

Evidence Compass



Technical Report

‘Stepped-down’ Intervention Programs to
Promote Self-Managed Physical Activity in
Service Veterans and their Dependents

A Rapid Evidence Assessment (REA)

November 2019



Australian Government
Department of Veterans' Affairs

Disclaimer

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This project utilised a Rapid Evidence Assessment (REA) methodology. An REA streamlines traditional systematic review methods in order to synthesise evidence within a shortened timeframe. The advantage of an REA is that rigorous methods for locating, appraising and synthesising evidence from previous studies can be upheld. Also, the studies reported can be at the same level of detail that characterise systematic reviews, and results can be produced in substantially less time than required for a full systematic review. Limitations of an REA mostly arise from the restricted time period, resulting in the omission of literature such as unpublished pilot studies, difficult-to-obtain material and/or non-English language studies. A major strength, however, is that an REA can inform policy and decision makers more efficiently by synthesising the evidence in a particular area within a relatively short space of time and at less cost.

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Acknowledgements

This REA was funded by the Department of Veterans' Affairs (DVA). We acknowledge the work of researchers from The University of Queensland (Australia), and Leeds Beckett University (UK), who were responsible for conducting the REA and preparing this report. These individuals include: Associate Professor Nicholas Gilson, Dr Zoe Papinczak, Dr Gregore Iven Mielke, Professor Catherine Haslam, Professor Jim McKenna, and Professor Wendy Brown.

For citation:

Gilson ND, Papinczak ZE, Mielke GI, Haslam C, McKenna J, Brown WJ (2019). *Intervention Strategies to promote Self-Managed Physical Activity in Service Veterans and their Dependants - A Rapid Evidence Assessment. Technical Report*. Report prepared for the Department of Veterans Affairs. Centre for Research on Exercise, Physical Activity and Health, The University of Queensland, Australia.

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Executive Summary

- A 'stepped-down' program is where clients transition from the care of a health professional (e.g. an exercise physiologist, physiotherapist, or occupational therapist), to self-managed care. Thus, a self-managed physical activity program is where clients take responsibility for initiating and maintaining their own physical activity regimes, instead of being dependant on supervision from a health expert.
- Presently, health care treatment models provided by the *Department of Veterans' Affairs* (DVA) may not enable or create channels for clients to transition to self-managed physical activity after a course of allied health treatment.
- The health benefits associated with regular physical activity (e.g., enhanced physical function, reduced risk of chronic diseases, reduced risk of falls, improved quality of life, enhanced cognitive functioning, and improved psycho-social wellbeing) may be promoted and sustained post-treatment through engaging clients in 'stepped-down' programs.
- The aim of this Rapid Evidence Assessment (REA) was to: 1) examine the scientific literature for evidence on the effectiveness of interventions to promote self-managed physical activity in service veterans and/or their dependants; 2) assess studies that compared the effectiveness of 'stepped-down' models of PA self-management to 'usual care' controls and; 3) identify key behaviour change techniques that have been used in these studies to successfully promote physical activity change.
- The overarching purpose of the review was to use the findings to inform the development of *Active Choices*, a DVA-funded 'stepped-down' program that seeks to facilitate the transition of clients from allied health service provision, to self-managed physical activity preferences, within their local active communities.
- Literature searches were conducted to identify randomised controlled trials that assessed self-managed interventions to promote physical activity and/or physical function/fitness, with participants who were service veterans and/or their dependants (e.g. spouses).
- Data were extracted on study characteristics, intervention strategies (assessed against a taxonomy of behaviour change techniques), and outcomes (physical activity, physical function/fitness, and where available, psychological health and social support, and health care costs). The overall strength of the evidence base was assessed on study quality (poor, fair, or good), the direction of change in study outcomes (positive or no effect), and the generalisability of study findings to the Australian context. These elements were used to rate the evidence base as 'supportive, promising, unknown, or unsupportive'.

