I^2=42%).
Rolland et al. 2007[89] (France; n=134; Severe dementia) 60 min sessions 2x/week for 12 months	Group exercise program (groups of 2-7) involving stretching, aerobic, strength, flexibility, and balance exercises. Katz ADL	**ADLs declined less in the exercise group** than in the control group at 12 months (p=.02). **Higher number of exercise sessions associated with less ADL decline** (p=.005).
Santa-Sosa et al. 2008[90] (Spain; n=16; Moderate dementia) 75 min sessions 3x/week for 12 weeks	Small group exercise program (groups of 4) involving joint mobility, resistance training, and coordination exercises. Katz ADL and Barthel Index	**Exercise group had higher ADL scores** on the Katz ADL at follow-up (p=.019). ADL scores on the Barthel Index **improved for exercise group** (p<.05) but did not change for control.
Littbrand et al. 2009[91] (Sweden; n=95; Moderate dementia) 45 min sessions 5x/fortnight for 13 weeks (29 sessions)	High-Intensity Functional weight-bearing Exercise (HIFE) program (groups of 3-9). Functional exercises involving everyday tasks targeting leg strength, gait, and postural ability. Barthel Index	Control group declined (p=.001) post intervention, while **exercise group maintained ADL function**, so that **exercise group was performing better than control** group post intervention (p=.03). Both exercise (p=.02) and control (p=.001) groups declined in ADLs 3 months post intervention.

Venturelli et al. 2011[92] (Italy; n=22; Moderate dementia) 30 min sessions 4x/week for 24 weeks	Institution-based walking program (individual) involving carer walking arm-in-arm with person along halls of care facility. Barthel Index	**Exercise group improved in ADL scores from baseline to follow-up** (p<.05). Specifically improved ADL items included transfers (p=.01), mobility on a level plane (p=.002), and stairs (p=.01).
Vreugdenhil et al. 2012[93] (Australia; n=40; Mild dementia) Daily sessions for 4 months; check-in phone calls at 2 weeks and 2 months.	Home-based exercise and walking program (individual – dyad), involving exercises focusing on strength and balance coupled with brisk neighbourhood walking. Barthel Index and Instrumental ADL Assessment	**Exercise group significantly better than control post intervention** (BI: p=.047; IADL: p=.007).
Pitkälä et al. 2013[94] (Finland; n= 210; Moderate dementia) Home: 60 min sessions 2x/week Group: 4 hr sessions 2x/week for 12 months	Home-based exercise (individual): individualised program to address identified needs. Group-based exercise (groups of 10): pre-determined exercise program involving strength + balance training. Functional Independence Measure	Group differences at 6 months (p=.003) and at 12 months (p=.015). **Home exercise group better than control** at 6 months (p=.001) and 12 months (p=.004). No difference between group exercise and control.
Öhman et al. 2016[95] (Finland; n=194; Moderate dementia) Home: 60 min sessions 2x/week Group: 4 hr sessions 2x/week for 12 months	Home-based exercise (individual): individualised program to address identified needs. Group-based exercise (groups of 10): pre-determined exercise program involving strength + balance training. Functional Independence Measure	In **mild-AD, less decline in ADLs in exercise group** compared to usual-care control at 6 months (p=.003) and 12 months (p<.001). In **moderate-severe AD, there was no difference in ADL decline** between exercise and control groups at 6 or 12 months.
Bossers et al. 2016[96] (Netherlands; n=109; Moderate dementia) 30 min sessions 4x/week for 9 weeks	Aerobic exercises and combined aerobic + strength exercises (individual). Katz Index and Erlangen-ADL test	**Aerobic exercise group improved in instrumental ADL function** while the control control group declined (Erlangen-ADL: p=.01). **Combined aerobic + strength group improved in both basic ADLs** (Katz: p=.01) **and instrumental ADLs** (Erlangen-ADL: p<.001) while the control group declined in both at 9 weeks.
Cancela et al. 2016[97] (Spain; n=189; Moderate dementia) Daily sessions for 15 months (mean weekly exercise 108.45 mins)	Aerobic physical activity exercise program involving cycling on exercise bikes (individual or in pairs). Katz Index	**Exercise group improved in basic ADL** function while the usual-care recreational non-physical activities control group declined (p=.03) at 15 months.
Toots et al. 2016[98] (Sweden; n=186; Moderate dementia)	High-Intensity Functional Exercise (HIFE) program (groups of 3-8). Functional exercises involving everyday	**Non-AD dementia had less basic ADL decline** than seated activity control at 4 months (p=.005) and 7 months (p<.001), **and less ADL decline** at 7 months

45 min sessions 5x/fortnight for 4 months	tasks targeting leg strength, gait, and postural ability. Functional Independence Measure and Barthel Index	(p=.011). **AD dementia has the same basic ADL decline** as the seated activity control, **and had worse ADL decline** than control (p=.032).
Morris et al. 2017[99] (USA; n=76; Mild dementia) 60 mins + 21 mins/week until reached 150 mins/week over 3-5 sessions/week for 26 weeks	Aerobic exercise. Disability Assessment of Dementia	**Aerobic exercise had improved ADL function** compared to non-aerobic stretching and toning control at 6 months (p=.02).
Satoh et al. 2017[100] (Japan; n=62; Moderate dementia) 40 min sessions 1x/week for 6 months	Seated physical exercise with music. Functional Independence Measure	**Exercise group maintained functional abilities** while cognitive stimulation control declined at 6 months (p=.048).

What could an evidence-informed <u>exercise plan</u> in the <u>community</u> to improve or support <u>ADL function</u> look like?

These studies involved people in the mild to moderate stages of dementia (mean MMSE 18.0 – 25.4). Two of these studies were at moderate risk for bias, one study was at unclear risk, and one was at higher risk for bias[a].

		Assessment	• Health assessment (e.g. by a general practitioner or geriatrician) to ensure person is safe to perform exercises. • Physical performance assessment e.g. functional reach test, Timed Up and Go, Sit to Stand test, Functional Independence Measure, Short Physical Performance Battery.

Plan 2.1	**PT or family member guided sessions**
	30-60 min sessions daily to twice/week over 4-6 months
	
	Phone follow-ups
	To check in when PT scaling back their visits
		Home-based plan: family member and person with dementia	• Goal-oriented, individually tailored exercise training to address identified functional or mobility needs. Goals set in partnership with person and family member at beginning of intervention.
			• Training for person with dementia and family member in the exercise program and provided with an exercise manual (instructions, illustrations, safety notes).
			• Family members trained to act as 'personal trainers' for the person with dementia, but should also be encouraged to do the exercises themselves.
			• Exercise program could involve:
			  ○ Multicomponent tailored PT-developed program incorporating:
			  ▪ Aerobic e.g. walking, climbing stairs

[a] Refer to 'Interpreting the research' on p. 10 of this *technical guide* for a definition of research bias.

			▪ Strength e.g. angle/wrist weights ▪ Balance e.g. doing two things at once ▪ Functional e.g. transfer training o Pre-determined program, e.g. the Canadian Centre for Activity and Aging Home Support Exercise Program (HSEP)[101], incorporating: ▪ User-friendly, functional and progressive exercises that can be done easily at home without the need for specialised equipment. ▪ 10 exercises including: walking from room to room, wall push-ups, rising up on toes, toe taps, seat walks, getting up from a chair, leg lifts, reaching, standing stretch, and seated stretch.
Plan 2.2	**PT or certified personal trainer guided sessions** 30-60 min sessions 2-5 times/week over 6-12 months	Gym or community centre-based Intervention: person with dementia (one-to-one or small group)	• Warm up and cool down protocol for each session e.g. gradually speed up/slow down on treadmill over 5 mins. • Predetermined exercise program incorporating: o Endurance e.g. 150 mins/week treadmill walking, or cycling on exercise bikes o Balance e.g. climbing a ladder, walking on a line, bouncing a ball o Strength e.g. using specialised gym equipment and exercises tailored to person's strength and abilities o Functional exercises e.g. getting up from the floor, doing two things at once.
		Equipment	• Exercise bikes, treadmill, weights, balls, balance pillows. • Outdoor training e.g. neighbourhood walking.
		Intervention scaling	• Progressively challenging levels of exercises as abilities improve e.g. o Increased difficulty e.g. weight, distance o Increased time o Increased repetitions.

Where the research studies reported data for minimum requirements for benefit:

Participation in a mean of 1.5 30-60 minute exercise sessions per week (at least a mean of 67.5% of prescribed exercises sessions) over 12 months.[94, 95, 99]

What could an evidence-informed <u>exercise plan</u> in <u>residential care</u> to improve or support <u>ADL function</u> look like?

The majority of these studies involve people with moderate stage dementia (mean MMSE 12.5 – 20.5). One study was at moderate risk for bias, three were at unclear risk, and three were at higher risk for bias. An eighth study was at moderate risk of bias and involved people in severe stage dementia (mean MMSE 8.8).

		Assessment	• Health assessment (e.g. by a geriatrician) to ensure person is safe to perform exercises. • Assessment of behavioural readiness for exercise program i.e. the person's ability to participate in an exercise program. • Physical performance assessment e.g. 6-meter walking speed, one-leg balance test, the Timed Up and Go test (Assessment of walking ability without a walking aid). • Heart rate in seated position to determine rate of exertion during exercise.

Plan 2.3 (Note: plan 2.3 is presented as one plan, with the first version being multi-component and the second based on aerobic exercise only)	**PT, OT, EP guided sessions** 30-75 min sessions 1-5 times/week over 3-12 months	Multicomponent exercise plan	• Small group sessions (2-9 people).
			• Session warm-up and cool-down e.g. gentle walking and stretching for 15 mins.
			• Exercises individualised in intensity according to abilities and progressively scaled over sessions.
			• Multicomponent sessions including:
			  ○ Walking: around a circuit; for half the session
			  ○ Strength/resistance adapted for each person's ability: e.g. squatting at different levels, lateral leg elevations, resistance elastic bands, weighted belt, heel raise, seated knee extension, toe raises while holding hands of trainer
			  ○ Balance: e.g. stepping exercises using cones and hoops on the ground; one or two leg balance exercises, walking on a soft surface, step-up onto boxes
			  ○ Flexibility/joint mobility: e.g. imitate flexibility exercises from facilitator
			  ○ Coordination: e.g. bouncing a foam ball, tossing/catching a ball, hand clapping to music
			  ○ Functional exercises: e.g. walking over obstacles, standing from sitting, turning the trunk and head while standing.
			• Music to accompany each session and support exercises.

	PT or trained care worker guided sessions 15-30 min sessions daily to 4 times/week over 6-15 months	Aerobic exercise only	• Moderate to high intensity walking sessions for 30 mins e.g.
			  ○ one-to-one guided walking with a trained care-worker around the residential care facility
			  ○ arm-in-arm walking with family member along residential facility hallways.
			• Cycling sessions in a gym alone or in pairs
			  ○ Session monitored by PT
			  ○ Bicycle geared to low resistance
			  ○ Pedalling at a constant, self-selected pace for at least 15 mins.

	Equipment	• Foam/rubber ground mats for safety during exercises. • Walk belt with safety handles to assist falls prevention. • Weighted belt, exercise bike, foam ball.

	Intervention scaling	• Progressively challenging levels of exercises as abilities improve e.g.
		  ○ Increased difficulty e.g. weight, distance, performance
		  ○ Increased time
		  ○ Increased repetitions.

	Maintenance	• Functional tasks introduced that target specific deficits for each person to maintain physical function. Care workers trained in facilitating ongoing practise with these tasks and incorporating into daily life activities.

Where the research studies reported data for minimum requirements for benefit:

Participation in a mean of 79.1% of 15-75 min exercise sessions over 3-12 months.[89-92, 97]

What costs are involved?

PTs, EPs, OTs and exercise trainers were all specially skilled in the exercise programs and in working with people with dementia. The following intervention times were taken from the studies that showed effective exercise interventions for improving ADL function in people with dementia.

	Intervention Administration Requirements	Total Hours
Home-based programs (4-6 months)	• 2 x 1 hour PT sessions per week • Training in program followed by daily exercise sessions with family member. 2 x phone calls to check on progress.	• 104 PT hours (12 months) • Timing not specified
Community gym-based program (6-12 months)	• 2 x 4 hour group PT sessions per week, each session with 2x PTs • 4 sessions per week for 6 weeks then 1 session per week for 20 weeks with exercise trainers	• 832 PT hours per group of 10; or 83.2 PT hrs per person (12 months) • 24.3 exercise trainer hours (6 months)
Residential care-based program (multicomponent) (3-12 months)	• 2 x 1 hour group OT sessions per week • 3 x 74 min group exercise scientist sessions per week • 5 x 45 min group sessions per fortnight, each session with 2 x PTs • 4 x 30 min trained research assistant sessions per week • 5 x 45 min group sessions per fortnight, each with 2 x PTs • 1 x 40 min exercise trainer session per week	• 104 OT hours per group of 2-7 (12 months) • 45 exercise scientist hours per group of 4 (3 months) • 43.5 PT hours per group of 3-9 (13 weeks) • 18 research assistant hours (9 weeks) • 60 PT hours per group of 3-8 (4 months) • 16 exercise trainer hours (6 months)
Residential care-based program (aerobic) (5.5-15 months)	• Training in program with PT for family member and person with dementia followed by 4 x 30 min family member led sessions per week • Mean 15.5 min PT sessions/day	• PT time unspecified. 48 family member hours (5.5 months) • 108.5 PT hours (15 months)

Other important costing considerations	Travel Session preparation Equipment Provision of booklets/documentation Administration hours

Who is involved?

Clinician	Physiotherapist; Exercise physiologist; Occupational therapist; exercise trainers
Person with dementia	What stage of dementia? • Evidence from effective interventions has involved people with mild, moderate and severe stage dementia. What if living alone? • Evidence from effective interventions involved a mix of people with dementia living alone or with their family member/in residential care.
Family member	Some studies involved family members (partner or adult children of the person with dementia) in working with the person to assist them in maintaining their prescribed exercise program.
Venue	Evidence from effective exercise interventions to support or improve ADL function in people living with dementia has been conducted in the person's home, in community-based group settings, and in residential care settings.

Have there been any negative effects reported from exercise interventions to support or improve ADL function in people living with dementia?

A number of studies reported no adverse events related to the exercise interventions. There were some intermittent minor complaints (e.g. stiffness, mild joint pain, discomfort) that were addressed by adjusting exercises, or eased with continuing the exercises. A few minor falls were reported during exercise interventions, and two severe adverse events could not be excluded from being related to the intervention. One person died from circulatory failure a day after intervention, and another developed heart rhythm abnormalities during exercise. Some studies did not comment on the presence or absence of adverse events.

3: Supporting everyday living activities through a cognitive program

Clinical Practice Guidelines for People with Dementia evidence statement[1]:

Number	Classification	Evidence statement
N/A	Evidence Based Research (Moderate to Low)	A systematic review (4 RCTs) found no significant effect of *cognitive stimulation therapy* on ADL function (moderate), while another systematic review (4 RCTs) found no significant effect of *cognitive training* on ADL function (low), and from 1 RCT found no effect of *cognitive rehabilitation* on ADL function (moderate). Based on the available evidence, the Guideline Adaptation Committee[1] decided not to form a recommendation.

There is no conclusive evidence to support the use of cognitive interventions to support everyday function in people with dementia, there is also no evidence of harm from participating in these interventions.

What does the research tell us?

- A Cochrane review[102] identifying four RCTs reported no significant benefit of cognitive stimulation therapy for ADL function. The Guideline Adaptation Committee[1] indicated there were significant flaws impacting on the findings of this review which led to no recommendation on cognitive stimulation therapy being developed. A separate Cochrane review[103] identifying four RCTs indicated that cognitive training was not associated with beneficial effects to ADL function when compared to controls. This same Cochrane review also identified one RCT[104] on cognitive rehabilitation, which found a significant mean change in the person with dementia's self-reported performance of everyday living goals.
- A literature search up until April 2017 and a quick search for systematic reviews in December 2017 identified two more recent systematic reviews, and eight additional RCTs (not included in the systematic reviews) reporting on the impact of cognitive interventions to improve everyday living function for people with dementia.
- One systematic review[105] looking at cognition-focused interventions (11 RCTs) found some support for the use of cognitive stimulation groups and cognitive rehabilitation for everyday functional performance in people with dementia. The study reported cognitive training was not associated with any benefit to everyday function.
- Another systematic review[106] looking at cognitive interventions for people living in long-term care facilities (8 RCTs) reported a trend towards benefit for cognitive interventions versus passive controls, but no benefit for cognitive interventions versus active controls for improving everyday function.
- Results across the eight recent RCTs varied, with some studies showing positive effects of cognitive interventions on everyday function, goal attainment or goal performance, while other studies showed no difference between cognitive intervention and control groups. Limitations and inconsistencies exist across the eight RCTs (e.g. potential for bias, and variable intervention lengths, intervention approaches, and everyday living/ADL outcome measures), which mean the evidence needs to be interpreted with caution.

Elements from effective cognitive interventions for improving/supporting everyday living function in dementia:

Cognitive program features	• Small group or one-to-one • Level of difficulty adapted to abilities Range of cognitive programs involving features from cognitive rehabilitation, cognitive stimulation, reminiscence therapy, and reality orientation. • Warm-up activities e.g. greetings, group song, group discussion, orientation exercises. • Cognitive rehabilitation strategies: individualised approach addressing personally meaningful goals. Compensation techniques, problem-solving, practical aids and strategies used to support techniques such as face-name learning, errorless learning, maintaining attention/concentration, and stress management e.g. training in use of external memory aids to improve independence in using compensatory strategies. Family member receives weekly phone calls to check-in. • Reminiscence therapy strategies e.g. session themes and prompts tailored to group members' interests, characteristics and life histories; objects used for taste, smell, touch, to stimulate discussion. • Reality orientation strategies e.g. day, month, location, weather; old/current newspapers; past/present personal/local photographs; materials to stimulate all 5 senses. • Cognitive stimulation strategies: focus on information processing rather than factual knowledge e.g. if looking at faces, who looks the youngest? Sessions focused on themes e.g. food, childhood, present day. Group discussions to stimulate working memory and sense of self. • Group activities e.g. word jumbles, matching pictures into pairs, picture puzzles, discussions. • Strategies: face-name association, errorless learning technique, spaced retrieval, vanishing cues, sensory integration, memory training (autobiographic and implicit), memory strategies for using mneumonics (chunking, organisation, categorisation), logical reasoning exercises, learning principals, application of cognitive skills to ADLs, repetition and practise, immediate positive feedback, practise in maintaining attention and concentration, practical aids, compensation techniques, stress management techniques. Focus of strategies on positive resources, intact functions, retained skills, and activities clients are still able to take part in. • Parallel family member sessions involving education on dementia and management.
Supporting features of the program	• Programs led by care workers, clinical psychologists, registered nurses, occupational therapists, allied health aides, neuropsychologists, counsellors, family members. • Supporting materials e.g. objects to stimulate conversation/discussion, photos, calendar, mobile phone, touch-screen tablet, music, cards, materials for games or activities, paper/pencils. • Group facilitator supports participation and guides discussion/engagement. • Family member supports engagement in sessions and between-session practise. • Multicomponent program e.g. supplement cognitive exercises with physical exercise, ADL support, activity-based tasks, sensory stimulation.
Intervention locations	• Home, residential care home, activity centres.

What should we hope to achieve and how to measure it?

Studies reporting effective cognitive interventions have varied in intervention length (4 weeks to 24 months). Measurement of effectiveness varied across studies depending on the ADL measure that was used.

Study (place, number of participants, average dementia stage); Intervention dose	Intervention (cognitive measure/s)	Outcome
Woods et al. 2012[102] (Systematic Review-UK; n=160; mild-moderate dementia) 1 – 5.75 months	4 trials investigating cognitive stimulation therapy. (Barthel Index, Katz ADL Scale, Lawton IADL Scale, Stewart's ADL Scale)	**Cognitive stimulation was not associated with any benefit to ADL function** (SMD 0.21, 95% CI -0.05 to 0.47, Z = 1.56, p = 0.12, I^2 = 0%).
Bahar-Fuchs et al. 2013[103] (Systematic Review-UK; n=146; mild-moderate dementia) 4 – 16 weeks	4 trials investigating cognitive training, and 1 trial investigating cognitive rehabilitation. (Bayer ADL Scale, COPM, Lawton IADL Scale, Modified Lawton IADL Scale, Spontaneous Behaviour Interview-ADL Scale)	**Cognitive training was not associated with any benefit to ADL function** (SMD 0, 95%CI -0.38 to 0.38, Z = 0.01, p = .99, I^2 = 0%). **Cognitive rehabilitation** (1 study, n=39)**, was associated with participant-reported improvement in goal performance (capacity for ADLs)** (mean change 1.22, 95%CI 0.09 to 2.35, Z = 2.11, p = 0.04).
Garrido-Pedrosa et al. 2017[105] (Systematic review-Spain; n=1259; mild-moderate dementia) 5 weeks – 12 months	11 trials investigating cognitive interventions (cognitive training, cognitive stimulation, reminiscence, cognitive rehabilitation). (Aachen Functional Item Inventory, Alzheimer's Disease Cooperative Study ADL, Barthel Index, Bayer ADL, COPM, Echelle Comportmentale Adaptive, Erlangen test of ADL, Katz ADL, Lawton IADL, Modified Barthel Index, Modified Lawton IADL, Multidimensional Observation Scale for Elderly Subjects, Nurse's Observation Scale for Geriatric Patients)	**Some support for the use of multicomponent cognitive programs involving a combination of cognitive stimulation and cognitive rehabilitation for ADL maintenance or improvement.** Specific activities included: training in compensatory strategies or use of external aids for managing ADLs, simulation of daily tasks, recognition of or reminiscence about everyday tasks, and involvement of some cognitive training tasks. **Cognitive training alone was not associated with any benefit to ADL function.**
Folkerts et al. 2017[106] (Systematic review-Germany; n=471; mild-severe dementia) 1 – 12 months	10 trials investigating cognitive interventions (cognitive stimulation, reminiscence, multimodal interventions). (Author-developed Daily Living Activities Observation Scale, ADL Assessment protocol – MDS-ADL, Barthel Index, Erlangen test of ADL, Katz ADL Scale, Nurse's Observation Scale for Geriatric Patients, Psychogeriatric Scale of Basic ADLs, Stewart's ADL)	**Cognitive interventions showed a nearly significant effect vs passive control for improving ADLs** (SMD = 0.28, 95% CI –0.02 to 0.58, Z = 1.85, p = 0.06; I^2 = 13%). **Cognitive interventions were not associated with benefit to ADL compared to active control** (SMD = –0.02, 95% CI –0.73 to 0.69, p = 0.96; I^2 = 0%). N.B. Both of these analyses contained only 3 or 2 studies respectively, and both included a paper which involved selective

		reporting of the ADL outcome i.e. the authors reported use of an ADL scale but did not supply results (Mapelli et al. 2013).
Robichaud et al. 1994[107] (Canada; n=40; dementia) 45 min sessions 3x/week for 10 weeks	Structured sensory integration activities. Psychogeriatric Scale of Basic Activities of Daily Living (PSBADL)	**Intervention group improved in level of assistance required with basic ADLs** (p=.009), compared to no change in control (usual care) group.
De Vreese et al. 1998/1999[108, 109] (Italy; n=24; mild-mod AD) 45 min sessions 2x/week for 3 months	Cognitive retraining and reality orientation (individual) with a focus on memory, language and executive abilities. Spontaneous Behaviour Interview – ADL scale Lawton IADL scale	**Benefits observed for intervention group in both outcomes.**
Tadaka et al. 2007[110] (Japan; n=60; Moderate dementia) 60-90 min sessions 1x/week for 8 weeks	Reminiscence therapy (group of 6) involving themes specific to participant characteristics and life histories. Multidimensional Observation Scale for Elderly Subjects (MOSES)	**No group differences for the Alzheimer's disease group**. People with **vascular dementia improved** in MOSES **disorientation** (p=.004) and MOSES **withdrawal** (p=.001) compared to control (usual care). No group differences for the vascular dementia group in MOSES self-care, depression or irritability.
Clare et al. 2010[111] (UK; n=69; Mild dementia) 60 min sessions 1x/week for 8 weeks	Cognitive rehabilitation (individual) involving a focus on addressing personally meaningful goals. Use of practical aids, face-name learning, practise in maintaining attention/concentration, stress management. Canadian Occupational Performance Measure (COPM) – performance and satisfaction scales Independent Living Scales (ILS) – Health and safety subtest	**Cognitive rehabilitation group rated higher levels of performance** (p<.001) **and satisfaction** (p<.001) compared to both relaxation therapy and control (usual care). No group differences on the ILS.
Clare et al. 2011[104] (UK; n=69; Mild dementia) 1 session/week for 8 weeks	Goal oriented cognitive rehabilitation (individual) involving identification of rehabilitation goals to focus on during therapy. Canadian Occupational Performance Measure (COPM) – performance and satisfaction scales	**Cognitive rehabilitation group improved ratings of performance** (p<.001) **and satisfaction** (p<.001) post intervention.
Graessel et al. 2011[112] (Germany; n=79; Moderate dementia) 120 min sessions 6x/week for 12 months	Motor stimulation, ADLs, Cognitive Stimulation (MAKS) (groups of 10) multicomponent therapy involving motor exercises, cognitive exercises, practicing ADLs, and creative tasks. Erlangen test of ADL (E-ADL test)	**Intervention group maintained basic ADL function, while control** (usual care) **group declined** (p=.002), so there was a significant mean difference between groups post intervention (p=.014).

Luttenberger et al. 2012a[113] (Germany; n=130; Moderate dementia) 120 min sessions 6x/week for 6 months	Motor stimulation, ADLs, Cognitive Stimulation (MAKS) (groups of 10) multicomponent therapy involving motor exercises, cognitive exercises, practicing ADLs, or creative tasks. Barthel Index (BI) Nurses' Observation Scale for Geriatric Patients (NOSGER)	**Intervention group improved in instrumental ADLs compared to control** (usual care; NOSGER: p=.013). **No group differences for basic ADLs** (NOSGER or BI).
Luttenberger et al. 2012b[114] (Germany; n=52; Moderate dementia) 120 min sessions 6x/week for 12 months	Motor stimulation, ADLs, Cognitive Stimulation (MAKS) (groups of 10) multicomponent therapy involving motor exercises, cognitive exercises, practicing ADLs, or creative tasks. Erlangen test of ADL (E-ADL test)	**Basic ADL function maintained for intervention group, but declined for control group** (p=.005) post intervention. At 10 months follow-up, both intervention (p=.001) and control (usual care; p<.001) groups had declined in basic ADL function.
Yamagami et al. 2012[115] (Japan; n=54; dementia) 60 min sessions 2x/week for 12 weeks	Brain activating rehabilitation (group) involving reality orientation and reminiscence therapy combined with various activities e.g. cooking, sewing, singing. Multidimensional Observation Scale for Elderly Subjects (MOSES)	**Post intervention, group differences found for MOSES total** (p=.038), **disorientation** (p=.014) **and withdrawal** (p=.031), with **intervention group better than control** (usual care) **on MOSES total** (p=.048) **and withdrawal** (p=.008). No group differences for MOSES self-care, depression or irritability.
Bergamaschi et al. 2013[116] (Italy; n=32; Mild AD) 5x 1-month cycles (120 min sessions 5x/week for 20 sessions) with 4-week breaks between cycles	Cognitive training (groups of 4) involving specific exercises to stimulate memory, attention, spatial orientation, perception, and visual analysis. Katz ADL scale Lawton IADL scale	Post intervention, **group differences found for basic ADLs** (p<.005), **with controls** (non-specific cognitive activity) **declining over time** (p<.05). **Group differences also found for instrumental ADLs** (p<.05), but no post-hoc differences were found.
Lee et al. 2013[117] (China, n=19; Moderate dementia) 30 min sessions 2x/week for 6 weeks	Computerised errorless learning program (CELP) or therapist-led errorless learning program (TELP) (individual). Uses errorless learning with spaced retrieval and vanishing cues with immediate positive feedback. Modified Barthel Index Lawton IADL scale	**The CELP group showed a positive change in basic ADL scores over time** (p=.02), whereas there was no change in TELP or control (general cognitive activities) groups. The **TELP group showed a positive mean change in basic ADLs** (p=.04), whereas there was no significant mean change in CELP or control groups. No changes were found in instrumental ADL function (IADL scale).
Schecker et al. 2013[118] (Germany; n=42; Mild AD) Intervention dose not reported	Cognitive stimulation (group) through either training group or focus group sessions. Barthel Index (BI) Lawton IADL scale Bayer ADL Nurses' Observation Scale for Geriatric Patients (NOSGER) – IADL and basic ADL scales	Post intervention **there was a group effect for the BI** (p=.004), **with the training group** (p<.001) **and the focus group** (p<.000) **better than control** (usual care), and a **group effect for NOSGER IADL** (p=.007), **with training group** (p=.007) **and focus group** (p=.01) **better than control.** No group differences for Lawton IADL, Bayer ADL, or NOSGER basic ADL.