- Searches identified 28 papers (representing 19 unique datasets and intervention programs), that met inclusion criteria. All studies originated in the USA. Participants ($n=45$ to $n=1092$) were typically older aged (mean age 55+ years) male veterans with high risk comorbidities (e.g. diabetes, post-traumatic stress disorder, or musculoskeletal disorders). Only one study targeted dependants.
- The primary outcomes of physical activity or physical function/fitness were assessed in 93% ($n=26$) and 36% ($n=10$) of selected studies respectively. Secondary outcomes of interest included psychological health and social support (21%; $n=6$ studies), and health care costs (7%; $n=2$ studies).
- Overall, 64% ($n=18$) of studies (service veterans only) found positive intervention effects (physical activity, physical function/fitness, psychological health or social support).
- When considering only those selected studies that compared a 'stepped-down' intervention to a 'usual care' group ($n=14$), 79% of studies ($n=11$) observed a positive between-group intervention effect in the primary outcome of physical activity; the mean magnitude of change was 53 minutes/week of self-reported moderate intensity physical activity.
- Intervention duration was typically 6 to 12 months. The behaviour change techniques most frequently utilised by intervention programs that observed positive intervention effects were education, social support, goal setting and review of goals, self-monitoring, devices (e.g. pedometers) to facilitate change, feedback and graded task strategies.
- Study quality (good), and direction of change (positive intervention effects observed in the majority of studies), indicated that the overall effectiveness of 'stepped-down' intervention programs to promote self-managed physical activity in service veterans was: **Promising – evidence suggestive of beneficial effect but further research required.**
- The REA found no Australian based studies that met inclusion criteria, or positive intervention effects with dependants. The generalisability of findings to DVA clients was therefore rated as: **Unknown – insufficient evidence of beneficial effect, and further research required.**
- The review findings highlight that 'stepped-down' programs have the potential to help service veterans' transition from allied health care to effective self-management of physical activity; they also identify key behaviour change techniques that should be embedded within intervention programs.
- However, as a pre-requisite to larger, scalable studies, the findings also emphasise the need for well-controlled, proof of concept research with DVA clients in the Australian context. These studies should utilise more accurate, objective measures of physical

activity change, test intervention programs with lower risk, relatively healthy clients, and importantly include dependants, as well as service veterans, in study recruitment.

1. Introduction

Allied health service professionals such as osteopaths, chiropractors, occupational therapists, podiatrists, exercise physiologists and physiotherapists play an essential role in preventing, diagnosing and treating a range of conditions and illnesses. In Australia, there has been significant growth in the provision of allied health services to *Department of Veterans' Affairs* (DVA) clients (i.e., service veterans and their dependants), especially those directed to improving musculoskeletal outcomes. For example, data from the DVA indicate that from the period of 2011/12 to 2016/17, there was a 59% growth in the average cost per patient for musculoskeletal services, and a 51% increase in the number of services each patient received, despite a 19% reduction in the number of patients who accessed musculoskeletal health services¹. Service uptake and cost growth were significantly underpinned by large increases in the number of DVA clients who saw an exercise physiologist for treatments involving physical activity.

The numerous health and social benefits which accrue when people start and maintain a program of regular physical activity is well established; this is particularly true for older Australians (65+ years) whose functional/physical fitness and social connectedness is enhanced by being habitually active².

Most DVA clients are older Australians³, and the increasing number of these clients seeing allied health professionals, and presumably becoming more physically active as a result, is testament to the success of DVA strategies for promoting better health for service veterans and their dependants. However, there is a risk that some allied health providers may be 'over-servicing' and providing treatment to DVA clients for longer than is clinically necessary. Furthermore, DVA's current programs are structured around treatment models by an allied health professional that may not enable or create channels for DVA clients to 'step-down' to sustainable self-managed physical activity after a course of allied health treatment. There are also questions about improving the sustainability of self-managed physical activity when undertaken in communities that might facilitate physical and psychological health, social connectivity, and health care savings.

A 'stepped-down' program is where clients transition from allied health care to self-managed care.

Thus, a self-managed physical activity program is where individuals take responsibility for initiating and maintaining their own physical activity regimes, instead of being dependant on supervision from a health expert or professional.

Assisting DVA clients in 'stepping-down' to self-managed physical activity may promote a range of positive health outcomes that are associated with regular physical activity. These include reduced risk of illness from chronic diseases (e.g., Type II diabetes, heart disease, stroke, dementia), improved physical function, reduced risk of falls and fall-related injuries, improved quality of life, enhanced cognitive function and reduced symptoms of depression and anxiety.^{4,5} 'Stepped-down' physical activity programs may also help in sustaining the health benefits achieved through allied health treatment and improve social connectedness through promoting engagement in group-based interactions and networks.

Given that very little is known about 'stepped-down' models of care, and strategies to transition DVA clients to active communities following treatment by an allied health professional, the aims of the current review were to:

- Examine the scientific literature for evidence on the effectiveness of interventions to promote self-managed physical activity in service veterans and/or their dependants;
- Assess studies that compared the effectiveness of 'stepped-down' models of PA self-management to 'usual care' controls and;
- Identify key behaviour change techniques that have been used in these studies to successfully promote physical activity change.

The overarching purpose of the review was to use the findings to inform the development of *Active Choices*, a DVA-funded 'stepped-down' program that seeks to facilitate the transition of DVA clients from allied health service provision, to self-managed physical activity preferences, within their local active communities.

2. Methods

This review adopted an REA methodology. REAs utilise a rigorous method for locating, appraising and synthesising evidence from previous studies. However, to ensure rapid assessment, the methodology introduces some limitations to the search criteria and evidence assessment (e.g., specific types of study design, or timeframe for study publication). Therefore, while the quality of the evidence is assessed in a rigorous way, an REA is typically not as exhaustive as a full systematic review or meta-analysis.

2.1 Defining the Research Question

The research question to be addressed in this REA was defined using the 'Population, Intervention, Comparison, Outcome' or PICO framework:

- **Populations** of interest were veterans, ex-service personnel, their families or dependants.
- **Interventions** to target changes in physical activity, sport, exercise or fitness, with a self-managed component were included. In line with the overarching purpose of the REA, 'stepped-down' interventions, where participants transitioned from a supervised to self-managed setting, were of particular interest.
- **Comparison** or control group study designs that provided a higher quality of evidence (i.e., randomised controlled trials), were targeted in the review.
- **Outcomes** of interest were primarily physical activity (inclusive of sport and exercise), or physical function/fitness (inclusive of cardio-respiratory fitness, muscular strength and endurance, gait, balance and flexibility), specifically the types of measures used, and the magnitude of change observed in these outcomes. When reported, secondary outcomes of interest included psychological health, social connectivity, health service utilisation, and cost of health service delivery.

2.2 Search Strategy

Database selection, search terms, and inclusion/exclusion criteria were agreed by the research team in consultation with the DVA. To identify relevant literature, systematic searches were performed in a comprehensive range of databases that included:

- The Cochrane Library; MEDLINE, Embase, PsycINFO, SPORTDiscus, PubMed, CINAHL, Health Collection, National Institute for Health and Clinical Excellence, Clinical Guidelines Portal, and the National Guidelines Clearinghouse.

Studies reported in a recent REA by Milanese and colleagues (2018)⁶ investigating the effects of sport on veteran physical and mental wellbeing, were manually reviewed and cross-referenced with results from the database searches. Where systematic reviews were identified in our searches, the individual studies within these reviews were located to assess whether the publications utilised a 'stepped-down' or self-managed physical activity approach.

2.3 Search Terms

Previous REAs published on the DVA's website were reviewed to identify search terms used to describe veterans, ex-service personnel, and their families or dependants. For the primary outcomes, the terms 'physical activity, exercise, sport, fitness and training' were agreed by the research team, and preliminary scoping of these search terms was undertaken to ensure their specificity and sensitivity were suitable for the REA. Based on this scoping exercise, 'gym' was added to 'training' to avoid capture of a large number of articles that assessed the impact of non-physical activity related 'training' programs.

The final search terms used in the REA were:

- **Population:** (veteran* OR ex-service OR exservice OR "war widow" OR military OR "armed service" OR "armed services" OR "armed force" OR "armed forces" OR soldier OR "defence force" OR ADF OR army OR navy OR "air force" OR airforce OR "defence family" OR ex-military OR exmilitary OR "retired military") AND
- **Intervention:** (sport* OR exercise* OR "physical exercise" OR "physical activity" OR fitness OR "gym training").

For the search completed in the PubMed database, the following MeSH terms were used:

- **Population:** (veterans OR veterans health OR military family) AND
- **Intervention:** (sport OR exercise OR physical exercise OR physical activity OR exercise training).

To maximise specificity, searches were limited to individual studies published in peer-reviewed journal articles, with full-text articles available in English.

2.4 Study Selection and Information Management

Studies were included if they:

- Utilised a randomised controlled trial design;

- Assessed a self-managed or 'stepped-down' intervention to promote physical activity and/or physical function/fitness;
- Recruited participants who were veterans, ex-service personnel, their families or dependants;
- Reported quantitative changes in primary outcomes of physical activity and/or physical function/fitness, for these participants.

A screening process was adopted to determine the eligibility of studies acquired through the search strategy, relative to these inclusion criteria. Studies were directly imported into *EndNote X9*, where screening for duplicates occurred. Records were then imported into *Rayyan* for title and abstract screening; studies that satisfied the initial title and abstract screening process progressed to full-text review and selection. One reviewer performed initial title and abstract screening, and full-text reviews, with the research team agreeing and reaching consensus on final study selection.