Orrell et al. 2014[119] (UK; n=236; Moderate AD/VaD) CST: 45 min sessions 2x/week for 7 weeks Maintenance: 1x/week for 24 weeks	Cognitive stimulation therapy + maintenance program (group) with maintenance program following same theory of cognitive stimulation sessions with themes and orientation-based activities. Alzheimer's Disease Cooperative Study ADL (ADCS-ADL)	At 3 months, there was a significant **mean difference between groups with intervention better than control** (usual care; p=.04). Group differences not maintained by 6 months.
Kim et al. 2015[120] (Korea; n=43; Mild AD) 60 min sessions (30 min individual + 30 min group) 1x/week for 8 weeks	Cognitive rehabilitation (individual and group) focusing on personally meaningful goals, using practical strategies and aids, compensation, orientation, and stress management strategies. Canadian Occupational Performance Measure (COPM) – performance and satisfaction scales Modified Barthel Index (MBI)	From baseline to post intervention the **intervention group improved in COPM performance** (p<.01) **and satisfaction** (p<.01), so that post intervention the **intervention group was better than control** (conversation + health videos) **in both COPM performance** (p<.01) **and satisfaction** (p<.01). No group differences for the MBI.
Amieva et al. 2016[121] (France; n=653; Mild AD) 90 min sessions 1x/week for 3 months. Maintenance sessions every 6 weeks for next 21 months	Cognitive training (groups of 5-8) involving a structured program focusing on various cognitive functions (memory, attention, language, executive function); or reminiscence therapy (groups of 5-8) focused on different personal themes; or cognitive rehabilitation (individual) involving personalised goals. Disability Assessment for Dementia (DAD) Grille d'Autonomie Gerontologique-Groupes Iso Ressources (AGGIR)	**Individualised cognitive rehabilitation group had lower functional decline** at 24 months in the per protocol analysis (DAD: p=.01; AGGIR: p=.007), and in the intention-to-treat analysis (AGGIR: p=.02) **compared to control** (usual care). No group differences at 3 months. No group differences for the cognitive training or reminiscence therapy groups at any time point.
Aşiret & Kapuchu 2017[122] (Turkey; n=62; Moderate AD) 30-45 min sessions 1x/week for 12 weeks	Reminiscence therapy (groups of 2-5) involving discussions around familiar objects and themes. Author-developed Daily Living Activities Observation Form	**Intervention group improved communication by 33.4% compared to no change in control** (conversation). The control group decreased in the restlessness score by 33.3%, compared to no change in intervention group. No other differences for mobility, hygiene, nutrition, sleep, dressing, collaboration, or socialisation.
Kudlicka et al. 2017[123] (UK; n=427; dementia) 10 sessions over 3 months followed by 4 maintenance sessions over 6 months	Cognitive rehabilitation (individual) involving problem-solving and evidence-based rehabilitation techniques to achieve personally meaningful goals. 'Goal attainment' (measure not reported)	At 3 months, **large significant positive effects reported for participant-rated** (d=0.97) **and carer-rated** (d=1.11) **goal attainment, which were maintained at 9 months** for both participant (d=0.94) and carer (d=0.96) ratings.
Regan et al. 2017[124]	Cognitive rehabilitation (individual - dyads) addressing personally	**Compared to control** (usual care), **intervention group improved in**

(Australia; n=40; Mild AD) 60 min sessions 1x/week for 4 weeks	meaningful goals with a focus on retained skills and activities the person is still able to participate in. Bayer ADL scale Everyday Cognition Scale (ECOG) Canadian Occupational Performance Measure (COPM) – performance and satisfaction scales	**COPM performance** (p=.035) **and satisfaction** (p=.008). No group differences for Bayer ADL or ECOG.

What could a <u>cognitive plan</u> in the <u>community</u> to improve or support <u>everyday function</u> look like?

These studies involved people living with mild-moderate stage dementia (mean MMSE 17.8 – 22.9). One of the studies was at low risk for bias, one was at moderate risk, and two had an unclear risk for bias[a].

Plan 3.1	**OT, therapist, or psych guided sessions**
	60-90 min sessions 1x/week over 8 weeks–3 months with maintenance sessions 6-weekly over 21 months
		Cognitive rehabilitation (individual with family member involvement)	• Initial sessions centred on identifying personally meaningful goals to be the focus of intervention.
			• Training in cognitive strategies to support everyday functioning and achievement of goals:
			  ○ Face/name learning to enhance learning of new information
			  ○ Errorless learning technique (to support learning of correct procedures)
			  ○ Use of practical aids and strategies to support functioning e.g. using a diary
			  ○ Practise in maintaining concentration and attention
			  ○ Stress management techniques.
			• Encouraged to practise strategies between sessions.
			• Family member involvement:
			  ○ Family member may be involved in goal setting when appropriate or encouraged to participate in part of the session to learn strategies and techniques
			  ○ Family member supports practise of strategies between sessions
			  ○ Family member may receive weekly phone check-ins to follow progress and problem-solve any difficulties.

Plan 3.2	**Care worker, neuropsych, experienced facilitator guided sessions**
	45-120 min sessions 2-5x/week over 7 weeks –5x 1-months cycles (1 month on, 1
		Cognitive stimulation/ cognitive training (small group 4)	• Exercises tailored to match cognitive abilities of the group.
			• Sessions started with a non-cognitive exercise such as a group ball game or a group song.
			• Cognitive training exercises:
			  ○ Aimed at stimulating a range of areas including spatial orientation, attention, perception, memory and emotions
			  ○ May include: paper/pencil tasks, time orientation, spatial orientation, and logical reasoning
			  ○ Challenge of exercises increase gradually over time.
			• Cognitive stimulation exercises:

[a] Refer to 'Interpreting the research' on p. 10 of this *technical guide* for a definition of research bias.

	month off) with maintenance sessions 1x/week over 24 weeks		○ Based around topics e.g. using money, word games, famous faces, the present day ○ Reality orientation involving use of a board with personal and orientation exercises ○ Sessions involved reminiscence but also incorporated a focus on present day. Information processing rather than generation of correct factual knowledge was encouraged e.g. identifying who looks the youngest in a series of pictures rather than naming who the people are.
		Equipment	• Orientation board, clock, pen/paper materials, materials for games, diary and other practical aids

Where the research studies reported data for minimum requirements for benefit:

Average session length was 78.8 mins an average of 1.7 times/week over a mean of 27.5 weeks. The majority of studies did not report the actual attendance rate. One study reported that an attendance rate of 75% of sessions was considered as having completed the intervention.[111]

What could a <u>cognitive plan</u> in <u>residential care</u> to improve or support <u>everyday function</u> look like?

These studies involved people with moderate stage dementia (mean MMSE 14.6 – 17.8). Two of the studies were at moderate risk of bias, three had an unclear risk, and three were at higher risk for bias.

Plan 3.3	**RN, skilled facilitator or care worker guided sessions** 30-120 min sessions 1-6x/week over 10 weeks-12 months	Groups (2-10) or individual (involving family member)	• Sessions may begin with a relaxation exercise, group song or group discussion exercise. Sessions begin with reality orientation for place and time. • Sessions personalised to the interests and abilities of participants. • Cognitive stimulation exercises involving orientation and pencil/paper exercises e.g. matching pairs, word jumbles, picture puzzles. • Memory training exercises. • Reminiscence therapy using familiar objects, pictures and themes to stimulate discussion. • Multicomponent intervention involving motor exercises (e.g. bowling, croquet), ADL training (e.g. preparing a snack), and activity-based tasks (e.g. gardening, woodwork, craft, sewing singing). • Structured group sensory integration activities using materials such as sandbags, music, balls, rope, cards. • Group environment aimed at being inviting and supportive, with facilitators prompting communication and providing praise.
		Equipment	• Pens, written activity materials, calendar, clock, diary, materials for sensory integration, materials for activities such as craft or woodwork, objects and pictures for reminiscence exercises.

Where the research studies reported data for minimum requirement for benefit:

Average session length was 58.8 mins an average of 2.4 times/week over a mean of 4.3 months. A number of studies did not report the actual attendance rate. For the studies that did, mean attendance for participants who finished the intervention was 83.7%.[107, 112, 115]

What costs are involved?

Therapists (e.g. RNs, OTs, psychologists, neuropsychologists), experienced facilitators, and care workers were involved in facilitating the cognitive programs.

	Intervention Administration Requirements	Total Hours
Community-based programs (7 weeks-21 months)	• 1 x 60 min individual session per week with OT and family member • 5 x 1-month cycles: 120min group (4) sessions 5x/week for 20 sessions with neuropsychologist • 2 x 45 min group session per week with 2x facilitators and 1x care worker for 7 weeks plus 1 session per week for 24 weeks • 1 x 90 min individual session per week with a psychologist plus maintenance sessions (unspecified time) every 6 weeks	• 8 OT hours + 2 hours family member session involvement + between-session practise time (8 weeks) • 200 neuropsychologist hours per group (over 5 months) • 28.5 hours with 2x experienced facilitators + 1x care worker (7.1 months) • 18 psychologist hours per individual (3 months) + maintenance sessions every 6 weeks (21 months)
Residential care-based program (10 weeks-12 months)	• 6 x 120 min small group (10) sessions per week with 2x therapists (RN) and aide • 2 x 45 min group session per week with 2x facilitators and 1x care worker for 7 weeks plus 1 session per week for 24 weeks • 3 x 45 min group sessions per week with unspecified facilitator • 2 x 45 min individual sessions per week with unspecified facilitator • 2 x 60 min group sessions per week with 3x care workers • 1 x 37.5 min group (2-5) sessions per week with skilled facilitator	• 624 hours with 2x therapists and 1x aide (12 months) • 28.5 hours with 2x experienced facilitators + 1x care worker (7.1 months) • 22.5 unspecified facilitator hours per group (10 weeks) • 18 unspecified facilitator hours (3 months) • 24 hours with 3 x care workers per group (12 weeks) • 7.5 skilled facilitator hours per group (12 weeks)

Other important costing considerations	Facilitator training (for therapists, facilitators, care workers and/or family members) Travel Session preparation Materials for cognitive activities and any supplementary physical or ADL exercises Provision of booklets/documentation Administration hours

Who is involved?

Clinician	Occupational therapists, registered nurses, psychologists, neuropsychologists, care workers, unspecified therapists, unspecified skilled/trained facilitators.
Person with dementia	What stage of dementia? • Evidence from the highest quality effective intervention studies has involved people with an average of mild to moderate stage dementia. What if living alone? • Evidence from effective interventions involved a mix of people living in the community or in residential care. The studies from the community did not specify whether the person was living alone or with their family member.

Family member	Some studies involved family members in working with the person to either facilitate the cognitive program or to assist them in practicing cognitive strategies from the program between sessions.
Venue	Evidence from effective cognitive interventions to support or improve everyday function in people with dementia has been conducted in the person's home, in community-based group settings, and in residential care settings.

Have there been any negative effects reported from cognitive interventions to improve everyday functioning in people with dementia?

The highest quality studies reporting on effective cognitive interventions to support everyday functioning in people with dementia did not report on whether or not there were any adverse events resulting from involvement in the interventions.

4: Supporting mobility and physical function through a falls prevention program

Clinical Practice Guidelines for People with Dementia evidence statement[1]:

Number	Classification	Evidence statement
NA	Evidence Based Research (Low)	Two RCTs found that falls prevention interventions led to reduced incidence of falls (low).

What does the research tell us?

- The Guideline Adaptation Committee[1] identified two RCTs reporting interventions that resulted in a statistically significant reduction in the incidence of falls in people with dementia. One intervention involved a combination of occupational therapy and physiotherapy, and the other intervention involved the use of a home technology system (nightlight and personal alarm).
- A systematic review examining long-term home and community-based exercise identified two other RCTs reporting statistically significant reductions in the risk of falls in people with dementia.[88]
- A search conducted in April 2017 generated one more RCT on a home and group exercise program that reported a statistically significant reduction in the incidence of falls in people with mild and moderate-severe dementia.

Elements from effective interventions for reducing falls in dementia:

Exercise	• Individually tailored strength and balance exercises.
Home safety	• Home safety assessment. • Education on dementia, cognitive abilities, and home hazards. • Home safety recommendations.
Technology	• Sensor lights. • Tele-assistance system with wearable device.

What should we hope to achieve and how to measure it?

Studies reporting effective falls prevention interventions have varied in intervention length (3 months to 12 months). Effectiveness in each of the studies was measured by the number of falls recorded in the intervention period.

Study (place, number of participants, average dementia stage); Length of intervention (sessions/ time frame)	Intervention	Outcome
Suttanon et al. 2012[125] (AUS; n=40) 6 visits, 5 phone calls over 6 months	Individualised home-based exercise: modified Otago Program (http://www.acc.co.nz/PRD_EXT_CSMP/groups/external_providers/documents/publications_promotion/prd_ctrb118334.pdf); balance, strength and walking. Monitored by PT and supported by family member.	**Falls rate decreased in exercise group (33%)** and increased in control group (89%) over 6 months.
Wesson et al. 2013[126] (AUS; n=22)	Combined home hazard reduction program (OT assesses function and home safety; provides home safety recommendations and	**Fewer falls in the intervention group** (5 falls) versus the control

9 visits, 3 phone calls, over 3 months	management strategies) and home-based strength and balance training exercises (prescribed and progressed by PT).	group (11 falls) at 3 months.
Tchalla et al. 2013[127] (France; n=96) Technology installed 12 months	Fall reduction program (American Geriatrics Society 2001) coupled with a home-based technology (nightlight path from bed to bathroom) and electronic bracelet with tele-assist service (remote intercom with telephone support via a central hotline).	**Reduced relative risk of falls** in technology intervention group by **48.8%** over 12 months.
Pitkälä et al. 2013[94] (Finland; n=210) 2 sessions/week, over 12 months	Home-based exercise: individualised program to address identified needs. Group-based exercise: pre-determined exercise program involving strength + balance training.	Individualised home based exercise **reduced falls risk by 30%** and group community based exercise **reduced falls risk 32%** over 12 months.
Öhman et al. 2016[95] (Finland; n=194) 2 sessions/week, over 12 months	Home-based exercise: individualised program to address identified needs. Group-based exercise: pre-determined exercise program involving strength + balance training.	Compared to control, exercise interventions **reduced falls by 35% in people with mild dementia** and **53% in people with severe dementia.**

What could an evidence-informed plan involving <u>combined home hazards, exercise and technology</u> to <u>reduce falls</u> look like?

These studies involved people with mild-stage dementia (mean MMSE 21.0 – 23.5). One of these studies was at moderate risk for bias, and the other study at unclear risk for bias[a].

Plan 4.1	**OT visits**
	Wk 1 x 2
	Wk 3 x 1
	Wk 5 x 1
	Wk 7 x 1
	Wk 12 x 1
	
	Phone follow-ups
	Wks 9–11
		Assessment	• Functional abilities e.g.
			  ○ Functional cognition
			  ○ Physical function.
			• Home safety assessment e.g.
			  ○ For environmental and behavioural fall hazards.

		Intervention: family member and person with dementia	• Problem solving in partnership with the therapist and dyad.
			• Identification of home safety recommendations tailored to specific home hazards and cognitive abilities of the person with dementia. Summarise in a personalised booklet, including:
			  ○ Description/explanation of identified hazards, and recommendations for addressing these in the context of the person's cognitive abilities e.g. rearranging furniture to improve access.
			  ○ Identification of habits to target for behavioural change e.g. leaving a handbag in the hallway is a trip hazard.
			  ○ Recommendation of any required items to buy e.g. sensor lights in the bathroom.
			  ○ Referral to any required home modification services e.g. to install shower rails.
			• Therapist-implemented recommendations during visits e.g.
			  ○ Fluorescent tape on step edges

[a] Refer to 'Interpreting the research' on p. 10 of this *technical guide* for a definition of research bias.

		○ Double-sided tape under floor mats. • Family member training in behaviour and management strategies e.g. environmental and task simplification to match cognitive abilities.
PT visits **Wk 2 x 2** **Wk 4 x 1** **Wk 6 x 1** **Wk 8 x 1**	Assessment	• Physical performance assessment. • Review of functional cognitive assessment to facilitate exercises that are tailored to abilities.
	Intervention: person with dementia and family member	• Prescription of up to 6 strength and balance exercises based on the Weight-Bearing Exercises for Better Balance program (http://webb.org.au/), individually tailored for cognitive and physical abilities: ○ Strength training exercises e.g. ▪ Block step-ups, sit-to-stand, calf raises ○ Static balance exercises e.g. ▪ Scaled stance positions with diminishing base of support, with eyes open/closed ○ Dynamic balance exercises e.g. ▪ Sideways walking, step-ups, stepping over an object, tapping feet on a block ○ Progressing difficulty of exercises e.g. ▪ Increasing: repetitions, frequency, time holding balance positions, height of stepping block, difficulty of balance positions ▪ Decreasing: chair height, amount of support in balance positions. • Provision of personalised booklet containing prescribed strength and balance exercises; large print, simplified instructions and colour photos used to describe correct technique of exercises. • Family members trained in providing supervision and/or demonstration of exercises as required.
Intervention support	Technology	• Sensor lights installed to provide a path from the bed to the bathroom that automatically turn on when the person gets out of bed. • Tele-assistance service with wearable device and 24/7 telephone support.
	Case sharing	• Information on assessments, goals and progress shared between OT and PT to support implementation and follow-up with the dyad.

Where the research studies reported data for minimum requirements for benefit:

Implementation of at least 50% of identified home safety recommendations and completion of exercises at least 2.8 times per week over 3 months.[126]

What could an evidence-informed <u>exercise plan</u> to <u>reduce falls</u> look like?

These studies involved people with mild to moderate stage dementia (mean MMSE 18.0 – 21.3). Two of these studies were at unclear risk for bias, and one study was at higher risk for bias.

Plan 4.2	**Home-based individualised exercise plan with PT (6-12 months)**
	
	Phone follow-ups between visits as required
		Assessment	• Balance and mobility assessment e.g.
			  ○ Functional Reach test, Step Test, Timed Up and Go Test, Human Activity Profile.
			• Daily functioning and mobility e.g.
			  ○ Functional Independence Measure
			  ○ Short Physical Performance Battery.

		Intervention: person with dementia and family member	• Goal-oriented exercises, individually tailored to needs and abilities of individual.
			• Education to ensure understanding of exercises and potential safety issues.
			• Prescribed exercises could be based on existing home exercise program (e.g. The Otago Program) or developed to address specific balance and mobility needs of each individual.
			• Exercises prescribed as appropriate e.g.
			  ○ Balance training e.g. picking items up off the floor
			  ○ Climbing stairs
			  ○ Walking
			  ○ Transfer training
			  ○ Dual tasking e.g. talking while walking or singing while dancing
			  ○ Outdoor activities.
			• Supplemental equipment used as appropriate e.g.
			  ○ Weights (e.g. ankle or hand)
			  ○ Exercise bikes
			  ○ Balls
			  ○ Balance pillow
			  ○ Canes.
			• Provision of individualised exercise booklet containing instructions and illustrations of exercises.
			• Exercises monitored at each visit and modified (scaled up or down) as required.
			• Family members trained in program to encourage exercises and monitor performance.
			• Phone follow-ups between visits for support and to answer any questions about the exercises.

Plan 4.3	**Group-based (up to 10 participants) exercise plan with two PTs (12 months)**	Assessment	• Daily functioning and mobility e.g.
			  ○ Functional Independence Measure
			  ○ Short Physical Performance Battery.

		Intervention: persons with dementia	• Set program:
			  ○ Balance training e.g. walking on a line, climbing a ladder, walking while bouncing a ball
			  ○ Strength training e.g. using specialised gym equipment such as leg press machine or hip abduction machine
			  ○ Endurance training e.g. exercise bikes
			  ○ Executive functioning training e.g. throwing a ball accurately, or doing tandem hand functions while simultaneously counting forwards or backwards.

	• Exercises supported with music, dancing, games and singalongs. Peer support between participants encouraged.

Where the research studies reported data for minimum requirements for benefit:
Adherence ranged from 5 sessions of independently practiced exercises per week over 6 months[125] to 1.5 physiotherapist-led sessions per week over 12 months.[94]

What costs are involved?
PTs and OTs providing interventions in these studies were all therapists experienced in working with people with dementia.

	Intervention Administration Requirements	Total Hours
Home based programs (Range 3-12 months Average visit 60 mins Average phone call 15 mins)	• 6 PT visits and 5 phone calls • 6 OT visits, 5 PT visits and 3 phone calls • 2 PT visits per week	• 7 hrs 15 mins (6 months) • 11 hrs 45 mins (3 months) • 104 hrs (12 months)
Group based program (12 months)	• 2 x 4 hour group PT sessions per week, each session with 2x PTs	• 416 hrs per group of 10; or 41 hrs 36 mins per person (12 months)
Technology system (12 months)	• Sensor lighting system Tele-assistance program with wearable device and 24/7 support	• Variable

Other important costing considerations	Travel Session preparation Equipment Provision of booklets/documentation Administration hours

Who is involved?

Clinician	Physiotherapist; Occupational therapist
Person with dementia	What stage of dementia? • Evidence from effective interventions has involved people with mild, moderate and severe stage dementia What if living alone? • Evidence from effective interventions involved a mix of people with dementia living alone or with their family member.
Family member	Family members were involved across the home-based studies to train as care partners to assist people with dementia in maintaining their prescribed exercise program or to implement home modification recommendations.
Venue	Evidence from effective interventions to reduce the incidence of falls in people with dementia has been conducted in the person's home and in community-based group settings. More research is needed to understand the benefit of falls prevention interventions conducted in residential care environments.

Have there been any negative effects reported from falls prevention interventions to reduce the incidence of falls in people with dementia?

No serious adverse events related to the interventions were reported in any of the studies. There were some intermittent minor complaints (e.g. stiffness, mild joint pain, discomfort) that were addressed by adjusting exercises, or eased with continuing the exercises.

5: Supporting mobility and physical function through an exercise program

Clinical Practice Guidelines for People with Dementia evidence statement[1]:

Number	Classification	Evidence statement
68	Evidence Based Research (Low)	People with dementia should be strongly encouraged to exercise. Assessment and advice from a physiotherapist or exercise physiologist may be indicated.

What does the research tell us?

- Neither the Guideline Adaptation Committee[1] or a recent Cochrane review[87] specifically reported on the impact of exercise interventions on physical function for people with dementia.
- A literature search up until April 2017 identified two recent systematic reviews that did report specifically on the impact of exercise interventions on physical function for people with dementia and nine more recent RCTs not included in these systematic reviews.
- The first systematic review[128] examining the effect of physical activity training on people living with dementia found that exercise improved mobility and balance, but did not impact on walking speed.
- The second systematic review[88] examining long-term home and community-based exercise found that exercise improved balance when compared with a non-exercise control.
- Results across the nine recent RCTs varied, with studies showing variable positive effects of exercise on physical function (balance, mobility, strength, endurance/physical function) between exercise and control groups.
- Limitations and inconsistencies exist across the nine RCTs (e.g. potential for bias; variable intervention lengths; variable intervention formats), which mean this is rated as very low quality evidence.
- This means that our confidence in the effect of exercise interventions to improve or support physical function in people with dementia is still limited and larger, rigorous trials are still needed to provide confirmatory evidence.
- Despite this, the World Health Organisation (WHO)[129] highlights the benefits of physical activity for older adults to improve cardiorespiratory and muscular fitness, enhance functional health, reduce risk of falling, support cognitive functioning and reduce risk of functional limitations.
- For older adults in general, the WHO[129] recommends at least 150 mins of moderate-intensity aerobic physical activity, plus muscle-strengthening activities on 2 or more days throughout the week.

Elements from effective exercise interventions for improving/supporting physical function in people with dementia:

Exercise intervention features	• Individually tailored exercises to the person's abilities.
	• Small group or one-to-one.
	• Range of exercises including:
	  ○ Aerobic e.g. walking, cycling, cross trainer
	  ○ Strength/resistance e.g. squatting, repeated stand-ups from a chair
	  ○ Balance e.g. one or two leg balance exercises
	  ○ Coordination e.g. tossing/catching a ball
	  ○ Functional exercises e.g. sitting/standing from a chair.
	• Intensity increased over time.

Supporting features of the program	• Exercises led by PTs, physical therapists, exercise scientists, professional trainers, EPs, OTs, RNs, or by carers (family or paid carers). • Music.

	• Equipment e.g. weighted belts, treadmill, cross trainer, bike, balls, foam ground mats, elastic bands. • Support strategies to match cognitive abilities of the person e.g. tailor communication, 1 or 2 step instructions, visual cues.
Exercise locations	• Home, residential care home, gym, community (e.g. neighbourhood walking).

What should we hope to achieve and how to measure it?

Studies reporting effective exercise interventions have varied in intervention length (9 to 65 weeks). Measurement of exercise effectiveness varied across studies depending on the physical function measure that was used.

Study (place, number of participants, average dementia stage); Length of intervention; Sessions/ time frame	Intervention (Physical function measure)	Outcome
Zeng et al. 2016[128] (Systematic review-China) 3-6 months	6 trials including: walking, strength, balance, resistance, and functional weight-bearing exercises. Berg Balance Scale; Cadence – steps/min; Functional Reach Test; Timed Up & Go; Walking Speed; Step Length	**Exercise associated with improved mobility** versus control (TUG: MD -2.87; 95%CI -3.25 – -2.5, p<.00001; I^2=8%), **improved balance** versus control (Functional Reach test: MD=4.25, 95%CI 3.52 – 4.98, p<.00001, I^2=0%), (BBS: MD=3.62, 95%CI 1.51 – 5.73, p=.0008, I^2=0%), and **improved gait** (cadence) (MD=12.71, 95%CI 6.92 – 18.51, I^2=0%). **Exercise was not associated with walking speed** (MD=13.21, 95%CI -8.01 – 34.43, p=.22, I^2=87%) or **step length** (MD=3.43, 95%CI -2.37 – 9.24, p=.25, I^2=50%).
Lewis et al. 2017[88] (Systematic Review-Australia) 4-12 months	3 exercise trials including: strength, balance and walking exercises; one treadmill walking program. Functional Reach test	**Exercise associated with improved balance** versus control (Functional Reach test: MD 5.2cm, 95%CI 0.51-9.86, I^2=76%).
Francese et al. 1997[130] (USA; n=11; "late stage" AD) 20 min sessions 3x/week for 7 weeks	Exercise regime involving use of music and equipment such as bean bags, beach balls, and leg weights (group). Balance: Tinetti Balance Evaluation Test Strength: Muscle strength	**Exercise group improved strength** (p=.01) **and was better than control group** post intervention (p=.01), and **exercise group had better balance than control post intervention** (p<.05).
Rolland et al. 2007[89] (France; n=134; Severe AD) 60 min sessions 2x/week for 12 months	Group exercise program (groups of 2-7) involving stretching, aerobic, strength, flexibility, and balance exercises. Balance: One leg balance test Mobility: 6-Meter Walking Speed, Get Up and Go test	Post intervention, **exercise group improved in 6-meter walking speed more than control group** (p=.002). No other group differences.