2.5 Data Extraction and Synthesis

The following data were extracted from the selected studies, and a summary table for each study generated (see *Evidence Profile*). This included:

- Details on source (authors, year and location), study aim, sample characteristics, and primary (and where applicable secondary) outcomes and measures;
- Intervention strategies, control/comparator group protocols, and key findings.

A matrix was then created to provide an overview of intervention strategies and reported outcomes. Study design, and direction and magnitude of changes observed in the primary and secondary outcomes, were mapped against intervention strategies using a modified taxonomy of behaviour change techniques⁷.

2.6 Study Quality

To assess the quality of studies, an adapted matrix was completed for each individual study, based on the exercise-specific TESTEX scale⁸. The matrix consists of 15 items with a 'yes' (1 point) or 'no' (0 point) response format, resulting in a quality score ranging from 0-15 points for each study. Standardised scoring was achieved by four members of the research team who each independently scored two studies. Inter-rater agreement was assessed, and group consensus reached in the case of any disparities in item scores. Following this process, the remaining studies were distributed equally and scored by two teams of two raters. A mean score was then calculated for selected studies to assess whether quality

across the evidence base was poor (0 to 4 points), fair (5 to 9 points), or good (10 to 15 points).

2.7 Evaluation of the Evidence

Study quality, the **direction of change** (positive or no effect) observed in the primary outcomes of interest, and the **generalisability** of the body of evidence to the Australian context were used to rate the overall strength of the evidence base as:

Supportive Clear consistent evidence of beneficial effect	Promising Evidence suggestive of beneficial effect but further research required	Unknown Insufficient evidence of beneficial effect, and further research required	Unsupportive Clear/consistent evidence of no effect, or negative/harmful effect
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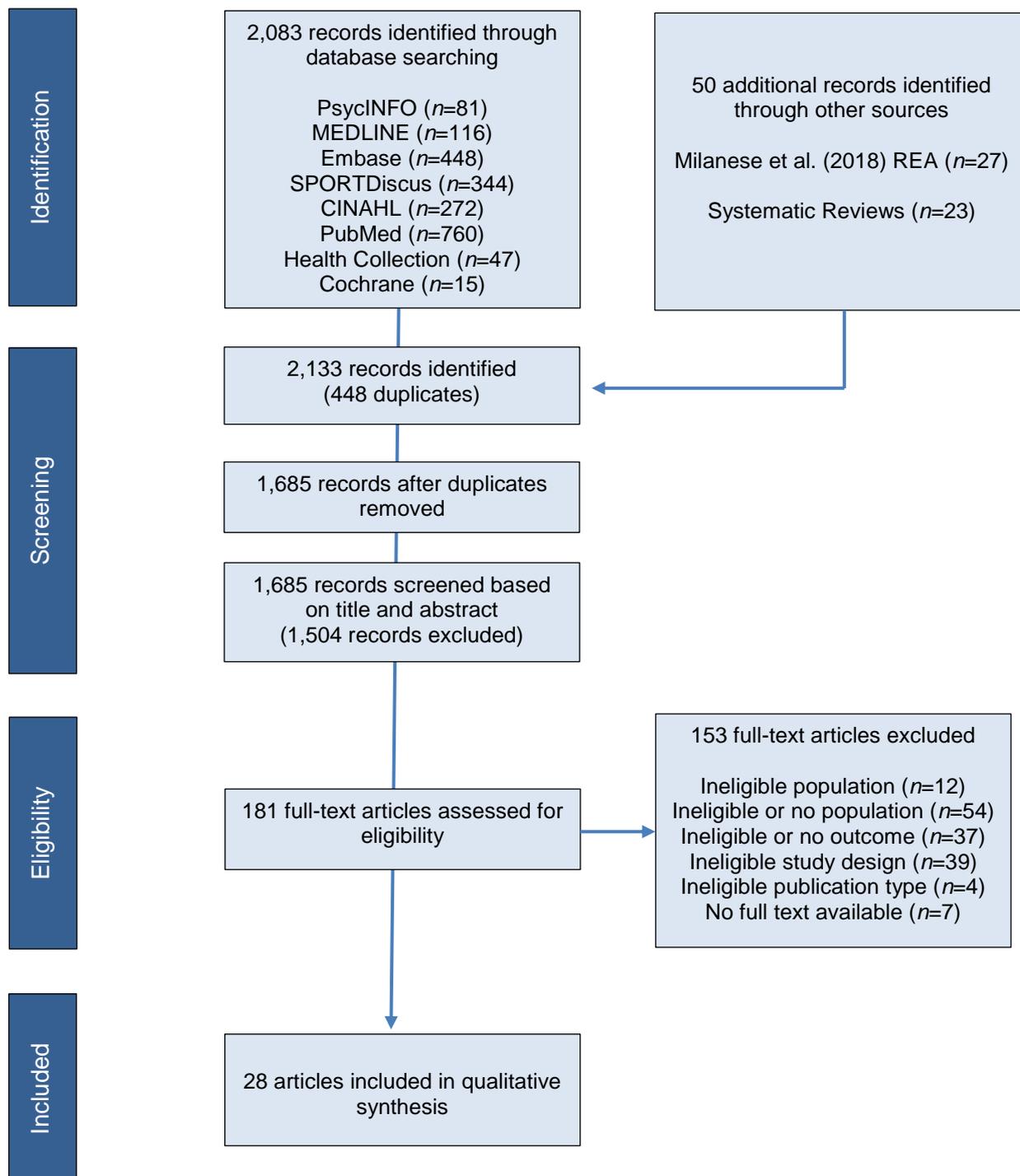
Study quality and direction of change provided an assessment of the internal validity of evidence in support of intervention effectiveness. The third component accounted for external factors that may influence effectiveness, specifically the extent to which the evidence could be applied to the Australian context and DVA clients.

3. Results

3.1 Study Selection

The flow of papers through the review process (i.e., identification, screening, eligibility and inclusion) is shown in Figure 1.

Figure 1. PRISMA flow diagram showing selection of papers for review.

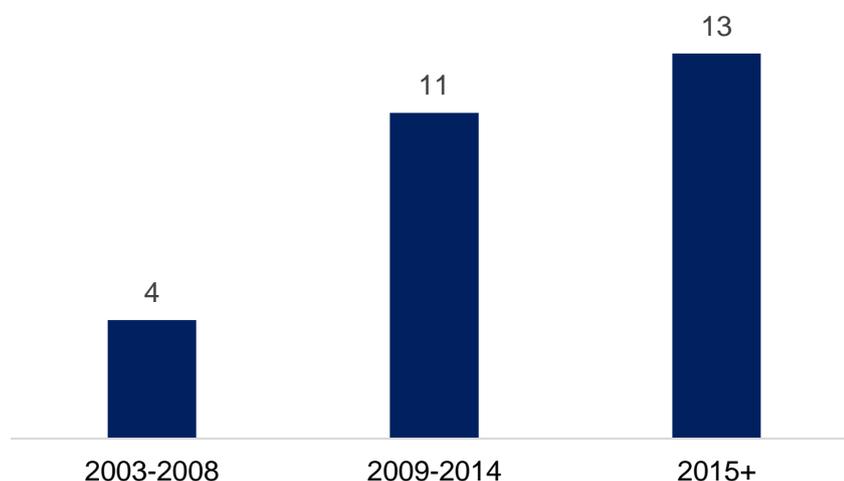


In total, 28 papers met the criteria for inclusion in the REA⁹⁻³⁶, and were subjected to detailed data extraction. Data are presented in tabulated form for each study in the *Evidence Profile* that accompanies this *Technical Report*. A total of 15 studies utilised six common data sets and intervention programs (but with different study aims, sub-populations and outcomes), resulting in 19 unique datasets and intervention programs.

3.2 Study Characteristics

Publication dates ranged from 2003-19, with an increasing rate of publications across this time period (see Figure 2).

Figure 2. Number of publications for selected studies (2003-19) in time periods of 5 years.



All 28 studies were located in the USA. Study participants ($n= 45$ to $n=1092$) were typically mid/older aged (mean age 55+ years in 79% [$n=22$] of studies), male (68-100% of the sample) veterans. Only one study described the inclusion of dependants (i.e., spouses; King et al., 2014³³), and the majority of participants in this study were female (94%).

Most studies (75%; $n=21$) reported on specific veteran populations with high risk comorbidities. These included glucose intolerance, hypertension, diabetes, overweight/obesity, mental illness, depression and post-traumatic stress disorder, chronic obstructive pulmonary disease, chronic back pain and/or osteoarthritis.

3.3 Study Outcomes and Measures

The primary outcomes of physical activity and/or physical function/fitness were assessed in 93% ($n=26$) and 36% ($n=10$) of selected studies, respectively. Secondary outcomes of

interest included psychological health and social support (21%; $n=6$ studies), and health care costs (7%; $n=2$ studies).