Christofoletti et al. 2008[131] (Brazil; n=54; Moderate dementia) 60 min sessions 3x/week for 6 months	Interdisciplinary program (physiotherapy, occupational therapy, and physical education) or a physiotherapy program (PT-individual; OT & Physical education-group). Balance: Berg Balance Scale (BBS) Mobility: Timed Up and Go (TUG)	**Compared to control, interdisciplinary group improved balance** (BBS: p<.05), **and physiotherapy group maintained balance while control declined** (BBS: p<.05). No group differences for mobility.
Santa-Sosa et al. 2008[90] (Spain; n=16; Moderate dementia) 75 min sessions 3x/week for 12 weeks	Small group exercise program (groups of 4) involving joint mobility, resistance training, and coordination exercises. Balance: 8-foot Up and Go Test (8-UGT), Tinetti Balance Scale (TBS) Endurance: 2-min Step Test (2-ST) Flexibility: Chair Sit and Reach test (CSRT), Back Scratch Test (BST) Strength: 30-sec Chair Stand Test (30-CST), Arm Curl Test (ACT)	With no change in control group, **group differences for all physical measures were found, all with the exercise group improving from baseline** (p<.05). Group differences were: ACT (p<.001), CST (p<.001) BST (p<.001), CSRT (p<.001), the 8-UGT (p<.001), the 2-ST (p=.01), and TBS (p<.001).
Kwak et al. 2008[132] (Korea; n=30; Moderate dementia) 30-40 min sessions 1/week for 12 months	Gradually increasing in intensity exercise program involving strength, aerobic exercise and stretching. ACMS – American College of Sports Medicine Guidelines for Exercise Testing (Muscle strength, Muscular endurance, Flexibility, Balance, Agility)	Post intervention, **exercise group improved Muscle strength** (p<.01), **Muscular endurance** (p<.01), **Flexibility** (p<.01), **Balance** (p<.05), **and Agility** (p<.01). Control worsened in Agility (p<.01) and did not change for any other measure.
Steinberg et al. 2009[133] (USA; n=27; Moderate AD) Daily (time not specified) for 12 weeks	Exercise program involving aerobic fitness, strength, balance and flexibility. Hand function: Jebsen Total Time (JTT) Mobility: Timed 8-Foot Walk Physical activity: Yale Physical Activity Survey (YPAS) Strength: Chair Sit To Stand test (CSTS)	Controlling for MMSE score, the **exercise group had improved hand performance** post intervention (JTT: p=.04). No other group differences.
Kemoun et al. 2010[134] (France; n=38; Moderate AD) 60 min sessions 3x/week for 15 weeks	Exercise program involving walking, stamina, and equilibrium. Bessou locomoter (walking speed, stride length, double limb support time)	Group **differences for walking speed** (p<.01) with **exercise group faster than control** post intervention (p<.01), **stride length** (p<.01) **with exercise group better than control** post intervention (p<.01), and **double limb support** (p<.01) with control group worsening from baseline (p<.01) and **exercise group improving** (p<.01) **so it was better than control post intervention** (p<.01).
Venturelli et al. 2011[92]	Informal carer-led walking program (individual).	**Exercise group improved endurance** from baseline to post

(Italy; n=22; Moderate AD) 30 min sessions 4x/week for 24 weeks	Endurance: 6-Minute Walk Test	intervention (p<.05), **and was better than control post intervention** (p<.05).
Roach et al. 2011[135] (USA; n=82; Severe AD) 15-30 min sessions 5x/week for 16 weeks	Activity exercise involving basic mobility, strength, balance, flexibility and endurance plus a supervised walk. Or a supervised walking program (individual). Acute Care Index of Function (ACIF – mobility, transfers, ambulation) Endurance: 6-Min Walk	**Group differences indicated improvement in ACIF transfers for exercise group** compared to decline in other groups (p=.04). No other group differences.
Hauer et al. 2012[136] (Germany; n=122; Mild dementia) 120 min sessions 2x/week for 3 months	Progressive resistance and functional training (groups of 4-6). Functional training focused on basic ADL-related motor functions such as postural control and walking. Mobility: Short Physical Performance Battery (SPPB: 5 chair stand, gait performance – walking speed, step length, cadence), Stair Climbing performance, Performance Oriented Motor Assessment (POMA), Timed Up and Go (TUG) Strength: Increase in maximum strength (1 repetition maximum; 1RM)	**Post intervention, exercise group performed better than control in all physical measures**: maximum strength (1RM: p<.001), 5 chair stands (p<.001), walking speed (p<.001), step length (p<.001), cadence (p<.001), Stair climbing (p=.006), POMA (p<.001), and TUG (p=.009).
Suttanon et al. 2012[125] (Australia; n=40; Mild dementia) 6 visits and 5 phone calls over 6 months	Home-based exercise program (individual) involving balance, strength and walking. Balance: Modified Clinical Test of Sensory Interaction of Balance (mCTCIB), Limits of Stability (LOS – reaction time, movement velocity, max excursion), Walk across test (step width, step length, walking speed), Step/quick turn (turn time, turn away), Functional Reach Test (FRT) Endurance: Step Test (ST) Mobility: Timed Up and Go (TUG) Physical activity: Human Activity Profile Strength: Sit To Stand (STS – rising index, centre of gravity), Timed Chair Stands	**Compared to control group, exercise group improved in balance** on the functional reach test (p=.002). But **compared to exercise group, control group improved in balance** on LOS movement velocity (p<.05). No other group differences.
Vreugdenhil et al. 2012[93] (Australia; n=40; Mild AD) Daily sessions for 4 months; check-in	Exercise program involving a focus on upper and lower body strength and balance training with neighbourhood walking (individual-dyad).	Compared to control group, **exercise group had improved balance** (functional reach: p=.032), **mobility** (TUG: p=.004), **and strength** (Sit to Stand: p<.001).

phone calls at 2 weeks and 2 months.	Balance: Functional reach test Mobility: Timed Up and Go (TUG) Sit Strength: To Stand test (STS)	
Pitkälä et al. 2013[94] (Finland; n= 210; Moderate AD) Home: 60 min sessions 2x/week Group: 4 hr sessions 2x/week for 12 months	Home-based exercise (individual): individualised program to address identified needs. Group-based exercise (groups of 10): pre-determined exercise program involving strength + balance training. Mobility: Short Physical Performance Battery (SPPB) Physical function: Functional Independence Measure (FIM)	Post intervention, **decline in physical function slower in exercise group** (FIM: p=.015). **Home exercise group had better physical function than control** post intervention (p=.004). No difference between Group exercise group and control group. No group differences for mobility.
Arcoverde et al. 2014[137] (Brazil; n=20; Moderate dementia) 35 min sessions 2x/week for 4 months	Treadmill walking program. Balance: Berg Balance Scale (BBS), Functional reach Mobility: Timed Up and Go (TUG) Strength: Sit To Stand test (STS)	**Exercise group improved compared to control in balance** (BBS: p=.00; functional reach: p=.00), and **mobility** (TUG: p=.00). No group difference for strength.
Schwenk et al. 2014[138] (Germany; n=61; Mild dementia) 120 min sessions 2x/week for 3 months	Progressive resistance and functional training (groups of 4-6). Functional training focused on basic ADL-related motor functions such as postural control and walking. Gait (speed, cadence, stride length, stride time, step width, step time variability, walk ratio)	**Post intervention, exercise group better than control in gait speed** (p<.001), **cadence** (p=.002), **stride length** (p=.008), **and stride time** (p=.001). No difference for other gait measures.
Bossers et al. 2015[139] (Netherlands; n=109; Moderate dementia) 30 min sessions 4x/week for 9 weeks	Aerobic exercises or combined aerobic + strength exercises. Balance: composite (Frailty and Injuries Cooperative Studies of Intervention Techniques subtest 4 + Figure of 8 test + Groningen Meander Walk test) Endurance: 6 Minute Walk test (6min W) Mobility: composite (6 meter Walk Test + Timed Up & Go) Strength: Leg strength composite (30 second Sit to Stand test + Dynamometer-max knee extension strength)	Compared to social group, **combined aerobic + strength group improved in endurance** (6min W: p=.004), **strength composite** (p<.001), **and balance composite** (p=.002). Compared to aerobic only group, **combined aerobic + strength group improved in 6min W** (p=.004) and **strength composite** (p=.001). No differences in mobility were found between groups.
Telenius et al. 2015[140] (Norway; n=163; Moderate dementia) 50-60min sessions 2x/week for 12 weeks	Functional exercises involving strength and balance. Individually tailored but delivered in small groups. Balance: Berg Balance Scale (BBS) Endurance: 6 Minute Walk test (6min W) Strength: 30 second Chair Stand Test (30-CST)	**Balance improved in the exercise group** compared to control (BBS: p=.02). **No difference between groups in endurance or strength**.

Cancela et al. 2016[97] (Spain; n=189; Moderate dementia) Daily sessions (mean 108.45 min/week) for 15 months	Aerobic physical activity exercise program. Mobility: Timed Up & Go (TUG)	**Exercise group improved in mobility** (TUG: p=.03) compared to control.
Kim et al. 2016[141] (Republic of Korea; n=33; Moderate AD) 60 min sessions 5x/week for 6 months	Aerobic exercise with stretching and relaxation combined with multicomponent cognitive program. Balance: Berg Balance Scale (BBS) Exercise intensity: Borg Scale Scores (BSS – pedal power) Strength: Dynamometer – grip strength	Compared to multicomponent cognitive intervention alone, **exercise + cognitive intervention group improved balance** (BBS: p<.04), **exercise intensity** (BSS: p<.004), **and grip strength** (Dynamometer: p<.02).
Öhman et al. 2016[95] (Finland; n=194; Moderate AD) 60 min sessions 2x/week for 52 weeks	Home-based exercise: individualised program to address identified needs. Group-based exercise: pre-determined exercise program involving strength + balance training. Physical function: Functional Independence Measure (FIM)	In **mild AD, less decline in physical function in exercise group** compared to usual-care control at 6 months (FIM: p=.003) and 12 months (p<.001). In **moderate-severe AD, there was no difference in physical function decline** between exercise and control groups at 6 or 12 months.
Sobol et al. 2016[142] (Denmark; n=200; Mild AD) 60 min sessions 3x/week for 16 weeks	Individually tailored aerobic exercise and strength program. Endurance: 6 minute Astrand Cycle Ergometer test – Est VO_2 max Mobility: Timed Up & Go (TUG), 400 Meter Walk test (400MW), 10 Meter Walk test (10MW) Strength: 30 second Sit to Stand test	**Endurance improved in the exercise group** (Est VO_2 max: p<.0001) compared to usual-care control. For **exercise attendance >66.6% (2-3 sessions/week), exercise group improved in endurance** (p<.0001), **and mobility** (TUG: p=.009; 400MW: p=.007; 10MW: p=.049). No change in strength.
Toots et al. 2016a[98] (Sweden; n=186; Moderate dementia) 45 min sessions 5x/fortnight for 4 months	High-intensity functional exercise program. Balance: Berg Balance Scale (BBS) Physical function: Functional Independence Measure (FIM – Motor)	**Balance was better in the exercise group at 4 months** (BBS: p<.001), but no longer different from control at 7 months. **No difference in physical function (FIM) between groups** at 4 or 7 months. **Non-AD dementia exercise group had better balance than control at 4** (BBS: p=.009) **and 7 months** (p=.003), **and better physical function than control at 7 months** (FIM: p=.011). **AD dementia exercise group was worse than control group in balance** (BBS: p=.005) **and physical function** (FIM: p=.032) **at 7 months.**
Toots et al. 2016b[143] (Sweden; n=186; Moderate dementia)	High-intensity functional exercise program. Mobility: Gait Speed Test (GST)	**No difference between groups in mobility** (GST) at 4 or 7 months. People in the **exercise group who walked with no support had better mobility than control at 4 months**

45 min sessions 5x/fortnight for 4 months		(GST: p=.009) **and 7 months** (p<.001). People in the **exercise group who walked with an aid were no different from control group** at 4 or 7 months.
Dawson et al. 2017[144] (USA; n=23; Moderate dementia) Sessions (time not specified) 2x/week for 12 weeks	Individual moderate intensity home-based functional exercise program with strength and balance. Balance: Berg Balance Scale (BBS) Mobility: 8ft Walk Test (8ft WT) Strength: 30 second Chair Stand Test (30-CST)	**Exercise group improved lower extremity strength** (30-CST: p=.004) **and balance** (BBS: p=.001) compared to control. **No difference in mobility** (8ft WT) between groups.
Morris et al. 2017[99] (USA; n=76; Mild dementia) 60 mins + 21 mins/week until reached 150 mins/week over 3-5 sessions/week for 26 weeks	Aerobic exercise. Endurance: Peak VO_2 Cardiorespiratory Exercise Testing, 6 Minute Walk Test (6MW)	**Aerobic exercise group had improved endurance** compared to non-aerobic stretching and toning control on the 6MW (p=.0003), but **no difference between groups in cardiorespiratory fitness** (peak VO_2).

What could an exercise plan in the community to improve or support physical function look like?

The home-based intervention studies involved people in the mild to moderate stages of dementia (mean MMSE 17.8 – 22.0). One of these studies was at moderate risk for bias, two had an unclear risk, and three were at a higher risk for bias[a].

The gym or community centre-based Intervention studies involved people in the mild to moderate stages of dementia (mean MMSE 18.0 – 25.4). One of these studies was at moderate risk for bias, five were at unclear risk, and one was at higher risk for bias.

		Assessment	• Health assessment (e.g. by a geriatrician) to ensure person is safe to perform exercises. • Physical performance assessment e.g. functional reach test, walking performance, Timed Up and Go, Sit to Stand test, Functional Independence Measure-Motor component, Short Physical Performance Battery.
Plan 5.1	**EP; PT; trained exercise specialist** 60 min sessions daily to twice/week over 3-12 months	Home-based plan: family member and person with dementia	• Program introduced and guided by practitioner. Reviewing progress in program, providing education to improve adherence, planning of the program with the family member and the person with dementia, and introducing the exercise program using goal-oriented individually tailored exercise training to address identified functional or mobility needs. • Goals set in partnership with person and family member at beginning of intervention. • Training for person with dementia and family member in the exercise program and provided with

[a] Refer to 'Interpreting the research' on p. 10 of this *technical guide* for a definition of research bias.

	Phone follow-ups To check on progress		an exercise manual (instructions, illustrations, safety notes). • Family members trained to act as 'personal trainers' for the person with dementia, but should also be encouraged to do the exercises themselves. • Exercise program could involve: o Multicomponent tailored PT-developed program incorporating: ▪ Aerobic e.g. walking, climbing stairs ▪ Strength e.g. angle/wrist weights, resistive bands ▪ Balance e.g. doing two things at once, shifting centre of gravity, tandem walks, chair sit to stands ▪ Functional e.g. transfer training, dual tasking, outdoor activities. o Pre-determined program: e.g. the Canadian Centre for Activity and Aging Home Support Exercise Program (HSEP),[101] incorporating: ▪ User-friendly, functional and progressive exercises that can be done easily at home without the need for specialised equipment. ▪ 10 exercises including: walking from room to room, wall push-ups, rising up on toes, toe taps, seat walks, getting up from a chair, leg lifts, reaching, standing stretch, and seated stretch. e.g. a modified Otago Program[145] incorporating: ▪ Strength and balance exercises ▪ Graduated walking program.
Plan 5.2	**PT, physical therapist or certified personal trainer guided sessions** 30-60 min sessions 2-5 times/week over 6-12 months	Gym or community centre-based plan: person with dementia (one-to-one or small group: 2-10)	• Warm up and cool down protocol for each session e.g. o gradually speed up/slow down on treadmill over 5 mins o cycling with a minimal workload for 10 mins o supervised stretching. • Predetermined exercise program incorporating: o Adaptation period e.g. introduction to exercise with minimal resistance and appropriate form; strength training o Strength/Resistance e.g. lifts on a leg press, cable pulley weights, heel rises o Functional exercises e.g. walking, stepping, climbing stairs, sitting down and standing up, group games, dancing, and tai chi, getting up from the floor o Balance e.g. in static and dynamic positions, throwing and catching a ball with a person moving in different directions, climbing a ladder o Aerobic e.g. treadmill, stationary bicycle, cross trainer or recumbent stepper; aim to reach 60-80% max heart rate during peak training after adaptation period.
		Equipment/ support	• Exercise bikes, treadmill, cross trainer, recumbent stepper, weights, balls, resistive bands.

		• Music and sing-alongs to support exercises. • Peer support in group sessions.
	Implementation strategies	• Identify strengths of the person. • Tailor communication and instruction to the cognitive abilities of the person, ensuring respect, reassurance and empathy. • Amend instruction as necessary e.g. 1 or 2 step instructions; provide clear written instructions with images to assist with correct execution of exercises; use touch as necessary and mirror techniques to provide instruction. • Include the person as an active participant throughout the program allowing them to make choices around their preferences e.g. walking in the neighbourhood rather than on a treadmill. • Focus on current possibilities and any adaptations that may be needed to support participation in enjoyed activities.

	Intervention scaling	• Progressively challenging levels of exercises as abilities improve e.g.
		  ○ Increased difficulty/intensity e.g. weight, distance, variation of base support in balance exercises
		  ○ Increased time
		  ○ Increased repetitions.

Where the research studies reported data for minimum requirements for benefit:

Home based intervention: Participation in a mean of 3.8 exercise sessions per week (at least a mean of 85.7% of prescribed exercises sessions) over 3-6 months.[125, 133, 144]

Gym or community centre-based Intervention: Participation in a mean of 2.1 exercise sessions per week (at least a mean of 88.5% of prescribed exercises sessions) over 3-4 months.[99, 136, 137, 142]

What could an <u>exercise plan</u> in <u>residential care</u> to improve or support <u>physical function</u> look like?

The majority of studies reporting on multicomponent exercise programs involved people in the moderate stages of dementia (mean MMSE 14.9 – 20.0). Three of these studies were at moderate risk for bias, two had an unclear risk, and two were at higher for bias. One study involved people in the severe stages of dementia (mean MMSE 8.8) and was at moderate risk for bias.

The studies reporting on aerobic intervention programs involved people in the moderate stage of dementia (mean MMSE 12.5-15.1). Two of these studies had an unclear risk for bias and two were at higher risk.

	Assessment	• Health assessment (e.g. by a geriatrician) to ensure person is safe to perform exercises. • Assessment of behavioural readiness for exercise program i.e. the person's ability to participate in an exercise program. • Physical performance assessment e.g. 6-meter walking speed, Berg Balance Scale, the Timed Up and Go test (Assessment of walking ability without a walking aid).

			• Heart rate in seated position to determine rate of exertion during exercise.

Plan 5.3	**PT, OT, physical therapist, exercise scientist, trained student, exercise professional guided sessions** 15-75 min sessions 2-5 times/week over 7 weeks - 6 months	Multicomponent exercise plan (one-to-one or small group 2-8)	• Small group sessions (2-8 people).
			• Session warm-up and cool-down e.g. gentle walking and stretching for 5-15 mins.
			• Adaptation period for introduction to exercise e.g. begin with light intensity and gradually increase over first few weeks.
			• Exercises individualised in intensity according to abilities and behavioural readiness for the program. Progressively scaled over sessions.
			• Multicomponent sessions including:
			  ○ Pre-determined program such as the High-Intensity Functional Exercise Program (HIFE Program)[146] incorporating:
			  ▪ Exercising in functional weight-bearing positions
			  ▪ Lower limb strength and balance exercises with static and dynamic balance e.g. step-up onto box, forward or side lunge
			  ▪ Dynamic balance exercises in walking e.g. walking on a soft surface, walking over obstacles
			  ▪ Static and dynamic exercises in standing e.g. side step and return, trunk rotation
			  ▪ Lower-limb strength with continuous balance support e.g. heel-raise, standing up from sitting
			  ▪ Walking with continuous balance support e.g. walking with numerous turns, walking in various directions
			  ○ Aerobic: e.g. walking around a circuit fast enough to reach moderate breathlessness
			  ○ Flexibility/joint mobility: e.g. imitate flexibility exercises from facilitator; hip and knee bends, leaning forward and backwards when seated
			  ○ Strength/resistance adapted for each person's ability: e.g. squatting at different levels, lateral leg elevations, resistance elastic bands, weighted belt, heel raise, toe rise, seated knee extension, toe raises while holding hands of trainer, hip abduction and hip extension
			  ○ Coordination: e.g. bouncing a ball with both hands, tossing/catching a ball, hand clapping to music
			  ○ Balance: e.g. stepping exercises using cones and hoops on the ground; one or two leg balance exercises, walking on a soft surface, step-up onto boxes.

			• Music to accompany each session and support exercises.

Plan 5.4	**PT, physical therapist or trained family member or care worker guided sessions** 15-30 min sessions daily to 4 times/week over 6-15 months	Aerobic exercise plan (one-to-one or in pairs)	• Family members and care workers trained in exercise support by a PT.
			• Adaptation period: stretching and strengthening of muscles over the first couple of weeks.
			• Session warm-up and cool-down e.g. gentle walking and stretching for 10-15 mins.
			• Moderate to high intensity walking sessions for 30 mins e.g.
			  ○ One-to-one guided walking with a trained care worker around the residential care facility
			  ○ Arm-in-arm walking with family member along residential facility hallways.
			• Cycling sessions in a gym alone or in pairs:
			  ○ Session monitored by PT or physical therapist
			  ○ Bicycle geared to low resistance
			  ○ Pedalling at a constant, self-selected pace for 15-30 mins.
			• Activity sessions e.g.
			  ○ Dance and stepping.

		Equipment	• Exercise bikes. • Foam/rubber ground mats for safety or balance during exercises, cones and hoops, weighted belts, elastic bands, balls. • Walk belt with safety handles to assist falls prevention. • Music to accompany exercises.

		Intervention scaling	• Progressively challenging levels of exercises as abilities improve e.g.
			  ○ Increased difficulty e.g. weight, distance, performance, narrowing the base of support
			  ○ Increased time
			  ○ Increased repetitions.

Where the research studies reported data for minimum requirements for benefit:

Multicomponent exercise program: Participation in a mean of 2.1 exercise sessions per week (at least a mean of 73.8% of prescribed exercises sessions) over 9 weeks - 12 months.[89, 90, 98, 139, 140, 143]

Aerobic exercise program: Participation in a mean of 4.8 exercise sessions per week (at least a mean of 93.8% of prescribed exercises sessions) over 5.5 months - 15 months.[92, 97, 141]

What costs are involved?

PTs, EPs, OTs and exercise trainers were all specially skilled in the exercise programs and in working with people with dementia.

	Intervention Administration Requirements	Total Hours
Home-based programs (3-6 months)	• Training in program followed by daily exercise sessions with family member. 2 x phone calls to check on progress. • 5 x family member-led sessions/week; 6 x PT sessions and 5 x PT phone calls to provide support between visits • 2 x 120 min training session for exercise specialists; 2 x physical therapist sessions per week • 2 x 60 min PT sessions per week	• Specific timing of family member sessions and phone calls not specified (3-4 months) • Specific timing of visits not specified (6 months) • 4 hours or physical therapist training; specific timing of visits not specified (3 months) • 104 PT hours (12 months)
Community gym-based program (3-12 months)	• 2 x 120 min group (4-6) qualified instructor sessions per week • 2 x 30 min physical therapist/ physical educator sessions per week • 3 x 60 min physical therapist sessions per week • 60-150 mins over 3-5 exercise trainer sessions per week for 6 x weeks. Gradually reduced to 1 session per week • 2 x 4 hour group (10) sessions per week with 2 x PTs	• 48 qualified instructor hours per group (3 months) • 12 physical therapist/ physical educator hours (3 months) • 48 physical therapist hours (4 months) • Specific over all exercise trainer timing not specified (6 months) • 832 PT hours per group with 2 x PTs (12 months)
Residential aged care-based program (multicomponent) (9 weeks-12 months)	• 2 x 60 min group (2-7) OT sessions per week • 2 x 55 min group (3-6) PT sessions per week • 5 x 45 min group (3-8) sessions per fortnight, each session with 2 x PTs • 3 x 75 min exercise scientist sessions per week • 4 x 30 min human movement sciences research assistant hours per week	• 104 OT hours per group (12 months) • 22 PT hours per group (3 months) • 240 PT hours per group (4 months) • 45 exercise scientist hours (12 weeks) • 18 hours human movement sciences research assistant per participant (9 weeks)
Residential aged care-based program (aerobic) (5.5-15 months)	• Training in program with PT for family member and person with dementia followed by 4 x 30 min family member led sessions per week • Mean 15.5 min PT sessions per day • 5 x 60 min PT sessions per week	• 48 family member hours (5.5 months) • 108.5 PT hours (15 months) • 130 PT hours (6 months)

Other important costing considerations	Travel Session preparation Equipment Provision of booklets/documentation Administration hours

Who is involved?

Clinician	Physiotherapist; Exercise physiologist; Occupational therapist; Physical therapist, Exercise trainer, Exercise practitioner, Qualified instructor, Registered nurse, Exercise scientist, Graduate students (nursing / physical therapy), Human movement sciences research assistants.
Person with dementia	What stage of dementia? • Evidence from effective interventions has involved people with mild, moderate and severe stage dementia. What if living alone? • Evidence from effective interventions involved a mix of people with dementia living alone, with their family member, or in residential care.
Family member	Some studies involved family members in working with the person to assist them in maintaining their prescribed exercise program. Other studies involved training care workers to support the person living with dementia in their exercises.
Venue	Evidence from effective exercise interventions to support or improve physical function in people with dementia has been conducted in the person's home, in community-based group settings, and in residential care settings.

Have there been any negative effects reported from exercise interventions to improve physical function in people with dementia?

The presence or absence of any adverse events related to the exercise interventions was poorly reported, with a third of studies not reporting on this at all. A number of studies reported there were no adverse events related to the intervention, or more vaguely that there were no serious adverse events. Minor adverse events were reported across a quarter of the studies, and involved issues such as falls during exercise, minor pain or discomfort that eased with continued exercise, dizziness or musculoskeletal issues. Three severe adverse events could not be excluded from being related to the intervention. One person died from circulatory failure a day after intervention, and two studies reported heart rhythm abnormalities during exercise.

6: Supporting cognitive function through an exercise program

Clinical Practice Guidelines for People with Dementia evidence statement[1]:

Number	Classification	Evidence statement
68	Evidence Based Research (Low)	People with dementia should be strongly encouraged to exercise. Assessment and advice from a physiotherapist or exercise physiologist may be indicated.

What does the research tell us?

- A recent Cochrane review[87] identified nine RCTs, and a more recent meta-analysis[147] identified 18 RCTs reporting on the impact of exercise interventions on cognitive function for people with dementia. Both studies report a small to medium positive effect of exercise for cognitive function in people with dementia when compared to controls. Due to inconsistency between studies, the review indicated that these results are inconclusive.
- A literature search up until April 2017 identified eight more RCTs reporting on the impact of exercise interventions to improve cognitive function for people with dementia.
- Results across the eight recent RCTs varied, with some studies showing positive effects of exercise on cognitive functions (general cognition, executive function, learning and memory), and others showing no difference between exercise and control groups. Limitations and inconsistencies exist across the eight RCTs (e.g. potential for bias and variable intervention lengths, intervention approaches, and cognitive outcome measures), which mean the evidence needs to be interpreted with caution.

Elements from effective exercise interventions for improving/supporting cognitive function in dementia:

Exercise intervention features	• Individually tailored exercises to the person's abilities. • Small group or one-to-one. • Intensity increased over time. • Music to supplement exercises. <u>Range of exercises:</u> General cognition: • Aerobic e.g. walking, cycling, cross trainer, rowing. • Balance e.g. going up a step, zigzagging, exercise balls. • Strength/resistance e.g. elastic bands, overhead pulley, leg raises. • Activity exercises e.g. dance. • Stretching e.g. ankle, waist, shoulder, neck. Executive function • Aerobic e.g. movement trainer machine, Nordic walking outdoors, dancing. • Balance e.g. trampoline jumping, climbing ladder, balance pillows. • Coordination e.g. throwing a ball as accurately as possible, bilateral drawing on large paper attached to a wall. • Strength e.g. wrist and ankle weights, gym equipment. • Dual tasking e.g. walking while talking, hand clapping to music, walking with full glass of water. Learning and memory • Combinations of the above exercises.
Supporting features of the program	• Exercises led by physiotherapists (PTs), exercise physiologists (EPs), occupational therapists (OTs), exercise trainers, dance therapists, Brain Gym Trainers, volunteers, care workers or by family members.

	• Music, sing-alongs, dance and games incorporated to support exercise. • Equipment e.g. gym, balls, weights, elastics, cycle machines, treadmills, rowing machines. • Multicomponent program e.g. supplement exercise with occupational therapy cognitive stimulation activities, psychoeducation (communication skills, pleasant events etc). • Peer support in group training from other persons with dementia.
Exercise locations	• Home, residential care home, gym, community (e.g. neighbourhood walking).

What should we hope to achieve and how to measure it?

Studies reporting effective exercise interventions have varied in intervention length (7 to 65 weeks). Measurement of exercise effectiveness varied across studies depending on the cognitive measure that was used. Cognitive functions measured included general cognition, executive function, and learning and memory.

Study (place, number of participants, average dementia stage); Length of intervention; Sessions/ time frame	Intervention (cognitive measure)	Outcome
Forbes et al. 2015[87] (Systematic Review-Canada) 6-24 weeks	9 trials including a range of exercises: walking, interdisciplinary program (physiotherapy, OT and physical education), dance, strength, and balance.	**Exercise groups tend to be associated with better cognitive function** compared with controls (SMD 0.43; 95%CI -0.05 to 0.92, p=.08, I^2=80%), but no clear conclusion can be made due to imprecision across the studies.
Groot et al. 2016[147] (Meta-Analysis-Netherlands) 6-52 weeks	7 aerobic, 5 non-aerobic, and 7 combined exercise trials. MMSE, Clock Drawing Test, Rapid Evaluation of Cognitive Function, Cambridge Neuropsychological test automated battery: Matching to Sample Delayed Recall subscale	**Physical activity associated with a positive overall effect on cognitive function** versus control (SMD 0.42; 95%CI 0.23 to 0.62, p<.01).
Van de Winckel et al. 2004[148] (Belgium; n=25; Moderate dementia) 30min sessions 7x/week for 3 months	Seated exercise routine following instructor with music (group). General cognition: MMSE, Amsterdam Dementia Screening Test 6 (ADS6)	Group difference on the **MMSE** (p=.02), with the **exercise group improving from baseline to post intervention** (p=.0001), while there was no change in control. **Category fluency (ADS6) improved for exercise group** (p<.05), but no change in control group. No other ADS6 subtests showed group differences.
Stevens et al. 2006[149] (Australia; n=75; Mild-moderate dementia) 30 min sessions 3x/week for 3 months	Gentle aerobic exercises involving joint and large muscle group movement with music (group). Executive function: Clock Drawing Test (CDT)	Post intervention, **exercise group performed better than the social control** (p=.002), but no difference with usual care control. **Social control worsened function from baseline to post intervention** (p=.000), **but exercise group and**

		usual care control maintained function.
Christofoletti et al. 2008[131] (Brazil; n=54; Moderate dementia) 60 min sessions 3x/week for 6 months	Interdisciplinary program (physiotherapy, occupational therapy, and physical education) or a physiotherapy program (PT-individual; OT & Physical education-group). General cognition: MMSE, Brief Cognitive Screening Battery (BCSB) Executive function: Clock Drawing Test (CDT), Verbal Fluency	No group differences for general cognition (MMSE, BCSB). Group **differences occurred between interdisciplinary group and control for verbal fluency** (p<.05) **and CDT** (p<.05), with both **favouring interdisciplinary group**.
Hokkanen et al. 2008[150] (Finland; n=29; Moderate dementia) 30-45 min sessions 1x/week for 9 weeks	Dance/movement therapy combining music, light exercise, and sensory stimulation (group). General cognition: MMSE Executive function: Clock Drawing Test (CDT) Memory & learning: Word List savings score Language: Cookie Theft	**Exercise group improved in general cognition** (MMSE: p=.007) **and on the Cookie Theft** (p=.044) post intervention compared to no change in control. No other group differences.
Kwak et al. 2008[132] (Korea; n=30; Moderate dementia) 30-40 min sessions 1/week for 12 months	Gradually increasing in intensity exercise program involving strength, aerobic exercise and stretching. General cognition: MMSE	**Exercise group improved in general cognitive functioning** by 30% post intervention (p<.01), while no change in control group.
Kemoun et al. 2010[134] (France; n=38; Moderate AD) 60 min sessions 3x/week for 15 weeks	Exercise program involving walking, stamina, and equilibrium. General cognition: French Rapid Evaluation of Cognitive Function (ERFC)	Post intervention, **exercise group performed better than control group on general cognition** (p<.01).
Venturelli et al. 2011[92] (Italy; n=22; Moderate AD) 30 min sessions 4x/week for 24 weeks	Informal carer-led walking program (individual). General cognition: MMSE	**Group difference in general cognition** (p<.001), with **exercise group maintaining MMSE scores** and control group declining post intervention (p<.05).
Yáguëz et al. 2011[151] (UK; n=27; Mild AD) 120 min sessions 1x/week for 6 weeks	Brain Gym exercise program designed to activate muscles on both sides of the body (group). Cambridge Neuropsychological Test Automated Battery (CANTAB): Executive function & attention: Spatial working memory, Rapid Visual Information Processing (RVIP) Memory & learning: Paired Associate Learning (PAL),	Post intervention, **exercise group better than control in Matching to sample** (p<.01). **Exercise group improved from baseline in Pattern Recognition** (p<.05) but control did not change. **Exercise group improved sustained attention** (RVIP: p<.01) **as did control** (p<.04). No group differences in Spatial working memory or in Motor screening. PAL not reported.