Of the 26 studies that measured physical activity, 65% ($n=17$) used self-report measures, and the remaining studies used objective measures that included pedometers (23%; $n=6$), and accelerometers (12%; $n=3$). Of the 10 studies that measured physical function/fitness, 90% ($n=9$) measured this directly with an objective performance test (e.g., time to complete a specified walking distance).

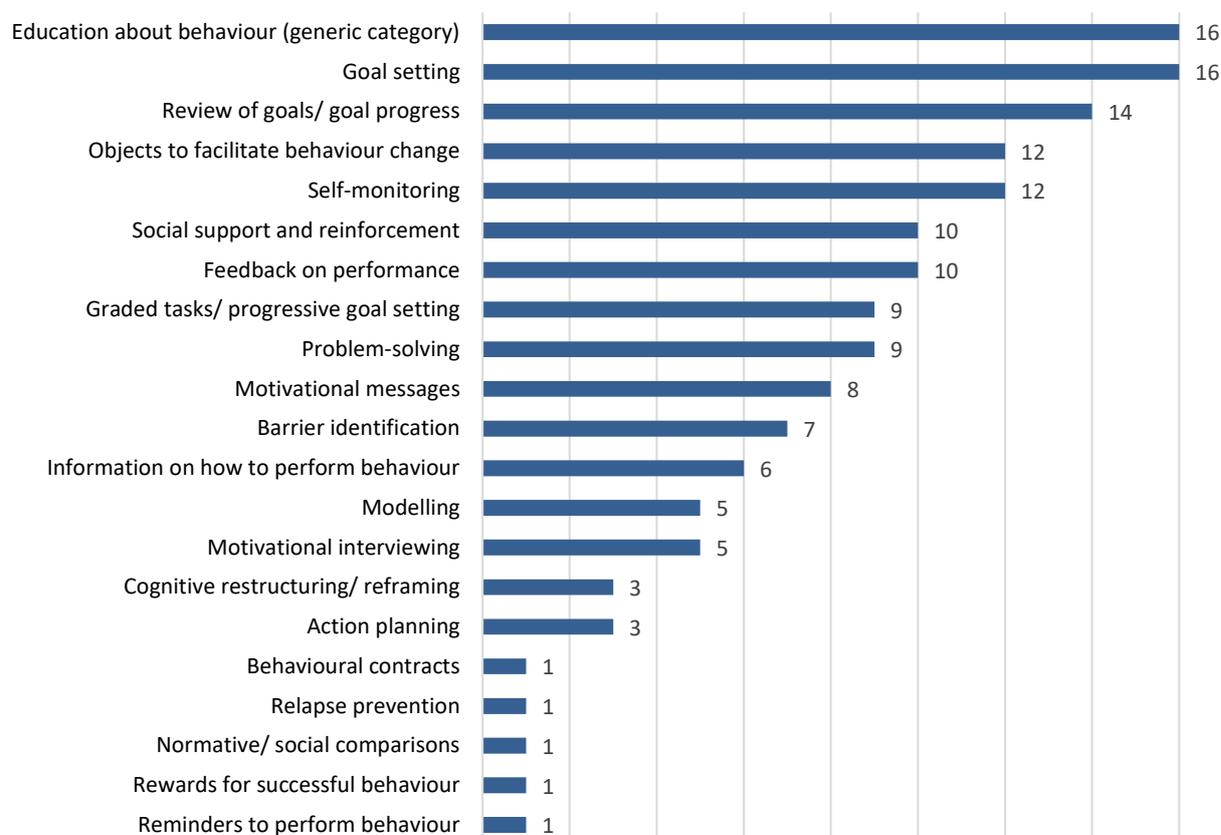
3.4 Intervention Strategies and Key Findings

When considering the 19 unique datasets and intervention programs, 63% ($n=12$ datasets) implemented physical activity specific interventions; the others used broader approaches targeting multiple health behaviours that included physical activity. 'Stepped-down' programs were most common (84%; $n=16$ datasets), with expert counselling used to transition participants from usual care to self-managed physical activity regimes. Self-managed programs without a 'stepped-down' component (16%; $n=3$ datasets) utilised website delivery in combination with pedometers.

Intervention duration ranged from 3 to 12 months, with the majority implemented over a 6+ month period (74%; 14 intervention programs). A control 'usual care' study design was utilised in 42% ($n=8$) of intervention programs, with the remaining studies allocating participants to comparator groups that received a range of intervention strategies that varied in complexity and scope.

The 19 unique intervention programs utilised 21 behaviour change techniques from the behavioural taxonomy⁷ (see Appendix A for a detailed description of these techniques and Appendix B for a matrix of the strategies used in each study). As Figure 3 shows, education, goal setting, and review of goals were the most common strategies (evident in 14 to 16 intervention programs); behavioural reminders, rewards, social/ normative comparisons, relapse prevention, and behavioural contracts were the least commonly used (each evident in one intervention program).

Figure 3. Frequency of behaviour change techniques used in intervention programs ($n = 19$ datasets).



The key findings for primary (physical activity and physical function/fitness) and secondary (psychological health and social support, and health care costs) outcomes are summarised in Table 1 (also refer to Appendix C and D for a summary of findings for each study).

Outcomes are categorised for physical activity specific, and multiple behaviour interventions, and the frequency and distribution of outcomes (positive or no effect) are shown.

More than half (58%; $n=15$) the studies that reported physical activity data ($n=26$) observed positive intervention effects. The mean magnitude of change across self-report studies was 53 minutes/week of moderate intensity physical activity; pedometer studies observed a mean increase of 849 steps/day. Of the 10 studies that reported physical function/fitness, fewer than half (40%; $n=4$) reported positive effects, while only one study reported a positive effect in psychological health, social support, or health care costs (from a possible 8 studies). Overall, 64% ($n=18$) studies found positive intervention effects in either physical activity, physical function/ fitness, psychological health or social support, with these positive effects more common in physical activity specific, than in multiple behaviour interventions. Positive intervention effects in primary and/or secondary outcomes were only found in

studies which reported on veterans. One study in this review examined dependants, and found no intervention effect.

Table 1. Effects for reported primary and secondary outcomes relative to intervention type.

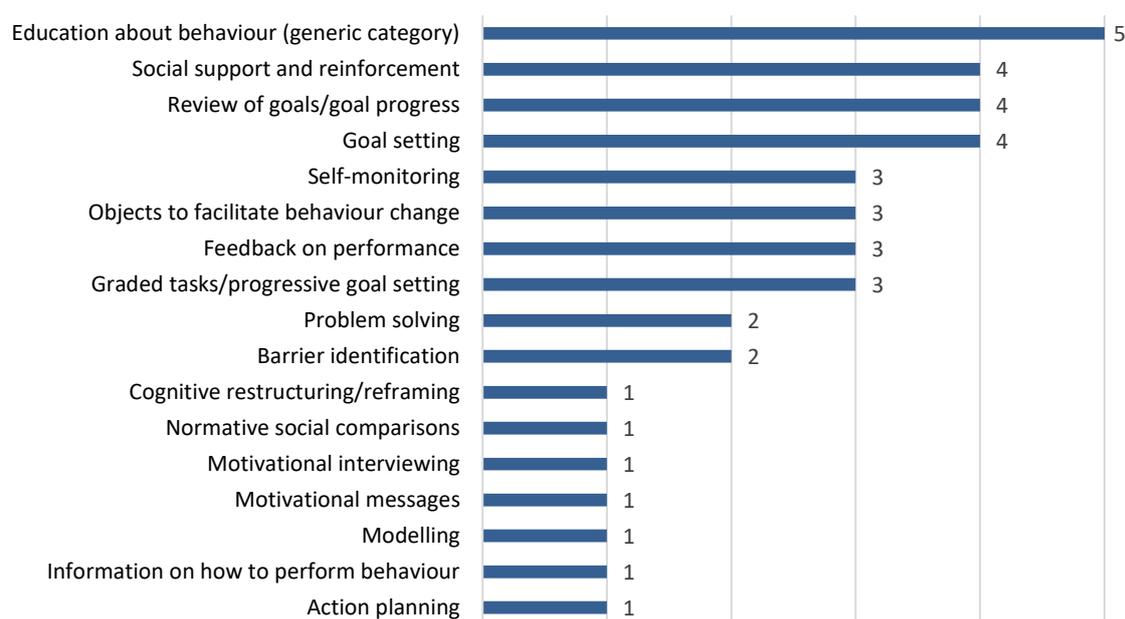
Outcomes		PA Interventions		Multiple Behaviours		All Interventions	
		Positive	No effect	Positive	No effect	Positive	No effect
Physical Activity (n=26)	SR	8	3	2	4	10	7
	Ped	4	2	/	/	4	2
	Accel	1	2	/	/	1	2
	All	13 (50%)	7 (27%)	2 (8%)	4 (15%)	15(58%)	11 (42%)
Physical Function/ Fitness (n=10)		4 (40%)	5 (50%)	/	1 (10%)	4 (40%)	6 (60%)
Psy + Social Support (n=6)		1 (17%)	2 (33%)	/	3 (50%)	1 (17%)	5 (83%)
Health Care Costs (n=2)		/	2 (100%)	/	/	/	2 (100%)

Notes. SR=Self Report; Ped=Pedometer; Accel=Accelerometer; Psy=Psychological Health.