	Matching to sample, Pattern recognition Psychomotor Speed: Motor Screening	
Vreugdenhil et al. 2012[93] (Australia; n=40; Mild AD) Daily sessions for 4 months; check-in phone calls at 2 weeks and 2 months.	Exercise program involving a focus on upper and lower body strength and balance training with neighbourhood walking (individual-dyad). General cognition: ADAS-Cog, MMSE	Compared to control, **exercise group improved general cognitive function** on the MMSE (p=.001) and the ADAS-Cog (p=.001).
Volkers et al. 2012[152] (Netherlands; n=130; Moderate dementia) 30 min sessions 5x/week for 18 months	Supervised walking program. Executive function: Composite (Key search, Category fluency, Digit span backwards, visual memory span backward, Stroop task, Digit Symbol Substitution Test) Memory: Composite (Eight Word test, Face recognition, Picture recognition)	No overall group differences for memory or executive function. For **people with mild dementia (MMSE>20), exercise group had a positive impact on executive function** (effect size 0.36).
Arcoverde et al. 2014[137] (Brazil; n=20; Moderate dementia) 35 min sessions 2x/week for 4 months	Treadmill walking program. General cognition: Cambridge Cognitive Examination (CAMCOG) Executive function: Clock Drawing Test (CDT), Verbal Fluency, Trail Making Test, Stroop test Attention: Digit Span Memory & learning: Rey Auditory Verbal Learning Test (RAVLT)	**Group difference on general cognitive function** (CAMCOG: p=.00), with **exercise group improved over control** at post intervention (p<.05). No other group differences.
Bossers et al. 2015[139] (Netherlands; n=109; Moderate dementia) 30 min sessions 4x/week for 9 weeks	Combined aerobic and strength program involving moderate to high intensity walking in combination with strength-based exercises. Or a strength program (individual). General cognition: MMSE Executive function: Composite (visual memory span backwards, digit span backwards, Stroop, Verbal fluency, Picture completion test, Trail Making Test) Memory: Verbal composite (8 Words, Digit span forwards), Visual composite (Visual memory span forwards, face/picture recognition)	Post intervention, **combined group was better than control on MMSE** (p<.001), **visual memory** (p<.001), **verbal memory** (p=.003) **and executive function** (p<.001) composites. **Aerobic group was better than control on executive function** (p=.021) only.
Holthoff et al. 2015[153] (Germany; n=30; Mild AD) 30 min sessions 3x/week for 12 weeks	Physical activity of the lower limbs using a movement trainer (individual). General cognition: MMSE Executive function: Fluency	No group difference for general cognition. **No group difference in executive function post intervention, but at 3 months follow-up, exercise group better than control** (p<.05).

Cancela et al. 2016[97] (Spain; n=189; Moderate dementia) Daily sessions (mean 108.45 min/week) for 15 months	Aerobic physical activity exercise program involving cycling (individual or in pairs). General cognition: MMSE	The **exercise group improved in their cognitive function** while the control group declined (p=.01).
Hoffman et al. 2016[154] (Denmark; n=200; Mild AD) 60 min sessions 3x/week for 16 weeks	Moderate to high intensity aerobic exercise program involving cycling, cross trainer, treadmill (groups of 2-5). General cognition: MMSE Executive function: Stroop, Verbal Fluency, Symbol Digit Modalities Test Memory: ADAS-Cog verbal memory	No group difference on cognitive measures across all people in the study. For **people who engaged in high exercise (attended >80% of sessions with intensity of >70% max HR), the exercise group performed better than controls** on the Symbol Digit Modalities Test (p=.028).
Kim et al. 2016[141] (Republic of Korea; n=33; Moderate AD) 60 min sessions 5x/week for 24 weeks	Physical exercise and multicomponent cognitive program (group). General cognition: ADAS-Cog, MMSE Executive function: Clock Drawing Test	No difference between groups on cognitive measures when assessed as initially planned. Once the analysis was adjusted to account for the group demographics, **the exercise group improved in general cognition on the ADAS-Cog** (p=.03) while the control group did not change.
Öhman et al. 2016[155] (Finland; n=194; Moderate AD) 60 min sessions 2x/week for 52 weeks	Home based and group based exercises involving aerobic, strength, balance, endurance, executive function and functional exercises (individual or groups of 10). General cognition: MMSE Executive function: Clock Drawing Test, Verbal Fluency	The **home exercise group improved on the CDT** more than controls (p=.03). No difference between groups in any other cognitive measures.
Satoh et al. 2017[100] (Japan; n=62; Moderate dementia) 40 min sessions 1x/week for 26 weeks	Seated physical exercise with music (group). General cognition: MMSE, Executive function: Word Fluency, Cube Drawing, Japanese Raven's Colored Progressive Matrices Memory: Logical memory Attention: Trail Making Test A	**The exercise group improved on the Cube Drawing more than control group** (p=.009). No group differences in any other cognitive measures.
Prick et al. 2017[156] (Netherlands; n=111; Mild dementia) 60 min sessions x8 (1st month weekly; last 2 months fortnightly) for 12 weeks	Dyadic multicomponent intervention involving physical exercise and psychoeducation (individual-dyads). Executive function: Key Search Test, Category Fluency Learning & Memory: Eight Words, Face Picture Recognition Attention: Digit span backwards, Digit Span Forwards	The **multicomponent intervention group improved in the Digit Span Forwards compared to the control group** (p=.04). No difference between groups found for executive function or memory.

What could an <u>exercise plan</u> in the <u>community</u> to improve or support <u>general cognitive function</u> look like?

These studies involved people living with mild-moderate stage dementia (mean MMSE 14.0 – 24.0). Two of these studies were at moderate risk of bias and one study had an unclear risk[a].

Plan 6.1	**Family member guided sessions with PT support**
	Daily sessions over 4-months
	
	Phone follow-ups
	To check-in at two time points over the intervention period
		Home-based plan: family member and person with dementia	• Provision of an exercise program adapted to suit people living with dementia by a PT, for example an adaptation of the Home Support Exercise Program (HSEP), developed by the Canadian Centre of Activity and Aging.[101]
			• Training for person with dementia and family member in the exercise program and provided with an exercise manual (instructions, illustrations, safety notes).
			• Family members trained to act as 'personal trainers' for the person with dementia, but should also be encouraged to do the exercises themselves.
			• Exercise program could involve daily exercises to be used in addition to 30min of brisk neighbourhood walking.
			• A pre-determined program such as the HSEP[101] could incorporate:
			  ○ User-friendly, functional and progressive exercises that can be done easily at home without the need for specialised equipment
			  ○ Exercises that progress over 3 levels of challenge and focus on balance and upper and lower body strength
			  ○ 10 simple exercises including: walking from room to room, wall push-ups, rising up on toes, toe taps, seat walks, getting up from a chair, leg lifts, reaching, standing stretch, and seated stretch.

Plan 6.2	**PT or physical educator guided sessions**
	30-60 min sessions 2-3 times/week over 4 months
		Gym or community centre-based aerobic plan: person with dementia (small group 2-10)	• Adaptation period (4 weeks) when people initially start the program to build up strength and familiarity with the program. Could involve gentle aerobic (e.g. 20 mins on treadmill at 2km/hr or 40%VO_2 max) and strength based exercises.
			• Warm up and cool down protocol for each session e.g. gradually speed up/slow down on treadmill over 5-10 mins or supervised stretching.
			• Increase intensity of program over time from 40-60% VO_2 max (or up to 70-80% of maximal heart rate).
			• Exercise program could involve:
			  ○ Training at moderate to high intensity on aerobic apparatus
			  ○ Treadmill walking, cycling on exercise bikes, using a cross trainer.

		Equipment	• Exercise bikes, treadmills, cross trainers.

		Intervention scaling	• Progressively challenging levels of exercises as abilities improve e.g.
			  ○ Increased difficulty e.g. weight, distance, speed, resistance
			  ○ Increased time
			  ○ Increased repetitions.

[a] Refer to 'Interpreting the research' on p. 10 of this *technical guide* for a definition of research bias.

Where the research studies reported data for minimum requirements for benefit:

Participation in 45 min sessions an average of 2.2 times/week (at least a mean of 88.4% of prescribed sessions) over a mean of 25 weeks.[137, 154]

What could an <u>exercise plan</u> in <u>residential care</u> to improve or support <u>general cognitive function</u> look like?

These studies involved people with moderate stage dementia (mean MMSE 11.8 – 15.1). Three of these studies were at unclear risk for bias, and three were at higher risk of bias.

Plan 6.3 (Note: plan 6.3 is presented as one plan, but based on the preferences of participants it could be any of the three listed program types, or a combination)	**PT or care worker guided sessions** 30-45 min sessions daily to once per week over 9 weeks-3 months	Music and dance in groups	• Interventions could be provided by trained care workers and supervised monthly by a registered dance therapist.
			• Studies on music and dance programs were lacking in specific details around the intervention approach. In general, dance intervention sessions involved:
			  ○ Age-specific music selected to supplement dance programs
			  ○ Warm up and cool down procedure for each session
			  ○ Seated exercises where participants followed demonstration from a PT. Exercises focused on balance, flexibility and upper and lower body strength.

	PT or Physical therapist guided sessions 60 min sessions 3-5 times per week over 15 weeks to 6 months	Multicomponent exercise program	• Assessment of individual physical functioning abilities to develop tailored programming.
			• Adaptation period e.g. over the initial 2 weeks, a focus on mobilising joints and muscle stimulation.
			• Each session involves a 10-15 min warm up and 10-15 min cool down e.g. stretching.
			• Exercise program developed to focus on specific areas e.g:
			  ○ Aerobic e.g. walking, cycling machine
			  ○ Balance e.g. zigzagging, striding over boards
			  ○ Endurance e.g. using an ergo cycle with arms and legs
			  ○ Functional exercises to incorporate multiple areas e.g. dance.
			• Cognitive program could be provided in addition to the exercise program.
			  ○ Provided by trained therapists in 60 min sessions 5 times per week
			  ○ Music therapy, art therapy, horticulture therapy, handicraft, recreational therapy, stretching, laughing therapy, activity therapy.

	PT or family member guided sessions (with PT support)	Aerobic exercise program	• Moderate to high intensity walking sessions for 30 mins e.g. ○ one-to-one guided walking with a trained care worker around the residential care facility

	15-30 min sessions daily to 4 times per week over 6-15 months		○ arm-in-arm walking with family member along residential facility hallways. • Cycling sessions in a gym alone or in pairs ○ Session monitored by PT ○ Bicycle geared to low resistance ○ Pedalling at a constant, self-selected pace for at least 15 mins.
		Equipment	• Cycling machines. • Any materials for the additional cognitive program.
		Intervention scaling	• Progressively challenging levels of exercises as abilities improve e.g. ○ Increased difficulty e.g. weight, distance, performance ○ Increased time ○ Increased repetitions. • Intensity of exercise 40-60% of maximum heart rate.

Where the research studies reported data for minimum requirements for benefit:

Participation in 41.9 min sessions an average of 4.4 times/week (at least a mean of 92.9% of prescribed sessions) over a mean of 8 months.[92, 97, 134, 141]

What could an <u>exercise plan</u> in the <u>community</u> to improve or support <u>executive function</u> look like?

These studies involved people with mild to moderate dementia (mean MMSE 18.0 – 24.2). Two of these studies were all at unclear risk for bias and one was at high risk.

		Assessment	• Physical performance assessment e.g Functional Independence Measure, Short Physical Performance Battery.
Plan 6.4	**PT or family member guided sessions** 30 min sessions 3x/week over 12 weeks	Home-based plan: person with dementia, family member, and PT	• Goals set in partnership with person and family member at beginning of intervention. Goal-oriented, individually tailored exercises based on assessment outcomes developed to address identified functional or mobility needs. • Family members trained to encourage the person with dementia to exercise. • Exercise program could involve: ○ Multicomponent tailored PT-developed program incorporating: ▪ 15 mins Aerobic e.g. cycling, Nordic walking ▪ 15 mins Strength e.g. angle/wrist weights ▪ 15 mins Balance e.g. doing two things at once, climbing stairs, picking up items from the floor ▪ 15 mins Executive functional e.g. throwing a ball accurately, dual-tasking (doing two things at once e.g. walking with a full glass, singing while dancing), transfer training, outdoor activities. ○ 30 mins training on a movement trainer (e.g. cycle/pedal exerciser) with variable programs e.g. differences in resistance and direction.

Plan 6.5	**PT or certified trainer guided sessions** 240 min sessions with a 30 min break once per week over 6 weeks - 12 months	Gym or community centre-based plan: person with dementia (one-to-one or small group)	• Structured non-aerobic exercise program (e.g. Brain Gym®) involving stretching, movements of the limbs, focusing on specific muscle groups, fine motor movements, hand-eye coordination, and balance.
			  ○ Exercises could include: cross-lateral walking in place, drawing large images single handed or bilaterally on vertical wall hanging, stretching, coordinated movements e.g. moving the right arm in specific movements while holding it and providing resistance with the left arm.
			• Predetermined exercise program. Per session incorporating:
			  ○ 15 mins aerobic e.g. cycling, rowing machine, outdoor Nordic walking, dancing
			  ○ 15 mins balance e.g. climbing a ladder, walking on a line, bouncing a ball, trampoline jumping, rising from the floor
			  ○ 15 mins strength e.g. using specialised gym equipment and exercises tailored to person's strength and abilities
			  ○ 15 mins executive function exercises e.g. throwing a ball accurately, dual-tasking (doing two things at once e.g. walking with a full glass, singing while dancing).

		Equipment	• Exercise bikes, treadmill, weights, balls, balance pillows • Outdoor training e.g. neighbourhood walking

		Intervention scaling	• Progressively challenging levels of exercises as abilities improve e.g.
			  ○ Increased difficulty e.g. weight, distance
			  ○ Increased time
			  ○ Increased repetitions

Where the research studies reported data for minimum requirements for benefit:

Participation in 60 minute exercise sessions a mean of 1.6 times per week (at least a mean of 83% of prescribed exercises sessions) over a mean of 7 months.[151, 153, 155]

What could an <u>exercise plan</u> in <u>residential care</u> to improve or support <u>executive function</u> look like?

These studies mostly involved people with moderate stage dementia (mean MMSE 15.3 – 20.5). One of these studies was at moderate risk for bias, while the remaining four studies were all at higher risk for bias.

		Assessment	• Assessment of health and physical function to determine ability to participate in exercise sessions.

Plan 6.6 (Note: plan 6.6 is presented as one plan, but based on the preferences of participants it could be any	**PT, OT and physical therapist guided sessions** 120 min sessions 5 times per	Interdisciplinary plan	• A combined program involving different multidisciplinary sessions:
			  ○ PT: one-to-one sessions with a focus on strength, balance and cognition e.g. praxis, memory and attention
			  ○ OT: group sessions with a focus on motor coordination and

of the three listed program types, or a combination)	week over 6 months		cognition through specifically planned arts and crafts activities ○ Physical therapy: group sessions with a focus on developing functional capacities, strength, balance, motor coordination, agility, flexibility and aerobic endurance. Could involve walking sessions in combination with upper and lower limb exercises.
	Exercise trainer guided sessions 30-40 min sessions 1-3 times per week over 12 weeks to 6 months	Group exercise	• Exercise sessions with music could involve: ○ Small groups seated or standing ○ Generation-specific music ○ Focus on muscle training for upper and lower limbs, hand clapping to music, singing, and breath and voice training ○ Gentle aerobic exercises focusing on movement of joints and large muscle groups.
	Research assistant, care worker, family member or volunteer guided sessions (with PT support) 30 min sessions 4-5 times per week over 9 weeks to 18 months	Individualised exercise	• Could involve aerobic or a combination of aerobic and strength exercises (with strength and aerobic sessions alternated). • Aerobic sessions could involve: ○ Moderate to high intensity walking (indoors or outdoors). • Strength exercises could involve: ○ Seated knee extensions, toe raises while standing and holding onto hands of trainer, hip abduction/extension while standing and holding onto a chair ○ 3 sets of 8 repetitions to start then increased in repetition and the addition of weights over time with improvement.
		Equipment	• Bars, exercise balls, elastic ribbons, proprioceptive stimulation plates. • Any materials required for the OT activities.
		Intervention scaling	• Progressively challenging levels of exercises as abilities improve e.g. ○ Increased difficulty e.g. weight, distance, performance ○ Increased time ○ Increased repetitions.

Where the research studies reported data for minimum requirements for benefit:

Participation in 28.9 min sessions an average of 2.4 times/week (at least a mean of 63.7% of prescribed sessions) over a mean of 7.0 months.[100, 131, 139, 149, 152]

What costs are involved?

PTs, OTs and exercise trainers were all specially skilled in the exercise programs and in working with people with dementia.

	Intervention Administration Requirements	Total Hours
Home-based programs (3-4 months)	• Training in program followed by daily exercise sessions and 30 min neighbourhood walks with family member. 2 x phone calls to check on progress. • 3 x 30 min family member encouraged cycle trainer sessions per week	• Timing for training and check-in phone calls not specified (4 months) • Any professional hours not specified (12 weeks)
Community gym-based program (6 weeks-12 months)	• 1 x 120 min group Brain Gym session per week • 2 x 30 min group aerobic treadmill sessions per week • 3 x 60 min group PT sessions per week • 2 x 4 hour group PT sessions per week, each session with 2x PTs	• 12 Brain Gym trainer hours per group (6 weeks) • 16 physical therapist/educator hours (4 months) • 48 PT hours per group (4 months) • 832 PT hours per group of 10; or 83.2 PT hrs per person (12 months)
Residential aged care-based program (3-18 months)	• 7 x 30 min group dance sessions per week with PT • 3 x 30 min group exercise with music sessions per week with researchers • 5 x 120 min group and on-to-one PT/OT/physical educator sessions per week • 1 x 37.5 min care worker led dance and music therapy sessions per week • 3 x 60 min exercise sessions per week • Training in program with PT for family member and person with dementia followed by 4 x 30 min family member led sessions per week • 5 x 30 min walking sessions per week with care workers (or family members or volunteers) • 4 x 30 min researcher aerobic or strength sessions per week • Mean 15.5 min PT sessions per day • 5 x 60 min PT exercise sessions per week • 1 x 40 min music trained physical trainer sessions per week	• 10.5 PT hours per group (3 months) • 18 researcher hours per group (3 months) • 240 multidisciplinary hours (6 months) • 5.6 care worker hours (9 weeks) • 45 hours (15 weeks) • 48 family member hours (5.5 months) • 180 care worker hours (18 months) • 18 researcher hours (9 weeks) • 108.5 PT hours (15 months) • 120 PT hours (6 months) • 16 physical trainer sessions (6 months)

Other important costing considerations	Travel Session preparation Equipment Provision of booklets/documentation Administration hours

Who is involved?

Clinician	Physiotherapists; occupational therapists; exercise trainers; dance therapists; care workers; volunteers.
Person with dementia	What stage of dementia? • Evidence from effective interventions has involved people with an average of mild to moderate stage dementia. What if living alone? • Evidence from effective interventions involved a mix of people with dementia living alone or with their family member.
Family member	Some studies involved family members in working with the person to assist them in maintaining their prescribed exercise program.
Venue	Evidence from effective exercise interventions to support or improve cognitive function in people with dementia has been conducted in the person's home, in community-based group settings, and in residential care settings.

Have there been any negative effects reported from exercise interventions to improve cognitive functioning in people with dementia?

A large number of studies did not report the presence or absence of adverse events at all. For the studies that did report on this, a few reported no adverse events or "no serious" adverse events related to the exercise interventions. There were some minor adverse events (e.g. musculoskeletal issues, dizziness/faintness), and a couple of severe adverse events that could not be excluded from being related to the intervention (e.g. atrial fibrillation).

7: Supporting cognitive function through a cognitive program

Clinical Practice Guidelines for People with Dementia evidence statement[1]:

Number	Classification	Evidence statement
N/A	Evidence Based Research (Low)	A systematic review (14 RCTs) found a significant effect of *cognitive stimulation therapy* on global cognition (low), while another systematic review (6 RCTs) found no significant effect of *cognitive training* on global cognition. Based on the available evidence, the Guideline Adaptation Committee[1] decided not to form a recommendation.

In healthy adults and people with mild cognitive impairment, cognitive interventions may have some benefit.[157] There is no conclusive evidence to support the use of cognitive interventions with people with dementia; there is also no evidence of harm from participating in these interventions.

What are cognitive interventions?

Cognition-focused interventions are those that target cognitive functioning, rather than focusing on other areas such as physical functioning or behavioural changes. The following are three of the primary cognitive intervention approaches discussed in the literature:

- Cognitive stimulation – a more general approach involving engagement in discussions and a range of activities to enhance social and general cognitive functioning. May involve exercises such as reality orientation. Often in a group setting.
- Cognitive training – an approach focusing on more specific cognitive domain outcomes (e.g. memory, executive functioning, attention), using a standard set of tasks. May involve paper/pencil or computerised exercises. May be in a group or individual setting.
- Cognitive rehabilitation – an individualised approach focusing on using strategies to compensate for cognitive changes and achieve personally meaningful goals. The focus is more on supporting everyday performance, rather than specific cognitive functions.[12, 102, 103]

What does the research tell us about cognitive interventions in people with a diagnosis of dementia?

- A Cochrane review[102] identifying 14 RCTs reported a significant benefit of cognitive stimulation therapy for global cognition. The Guideline Adaptation Committee[1] indicated there were significant flaws impacting on the findings of this review which led to no recommendation on cognitive stimulation therapy being developed. A separate Cochrane review[103] identifying 11 RCTs plus one additional RCT identified by the Guideline Adaptation Committee[1, 86] indicated that cognitive training was not associated with beneficial effects to global cognition when compared to controls.
- A literature search up until April 2017 and a quick search for systematic reviews in December 2017 identified one more recent systematic review, and ten additional RCTs (not included in the systematic reviews) reporting on the impact of cognitive interventions to improve cognitive function for people with dementia.
- The systematic review[106] looking at cognitive interventions for people living in long-term care facilities reported a benefit of cognitive interventions to support global cognition compared to a passive control group (7 RCTs) and an active control group (5 RCTs).
- Results across the ten recent RCTs varied, with some studies showing positive effects of cognitive interventions on global cognitive function, others showing benefits to specific aspects of cognition such as executive function, while other studies showed no difference between cognitive intervention and control groups. Limitations and inconsistencies exist across the ten RCTs (e.g. potential for bias, and variable intervention lengths, intervention approaches, and cognitive outcome measures), which mean the evidence needs to be interpreted with caution.

Elements from effective cognitive interventions for improving/supporting cognitive function in dementia:

Cognitive program features	• Small group or one-to-one. • Level of difficulty adapted to abilities. Range of cognitive programs involving features from reality orientation, cognitive stimulation, and cognitive rehabilitation. • Warm-up activities e.g. non-cognitive soft ball game, group introductions, orientation exercises. • Reality orientation strategies e.g. day, month, location, weather; old/current newspapers; past/present personal/local photographs; materials to stimulate all 5 senses. • Cognitive stimulation strategies: focus on information processing rather than factual knowledge e.g. if looking at faces, who looks the youngest? Sessions focused on themes e.g. food, childhood, present day. • Cognitive rehabilitation strategies: individualised approach addressing personally meaningful goals e.g. training in use of external memory aids to improve independence in using compensatory strategies. • Practise in communication and social interactions. • Group activities e.g. bingo, spelling games, dominoes, word jumbles, picture puzzles. • Strategies: errorless learning technique, face-name association, practise in maintaining attention and concentration, practical aids, language training, ADL training, community activities, stress management techniques, cueing from interventionists with answers or support in spontaneous retrieval using aids.
Supporting features of the program	• Programs led by care workers, speech pathologists, clinical psychologists, registered nurses, occupational therapists, physiotherapists, family members. • Supporting materials e.g. orientation board, whiteboard, calendar, diary, clock, photos, newspapers, magazines, materials for games, scrap books, notes. • Multicomponent program e.g. supplement cognitive exercises with physical exercise, ADL support, sensory stimulation. • Peer support.
Intervention locations	• Home, residential care home, activity centres.

What should we hope to achieve and how to measure it?

Studies reporting effective cognitive interventions have varied in intervention length (4 weeks to 12 months). Measurement of effectiveness varied across studies depending on the cognitive measure that was used.

Study (place, number of participants, average dementia stage); Intervention dose	Intervention (cognitive measure/s)	Outcome
Woods et al. 2012[102] (Systematic Review-UK; n=658; mild-moderate dementia) 4 weeks – 24 months	14 trials investigating cognitive stimulation therapy. (ADAS-Cog, MMSE)	**Cognitive stimulation associated with a positive benefit on cognitive function** compared with controls (SMD 0.41; 95%CI 0.25 to 0.57, p<.00001, I^2=0%).

Bahar-Fuchs et al. 2013[103] (Systematic Review-UK; n=173; mild-moderate dementia) 4 – 24 weeks	6 studies investigating cognitive training, and 1 study investigating cognitive rehabilitation. (ADAS-Cog, MMSE, Mattis Dementia Rating Scale)	**Cognitive training not associated with any effect on global cognition** versus control (SMD 0.10; 95%CI -0.21 to 0.40, p=.53, I^2=0%). **Change in global cognition was not measured for cognitive rehabilitation**.
Folkerts et al. 2017[106] (Systematic review-Germany; n=471; mild-severe dementia) 1 – 12 months	11 trials investigating cognitive interventions (cognitive stimulation, reminiscence, multimodal interventions). (Addenbrooke's Cognitive Examination Revised, ADAS-Cog, Hasegawa Dementia Scale Revised, MMSE, Royal College of Physicians mental scale for the elderly)	**Cognitive intervention associated with a moderately positive effect on global cognition compared to passive control** (n=7 studies: SMD 0.47, 95%CI 0.27 to 0.67, p<.00001, I^2=40%). **Cognitive intervention also associated with a moderately positive effect on global cognition compared to active control** (n=5 studies: SMD 0.55, 95%CI 0.22 to 0.89, p=.001, I^2=50%).
Woods, 1979[158] (UK; n=14; "elderly infirm") 30 min sessions 5x/week for 20 weeks	Reality orientation (groups of 3-4) involving naming objects, reading information and copying from the blackboard. Clues and prompts used to support correct answers. Memory: Wechsler Memory Scale (WMS) Concentration: composite (Wechsler Memory Scale + Memory and Information Test items + Clifton Assessment Schedule) Information and orientation: composite (Wechsler Memory Scale + Memory and Information Test items+ Clifton Assessment Schedule)	**No group differences in memory** (WMS: F=2.34, df 4,22, p<.10). Post hoc **reality orientation group improved more than control and social therapy** combined (t=2.43, p<.025). **Concentration scores changed over time across groups** (F=3.81, df 2, p<.05). Post hoc **reality orientation group improved compared to social therapy** (t=2.84, p<.025), **but not control**. No group differences for information and orientation.
Baines et al. 1987[159] (UK; n=15; Moderate-severe "impairment of cognitive functioning") 30 min sessions 5x/week for 4 weeks	Reality orientation + reminiscence therapy crossover (groups of 5). Reality orientation involved an orientation board, past/present materials and materials to stimulate all 5 senses. Reminiscence therapy involved stimulating materials from the past. General cognition: Cognitive Assessment Scale- mental ability Information and orientation: Cognitive Assessment Scale-information and orientation Communication: Holden Communication Scale	**Reminiscence group better on information and orientation than control** a month after first intervention round (p<.026). **Reality orientation + reminiscence group sig better on information and orientation than reminiscence + reality orientation group** post second intervention round (p<.041), and **better than control** at follow-up a month after second intervention round (p<.048). No group differences for mental ability or communication.
Beck et al. 1988[160] (USA; n=20; Moderate dementia) 30-40 min sessions 3x/week over 6 weeks	Cognitive skills remediation training (individual) involving training in areas of attention, reading, concentration and remembering. Attention/Executive function: Letter cancellation task, Match to a	**No significant between group differences.** Within groups, **cognitive skills remediation training group improved in recall or numbers** (p<.05) whereas no change in control. In contrast, cognitive skills remediation group **worsened in matching a sample**

	sample, Match to a sample different orientation Memory: Recall of numbers, Recall of parts of a story	**with a different orientation** (p<.01), as did control group (p<.05). No other group differences.
Ferrario et al. 1991[161] (Italy; n=19; Mild-moderate dementia) 60 min sessions 5x/week for 24 weeks	Reality orientation therapy (groups of 4-5). General cognition: Cognitive Assessment Scale – mental ability Information and orientation: Cognitive Assessment Scale – information and orientation	Post intervention **reality orientation group improved information and orientation** (p<.05) **and mental ability** (p<.01), compared to no change in control group.
Baldelli et al. 1993[162] (Italy; n=23; Moderate dementia) 60 min sessions 3x/week for 3 months	Reality orientation therapy. General cognition: MMSE Orientation: Berg's Orientation Scale for Geriatric Patients	Post intervention, **reality orientation group improved in cognition** (MMSE: p=.008) **and orientation** (OSGP: p=.004) **and had better cognitive** (MMSE: p=.029) **and orientation** (OSGP: p=.009) **scores than control**.
Breuil et al. 1994[163] (France; n=56; Mild dementia) 60 min sessions 10x over 5 weeks	Cognitive stimulation therapy (groups of 10). Used mental imagery, identification, naming, and classification of items to stimulate encoding, consolidation and retrieval of information. General cognition: MMSE, global score composite (MMSE + word list memory + picture pair association + verbal fluency) Executive function: verbal fluency Memory: Word list memory, picture pair association test	**General cognition improved for cognitive stimulation group compared to control** (MMSE: p<.005; global score: p<.01). No group differences for memory (word list memory, picture pair association test), or fluency (verbal fluency).
Quayhagen et al. 1995[164] (USA; n=78; Mild-moderate dementia) 60 min sessions 6x/week with family carer + Weekly sessions for 12 weeks with research team	Active cognitive stimulation training (individual – dyads) involving focus on memory, executive function, and social interaction using skills training with a cognitive rehabilitation or remediation approach. General cognition: Mattis Dementia Rating Scale (DRS); Executive function/attention: composite of Geriatric coping schedule + DRS conceptualisation, WMS-R visual memory span + Digit span Fluency: composite of verbal fluency (FAS) + Category test + DRS initiation Memory: composite (Wechsler Memory Scale revised + DRS memory, Visual Reproduction test (VRT))	Group differences were found where **active cognitive stimulation group improved compared to controls for general cognition** (DRS: F=3.99, p=.004), **memory** (composite: F=3.77, p=.006), **non-verbal memory** (VRT: F=3.75, p=.006), **and fluency** (composite: F=3.85, p=.005). No group differences for verbal memory or executive functioning.
Quayhagen et al. 2000[165] (USA; n=103; Mild-moderate dementia)	Cognitive stimulation intervention (individual – dyads). Carer acts as interventionist using memory stimulation, problem-solving, and conversational activities.	**Group difference found for memory** (delayed memory composite: F=4.60, p=.034), **with cognitive stimulation group improving over time** (p=.029) and

60 min sessions 5x/week for 8 weeks	<u>Executive function:</u> composite (Geriatric Coping Schedule + DRS Conceptualisation) <u>Verbal fluency:</u> composite (FAS + Animal category names + DRS initiation) <u>Memory:</u> immediate memory composite (WMS-R Logical memory I + Visual reproduction I subscales + DRS memory), delayed memory composite (WMS-R Logical memory II + Visual reproduction II)	no change in other groups. No other group differences found, but **cognitive stimulation group improved in executive function** (composite: p=.009) **and verbal fluency** (composite: p=.018) when there was no change in the other groups. No group differences for immediate memory.
Baldelli et al. 2002[166] (Italy; n=87; Moderate dementia) 60 min sessions 5x/week for 1 month	Reality orientation therapy + physical therapy. <u>General cognition:</u> MMSE	**Reality orientation group improved in general cognition post intervention** (MMSE: p<.001), and **had higher cognitive scores compared to control** (MMSE: p<.05).
Spector et al. 2003[167] (UK; n=201; Moderate dementia) 45 min sessions 2x/week for 7 weeks	Cognitive stimulation therapy program (small groups) involving concepts from cognitive stimulation and reality orientation. Sessions had themes promoting reminiscence and included multi-sensory stimulation. <u>General cognition:</u> ADAS-Cog, MMSE <u>Communication:</u> Holden Communication Scale	**Cognitive stimulation group improved in general cognition compared to control** (ADAS-Cog: p=.014; MMSE: p=.044). No group differences for communication.
Chapman et al. 2004[168] (USA; n=54; Moderate dementia) 90 min sessions 1x/week for 8 weeks. Then 1x/month maintenance to 12 months.	Cognitive communication stimulation program (groups of 6-7) designed to enhance verbal content, functional abilities and quality of life through a focus on conversational interaction. <u>General cognition:</u> ADAS-Cog, MMSE <u>Communication:</u> composite (narrative discourse + procedural discourse + California Proverb Test)	**General cognitive function was variable, with no group differences on the ADAS-Cog, but on the MMSE, cognitive stimulation group maintained performance at 12 months**, and control group declined (MMSE: p=.041). No between group differences for **communication,** but in post hoc analyses **cognitive stimulation group maintained function and control group declined** (p=.03) over 12 months.
Loewenstein et al. 2004[169] (USA; n=44; Mild dementia) 45 min sessions 2x/week for 12-16 weeks (24 sessions)	Cognitive rehabilitation (individual) involving spaced retrieval technique, time-and-place orientation, dual cognitive support, procedural and motor memory training, sustaining attention, training in making change and balancing a chequebook. <u>General cognition</u>: MMSE <u>Executive function/attention:</u> Continuous Performance Test (CPT), Modified Making-Change-for-a-Purchase Task, Bill-Paying-Balancing-a-Check book Task, digit	**Between group differences existed for general cognition** (MMSE: p<.05) and **orientation** (MMSE orientation: p<.01). **Memory was variable with differences for face-name associations** (Face-Name three-trial: p<.005; Face-Name delayed: p<.0001), but not for POME, List learning or WMS Logical memory. **Executive function was variable with differences for making change** (Making change: p<.05) **and continuous performance** (CPT commission errors: p<.05; CPT reaction: p=.001),

	span, Trail Making Test (TMT), Category fluency Memory: Face-Name Association Task, Procedural Object-Memory Evaluation (POME), List Learning, WMS Logical memory Orientation: MMSE orientation	but not for balancing a check book, digit span or TMT. No other between group differences existed. Within groups **cognitive rehabilitation group improved from at post intervention in orientation** (p<.01), **some aspects of memory** (Face-Name three-trial: p<.001; Face-Name delayed: p<.001), **and some aspects of executive function** (making change: p<.05; CPT commission: p<.05; CPT reaction: p<.01). **Control declined in executive function continuous performance** (CPT commission: p<.05).
Bottino et al. 2005[170] (Brazil; n=13; Mild dementia) 90 min sessions 1x/week for 5 months	Cognitive rehabilitation (group) involving errorless learning technique, training in face-name associations, use of external memory aids, language, and ADLs, involvement in external activities to stimulate social interactions. General cognition: ADAS-Cog, CDR, MMSE Executive function/attention: Block design, Digit span forward + backwards, Trail Making test A + B, Verbal fluency Memory: Fuld Object Memory Evaluation FOME Communication: Wechsler Intelligence Revise Scale WAIS-R vocabulary, Boston Naming Test	**General cognitive function was variable with no group differences post intervention for ADAS-Cog, but cognitive rehabilitation group scored higher than control on MMSE** (p=.047). **Executive function was variable, with cognitive intervention group better than control in digit span** (Digit span backwards: p=.018), but in other measures. No other group differences identified for communication or memory.
Kawashima et al. 2005[171] (Japan; n=32; Moderate AD) 20 min sessions 6x/week for 6 months	Learning training involving exercises in arithmetic and reading/writing. General cognition: MMSE	Post intervention, **learning training group maintained MMSE scores, whereas control** (usual care) **declined** (p<.05), so that post intervention, **learning training group had a significantly better MMSE score than control** (p<.05).
Onder et al. 2005[172] (Italy; n=156; Moderate dementia) 30 min sessions 3x/week for 25 weeks	Reality orientation (individual – dyad) involving time-place orientation, topics of general interest with a focus on attention, memory and visuospatial exercises. General cognition: ADAS-Cog, MMSE	**General cognitive function improved for the reality orientation group and declined for the control group** (ADAS-Cog: p=.01; MMSE: p=.02).
Haight et al. 2006[173] (Ireland; n=30; Moderate dementia) 8 hours over 6 weeks	Review/life story book intervention (individual) involving encouragement to use cognitive and organisational skills to organise a life book record of a person's recalled and reconstructed lifespan memories. General cognition: MMSE	**Lifebook intervention group improved in general cognition** (MMSE: p<.0005) **and communication** (COS: p<.005) compared to control.

	Communication: Communication Observation Scale (COS)	
Requena et al. 2004/2006[174, 175] (Spain; n=86; Moderate dementia) 45 min sessions 5x/week for 12 months with family reinforced sessions at home on weekends	Cognitive stimulation therapy program (group of 5) or cognitive stimulation therapy program + drug. Therapy involved 7 stimulation areas (orientation, bodily awareness, family/society, self-care, reminiscing, household activities, animals, people, things), supplemented with computer training, sensory stimulation, music and muscle relaxation. General cognition: ADAS-Cog, MMSE	**Between group differences found for general cognition** (ADAS-Cog: p<.0001; MMSE: p<.0001). Post intervention, **cognitive stimulation + drug group better than control in general cognition** (ADAS-Cog and MMSE), **as was the cognitive stimulation group** (MMSE). Post intervention **cognitive stimulation + drug group improved on global cognition** (ADAS-Cog: p<.005; MMSE: p<.05), **as did cognitive stimulation group** (ADAS-Cog: p<.005); MMSE: p<.001); Control groups declined. At 2 year follow-up, **cognitive function maintained in cognitive stimulation + drug group, whereas it declined in cognitive stimulation** and control groups (ADAS-Cog, MMSE).
Tárraga et al. 2006[176] (Spain; n=46; Mild dementia) 20 min sessions 3x/week + 3.5 hr/day psycho-stimulation for 24 weeks	Interactive Multimedia Internet Based System (IMIS) + integrated psycho-stimulation program (IPP) and IPP group. IMIS involves a variety of different computer-based stimulation programs covering domains of attention, calculation, gnosis, language, memory and orientation. IPP involved cognitive stimulation, instrumental ADL reinforcement, and workshops (e.g. music therapy, physical activity, arts). General cognition: ADAS-Cog, MMSE Attention and memory: Syndrom-Kurz test	Post intervention, **between group differences were found for cognitive function** on the MMSE (p=.001), but not ADAS-Cog (p=.06). **IMIS + PPI group better than control group in cognitive function** (ADAS-Cog: p<.05; MMSE: p=.05), **and PPI group better then control group on cognitive function** in the MMSE (p<.05). No group differences for attention and memory.
Galante et al. 2007[177] (Italy; n=11; Mild dementia) 60 min sessions 3x/week for 4 weeks	Computer cognitive rehabilitation (individual) involving a range of cognitive functions including memory, language, perception, intelligence, attention and spatial cognition. General cognition: MMSE Executive function/attention: Digit cancellation test, Raven's coloured progressive matrices, Semantic and phonemic verbal fluency Memory: Prose memory; Corsi's block tapping test, Bisyllabic Word Repetition Test Communication: Denomination Praxis: Constructional apraxia and Ideomotor apraxia for superior limbs	**Computer cognitive rehabilitation group maintained general cognitive functioning, while the control group declined** at 9 months compared to baseline (MMSE: p=.04), and compared to 3 months post intervention (MMSE: p=.008). No other group differences occurred in terms of communication, memory, executive function or praxis.

Onor et al. 2007[178] (Italy; n=16; Mild dementia) Person: 60 min sessions 3x/week for 4 months Family carer: 60 min sessions 1x/week for 4 months	Cognitive rehabilitation program (group) involving reality orientation therapy, occupational therapy, and reminiscence therapy. Family carers attended simultaneous psychoeducation program. General cognition: MMSE, Milan Overall Dementia Assessment (MODA)	**No group differences for cognition, but the MMSE improved within the cognitive rehabilitation group** between 12 and 16 weeks (p=.048).
Tadaka et al. 2007[110] (Japan; n=60; Moderate dementia) 60-90 min sessions 1x/week for 8 weeks	Reminiscence therapy (group of 6) involving themes specific to participant characteristics and life histories. General cognition: MMSE	No group differences for cognition in Alzheimer's disease. **For vascular dementia**, a significant effect (p=.01) for cognition showed the **reminiscence therapy group had higher cognitive scores than control group** post intervention (MMSE: p<.05) and after 6 months (p<.05).
Wang et al. 2007[179] (Taiwan; n=102; Moderate dementia) 60 min sessions 1x/week for 8 weeks	Reminiscence therapy (groups of 8-10) involving different weekly themes and the use of memory prompts such as photos and familiar objects. General cognition: MMSE	**Group effect for cognition** (MMSE: p=.015) where the **reminiscence therapy group improved** while control group maintained their score.
Burgener et al. 2008[180] (USA; n=43; Mild dementia) Tai Chi: 60 min sessions 3x/week CBT/support: 90 min sessions alternating 1x/week for 40 weeks	Multimodal intervention (group) involving Tai Chi, cognitive behavioural therapy (CBT), and support group participation. General cognition: MMSE	At 20 weeks, **multimodal intervention group performed cognitively better than control** (MMSE: p=.05). Cognitive function for the intervention group was maintained post intervention at 40 weeks.
Neely et al. 2009[181] (Sweden; n=30; Moderate dementia) 60 min sessions 1x/week for 8 weeks	Collaborative memory program (individual – dyad) or individual memory program, both involve practicing strategies to support everyday mneumonic and occupational performance. Use of spaced retrieval and hierarchical cueing. Memory: Collaborative object recall random/clustered, recall of non-categorasible/categorisable words	No group differences for collaborative memory performance, with an effect showing **all groups declined in collaborative memory performance overall** (p<.01). **Collaborative memory program group improved collaborative object recall performance with random placement of objects for the person with dementia** (p<.05) **and recall of categorisable words** (p<.05) compared to individual memory program and control groups.
Clare et al. 2010[111] (UK; n=69; Mild dementia) 60 min sessions 1x/week for 8 weeks	Cognitive rehabilitation (individual) involving a focus on addressing personally meaningful goals. Use of practical aids, face-name learning, practise in maintaining attention/concentration, stress management. Executive function/attention: Map search, elevator counting, elevator	**Group effect for Verbal fluency** (p=.018), **but no significant between group differences**. No other group differences for memory or executive function measures.

	counting with distraction (Test of everyday Attention), Verbal fluency Memory: Rivermead Behavioural Memory Test (RBMT)	
Haslam et al. 2010[182] (UK; n=73; Moderate dementia) 30 min sessions 1x/week for 6 weeks	Group reminiscence (~5) or individual reminiscence involving focussed discussions using objects to draw connections between past/present. General cognition: Addenbrooke's Cognitive Examination Revised (ACE-R)	**Significant group effect between group reminiscence, individual reminiscence and control** (group skittles games) groups (p=.001). Post hoc tests showed that **group reminiscence significantly improved compared to individual reminiscence** (p=.001) **and control** (p=.005) **groups.**
Buettner et al. 2011[183] (USA; n=77; Mild dementia) 60min sessions 2x/week for 4 weeks	Cognitive stimulation (group) involving physical and cognitive tasks focusing on attention, concentration, short term memory, organised thinking, hand-eye coordination, communication, visuospatial and sensory identification. General cognition: MMSE Executive function: Trail Making Test B (TMT-B)	**Cognition improved for the cognitive stimulation group but declined in the control group** (MMSE: p<.001). No group differences for executive function.
Coen et al. 2011[184] (Ireland; n=27; Moderate dementia) 45 min sessions 2x/week for 7 weeks	Cognitive stimulation therapy (groups of 5) involving a focus on themes, reminiscence, information processing multisensory stimulation and reality orientation. General cognition: ADAS-Cog, MMSE	**Cognitive function improved for cognitive stimulation group compared to control** for MMSE (p=.013), but not for ADAS-Cog.
Graessel et al. 2011[112] (Germany; n=79; Moderate dementia) 120 min sessions 6x/week for 12 months	Motor stimulation, ADLs, Cognitive Stimulation (MAKS) (groups of 10) multicomponent therapy involving motor exercises, cognitive exercises, practicing ADLs, or creative tasks. General cognition: ADAS-Cog	**MAKS group maintained cognitive function over 12 months**, whereas control group declined (ADAS-Cog: p=.039) so that groups were different post intervention (p=.018). **Participation in MAKS intervention was a predictor of cognitive function at 12 months** (p<.001).
Lee et al. 2013[117] (China, n=19; Moderate dementia) 30 min sessions 2x/week for 6 weeks	Computerised errorless learning program (CELP) or therapist-led errorless learning program (TELP) (individual). Uses errorless learning with spaced retrieval and vanishing cues with immediate positive feedback. General cognition: MMSE, Mattis Dementia Rating Scale (DRS) Memory: Hong Kong List Learning test (HKLLT), Brief Assessment of Prospective Memory (Chinese BAPM)	Over time, **cognition** on the DRS **improved for both CELP** (p=.04) **and TELP** (p=.03) intervention groups but did not change in control. No cognitive changes on the MMSE. **Within groups, CELP group improved cognition** (DRS: p=.03; MMSE: p=.04), **but no change for TELP**. No group differences for memory.
Mapelli et al. 2013[185] (Italy; n=30; Moderate dementia)	Cognitive stimulation (group) involving personal/spatial/temporal orientation with structured program (memory, language,	Post intervention, **cognitive stimulation group had better performance on the MMSE** (p<.001) **and the ENB2** (p<.001) compared to the placebo

60 min sessions 5x/week for 8 weeks	spatial/temporal orientation, attention, logic). General cognition: Esame Neuropsicologico Breve 2 (ENB2), MMSE	occupational therapy group and the usual care control group.
Yamanaka et al. 2013[186] (Japan; n=56; Moderate dementia) 45 min sessions 2x/week for 7 weeks	Cognitive stimulation therapy (group) involving exercises around a range of themes. General cognition: MMSE, Neurobehavioral Cognitive Status Exam (COGNISTAT)	**Compared to control** (usual care)**, cognition improved for the cognitive stimulation group** for both the MMSE (p=.003) and the COGNISTAT (p=.00005).
Aşiret & Kapuchu 2017[122] (Turkey; n=62; Moderate AD) 30-45 min sessions 1x/week for 12 weeks	Reminiscence therapy (groups of 2-5) involving discussions around familiar objects and themes. General cognition: MMSE	**Reminiscence group improved MMSE** from baseline to post intervention **compared to control** (p<.001).
Chen et al. 2016[187] (Taiwan; n=44; Moderate dementia) 30 min sessions 2x/week for 3 months	Learning therapy (individual) based on abilities, personal attributes and interests. Used mathematical exercises, reading aloud from a book and positive reinforcement. General cognition: MMSE	**Learning therapy group changed in cognition compared to control** (MMSE: p<.01), where learning therapy group improved in cognition (MMSE: p<.001) but no change in control.
De Luca et al. 2016[188] (Italy; n=20; Mild dementia) 45 min sessions 3x/week for 8 weeks	Web-based cognitive training + standard neurorehabilitation (individual) involving focus on domains of selective/divided attention, visuospatial memory, semantic/phonemic verbal fluencies, and ideomotor/constructive praxis. Used activities on accuracy of task execution, time of reaction, reduction of errors, and level of motivation during therapy. General cognition: MMSE Executive function/attention: Attentive matrices (AM), Category verbal fluency, Letter verbal fluency Praxis: Constructional apraxia test (CA)	**Cognitive training + rehabilitation group changed compared to control for cognition** (MMSE: p<.001), **executive function** (AM: p<.01) **and praxis** (CA: p<.001). **Cognitive training + rehabilitation group improved for cognition** (MMSE: p=.04), **executive function** (AM: p=.01), **and praxis** (CA: p<.001), whereas there were no changes for the control group. No group differences for fluency.
Kim et al. 2016[189] (Korea; n=53; Moderate dementia) 60 min sessions 5x/week for 6 months	Multi-domain cognitive stimulation (group) involving art, music, recollection, horticultural therapy, cognitive occupational therapy, and exercise. General cognition: MMSE Executive function: Verbal fluency Memory: Word-list memory, recall, recognition, constructional praxis recall Communication: Korean Boston Naming test (BNT)	No between group differences. **Cognitive stimulation group maintained cognitive function, whereas it declined for control** (MMSE: p=.003), similarly **cognitive stimulation group maintained verbal fluency** where it declined in control (p=.01), **and maintained word list recall function** where it declined in control (p=.03). **Intervention group improved word list registration** (p=.03) whereas no change in control. No group

	Visuospatial function: Constructional praxis	differences for other communication (BNT), memory (constructional praxis recall), or visuospatial functions (constructional praxis).
Laakonen et al. 2016[190] (Finland; n=136; Moderate dementia) 4 hour sessions 1x/week for 8 weeks	Self-management group rehabilitation (group). Used a goal-oriented focus aiming to enhance mastery, self-efficacy and problem-solving skills. Carers participated in parallel group. General cognition: CDR Executive function: Verbal fluency, Clock drawing test (CDT)	**No group differences post intervention** (3 months). **By follow-up** (9 months) **self-management group significantly better than control in executive function** (verbal fluency: p=.01; CDT: p=.03). No difference in general cognition between groups (CDR).
Capotosto et al. 2017[191] (Italy; n=39; Moderate dementia) 2 sessions/week for 7 weeks	Cognitive stimulation therapy (groups of 7-8). Sessions followed themes, and involved reality orientation and cognitive activities. General cognition: ADAS-Cog, MMSE Attention: Digit Span Backwards Communication: Narrative language test (NLT)	**Cognitive stimulation therapy group maintained cognitive function in the MMSE whereas control group declined** (p=.045) and post intervention, **cognitive stimulation therapy group was better than control group in ADAS-Cog** (p=.016). **Intervention group improved in communication** (NLT: p=.001), while no change in control. No group differences for attention (Digit Span).
Tanaka et al. 2017[192] (Japan; n=43; Moderate dementia) Group: 60 min sessions Individual: 20 min sessions 2x/week for 12 weeks	Brain activating rehabilitation (groups of 3-5) or brain activating rehabilitation (individual). Cognitive rehabilitation involving reality orientation, reminiscence, and physical activities. Aims to enhance motivation and recruit compensatory networks to maximise remaining functions. Cognitive function: MMSE, CDR Communication: Brief communication Scale (BCS)	**Group differences for cognitive function** in MMSE (p=.029), with **group brain activating rehabilitation improving** (MMSE: p=.016). **No group differences between individual brain activating rehabilitation and control on the MMSE**. No group differences for the CDR or communication (BCS).

The majority of studies reported above focused on a specific cognitive intervention approach (e.g. cognitive stimulation, cognitive training, or cognitive rehabilitation). The following tables each provide a composite 'cognitive program' generated from the highest quality evidence available from the above effective cognitive interventions to support cognitive function in people with dementia. Two 'cognitive programs' have been outlined, based on the outcome of focus: general cognitive function or executive functioning. This separation was done based on the effective outcomes from the above studies. Interventions that showed benefit to learning, communication and memory overlap with the presented cognitive programs.

What could a cognitive plan to improve or support general cognitive function look like?

The community-based studies involved people with mild – moderate stage dementia (mean MMSE 14.8 – 24.0). Two of these studies were at moderate risk for bias and three had an unclear risk[a].

The residential care-based studies involved people living with moderate – severe stage dementia (mean MMSE 14.5). One of these studies was at low risk for bias, one was at moderate risk, and two had an unclear risk for bias.

Plan 7.1	**Family member, therapist, psych or SP guided sessions**
	30-90 min sessions
	1-5x /week
	over 8 weeks–12 months
		Community-based plan: individual, small group (5-7) or dyad (family member and person with dementia)	• Sessions may start with a brief muscular relaxation exercise, and spatial/temporal orientation. Encouragement to use compensatory strategies (e.g. calendar, diary), participate in social interaction and use reminiscent memory (e.g. talk about their life).
			• Group reminiscence discussions. Use of familiar objects to stimulate discussion based on taste, smell, touch etc. Facilitator guides discussion, prompting with questions as required.
			• Stimulation through communication highlighting relevant verbal content (e.g. retelling important life events) and functional abilities (e.g. discussing hobbies and daily home activities).
			• Training in use of external memory aids using verbal instructions and demonstration. Training provided in group sessions and at home by family members.
			• Training in cognitive strategies to support everyday functioning:
			  ○ Errorless learning technique (to support learning of correct procedures)
			  ○ Spaced retrieval (practicing remembering over increasingly longer periods of time)
			  ○ Face/name associations to support remembering
			  ○ Dual cognitive support (providing cues and enhance the organisation and identification of the most important information to be remembered)
			  ○ Language training e.g. through discussing interesting themes with the group
			  ○ Procedural memory training e.g. manipulating an object (e.g. can opener) as if using it
			  ○ ADL training e.g. writing an appointment in the diary, writing the list for grocery shopping, making change for a purchase
			  ○ General social activities e.g. visiting a museum or the movies.
			• Dyadic approach may involve:
			  ○ Family member trained and provided manual on conducting sessions in reality orientation and cognitive training
			  ○ Sessions involve personal orientation (e.g. time/space), topics of general interest (e.g. famous people, historical events), memory, attention, and visuospatial exercises
			  ○ Person with dementia prompted to provide spontaneous or cued (e.g. calendar, diary, notes) answers

[a] Refer to 'Interpreting the research' on p. 10 of this *technical guide* for a definition of research bias.

			○ Family member encouraged to informally involve person with dementia in reality-based communication 2-3 times throughout the day. • May include more general support e.g. ○ Provision of education to the person living with dementia and their support people on dementia and current research ○ Family members attend simultaneous support group
Plan 7.2	**Care worker, therapist, psych or RN guided sessions** 30-120 min sessions 2-6x/week over 4 weeks–12 months	Activity centre or residential care based group (small group 3-10)	• Warm up activity such as gentle non-cognitive exercise (e.g. soft ball game) or group social activity (e.g. greetings, group song or meaningful discussion). • Reality orientation with a focus on comparing to present day e.g. orientation board, old/current newspapers, personal/local photographs from the past and present, materials to stimulate all 5 senses. • Reminiscence with no comparisons to present day (historical accuracy not important) e.g. old photos of local scenes, personal photos, books, magazines, newspapers. • Cognitive stimulation exercises around topics e.g. using money, word games, famous faces, the present day. • Cognitive activities e.g. spelling games, simplified bingo, dominoes, naming objects, completing a personal daily diary, paper/pen exercises, word jumbles, matching symbols into pairs, picture puzzles to be solved. • Could involve multicomponent approach supplementing cognitive exercises: ○ Physical exercises e.g. bowling, croquet, balancing a tennis ball on a Frisbee and passing it around ○ ADL training e.g. preparing a snack ○ Creative tasks e.g. gardening, working with wood or other materials. • Facilitator strategies could involve: ○ Adapting level of difficulty to group interests and cognitive abilities ○ Clues/prompts given to guide correct answers with limited stress ○ Supervision, discussion, demonstration.
		Equipment	• Blackboard/whiteboard, calendar, clock, scrap books, workbook exercises, photos, newspapers, materials for motor exercises, ADL or creative tasks.

Where the research studies reported data for minimum requirements for benefit:

Average session length was 58.1 mins an average of 3.1 times/week over a mean of 5.2 months. The majority of studies did not report the actual attendance rate. For the studies that did, mean attendance was 87.9% of the prescribed sessions.[112, 159, 167]

What could a <u>cognitive plan</u> to improve or support <u>executive function</u> look like?

The community-based studies involved people living with mild – moderate stage dementia (mean MMSE 20.8 – 24.0). One of these studies was at low risk for bias, one was at moderate risk, and three had an unclear risk for bias.

The residential care-based studies involved people with unclear dementia stage ("elderly infirm") or mild stage dementia (mean MMSE 25.0). One study was at unclear risk for bias and the other study was at higher risk for bias.

Plan 7.3	**OT, RN, PT, Psych, SW, Neuropsych, family member guided sessions**
	45 min-4 hour sessions 1-2x/week over 2-5 months
		Community-based plan: individual or small group (~10)	• Sessions may begin with spatial/temporal orientation.
			• Intervention approach using cognitive rehabilitation:
			  ○ Address personally meaningful goals
			  ○ Practical aids and strategies to support goal attainment e.g. using compensatory strategies or errorless learning techniques
			  ○ Techniques for learning new information e.g. face-name learning, spaced retrieval, dual cognitive support
			  ○ ADL training, procedural memory training
			  ○ Practise in maintaining concentration and attention
			  ○ Stress management strategies
			  ○ Person with dementia encouraged to practise strategies and work on goals between sessions
			  ○ Family member invited to join last 15 mins of session to learn how best to support between session practice.
			• Family member trained in providing stimulating activities that promote conversation, memory and problem-solving. Providing positive reinforcement to the person with dementia encouraged.
			• Group program focusing on developing skills in self-management, self-efficacy, and empowerment for both the person with dementia and their family member:
			  ○ Family member and person with dementia involved in simultaneous objective-oriented groups aimed at enhancing mastery of everyday life, self-efficacy, problem-solving skills, and using own resources
			  ○ Group participation may involve sharing experiences, group discussion, peer support and overcoming own limits.

Plan 7.4	**Therapist or care worker guided sessions** 30-45 min sessions 3-5x/week over 8-20 weeks	Residential care based plan: individual or small group (3-4)	• Group activities such as spelling games, bingo, dominoes. • Pen/paper exercises such as writing a personal diary, cognitive stimulation exercises in a specifically designed booklet. • Computer-based activities involving games with increasing difficulty. • Activities designed to address specific cognitive domains e.g. attention, visuo-spatial memory, verbal fluency, and praxis.

		• Facilitators use strategies such as demonstration, supervision, and encouragement.
	Equipment	• Workbooks, pens, whiteboard/blackboard, calendar, clock, diary, materials for games, computer and software.

Where the research studies reported data for minimum requirements for benefit:

Average session length was 99.0 mins an average of 2.0 times/week over a mean of 2.7 months. The majority of studies did not report the actual attendance rate. For the study that did, mean attendance of 75% or more of the prescribed sessions was considered necessary to have completed the intervention.[111]

A cognitive program to support leaning, memory and communication may involve a combination of the intervention approaches used to support general cognitive function and executive functioning.

What costs are involved?

Therapists (e.g. RNs, OTs, PTs, SPs, psychologists) and care workers were involved in facilitating the cognitive programs.

	Intervention Administration Requirements	Total Hours
Community-based programs (8 weeks-12 months)	• 1 x 60 min individual session per week with OT and family member	• 8 OT hours + 2 hours family member session involvement + between-session practise time (8 weeks)
	• 1 x 4 hour group session (10) per week for person with dementia and family member with 2x facilitators (RNs, OTs or PTs)	• 32 hours with 2x therapists and family member (8 weeks)
	• 1 x 90 min group session per week with unspecified facilitator	• 30 hours with unspecified facilitator (5 months)
	• 1 x 90 min group (6-7) session per week (8 weeks) then 1 x monthly individual session with therapist (SP) (44 weeks)	• 12 therapist hours per group (8 weeks) + monthly unspecified therapist hours per individual (up to 12 months)
	• 3 x 30 min family member sessions per week + training with team (psych, therapists, physicians)	• 37.5 family member hours + unspecified training sessions with team (25 weeks)
	• 2 x 45 min sessions per week with neuropsychologist over 24 sessions	• 18 neuropsychologist hours (12-16 weeks)
	• 1 x 75 min session per week with 2x facilitators (public health nurse/psych)	• 10 hours with 2x facilitators (public health nurse/psych) (8 weeks)
	• 5 x 60 min sessions per week with family member and interventionist (psych, SW, RN)	• 40 interventionist (psych, SW, RN) and family member hours (8 weeks)
Residential aged care-based program (4 weeks-12 months)	• 2 x 45 min small group sessions per week with therapist and care worker	• 10.5 therapist and care worker hours per group (7 week)
	• 5 x 30 min small group (3-4) sessions per week with care worker	• 50 care worker hours per group (20 weeks)

	• 5 x 30 min small group sessions per week with therapist (psych) and care worker • 6 x 120 min small group (10) sessions per week with 2x therapists (RN) and aide • 3 x 45 min individual sessions per week with care worker	• 10 therapist and care worker hours per group (4 weeks) • 624 hours 2x therapists and 1x aide (12 months) • 18 care worker hours (8 weeks)

Other important costing considerations	Facilitator training (for therapists, care workers and/or family members) Travel Session preparation Materials for cognitive activities and any supplementary physical or ADL exercises Provision of booklets/documentation Administration hours

Who is involved?

Clinician	Registered nurses, occupational therapists, physiotherapists, speech pathologists, psychologists, care support workers.
Person with dementia	What stage of dementia? • Evidence from the highest quality effective intervention studies has involved people with an average of mild to moderate stage dementia. What if living alone? • Evidence from effective interventions involved a mix of people with dementia living alone or with their family member.
Family member	Some studies involved family members in working with the person to either facilitate the cognitive program or to assist them in practicing cognitive strategies from the program between sessions.
Venue	Evidence from effective cognitive interventions to support or improve cognitive function in people with dementia has been conducted in the person's home, in community-based group settings, and in residential care settings.

Have there been any negative effects reported from cognitive interventions to improve cognitive functioning in people with dementia?

The majority of studies have not reported on the presence or absence of any adverse events resulting for participation in the various cognitive interventions. One study reported that participants in a reality orientation intervention showed a trend for lower life satisfaction, while another study involving a cognitive stimulation intervention reported a benefit to quality of life.

8: Supporting communication through a communication program

Clinical Practice Guidelines for People with Dementia evidence statements[1]:

Number	Classification	Evidence statement
60	Evidence Based Research (Low)	Training programs (for aged care staff) should be comprehensive and **have a strong focus on communicating effectively with the person with dementia** and his or her carer(s) and family and recognising, preventing and managing behavioural and psychological symptoms of dementia. Staff should be trained in the principles of person-centred care and how these principles are applied in practice.
77	Practice Point	Health and aged care staff and carers and family should identify, monitor and address environmental, physical health and psychosocial factors that may increase the likelihood of the person with dementia experiencing distressing behavioural and psychological symptoms. These factors include: • Unmet needs (e.g. pain, hunger, need to eliminate, lack of privacy, lack of meaningful activities, **communication**) • Lowered stress threshold (e.g. **conflicts of poor communication** within the family or between staff, carer stress)

Intervention approaches to support communication in dementia are broad i.e. the intervention may focus on supporting the person living with dementia to adapt to changes in their communication abilities, or may support care workers or family members in developing skills to generate more effective communication interactions with people living with dementia. Given the nature of these approaches, a range of outcomes were considered as important for the context of this review. For the person with dementia: communication, quality of life, wellbeing and engagement were included as relevant outcomes, while for family members and care workers: communication skills, knowledge and burden were included. There is currently no strong evidence base to support the use of these interventions to support communication with people living with dementia, but there is also no evidence of harm from participating in these interventions.

What does the research tell us?

- The Guideline Adaptation Committee[1] did not make a recommendation about interventions to support communication in dementia, but provided an evidence statement that one (of two) RCTs[193] found that training staff in providing person-centred care and communicating effectively with the person with dementia improved the quality of life of the person with dementia (proxy rated) (low).
- A literature search up until December 2017 identified seven systematic reviews, and four additional RCTs (not included in the systematic reviews) reporting on the impact of interventions to support communication for and with people living with dementia.
- A Cochrane review[102] identifying four cognitive stimulation therapy RCTs reported staff ratings of the person with dementia's communication and social interaction when not engaged in the cognitive stimulation program improved.
- A systematic review[194] looking at communication strategies for people with dementia in residential care found no effect of interventions directed for the person with dementia. Results from the remaining intervention studies (not included in the meta-analysis) directed for the person with dementia were variable with some showing positive benefits and others showing no benefit. The review also looked at interventions directed towards carers and staff, reporting six studies with positive effects on communication, and one with no benefit to communication.
- A systematic review[195] reported positive benefits of communication skills training for staff skills and knowledge in residential care settings and staff burden. The review also reported positive benefits to family member knowledge and skills in the home setting.
- Two systematic reviews were not specifically aimed at communication outcomes[196, 197], but included single studies that involved a communication component for people with dementia. These showed improvement in verbal expression from the person with dementia via

involvement in a computer based cognitive intervention, and improved quality of life via an early stage memory loss support program.

- A systematic review[198] reported on interventions to improve communication between care workers and people living with dementia in residential care. The review reported 3 studies that showed benefits to verbal communication of the person with dementia, and variable results for verbal communication of staff with 2 studies showing positive benefits, and 2 showing no benefit. The review also reported on non-verbal communication, finding positive benefits for the person with dementia and care workers.
- The most recent systematic review[199] looked at communication training interventions aimed at care workers and family carers of people with dementia. The review (5 RCTs) found benefits to carer knowledge post intervention, but the long-term benefits were variable. Variable benefits were also reported for carer burden and person with dementia quality of life.
- One of the recent RCTs (not included in any systematic reviews) involved an intervention aimed directly at the person living with dementia, while the other 3 recent RCTs involved interventions aimed towards care workers. Results across the four recent RCTs varied, with studies showing some positive effects of communication interventions for improving communication of the person with dementia or care workers, while other variables within the studies showed no differences between intervention and control groups. Limitations and inconsistencies exist across the four RCTs (e.g. potential for bias, and variable intervention lengths, intervention approaches, and communication outcome measures), which mean the evidence needs to be interpreted with caution.

Elements from effective interventions for improving/supporting communication in dementia:

Communication intervention features	Interventions focused towards the person with dementia (small group or individual – person with dementia or dyadic): • Cognitive stimulation strategies: theme-based sessions involving creativity, word games, current affairs. • Life storybook/memory book: developed in discussion with the person with dementia and used as a conversational aid. • Walking and conversation: personalised conversation tailored to the person with dementia. • Snoezelen multisensory care plan used during care interactions. • Montessori personalised activities. • Lexical semantic stimulation: lexical tasks designed to improve semantic verbal processing. • Paro companion robot to stimulate interaction. • Dyadic intervention covering topics such as dementia education, effective communication, building on existing effective strategies, compensatory techniques, coping with memory changes, social and family relationships, daily living skills, stress management, future planning. Interventions focused towards the family member: • Family member training: education and skills training, antecedent-behaviour-consequences (ABC) problem-solving, behaviour management plans, communication strategies, memory strategies, pleasant events, coping strategies, support for the future. Interventions focused towards care workers: • Training program: effective communication (verbal and non-verbal), understanding dementia and the effects on social participation, strategies to support social abilities, behaviour management, understanding emotional expression, using multisensory stimulation. • Person centred care + person centred environments. • Care worker support: relaxation techniques and coping strategies to manage work-related stress.

Supporting features of the programs	• Programs led by care workers, family members, psychologists, counsellors, social workers, speech pathologists, gerontologists, geropsychologists, physiotherapists, RNs, OTs, therapists/health professionals, consultants, intervention specialists, accredited trainers, volunteers, researchers • Supporting materials e.g. objects to stimulate conversation/discussion, Montessori materials, multisensory materials, photos, paper/pencils, program manual, diary, educational DVDs. • Staff provided with formal supervision, hands-on training and feedback. • Staff sessions involved: active learning, brainstorming, group discussions, role-playing.
Intervention locations	• Home, residential care home, activity centres.

What should we hope to achieve and how to measure it?

Studies reporting effective communication interventions have varied in intervention length (2 weeks to 9 months). Measurement of effectiveness varied across studies depending on the focus of intervention and the measures that were used. Interventions were generally either focused towards the person with dementia or family members (aka family carers) or care workers, however outcomes could indirectly affect either group depending on the intervention. Outcomes considered for the person with dementia were: communication, quality of life, wellbeing, and/or engagement. Outcomes considered for family carers/care workers were: communication skills, knowledge, and/or burden.

Study (place, number of participants, average dementia stage); Intervention dose	Intervention (measure/s: communication, quality of life, wellbeing, engagement, knowledge, burden)	Outcome
Vasse et al. 2010[194] (Systematic Review-Netherlands; n=1471; moderate-severe dementia) 4 – 52 weeks	10 studies investigating person with dementia-directed communication interventions and 9 studies focusing on care worker communication techniques. Communication Assessment Scale, Communication Observation Scale for the cognitively impaired, Functional Assessment of Communication Skills for adults - social communication and communication of basic needs relative to the independence dimension, Holden Communication Scale, Picture Description Test	**No significant overall effect for person with dementia-directed communication interventions** (5 RCTs) was found for treatment groups (SMD=0.53, 95%CI -0.07 to 1.14, p=.09, I^2=84%). **Remaining person with dementia-directed studies** (not included in the meta-analysis) **were variable with some showing positive benefits** (1 RCT, 1 quasi-experimental controlled trial) **and others showing no benefit** (1 RCT, 2 controlled trials). The majority of **carer and care worker-directed interventions** (1 RCT, 3 quasi-experimental controlled trials, 2 controlled trials) **showed positive effects to communication, while one** (RCT) **showed no benefit to communication**.
Eggenberger et al. 2012[195] (Systematic Review-Austria; n=831; moderate-severe dementia) 0 – 9 months	12 studies investigating communication skills training in dementia care. Assessment of Awareness of Communication Strategies, Thomas Assessment of Communication Inadequacy, Communication Skills Checklist,	**Positive benefits of communication skills training for care worker skills and knowledge** in residential care settings (1 RCT, 2 before & after studies) **and care worker burden** (2 RCTs). The review also reported **positive benefits to family carer knowledge and skills**

	Questionnaire about Knowledge on Communication Skills in Dementia Care	in the home setting (2 RCTs, 1 clinical controlled trial).
Woods et al. 2012[102] (Systematic Review-UK; n=223; mild-moderate dementia) 4 – 24 weeks	4 trials investigating cognitive stimulation therapy. Holden Communication Scale MOSES-Withdrawn behaviour (Multidimensional Observation Scale for Elderly Subjects)	**Care worker ratings of person with dementia communication and social interaction outside of cognitive stimulation therapy sessions improved for intervention groups** (SMD 0.44, 95%CI 0.17 to 0.71, p=.002, I2=0.0%).
García-Casal et al. 2016[196] (Systematic Review-Spain; n=27; mild dementia) 3 months	1 trial investigating lexical semantic stimulation. Verbal naming test, Phonemic and Semantic Fluency, Brief Story Recall, Rey Auditory Verbal Learning Test	Included a single study involving a communication component for people with dementia that showed **improvement in verbal expression from the person with dementia via involvement in a computer-based cognitive intervention** (1 RCT).
Quinn et al. 2016[197] (Systematic Review-UK; n=142; mild dementia) 9 weeks	1 trial investigating an early stage memory loss support group. QOL-AD, SF-36, Family Assessment Measure: communication, affective expression and involvement subscale, Perceived Stress Scale, Self-Efficacy Scale	Included a single study involving a communication component for people with dementia that showed **improved person with dementia quality of life via an early stage memory loss support program** (1 RCT).
Machiels et al. 2017[198] (Systematic Review-Netherlands; n=382 people with dementia + n=235 care worker; moderate-severe dementia) 1 – 10 sessions	6 studies reporting on interventions to improve communication between care workers and people living with dementia in residential care. Brief Symptom Inventory, Caregivers Perceived Ease of Caregiving, Communication Skills Checklist, Discourse Characteristics s/resident, Facial expressions of emotion during semi-structured interview, Interaction Behaviour Measure, Modified Interaction Behaviour Measure, Nonverbal affective behaviour rating scheme, Nurses Hassles and Uplifts-Hassles subscale, Observation Form of General Communication, Roter Interaction Analysis System	3 studies (1 RCT, 1 cluster RCT, 1 non-RCT) showed **benefits to verbal communication of the person with dementia. Variable results for verbal communication of care workers with 2 studies** (1 RCT, 1 cluster RCT) **showing positive benefits, and 2 showing no benefit** (2 non-RCTs). The review also reported on **non-verbal communication, finding positive benefits for the person with dementia** (1 RCT, 2 cluster RCTs), **and care workers** (2 cluster RCTs).
Morris et al. 2017[199] (Systematic Review-UK; n=791 people with dementia + n=1199 care workers + n=1705 family carers; mild-severe dementia) 1 session to 9 months	Communication training interventions aimed at care workers (22 studies) and family carers (16 studies) of people with dementia. Approaches to Dementia Care, Communication Support Strategies in Dementia test, DEMQOL, Faces Scale, Menorah Park Engagement Scale, Modified Nursing Care Assessment Scale, Perceived Stress Scale,	5 RCTs found **benefits to carer knowledge post intervention, but the long term benefits were variable** across the 3 RCTs that extended follow-up. **4 studies** (2 RCTs, 1 pre-post, 1 case control study) **found intervention reduced carer burden, while 5 RCTs found no difference in carer burden compared to control**. **For the person with dementia,** 4 RCTs found **no difference to wellbeing or quality of life, while** 1 case control

	Preparedness to Provide Care scale, Quality of Care Interactions, QOL-AD, Self-Efficacy Questionnaire, SF-36, Revised Caregiving Scale for Self-Efficacy, Sense of Competence Questionnaire, Zarit Burden Inventory	study found **improvement in quality of life.**
Friedman & Tappen, 1991[200] (USA; n=30 people with dementia; Severe dementia) 30 min sessions 3x/week for 10 weeks	Walking with the investigator while having personally relevant conversation (individual). Communication Observation Scale for the cognitively impaired (COS) Communication Assessment for the cognitively impaired Scale (CAS)	**There was an overall difference between walking + conversation group** compared to control (conversation only) (p=.024). The **walking + conversation group improved on the COS compared to control** (p=.007). No group differences for the CAS alone.
Wells et al. 2000[201] (Canada; n=40 people with dementia, n=44 care workers; Severe dementia) 20-30 min sessions 5x followed by 20-30 min fortnightly reinforcement sessions for 3 months, then 20-30 min monthly reinforcement sessions until 6 months	Abilities-focused education program for care workers with sessions on: understanding the effects of dementia on social/self-care abilities, assessing function and providing intervention to maintain/compensate for changes secondary to dementia. Modified Interaction Behaviour Measure (MIBM) Interaction Behaviour Measure (IBM) Caregivers Perceived Ease of Caregiving Nurses Hassles and Uplifts Scale (NHUS) – Hassles subscale	**People with dementia cared for by the education group declined less than control** (no education) **on MIBM-personal attending** (p=.040) **and improved compared to control on MIBM-calm/functional** (p=.023) **and MIBM-agitation** (p=.021). **Education group care workers maintained compared to control declining on IBM social/flexible** (p=.010), and i**mproved compared to control on IBM relevance** (p=.003), **IBM personal/attending** (p=.021), **and IBM relaxed** (p=.026). No group differences for ease of caring or NHUS.
Burgio et al. 2002[202] (USA; n=79 people with dementia, n=85 care workers; Severe dementia) 5hr in-service over 3 days in week 1, followed by hands-on training for weeks 2-3, and formal staff management for 6 months	Behaviour management skills training program and formal staff management, covering communication, behaviour and environments. Behaviour Management Skills Checklist (BMSC)	Post intervention, **care workers in the formal staff management group improved in providing delayed physical assistance to residents following a verbal prompt compared to control** (usual staff management) (p<.01). No group differences on other BMSC behaviour management or communication skill variables. At 6-month follow-up, **formal staff management group improved rate of announcing single activities** (p<.05) **and delaying physical assistance following a prompt** (p<.05) compared to control.
Dijkstra et al. 2002[203] (USA; n=66 people with dementia, n=40 care workers; Moderate dementia) 60 min in-service session followed by daily hands-on	Communication enhancing strategies for care workers involving developing personalised memory books for residents and training in effective communication strategies. Discourse characteristics of care workers and residents	For the **intervention group, person with dementia communication improved compared to control for utterances** (p=.005), **unique words** (p=.001), **information units** (p=.002), **global coherence** (p=.002), **local coherence** (p=.008), **and indefinite words** (p=.002). No group differences for people with dementia on use of words or empty phrases.

training over 2-4 weeks		**Care workers in the intervention group improved compared to control in their use of facilitators** (p=.011), **encouragement** (p=.017), **and cues** (p=.001). No group differences for care workers on utterances, questions or prompts.
Magai et al. 2002[204] (USA; n=91 people with dementia, n=21 care workers; Severe dementia) 60 min sessions 10x over 2 weeks	Staff training in non-verbal communication and emotional expression (group). Facial expressions of emotion during semi-structured interview	**Positive affect of people with dementia in the staff training group improved compared to placebo** (understanding cognition/behaviour in dementia) **and control** (usual care) over the first 6 weeks (p<.05). By 12 weeks, these differences no longer remained. No group differences for negative affect.
Tappen et al. 2002[205] (USA; n=55 people with dementia; Moderate Alzheimer's) 30 min sessions 3x/week for 16 weeks	Conversation where facilitator engages person with dementia in personally meaningful topics, or conversation + walking where conversations conducted while simultaneously walking with the person. Picture description test	**The conversation group improved compared to walking, and conversation + walking groups in the mean number of information units produced** (p=.043) **and conciseness of responses (**p=.010). No group differences for number of words used.
Teri et al. 2005[206] (USA; n=95 family dyads; Moderate Alzheimer's) 60 min sessions 1x/week for 8 weeks, followed by monthly phone calls x4	STAR-Carer Training for family carers involving problem-solving, behaviour management, communication, pleasant events and carer support. Quality of Life in Alzheimer's Disease (QOL-AD) Screen for Caregiver Burden (SCB) Revised Memory and Behaviour Problem Checklist (RMBPC)-Caregiver reaction	Post intervention, **the STAR-Carer training group improved compared to control** (usual care) **in quality of life for the person with dementia** (p=.049) **and burden for the carer** (SCB: p=.011; RMBPC: p=.024). After 6 months these differences remained (QOL-AD: p=.031; SCB: p=.029; RMBPC: p=.037).
van Weert et al. 2005[207] (Netherlands; n=126 people with dementia, n=117 care workers; Moderate-severe dementia) 4 hr in-service sessions 1x/week for 4 weeks followed by implementation in 24hr care over a minimum 3-month period	Snoezelen training for care workers with a focus on verbal/non-verbal communication, understanding the need for attentiveness, and practical skills in applying multisensory stimulation. Video assessment of non-verbal and verbal communication from the person with dementia and care workers	**Snoezelen care worker's non-verbal communication compared to control** (usual care) **improved for duration of eye contact** (p<.001), **affective touch** (p<.001), **and mean number of smiles** (p<.001); no difference for instrumental touch. **Person with dementia non-verbal communication in the Snoezelen group improved compared to control for duration of eye contact** (p<.05) **and mean number of smiles** (p<.01). **Snoezelen care worker's verbal communication improved compared to control for positive affective communication** (p<.001), **positive instrumental communication** (p<.001), **negative affective communication** (p<.05), **negative instrumental communication** (p<.01) **and the**

		total number of verbal utterances increased (p<.001). **Person with dementia verbal communication in the Snoezelen group improved compared to control for negative affective communication** (p<.05) **and the level of positive instrumental autonomy** (p<.01); no differences for positive affective communication, negative instrumental, overall positive instrumental, or verbal utterances.
Haight et al. 2006[173] (Ireland; n=30 people with dementia; Moderate dementia) 8 hours over 6 weeks	Review/life story book intervention (individual) involving encouragement to use cognitive and organisational skills to organise a life book record of a person's recalled and reconstructed lifespan memories. Communication Observation Scale (COS)	**Lifebook intervention group improved in communication** (COS: p<.005) compared to control.
Kuske et al. 2009[208] (Germany; n=210 people with dementia, n=96 care workers; Severe dementia) 60 min sessions 13x over 13 weeks	Staff training program with modules on dementia, communication, person and environment. GEROLF questionnaire Maslach Burnout Inventory (MBI-D)	**Care workers from the training program increased their GEROLF knowledge scores compared to relaxation and control** (usual care) groups (p=.007). **Group effects also seen for** GEROLF **overall competence** (p=.028), with training staff improving over control at follow-up (p=.006), GEROLF **expertise** (p=.001), with training group improving compared to control post intervention (p=.003) and follow-up (p=.00), and GEROLF **social competence** (p=.028), with training group improving over control at follow-up (p=.004). No group differences for other GEROLF subscales or the MBI.
Logsdon et al. 2010[209] (USA; n=142 family dyads; Mild dementia) 90 min sessions 1x/week for 9 weeks	Early stage memory loss support group involving both members of the dyad. Quality of Life-Alzheimer's Disease (QOL-AD) Medical outcome Study short form (SF-36) Family Assessment Measure-communication, affective expression and involvement subscale Perceived Stress Scale (PSS) Self-Efficacy Scale (SES)	**Participants in the support group reported improved QOL-AD scores compared to worse scores in control** (usual care) group (p<.001). No group differences found for any of the other measures.
de Rotrou et al. 2011[210] (France; n=141 family dyads; Moderate Alzheimer's)	Psychoeducation program for family carers with focus on education, problem-solving, behaviour management, communication skills, crisis management, coping strategies,	**Carer understanding of disease** (VAS: p<.003) **and perceived ability to cope** (VAS: p<.025) **both increased in the education program group compared to**

120 min sessions 1x/week for 12 weeks	information on resources and practical advice. Zarit Burden Inventory (ZBI) Sense of Competence Questionnaire (SCQ) Carer's perception of disease understanding (visual analogue scale-VAS)	**control** (usual care). No group differences on the ZBI or SCQ.
Liddle et al. 2012[211] (Australia; n=29 family dyads; Moderate dementia) 45 minute sessions x2	Educational DVDs for family carers. RECAPS (memory strategies): Reminders, Environment, Consistent routines, Attention, Practice, Simple steps, and MESSAGE (communication strategies): Maximise attention, Expression and body language, Keep it simple, Support their conversation, Assist with visual aids, Get their message, Encourage and Engage in conversation. Faces Scale Communication and Memory Support in Dementia (CMSD) Zarit Burden Inventory (ZBI)	Post intervention, **family carers in the educational DVD group showed improved CMSD knowledge scores compared to control** (usual care) (p=.001). No group differences for carer burden on the ZBI or person with dementia well-being on the Faces Scale.
Clare et al. 2013[193] (UK; n=57 care workers, n=65 people with dementia; Severe dementia) 90 min sessions 1x/week for 2 weeks, followed by fortnightly group supervision sessions for 6 weeks	AwareCare staff training providing guidance recognising awareness in people with dementia and developing communication skills. Quality of Life in Late Stage Dementia (QUALID) Positive Response Schedule (PRS) Maslach Burnout Inventory (MBI) General Health Questionnaire (GHQ-12) Approaches to Dementia Questionnaire (ADQ)	**Family-rated quality of life of the person with dementia improved compared to control** (usual care) (p=.022), but not for staff-rated person with dementia quality of life. No group differences for person with dementia wellbeing (PRS), or any of the carer measures.
Judge et al. 2013[212] (USA; n=128 family dyads; Mild dementia) 90 min sessions x6	ANSWERS: Acquiring New Skills While Enhancing Remaining Strengths. Psychoeducational skills training with cognitive rehabilitation training designed for family dyads. Caregiver Mastery Emotional Health Strain Physical Health Strain Self-Efficacy Dyadic Relationship Strain	Post intervention, **training group carers experienced less Emotional Health Strain** (p=.01) **and Dyadic Relationship Strain** (p=.01), **and had improvements in Caregiver Mastery** (p=.01) **compared to control** (educational resources). No group differences for the outcomes of Physical Health Strain or Self-Efficacy.
van der Kooij et al. 2013[213] (Netherlands; n=124 care workers; Dementia) 9 months	Integrated Emotion-Oriented Care to help care workers communicate empathically, verbally and non-verbally with people with dementia, and to support emotional balance.	**Trained care workers reported improvements in level of expertise in emotion-oriented techniques** (p=.001) **and knowledge regarding the personality/life history of the residents** (p=.008) **compared to control** (usual care) in the

	Emotion-oriented Skills in the Interaction with elderly people with Dementia (ESID) with retrospective baseline measurement of care worker's internal judgement of emotion-oriented skills	retrospective analysis. No group differences for working with a care plan or on the ESID baseline to post intervention analyses.
van der Ploeg et al. 2013[214] (Australia; n=44 people with dementia; Severe dementia) 30 min sessions 2x/week for 2 weeks	Montessori personalised activities for the person living with dementia. Menorah Park Engagement Scale (MPES) Philadelphia Geriatric Centre Affect Rating Scale (PGCARS) – positive/negative affect	Compared to control (social interaction), **during Montessori intervention there was more positive** (p=.001) **and interested** (p=.001) **affect, less neutral affect** (p<.001), **and more constructive/active engagement** (p<.001). No group differences in negative affect or passive engagement.
Chennoweth et al. 2014[215] (Australia; n=601 people with dementia; Severe dementia) 32hrs off-site training, followed by 2-16hrs on-site supervision + phone support	Person-centred care (PCC) with a focus on recognising the person's feelings when agitated, interacting in a person-centred way, and using person-centred care planning to meet psychosocial needs. Person-centred environments (PCE) with a focus on safety, accessibility, utility of outdoor spaces, using colour and objects for way-finding, familiarity. Interventions were trialled separately and combined (PCC+PCE). DEMQOL Quality of Interactions Schedule (QUIS)	Although no group effects, **quality of life** (DEMQOL) **improved over time for PCC** (p=.0003) **and PCE** (p=.02), **but not for PCC+PCE or control** (usual care). A group effect (p=.007) showed that **the PCC+PCE group improved over time** (p=.006) **in the care interaction quality** (QUIS) **compared to the other groups**, which did not change.
Jelcic et al. 2014[216] (Italy; n=27 people with dementia; Mild dementia) 60 min sessions 2x/week for 3 months	Lexical semantic stimulation (LSS) to enhance semantic verbal processing in people living with dementia. Delivered directly (LSS-Direct) or via teleconferencing (LSS-Tele) (groups of 3-4). Verbal Naming Test (VNT) Phonemic and Semantic Fluency Brief Story Recall (BSR) Rey Auditory Verbal Learning Tests (RAVLT)	Group differences found **for VNT** (p=.003), with **both LSS-direct** (p<.05) **and LSS-Tele** (p<.05) **performing better than control** (unstructured cognitive treatment). Group differences **for BSR immediate** (p=.018) with **both LSS-Direct** (p<.05) **and LSS-Tele** (p<.05) **better than control**. No group differences for BSR delayed. Group differences **for RAVLT delayed** (p=.035) with **LSS-Direct better than control** (p<.05) **but no difference in LSS-Tele**. No group difference for RAVLT immediate. No group differences for fluency, but **LSS-Tele group improved on phonemic** (p=.04) **and semantic** (p=.03) **fluency**.
Ortega et al. 2015[217] (UK; n=273 family dyads; Mild dementia)	Cognitive stimulation program led by family carer, focusing on different themes such as being creative, word games, and current affairs.	Post intervention, **the quality of the caregiver-person with dementia relationship for the person with dementia had improved for the cognitive stimulation group compared to control** (usual care)

30 min sessions 3x/week for 25 weeks	Quality Of Life in Alzheimer's Disease (QOL-AD) DEMQOL Quality of Caregiver-Patient Relationship (QCPR)	(p=.02). No other group differences for any of the person with dementia or carer outcomes.
Sprangers et al. 2015[218] (Netherlands; n=26 people with dementia, n=24 care workers; Moderate dementia) 8 weeks	Cognitive skills training program for care workers with a focus on increasing effective communication and reducing ineffective communication. Communication Skills Checklist (CSC) Observation Form of General Communication (OFGC) Neuropsychiatric Inventory-Questionnaire (NPI-Q) Carer distress	**Care workers in the training program improved in levels of distress compared to worsening levels in control** (p<.05). No group differences for other outcome measures.
Barbosa et al. 2016[219] (Portugal; n=56 care workers; n=47 people with dementia; Moderate-severe dementia) 90 min sessions 1x/week for 8 weeks, followed by 3 days of on-site supervision	Person-centred care psychoeducational program + support for care workers. Program involved education on dementia, communication and behavioural strategies. Support involved coping strategies to manage work-related stress, relaxation techniques, and strengthening/stretching exercises. Rating of care worker communication behaviours (18 verbal + 8 non-verbal)	For **verbal communication, there was a group effect for 'informing'** (p=.030) **with education program + support intervention group improving compared to control group** (education program only) declining. For **nonverbal communication, there was a group effect for 'Laugh' frequency** (p=.001) **with education program + support intervention group increasing and control decreasing**. No other group differences.
Conway et al. 2016[220] (Australia; n=38 care workers; Dementia) 60 min session followed by individual feedback sessions at 1, 2, and 6 weeks.	Educational DVD to give staff practical communication strategies: MESSAGE: Maximise attention, watch your Expression and body language, keep it Simple, Support conversation, Assist with visual Aids, Get their message, Encourage and Engage in communication. Communication Support Strategies in Dementia (CSSD) - knowledge test Self-Efficacy Questionnaire (SEQ) Modified Nursing Care Assessment Scale (M-NCAS) Preparedness to Provide Care (PPC) Approaches to Dementia Questionnaire (ADQ)	No group differences for any of the outcomes. But **the MESSAGE group improved on the CSSD** post intervention (p=.016) and follow-up (p=.016), **on the SEQ** at follow-up (p=.024), **and on the PPC** (p=.007) at follow-up, compared to no change in control. **On the M-NCAS strain, the MESSAGE group maintained scores while the control group declined** (p=.023). No differences for M-NCAS attitude or the ADQ.
Liang et al. 2017[221] (New Zealand; n=30 family dyads; Moderate-severe dementia) 30 min sessions 2-3x/week for 6 weeks	Paro companion robot to prompt interaction and mimic the benefits of caring for a pet. Sessions conducted in group setting (3-6) and at home with the dyad. Facial expressions time sampling Social interactions time sampling	Compared to control (usual care), the **Paro group had more happy/smiling facial expressions** (p=.043) **and talked more to staff/activity coordinator** (p=.042). No other group differences were found for observations of facial expressions or social behaviour.

Williams et al. 2017[222] (USA; n=27 people with dementia, n=29 care workers, n=42 care worker-resident dyads) 60 min session 1x/week for 3 weeks	Communication intervention focusing on training staff to self-monitor and avoid specific aspects of 'elderspeak' that can have a negative impact on the person with dementia. Video-coded staff communication – use of 'elderspeak'	**Communication group reduced the use of 'elderspeak' used in care** post intervention (p=.002) and at 3-month follow-up (p=.016), whereas there was no change in the control (usual care) group.

What could a plan for the person with dementia to improve or support their communication and engagement look like?

These studies involved people living with mild-severe stage dementia (mean MMSE 6.0 – 24.5). One of the included studies was at moderate risk of bias, six had an unclear risk, and the remaining three studies were all at high risk for bias[a].

Plan 8.1 (Note: plan 8.1 is presented as one plan, with the second component targeted towards the dyad)	**Care worker, family member, researcher, psych, RN, OT, therapist guided sessions** 30-60 min sessions 2-3x/week over 2–25 weeks (or staff skills integrated into 24hr care over 3 months i.e. Snoezelen)	Communication plan for the person with dementia in community or residential care settings, individual or small groups of 3-6	• Walking and conversation:
			  ○ Individual walks with a support person while engaging in personally relevant conversation for the person with dementia
			  ○ Conversation specifically tailored to the person's history, and also involves discussing objects/events in the immediate environment throughout the walk
			  ○ Strategies such as open-ended questions and follow-up questions used to facilitate conversation.
			• Cognitive stimulation:
			  ○ Run by family member at home, focusing on topics such as being creative, current affairs and word games.
			• Lexical semantic stimulation:
			  ○ Lexical tasks designed to enhance semantic verbal processing with a focus on interpreting written words, sentences, and stories
			  ○ Exercises covered: semantic categories and similarities, relationships between words and paradigms, understanding the context of text or a story, recognition of nonsense sentences, and understanding definitions
			  ○ Group discussions about responses encouraged to stimulate verbal competencies.
			• Personalised life storybook:
			  ○ Created through a structured individual life review process. The use of cognitive and organisational skills are encouraged through personally

[a] Refer to 'Interpreting the research' on p. 10 of this *technical guide* for a definition of research bias.

			meaningful conversation with the person with dementia as the person recalls and reconstructs memories from across their lifespan ○ Photos included to support memories ○ Staff trained in using book to support personal interactions with the person with dementia. • Individualised attention with Snoezelen (multisensory environments and materials designed to stimulate positive sensory engagement):[223] ○ Use of multisensory stimulation during care routines e.g. nice smelling soap, soft towels ○ Snoezelen care plan developed through completion of a life history review by family members and stimulus preference screening form to understand what sensory stimuli the person with dementia might prefer ○ Staff educated on how to approach each resident and implement personalised care plans within normal care routines. • Individualised attention with Montessori: ○ Family consulted to generate a list of preferred personalised activities for each person living with dementia, based on previous interests/hobbies ○ Facilitator engages one-on-one with the person with dementia to introduce preferred activities e.g. listening/singing to favourite music, arranging flowers, puzzles, folding laundry, viewing/sorting pictures. • Paro companion robot: ○ Unstructured group sessions where after demonstration by the facilitator, Paro passed around for interaction with each group member ○ Family members educated on use or Paro, then facilitated the personalised use of Paro at home with the person with dementia.
	Volunteer, professional guided sessions 90 min sessions 1x/week over 9 weeks	Communication plan for the dyad (person with dementia and family member) in community settings	• Support group: ○ Sessions divided to sometimes include the dyad together, and sometimes have separate sessions with the family member and person with dementia in different groups ○ Sessions covered: coping with memory problems, education on dementia, social and family relationships, daily living skills, self-esteem, planning for the future, legal and financial considerations, health considerations and stress management.
		Equipment	• Program manual/intervention notebook, companion robot, materials for

			Montessori/Snoezelen interventions, memory book, personalised photos.

Where the research studies reported data for minimum requirements for benefit:

Average session length was 45.0 mins an average of 2.4 times/week over a mean of 11.1 weeks. The majority of studies did not report the actual attendance rate. From the two studies that did report attendance rate, the average was attendance at 41.7% of sessions.[217, 221]

What could a plan for <u>care workers or family members</u> to improve or support <u>the person with dementia's communication and quality of life</u> look like?

The community-based studies involved people living with mild – moderate stage dementia (mean MMSE 13.6 – 23.4). Both of these studies were at high risk for bias.

The residential care-based studies involved people living with moderate – severe stage dementia (mean MMSE 3.4 – 13.2). One of these studies was at low risk for bias, one was at moderate risk, two had an unclear risk, and four were at higher risk for bias.

Plan 8.2 (Note: plan 8.2 is presented as one plan, with the first version targeted towards family members, and the second version targeted towards care workers in residential care)	**Consultant, counsellor, psych, social worker, SP guided sessions** 60 min sessions 1x/week over 8 weeks, followed by 4x monthly phone calls, or 2x 45 min sessions	Communication plans for family members in the community (individual)	• Family member training sessions:
			  ○ Face-to-face training without person with dementia present to allow for open communication
			  ○ ABC problem-solving strategies for behaviour management
			  ○ Family member kept diary of difficulties encountered, and collaboratively with consultant brainstormed and produced written support plans
			  ○ Sessions on communication, facilitating pleasant events to improve mood in the person with dementia, and ensuring family member support for managing future issues
			  ○ Monthly follow-up calls to support ongoing use of strategies.
			• Educational DVDs:
			  ○ DVDs developed, describing the use of strategies to support the person living with dementia
			  ○ Memory strategies (reminders, environment, consistent routines, attention, practice, simple steps)
			  ○ Communication strategies (maximise attention, expression and body language, keep it simple, support their conversation, assist with visual aids, get their message, encourage and engage in conversation)
			  ○ Family member given booklet summarising DVD content, and prompt cards listing the strategies outlined.

	Accredited trainer, care worker, researcher, psych guided sessions 20–90 min sessions 1–10x over 1–2 weeks, followed by on-site supervision for 2-8 weeks or reinforcement sessions over 3 months	Communication plan for care workers in residential care	• Training in recognising and understanding the effects of dementia on the person (i.e. awareness, social functioning, self-care abilities). Developing skills in: o Assessing abilities o Communication strategies o Provision of interventions aimed at maintaining skills or compensating for changes in social/self-care abilities. • Communication-specific education: o Effective communication techniques: using short sentences/instructions, giving positive feedback, allowing sufficient time for the person to respond to an instruction or question, having meaningful discussions with the person with dementia around their life/hobbies o Non-verbal communication and emotions: universal/culturally-specific aspects of basic emotion, emotional triggers, recognising/distinguishing emotions (facial, vocal and bodily indicators), understanding communication through emotion, emotional validation. • Person-centred care and person-centred environments: o Focus on interacting in a person-centred way, paying attention to the person's emotions if agitated, and using a person-centred care plan to meet the individual's psychosocial needs o Use of environmental audit tool to identify any features of the facility that need improvement, such as: accessibility, safety, utility of outdoor spaces, ensuring feelings of familiarity, using colours/objects to support function in the environment. • Education strategies: o Didactic sessions o Training involving different learning exercises, experiential and adult learning strategies, role playing and games to encourage staff participation o Observation and hands-on training during care routines with feedback sessions on implementation of strategies o Onsite supervision and phone support.
		Materials / resources	• Educational DVDs, training spaces, training materials e.g. media to support learning of emotional recognition, person-centred environmental modifications, materials to support person-centred care plans.

Where the research studies reported data for minimum requirements for benefit:

Average session length was 64.2 mins an average of 1.0 time/week over a mean of 4.4 weeks, with a reinforcement/supervision period for an average of 10.4 weeks. A number of studies did not report the actual attendance rate. For the studies that did, mean attendance for care workers and family members who engaged in the intervention was 83.9%.[201, 204, 206, 215]

What could a plan for <u>care workers or family members</u> to improve or support <u>their own communication skills, knowledge or burden</u> look like?

The family member-based studies involved people caring for people with mild – moderate stage dementia (mean MMSE 13.6 – 23.0). Three of these studies had an unclear risk for bias and one study was at higher risk for bias.

The care worker-based studies involved people caring for people with moderate – severe stage dementia (mean MMSE 4.5 – 13.2). Six of these studies had an unclear risk for bias and five studies were at higher risk for bias.

Plan 8.3 (Note: plan 8.3 is presented as one plan, with the first version targeted towards family members, and the second version targeted towards care workers in residential care)	**Consultant, counsellor, psych, social worker, SP, health professional, intervention specialist guided sessions** 60–120 min sessions 1x/week over 8–12 weeks, followed by 4x monthly phone calls, or 45–90 min sessions 2–6x	Communication plan for family members in the community (individual, dyads or small groups of 6-10)	• Family member training sessions:
			  ○ Face-to-face training without person with dementia present to allow for open communication
			  ○ ABC problem-solving strategies for behaviour management
			  ○ Family member kept diary of difficulties encountered, and collaboratively with consultant brainstormed and produced written support plans
			  ○ Sessions on communication, facilitating pleasant events to improve mood in the person with dementia, and ensuring family member support for managing future issues
			  ○ Monthly follow-up calls to support ongoing use of problem-solving and strategies.
			• Educational DVDs:
			  ○ DVDs developed, describing the use of strategies to support the person living with dementia
			  ○ Memory strategies (reminders, environment, consistent routines, attention, practice, simple steps)
			  ○ Communication strategies (maximise attention, expression and body language, keep it simple, support their conversation, assist with visual aids, get their message, encourage and engage in conversation)
			  ○ Family member given booklet summarising DVD content, and prompt cards listing the strategies outlined.
			• Psychoeducational skills and cognitive rehabilitation skills training:

			○ Focus on enhancing remaining strengths and skills, while learning compensatory strategies to cope with cognitive changes ○ Tailored approach taking into consideration disease stage and each care situation ○ Education and techniques provided across sessions covered: education on dementia, effective communication, problem-solving, crisis management, managing money, staying active, recognising and understanding emotions/behaviours, coping strategies, practical advice and information on resources.
	Health and nursing scientist, training experts, geropsychologist, gerontologist, PT, SP guided sessions 20–90 min sessions 1–13x over 1–13 weeks, followed by on-site supervision for 3 days–6 months	Communication plan for care workers in residential care or community	• Training in recognising and understanding abilities and the effects of dementia on the person (awareness, social functioning, behaviour, self-care abilities, environment): ○ Assessing abilities ○ Communication strategies ○ Communicative behavioural strategies to interact with a person with dementia ○ Provision of interventions aimed at maintaining skills or compensating for changes in social/self-care abilities. • Communication-specific education: ○ Effective communication techniques: using short sentences/instructions, giving positive feedback, allowing sufficient time for the person to respond to an instruction or question, having meaningful discussions with the person with dementia around their life/hobbies ○ Non-verbal communication and emotions: eye contact, universal/culturally-specific aspects of basic emotion, emotional triggers, recognising/distinguishing emotions (facial, vocal and bodily indicators), understanding communication through emotion, emotional validation ○ MESSAGE: Maximise attention, watch your Expression and body language, keep it Simple, Support conversation, Assist with visual Aids, Get their message, Encourage and Engage in communication[224] ○ Self-monitoring of communication and interactions e.g. ensuring not to use negative communication strategies such as ‘elderspeak’. • Training in approaches to care:

		○ Person-centred care: focus on interacting in a person-centred way, paying attention to the person's emotions if agitated, and using a person-centred care plan to meet the individual's psychosocial needs ○ Person-centred environments: use of environmental audit tool to identify any features of the facility that need improvement, such as: accessibility, safety, utility of outdoor spaces, ensuring feelings of familiarity, using colours/objects to support function in the environment ○ Psychosocial methods to aid care workers in communicating effectively with people with dementia e.g. Snoezelen, validation, reminiscence, motor stimulation, multisensory stimulation. • Care worker support strategies: ○ Coping strategies to manage work-related stress ○ Relaxation techniques ○ Stretching/strengthening exercises. • Education strategies: ○ Education strategies such as role-playing, games, brainstorming ○ Use of DVD to provide educational message with vignettes/demonstrations ○ Booklets with written information on strategies learnt ○ Group discussions on training content and case examples ○ Hands-on training during care tasks ○ Ongoing supervision, formal mentoring and formal feedback after training ○ Tailored training to care worker's existing knowledge and skills.
	Materials / resources	• Educational DVDs, training spaces, training materials e.g. booklets to support learning, person-centred environmental modifications, materials to support person-centred care plans, multisensory materials.

Where the research studies reported data for minimum requirements for benefit:

Average session length was 70.0 mins an average of 1.3 times/week over a mean of 10.6 weeks, with a reinforcement/supervision period for an average of 27.4 weeks. A number of studies did not report the actual attendance rate. For the studies that did, mean attendance for care workers and family members who engaged in the intervention was 74.5%.[201, 206, 208, 215, 222]

What costs are involved?

Therapists/health professionals (e.g. psychologists, counsellors, social workers, speech pathologists, geropsychologists, gerontologists, physiotherapists, registered nurses, occupational therapists), consultants, intervention specialists, accredited trainers, care workers, volunteers, professionals, family members, and researchers were involved in facilitating the communication programs.

	Intervention Administration Requirements	Total Hours
Programs for the person with dementia (2 – 25 weeks)	• 3 x 30 min family member-led sessions per week, plus unspecified time of in-home training (RN, psych, or OT) and phone support over 25 weeks • 8 care worker hours over 6 weeks • 3 x 30 min researcher-led sessions per week over 10 weeks • 1 x 60 min researcher-led in-service session, plus 2-4 weeks (time unspecified) of daily hands-on training with care workers • 3 x 30 min graduate student-led sessions per week over 16 weeks • Care workers integrated methodology (time unspecified) into care routines over 3 months • 2 x 30 min psychologist-led individual sessions per week over 2 weeks • 2 x 60 min group (3-4) therapist-led sessions per week over 3 months • 2.5 x 30 min group (3-6) researcher-led sessions per week for 6 weeks, plus family carer-led sessions (time unspecified) over 6 weeks	• 37.5 family member hours and unspecified therapist hours (25 weeks) • 8 care worker hours (6 weeks) • 15 researcher hours (10 weeks) • 1 researcher + care worker hour, plus unspecified researcher + care worker hours (2-4 weeks) • 24 graduate student hours (16 weeks) • Unspecified care worker hours (3 months) • 2 psychologist hours (2 weeks) • 26 therapist hours (3 months) • 7.5 researcher hours, plus unspecified family member hours (6 weeks)
Community-based programs for family members (9 weeks – 6 months)	• 1 x 90 min group session per week with 3-4 trained volunteers per group (2 of these masters level professionals) • 1 x 60 min individual session per week with consultant (counsellor, psych, social worker) for 8 weeks, plus 4x monthly phone calls • 1 x 120 min group (6-10) session per week with a psychologist plus weekly input (unspecified time) from experienced health professionals (OT, geriatrician, psychiatrist, psychologist, social worker, speech pathologist) over 12 weeks • 2 x 45 min individual sessions with 2 x professionals (psych, SP) • 6 x 90 min sessions with a masters-level intervention specialist (e.g. counsellor)	• 13.5 hours with 3-4 volunteers per group (9 weeks) • 8 consultant hours plus 4x phone calls of unspecified time (6 months) • 24 psychologist hours with unspecified time from differing experienced health professionals (12 weeks) • 1.5 psychologist and speech pathologist hours per individual • 9 intervention specialist hours
Programs targeted towards care workers (10 weeks – 12 months)	• 13 x 60 min care worker group (up to 12) sessions with health and nursing scientist over 13 weeks • 1 x 90 min accredited trainer session per week for 2 weeks, plus 6 x 10 min observation sessions per week and fortnightly group supervision (time unspecified) for 6 weeks	• 13 health and nursing scientist hours (13 weeks) • 9 trainer hours plus 3 x fortnightly supervision sessions (unspecified) (8 weeks)

	• 32 hours off-site training for 5x care workers with 2x person-centred care experts and 1x trainer, plus 2-16 hours on-site supervision, plus phone support (time unspecified) • 1 x 60 min researcher-led session per week over 3 weeks • 5 x 25 min researcher-led sessions, then 1 x 25 min session fortnightly for 3 months, then monthly 25 min sessions for 3 months • 5 geropsychologist hours over 1 week, plus hands-on training (time unspecified) over 4 weeks, plus integrated formal staff management (time unspecified) over 6 months • 1 x 60 min researcher-led session, plus daily sessions (time unspecified) over 2-4 weeks • 10 x 60 min clinical psychologist-led sessions over 2 weeks • Implementation trainer hours (unspecified) over 9 months • 1-2 sessions (trainer unspecified) per staff member over 8 weeks • 1 x 90 min gerontologist and PT sessions per week over 8 weeks, plus 3 days on-site supervision during morning care (time unspecified) • 1 x 60 min SP group session, plus 3x individual SP feedback sessions (time unspecified) over 6 weeks	• 34-48 person-centred care expert x2 plus 1x trainer hours • 3 researcher hours (3 weeks) • 5.8 researcher hours (6 months) • 5 geropsychologist hours plus integrated supervisor hours (unspecified) (6 months) • 1 researcher hour, plus daily sessions (unspecified) (2-4 weeks) • 10 clinical psychologist hours (2 weeks) • Unspecified implementation trainer hours (9 months) • Unspecified trainer hours (8 weeks) • 12 gerontologist and PT hours plus 3 days supervision sessions (unspecified) (8 weeks) • 1 SP hour, plus 3x SP sessions (unspecified) (6 weeks)

Other important costing considerations	Facilitator training (for therapists, facilitators, care workers and/or family members) Costs of resources (e.g. educational DVDs, intervention booklets) Travel Session preparation Ongoing supervision (on-site or via telephone) Materials for any intervention activities or environmental modifications Administration hours

Who is involved?

Clinician	Therapists/health professionals (e.g. psychologists, counsellors, social workers, speech pathologists, geropsychologists, gerontologists, physiotherapists, RNs, OTs), consultants, intervention specialists, accredited trainers, care workers, volunteers, professionals, family members, and researchers.
Person with dementia	What stage of dementia? • Evidence from the highest quality effective intervention studies has involved people across a range of dementia stages, from mild to severe. What if living alone? • Evidence from effective interventions involved a mix of people living in the community or in residential care. The studies from the community ranged from requiring the family member to provide a

	minimum of 4 hours care per week for the person with dementia, to both members of the dyad living together.
Family member	Some studies involved family members in working with the person to facilitate the program or to participate in the program alongside the person with dementia (dyad). Other studies involved provision of the intervention to the family member with the aim of benefiting both the family member and the person with dementia. Care workers were involved in a proportion of studies, either as receiving an intervention to then become facilitators of a program for the person with dementia, or in order to develop their own skills in communication and interaction.
Venue	Evidence from effective intervention programs to support or improve communication in people with dementia and their family members/care workers has been conducted in the person's home, in community-based group settings, and in residential care settings.

Have there been any negative effects reported from interventions to improve communication for people living with dementia?

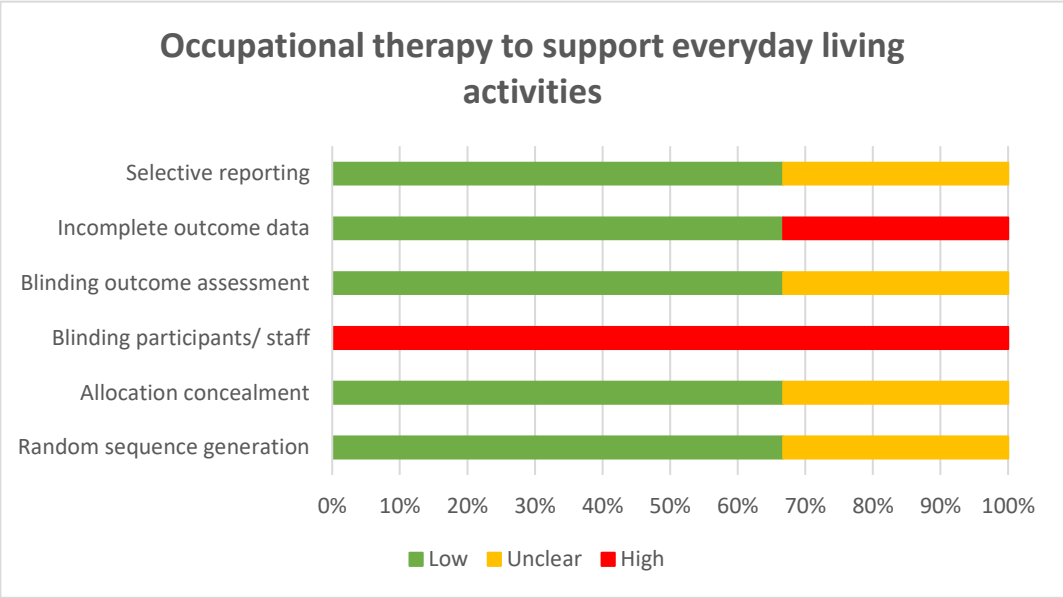
The majority of studies reporting on effective interventions to support communication in people living with dementia did not report on whether or not there were any adverse events resulting from involvement in the interventions. One study reported no adverse events attributable to the intervention, while another study reported that qualitatively, some of the people with dementia felt that a cognitive stimulation therapy intervention led to frustration if the activities were seen as too difficult or too easy.

Appendix 1: Risk of bias summaries and graphs

Risk of bias summary 1: Supporting everyday living activities through occupational therapy

	Random sequence generation	Allocation concealment	Blinding participants/ staff	Blinding outcome assessment	Incomplete outcome data	Selective reporting
Gitlin et al. 2001	?	?	-	?	-	?
Graff et al. 2006	+	+	-	+	+	+
Gitlin et al. 2010	+	+	-	+	+	+

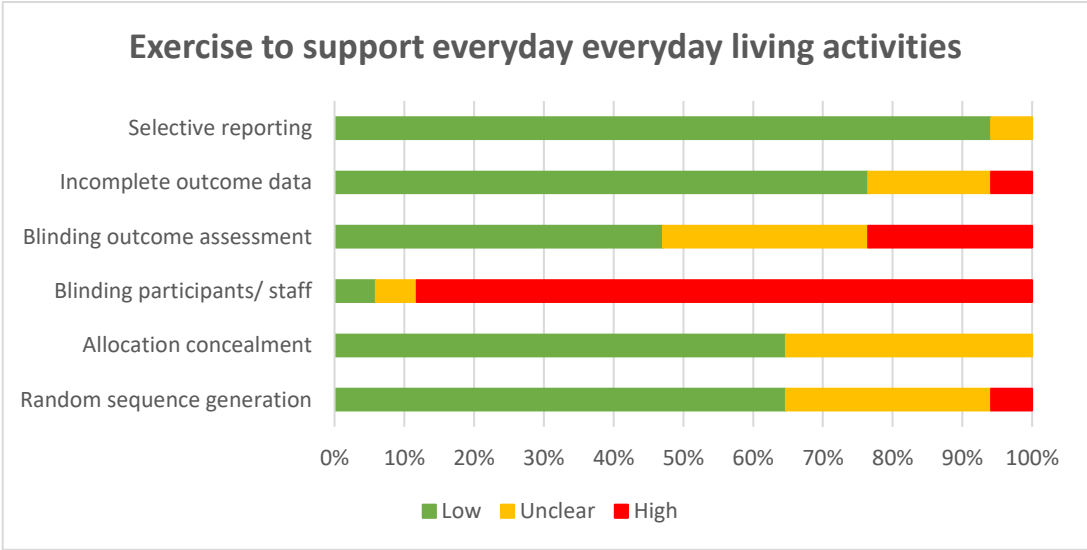
Risk of bias graph 1: Supporting everyday living activities through occupational therapy



Risk of bias summary 2: Supporting everyday living activities through exercise

	Random sequence generation	Allocation concealment	Blinding participants/ staff	Blinding outcome assessment	Incomplete outcome data	Selective reporting
Francese et al. 1997	?	?	-	?	+	+
Rolland et al. 2007	+	+	-	+	+	+
Santa-Sosa et al. 2008	?	?	-	+	+	+
Kwak et al. 2008	?	?	-	?	?	?
Littbrand et al. 2009	?	+	-	+	+	+
Venturelli et al. 2011	?	+	+	?	+	+
Vreugdenhil et al. 2012	+	+	-	+	+	+
Suttanon et al. 2012	+	+	-	+	-	+
Pitkala et al. 2013	+	+	-	?	?	+
Öhman et al. 2016a	+	+	-	?	?	+
Bossers et al. 2016	+	?	?	-	+	+
Cancela et al. 2016	+	+	-	-	+	+
Hoffman et al. 2016	+	+	-	+	+	+
Toots et al. 2016a	+	+	-	+	+	+
Dawson et al. 2017	+	?	-	-	+	+
Morris et al. 2017	+	+	-	+	+	+
Satoh et al. 2017	-	?	-	-	+	+

Risk of bias graph 2: Supporting everyday living activities through exercise

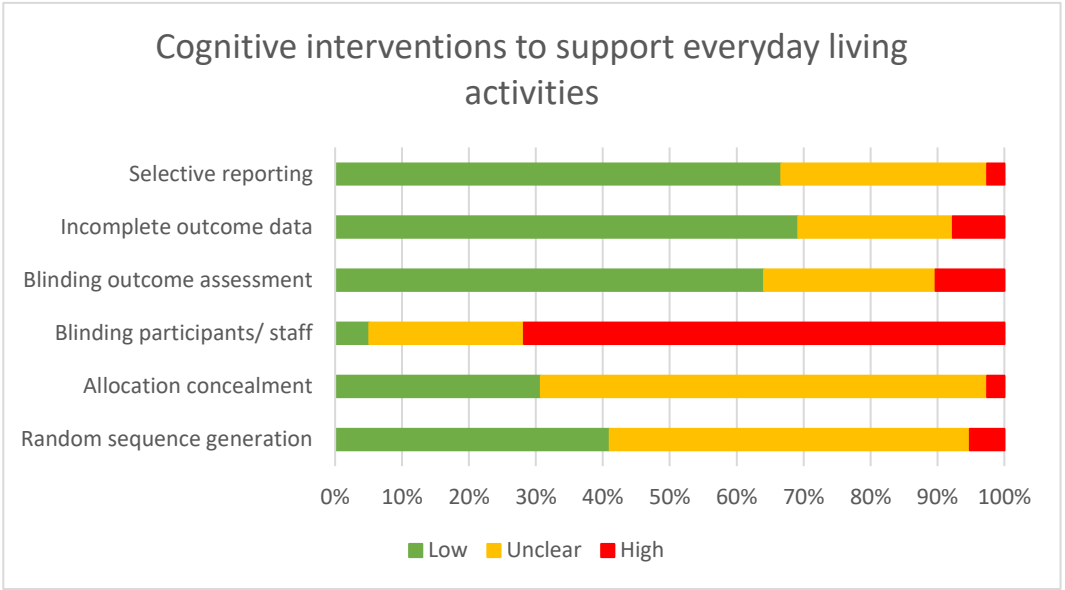


Risk of bias summary 3: Supporting everyday living activities through cognitive interventions

	Random sequence generation	Allocation concealment	Blinding participants/ staff	Blinding outcome assessment	Incomplete outcome data	Selective reporting
Goldwasser et al. 1987	?	?	?	+	+	?
Baldelli et al. 1993	?	?	?	?	+	+
Breuil et al. 1994	?	?	?	+	+	?
Robichaud et al. 1994	?	?	?	-	+	+
de Vreese et al. 1998	?	?	-	+	+	?
Baldelli et al. 2002	?	?	?	?	+	+
Cahn-Weiner et al. 2003	+	?	?	?	+	+
Spector et al. 2003	+	+	+	+	+	+
Chapman et al. 2004	+	+	?	+	+	+
Lai et al. 2004	?	?	-	+	+	?
Loewenstein et al. 2004	?	+	-	+	+	?
Bottino et al. 2005	+	+	-	+	+	+
Onder et al. 2005	+	+	-	+	+	?
Haight et al. 2006	?	?	-	?	?	?
Tarraga et al. 2006	?	?	-	?	?	?
Galante et al. 2007	+	?	-	+	-	+
Onor et al. 2007	?	?	-	?	+	+
Tadaka et al. 2007	+	?	-	+	+	+
Clare et al. 2010	+	+	+	+	+	+
Clare et al. 2011	?	?	-	+	?	+
Graessel et al. 2011	+	+	-	+	+	+
Kurz et al. 2012	+	+	-	+	+	+
Luttenberger et al. 2012a	+	?	-	?	-	+
Luttenberger et al. 2012b	?	?	-	+	+	+
Woods et al. 2012	+	?	-	+	+	+

Yamagami et al. 2012	?	?	-	-	+	+
Bergamaschi et al. 2013	+	?	-	+	+	+
Lee et al. 2013	?	?	-	+	?	?
Schecker et al. 2013	?	?	-	+	?	+
Orrell et al. 2014	+	+	-	+	+	+
Kim, 2015	?	?	-	+	?	+
Ortega et al. 2015	+	+	-	+	+	+
Amieva et al. 2016	?	+	-	+	+	+
Asiret & Kapucu 2016	-	?	?	?	+	?
De Luca et al. 2016	-	-	?	?	?	-
Capotosto et al. 2017	?	?	-	?	?	+
Kudlicka et al. 2017	?	?	-	+	?	?
Regan et al. 2017	+	+	-	-	-	?
Tanaka et al. 2017	?	?	-	-	+	+

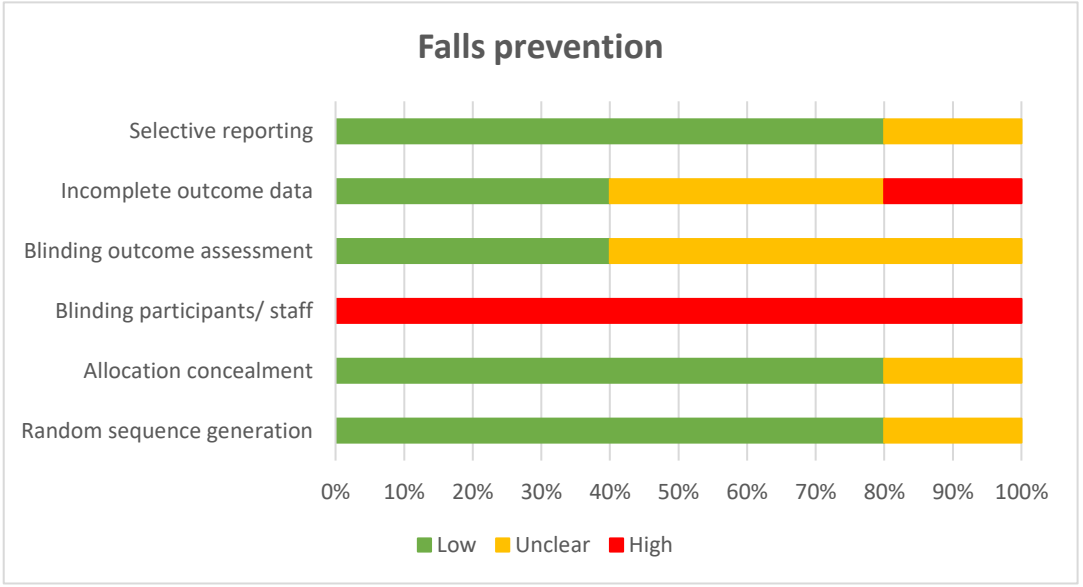
Risk of bias graph 3: Supporting everyday living activities through cognitive interventions



Risk of bias summary 4: Supporting mobility and physical functioning through falls prevention

	Random sequence generation	Allocation concealment	Blinding participants/ staff	Blinding outcome assessment	Incomplete outcome data	Selective reporting
Suttanon et al. 2012	+	+	-	+	-	+
Pitkala et al. 2013	+	+	-	?	?	+
Tchalla et al. 2013	?	?	-	?	+	?
Wesson et al. 2013	+	+	-	+	+	+
Öhman et al. 2016a	+	+	-	?	?	+

Risk of bias graph 4: Supporting mobility and physical functioning through falls prevention

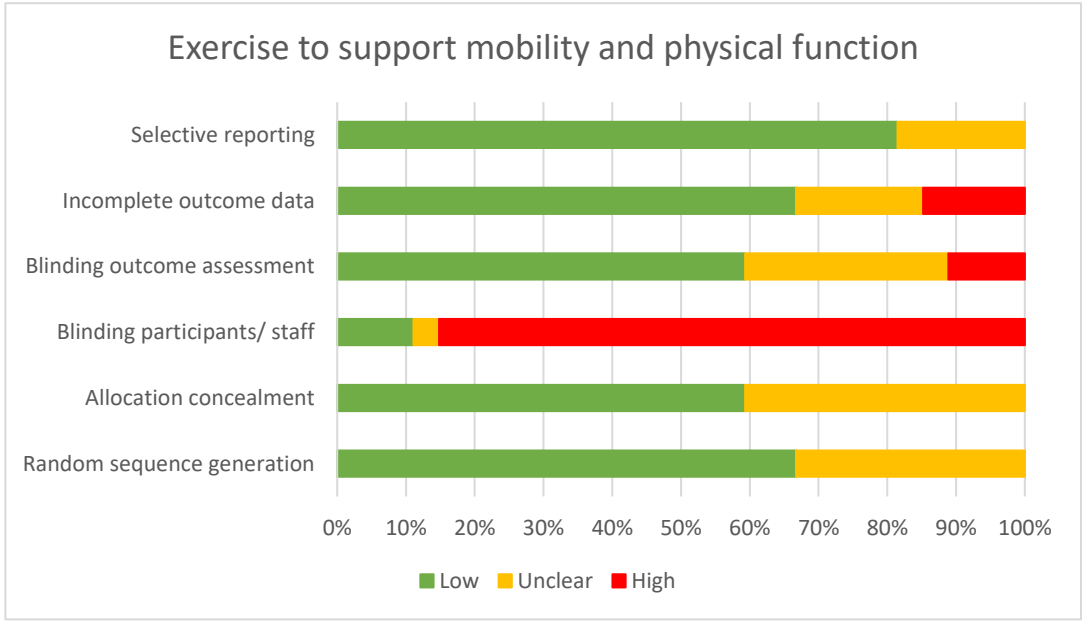


Risk of bias summary 5: Supporting mobility and physical functioning through exercise

	Random sequence generation	Allocation concealment	Blinding participants/ staff	Blinding outcome assessment	Incomplete outcome data	Selective reporting
Francese et al. 1997	?	?	-	?	+	+
Cott et al. 2002	+	?	-	+	-	+
Rolland et al. 2007	+	+	-	+	+	+
Christofoletti et al. 2008	?	+	-	+	-	+
Santa-Sosa et al. 2008	?	?	-	+	+	+
Kwak et al. 2008	?	?	-	?	?	?
Steinberg et al. 2009	?	?	-	+	?	+
Kemoun et al. 2010	?	?	-	+	-	+
Roach et al. 2011	?	?	-	+	+	?
Venturelli et al. 2011	?	+	+	?	+	+
Hauer et al. 2012	+	+	+	?	+	?
Suttanon et al. 2012	+	+	-	+	-	+
Vreugdenhil et al. 2012	+	+	-	+	+	+
Pitkala et al. 2013	+	+	-	?	?	+
Arcoverde et al. 2014	?	+	-	+	+	+
Schwenck et al. 2014	+	+	+	?	+	+
Telenius et al. 2015	+	+	-	+	+	+
Bossers et al. 2016	+	?	?	-	+	+
Cancela et al. 2016	+	+	-	-	+	+
Kim, Han et al. 2016	+	+	-	?	?	+
Öhman et al. 2016a	+	+	-	?	?	+
Sobol et al. 2016	+	?	-	+	+	?
Toots et al. 2016a	+	+	-	+	+	+
Toots et al. 2016b	+	+	-	+	+	+
Dawson et al. 2017	+	?	-	-	+	+

Lam et al. 2017	+	?	-	+	+	?
Morris et al. 2017	+	+	-	+	+	+

Risk of bias graph 5: Supporting mobility and physical functioning through exercise

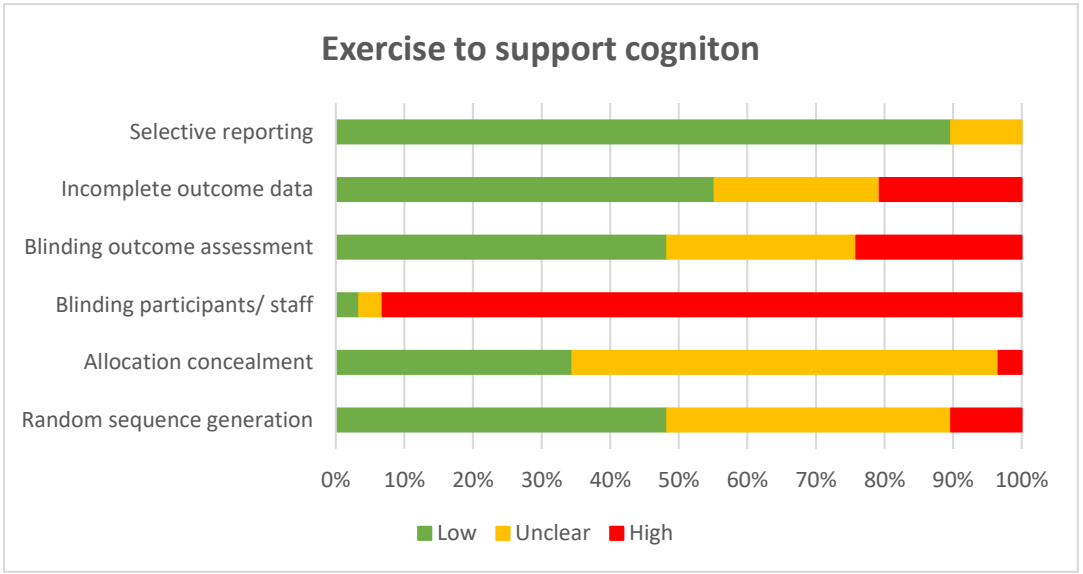


Risk of bias summary 6: Supporting cognition through exercise

	Random sequence generation	Allocation concealment	Blinding participants/ staff	Blinding outcome assessment	Incomplete outcome data	Selective reporting
Cott et al. 2002	+	?	-	+	-	+
Van de Winckel et al. 2004	+	?	?	-	+	+
Stevens et al. 2006	+	?	-	?	-	+
Christofoletti et al. 2008	?	+	-	+	-	+
Hokkanen et al. 2008	?	?	-	?	?	?
Kwak et al. 2008	?	?	-	?	?	?
Miu et al. 2008	?	?	-	+	?	+
Steinberg et al. 2009	?	?	-	+	?	+
Eggermont et al. 2009a	+	?	-	+	+	+
Eggermont et al. 2009b	?	?	-	+	+	+
Hwang et al. 2010	?	?	-	?	-	+
Kemoun et al. 2010	?	?	-	+	-	+
Venturelli et al. 2011	?	+	+	?	+	+
Yaguez et al. 2011	?	?	-	?	?	?
Vreugdenhil et al. 2012	+	+	-	+	+	+
Volkers et al. 2012	+	?	-	+	-	+
Arcoverde et al. 2014	?	+	-	+	+	+
Cheng et al. 2014	-	?	-	-	+	+
Bossers et al. 2015	+	+	-	+	+	+
Holthoff et al. 2015	?	?	-	+	+	+
Cancela et al. 2016	+	+	-	-	+	+
Hoffman et al. 2016	+	+	-	+	+	+
Kim, Han et al. 2016	+	+	-	?	+	+
Öhman et al. 2016b	+	+	-	-	?	+
Sampaio et al. 2016	-	-	-	?	+	+

Dawson et al. 2017	+	?	-	-	+	+
Morris et al. 2017	+	+	-	+	+	+
Satoh et al. 2017	-	?	-	-	+	+
Prick et al. 2017	+	?	-	-	+	+

Risk of bias graph 6: Supporting cognition through exercise



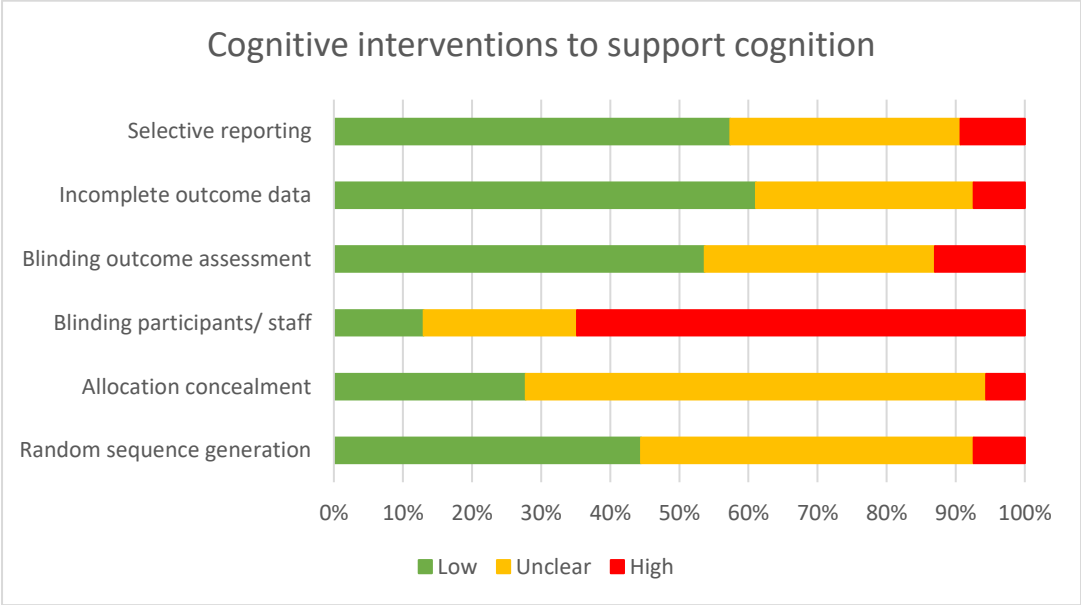
Risk of bias summary 7: Supporting cognition through cognitive interventions

	Random sequence generation	Allocation concealment	Blinding participants/ staff	Blinding outcome assessment	Incomplete outcome data	Selective reporting
Woods et al. 1979	+	?	+	+	+	+
Wallis et al. 1983	+	+	+	+	?	+
Baines et al. 1987	?	?	+	+	+	+
Beck et al. 1988	?	?	-	-	+	+
Ferrario et al. 1991	?	?	?	?	+	+
Baldelli et al. 1993	?	?	?	?	+	+
Heiss et al. 1993	+	?	-	-	-	?
Breuil et al. 1994	?	?	?	+	+	?
Quayhagen et al. 1995	+	?	-	+	?	-
de Vreese et al. 1998	?	?	-	+	+	?
Quayhagen et al. 2000	+	?	-	+	?	+
Davis et al. 2001	?	?	-	+	+	?
Koltai et al. 2001	+	?	-	+	?	+
Spector et al. 2001	+	+	?	+	+	+
Baldelli et al. 2002	?	?	?	?	+	+
Cahn-Weiner et al. 2003	+	?	?	?	+	+
Spector et al. 2003	+	+	+	+	+	+
Chapman et al. 2004	+	+	?	+	+	+
Lai et al. 2004	?	?	-	+	+	?
Loewenstein et al. 2004	?	+	-	+	+	?
Bottino et al. 2005	+	+	-	+	+	+
Kawashima et al. 2005	?	?	?	?	?	?
Onder et al. 2005	+	+	-	+	+	?
Haight et al. 2006	?	?	-	?	?	?
Requena et al. 2006	?	?	+	+	+	+

Tarraga et al. 2006	?	?	-	?	?	?
Galante et al. 2007	+	?	-	+	-	+
Onor et al. 2007	?	?	-	?	+	+
Tadaka et al. 2007	+	?	-	+	+	+
Wang et al. 2007	?	?	?	?	?	+
Burgener et al. 2008	?	?	-	?	?	+
Neely et al. 2009	+	?	-	-	?	?
Clare et al. 2010	+	+	+	+	+	+
Haslam et al. 2010	?	?	-	-	+	-
Buettner et al. 2011	?	?	+	+	?	+
Buschert et al. 2011	+	+	-	?	+	+
Coen et al. 2011	?	?	?	?	?	+
Graessel et al. 2011	+	+	-	+	+	+
Yamagami et al. 2012	?	?	-	-	+	+
Lee et al. 2013	?	?	-	+	?	?
Mapelli et al. 2013	+	?	-	+	+	-
Yamanaka et al. 2013	-	?	-	+	+	?
Orrell et al. 2014	+	+	-	+	+	+
Ortega et al. 2015	+	+	-	+	+	+
Amieva et al. 2016	?	+	-	+	+	+
Asiret & Kapucu 2016	-	?	?	?	+	?
Chen et al. 2016	-	-	-	?	?	-
De Luca et al. 2016	-	-	?	?	?	-
Kim, Yang et al. 2016	+	-	-	?	-	?
Laakonen et al. 2016	+	+	-	?	+	?
Capotosto et al. 2017	?	?	-	?	?	+
Kudlicka et al. 2017	?	?	-	+	?	?
Regan et al. 2017	+	+	-	-	-	?

Tanaka et al. 2017	?	?	-	-	+	+

Risk of bias graph 7: Supporting cognition through cognitive interventions

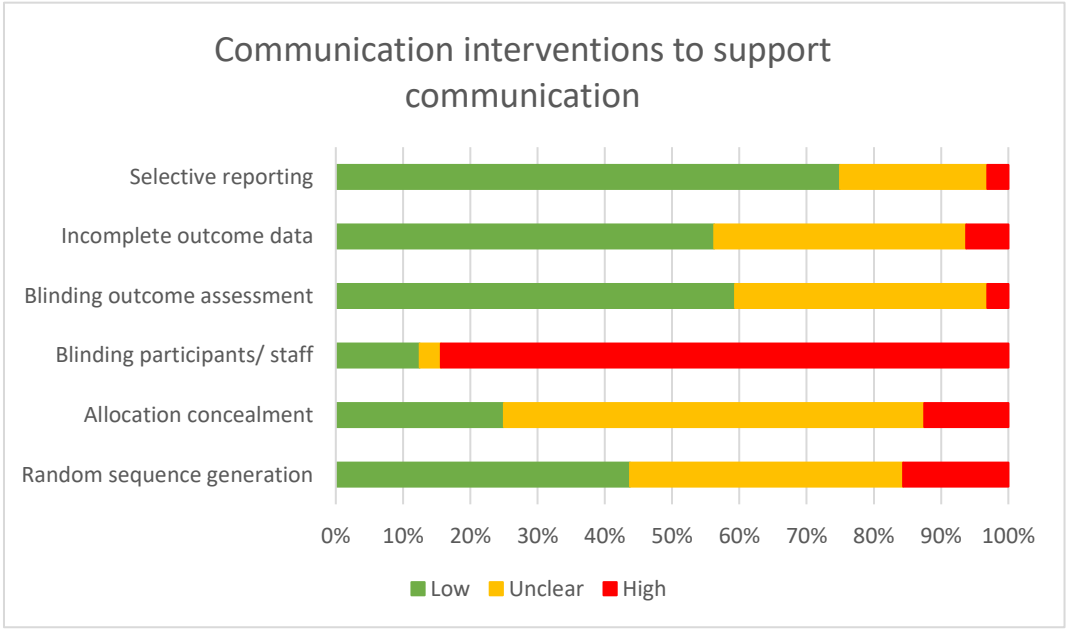


Risk of bias summary 8: Supporting communication through communication interventions

	Random sequence generation	Allocation concealment	Blinding participants/ staff	Blinding outcome assessment	Incomplete outcome data	Selective reporting
Baines et al. 1987	?	?	+	+	+	+
Friedman & Tappen 1991	+	?	-	?	?	+
Wells et al. 2000	-	-	-	+	?	+
Spector et al. 2001	+	+	?	+	+	+
Burgio et al. 2002	?	?	-	?	+	?
Cott et al. 2002	+	?	-	+	-	+
Dijkstra et al. 2002	?	?	-	?	?	?
Magai et al. 2002	?	?	-	+	?	?
Tappen et al. 2002	?	?	-	+	?	+
Spector et al. 2003	+	+	+	+	+	+
Teri et al. 2005	?	?	-	+	+	-
van Weert et al. 2005	-	-	-	+	+	+
Haight et al. 2006	?	?	-	?	?	?
Visser et al. 2008	+	+	-	+	+	+
Chennoweth et al. 2009	+	+	+	+	+	+
Kuske et al. 2009	+	+	-	?	+	+
Logsdon et al. 2010	-	-	-	?	?	+
De Rotrou et al. 2011	?	?	-	+	+	+
Liddle et al. 2012	?	?	-	?	?	+
Clare et al. 2013	+	+	+	+	+	+
Judge et al. 2013	?	?	-	+	?	+
van der Kooij et al. 2013	?	?	-	-	?	?
van der Ploeg et al. 2013	+	?	-	?	+	?
Chennoweth et al. 2014	?	+	-	+	+	+
Jelcic et al. 2014	-	?	-	+	?	+

Ortega et al. 2015	+	+	-	+	+	+
Sprangers et al. 2015	-	-	-	?	?	+
Barbosa et al. 2016	+	?	-	?	+	+
Conway et al. 2016	?	?	-	?	-	+
Prick et al. 2016	+	?	-	+	+	?
Liang et al. 2017	+	?	-	?	+	+
Williams et al. 2017	+	?	-	+	+	+

Risk of bias graph 8: Supporting communication through communication interventions



Appendix 2: List of assessments used across the research

The following lists contain the assessments/outcome measures used across the studies reported throughout the programs included in the *technical guide*.

Assessments of everyday living activities / ADLs

Aachen Functional Item Inventory
Alzheimer's Disease Cooperative Study ADL (ADCS-ADL)
Assessment of Motor and Process Skills (AMPS)
Barthel Index (BI) / Modified BI
Bayer ADL Scale
Canadian Occupational Performance Measure (COPM)
Changes in Advanced Dementia Scale
Disability Assessment for Dementia (DAD)
Echelle Comportmentale Adaptive
Erlangen-ADL test
Everyday Cognition Scale (ECOG)
Functional Independence Measure (FIM)
Grille d'Autonomie Gerontologique-Groupes Iso Ressources (AGGIR)
Independent Living Scales
Instrumental ADL assessment/Lawton IADL scale
Interview of Deterioration in Daily Activities in Dementia
Katz ADL Index/Scale
Multidimensional Observation Scale for Elderly Subjects (MOSES)
Nurse's Observation Scale for Geriatric Patients (NOSGER)
Psychogeriatric Scale of Basic ADLs
Spontaneous Behaviour Interview – ADL Scale
Stewart's ADL Scale

Assessments of physical performance/function

2-Minute Step test
6-Meter Walking speed
6 minute Astrand Cycle Ergometer test – Est VO_2 max
6-Minute Walk test
8-Foot Up and Go test
8-Foot Walk test
30-Second Chair Stand test
10 Meter Walk test
400 Meter Walk test
ACMS – American College of Medicine Guidelines for Exercise testing (muscle strength, muscular endurance, flexibility, balance, agility)
Acute Care Index of Function (mobility, transfers, ambulation)
Arm Curl test
Back Scratch test
Berg Balance Scale
Bessou locomotor (walking speed, stride length, double limb support time)
Borg Scale Scores
Cadence – steps/min
Chair Sit and Reach test

Chair Sit to Stand test
Figure of 8 test
Frailty and Injuries Cooperative Studies of Intervention Techniques subtest 4
Functional Reach test
Gait (speed, cadence, stride length, stride time, step width, step time variability, walk ratio)
Gait Speed test
Get Up and Go test
Groningen Meander Walk test
Human Activity Profile
Increase in Maximum Strength
Jebsen Total Time
Limits of Stability (reaction time, movement velocity, max excursion)
Modified Clinical Test of Sensory Interaction of Balance
Muscle strength
One leg balance test
Peak VO_2 Cardiorespiratory Exercise Testing
Performance Oriented Motor Assessment
Short Physical Performance Battery
Sit to Stand test
Stair Climbing performance
Step length
Step/quick turn (turn time, turn away)
Step Test
Strength – dynamometer
Timed 8-Foot Walk test
Timed Chair Stands
Timed Up and Go test
Tinetti Balance Evaluation test
Walk across test (step width, step length, walking speed)
Walking speed
Yale Physical Activity Survey

Assessments of cognitive function or communication (related to the person with dementia or care workers/family members)

Addenbrooke's Cognitive Examination Revised (ACE-R)
Alzheimer's Disease Assessment Scale – Cognitive (ADAS-Cog)
Amsterdam Dementia Screening Test 6 (ADS6)
Approaches to Dementia Care
Assessment of Awareness of Communication Strategies
Attentive matrices
Behaviour Management Skills Checklist
Berg's Orientation Scale for Geriatric Patients
Bill-Paying-Balancing-a-Check book Task
Bisyllabic Word Repetition Test
Block design
Boston Naming Test
Brief Assessment of Prospective Memory
Brief Cognitive Screening Battery (BCSB)
Brief communication Scale
Brief Story Recall
California Proverb Test

Cambridge Cognitive Examination (CAMCOG)
Cambridge Neuropsychological test automated battery (CANTAB): Matching to Sample; Motor Screening; Paired Associate Learning (PAL); Pattern recognition; Spatial working memory; Rapid Visual Information Processing (RVIP)
Category test
Clifton Assessment Schedule
Clinical Dementia Rating scale (CDR)
Clock drawing test
Cognitive Assessment Scale
Collaborative object recall random/clustered
Communication and Memory Support in Dementia (CMSD)
Communication Assessment Scale
Communication Observation Scale (COS)
Communication Skills Checklist
Communication Support Strategies in Dementia test
Constructional apraxia and Ideomotor apraxia
Continuous Performance Test
Cookie Theft
Corsi's block tapping test
Cube Drawing
Denomination
Digit cancellation test
Digit span (backwards/forwards)
Digit Symbol Substitution Test
Discourse Characteristics staff/resident
Discourse – narrative/procedural
Eight Word test
Elevator counting
Emotion-oriented Skills in the Interaction with elderly people with Dementia (ESID)
Esame Neuropsicologico Breve 2 (ENB2)
Face-Name Association Task
Face/picture recognition
Faces Scale
Facial expressions of emotion during semi-structured interview
Family Assessment Measure: communication, affective expression and involvement subscale
Fuld Object Memory Evaluation (FOME)
Functional Assessment of Communication Skills for adults
French Rapid Evaluation of Cognitive Function (ERFC)
Geriatric coping schedule
Hasegawa Dementia Scale Revised
Holden Communication Scale
Hong Kong List Learning test (HKLLT)
Interaction Behaviour Measure
Key search test
Letter cancellation task
List Learning
Logical memory
Map search
Match to a sample
Mattis Dementia Rating Scale (DRS)
Memory and Information Test items
Menorah Park Engagement Scale

Milan Overall Dementia Assessment (MODA)
Mini-Mental State Examination (MMSE)
Modified Interaction Behaviour Measure
Modified Making-Change-for-a-Purchase Task
Modified Nursing Care Assessment Scale (M-NCAS)
Narrative language test
Neurobehavioral Cognitive Status Exam (COGNISTAT)
Nonverbal affective behaviour rating scheme
Observation Form of General Communication
Philadelphia Geriatric Centre Affect Rating Scale (PGCARS)
Picture completion test
Picture Description Test
Picture pair association
Procedural Object-Memory Evaluation (POME)
Prose memory
Quality of Care Interactions
Quality of Interactions Schedule (QUIS)
Questionnaire about Knowledge on Communication Skills in Dementia Care
Rapid Evaluation of Cognitive Function
Raven's Colored Progressive Matrices
Recall of non-categorasible/categorisable words
Recall of numbers/parts of a story
Rey Auditory Verbal Learning Test (RAVLT)
Rivermead Behavioural Memory Test (RBMT)
Roter Interaction Analysis System
Royal College of Physicians mental scale for the elderly
Stroop task
Symbol Digit Modalities Test
Syndrom-Kurz test
Thomas Assessment of Communication Inadequacy
Trail Making Test
Verbal Fluency (FAS)
Verbal naming test
Visual memory span
Visual Reproduction test
Wechsler Intelligence Scale Revised (WAIS-R)
Wechsler Memory Scale
Word List Memory
Word List Savings score

Assessments of wellbeing, stress and self-efficacy (for either person with dementia or care workers/family members)

Brief Symptom Inventory
Caregiver Mastery
Caregivers Perceived Ease of Caregiving
DEMQOL
Dyadic Relationship Strain
Emotional Health Strain
General Health Questionnaire (GHQ-12)
GEROLF questionnaire
Maslach Burnout Inventory (MBI-D)

Medical outcome Study short form (SF-36)
Neuropsychiatric Inventory-Questionnaire (NPI-Q) – Family member distress
Nurses Hassles and Uplifts-Hassles subscale
Perceived Stress Scale
Physical Health Strain
Positive Response Schedule
Preparedness to Provide Care scale
Quality of Caregiver-Patient Relationship
Quality of Life in Alzheimer's Disease (QOL-AD)
Quality of Life in Late Stage Dementia (QUALID)
Revised Caregiving Scale for Self-Efficacy
Revised Memory and Behaviour Problem Checklist (RMBPC) – Caregiver reaction
Screen for Caregiver Burden (SCB)
Self-Efficacy Scale
Sense of Competence Questionnaire
Zarit Burden Inventory (ZBI)

Appendix 3: The *technical guide* development team

Thank you to our consumer representatives, who were sought via the CDPC and the Dementia Consumer Advocates. Thanks to Kate Laver for acting as an advisor on the project, and thank you to our workshop participants: Ron Sinclair, Theresa Flavin, Jessica Roberts, John Quinn, Glenys Petrie, Sally Grosvenor, Lorraine Poulos, Tim Dixon, Marta Skibiki, Ellie Stevenson, Michelle Anthony, Natalie Robson, and the Investigator team.

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