When considering only those studies that compared a 'stepped-down' intervention to a 'usual care' group (n=14), 79% (n=11) observed a positive between-group intervention effect in physical activity. Four of these studies assessed physical function/fitness, and two of these studies reported no significant differences in function/fitness indices between intervention and control groups.

The behaviour change techniques utilised by intervention programs that compared 'stepped-down' to 'usual care', with positive effects (n=5), are shown in Figure 4.

Figure 4. Behaviour change techniques used by interventions ($n=5$) that compared 'stepped-down' to 'usual care' treatment (with positive intervention effects).



Ranked in order of prevalence:

- 80-100% ($n=4-5$) of successful intervention programs used education, social support, goal setting and review of goals;
- 60% ($n=3$) of the interventions adopted self-monitoring, devices (e.g., pedometers), to facilitate change, feedback and graded task strategies;
- 40% of successful programs ($n=2$) utilised problem solving and barrier identification;
- 20% ($n=1$) elicited change by providing information on how to perform behaviour, and engaging participants in cognitive restructuring, social comparisons, motivational interviewing and messages, modelling, and action planning.

3.5 Study Quality

The individual item and composite scores for the quality of each selected study are presented in the *Evidence Profile*. Table 2 provides an overview of the number and proportion of studies scoring a point for each of the TESTEX criteria.

The mean score across the 15 items was 10.7 ($SD = 2.1$; range = 6 to 15) for the 28 selected studies. The proportion of studies classified as 'good' (10 to 15 points) was 64% ($n=18$ studies), with the remaining studies (36%; $n=10$), classified as 'fair' (5 to 9 points). Five items (#1, #6b, #10a, #10b and #11) scored highly (86% to 100%; $n = 24$ to 28 studies). Low scoring quality items were #6c (i.e., identification of a behaviour change theory to inform

intervention strategies; 32% or $n=9$ studies), and #7 (i.e., use of an objective measure of physical activity; 50% or $n=14$ studies).

Table 2. Number and percentage of studies scoring a point for each item on the TESTEX Quality Assessment Matrix (15 items).

TESTEX Criteria		<i>n</i> (%)
1	Eligibility criteria specified	28 (100)
2	Randomisation method specified	15 (54)
3	Allocation concealment at time of consent	17 (61)
4	Groups similar at baseline	21 (75)
5	Blinding of assessor (for at least one key outcome)	18 (64)
6a	Physical activity intervention parameters reported	8 (64)
6b	Physical activity intervention strategies described	27 (96)
6c	Behavioural change theory in which intervention strategies are based is identified	9 (32)
7	Objective measure of physical activity used	14 (50)
8a	Outcome measures assessed in 85% of participants	15 (54)
8b	Physical activity data reported during intervention period	22 (79)
9	Intention to treat analysis performed	16 (57)
10a	Between-group statistical comparisons reported for primary outcome of interest	28 (100)
10b	Between-group statistical comparisons reported for at least one secondary outcome of interest	28 (100)
11	Point estimates and measures of variability reported for all outcome measures	24 (86)

3.6 Evaluation of the Evidence

Study quality (mean score of 10.7 out of a total possible score of 15), and **direction of change** (64% of studies observed a positive intervention effect in outcomes of interest), indicate that the effectiveness of 'stepped-down' intervention programs to promote self-managed physical activity in service veterans was rated as:

Promising - evidence suggestive of beneficial effect but further research required.

However, the REA found no positive intervention effects for the dependants of service veterans, and no studies located in Australia met inclusion criteria. Therefore, the **generalisability of findings** to DVA clients (both service veterans and their dependants) was rated as:

Unknown – insufficient evidence of beneficial effect, and further research required.

4. Discussion

4.1 Effectiveness of 'Stepped-down' Physical Activity Programs

The initial aims of this REA were to:

- Examine the scientific literature for evidence on the effectiveness of interventions to promote self-managed physical activity in service veterans and/or their dependants and;
- Assess studies that compared the effectiveness of 'stepped-down' models of PA self-management to 'usual care' controls.

In regard to these two aims:

The current evidence base highlights the promising role 'stepped-down' programs can play in helping service veterans transition from allied health care to effective self-management of physical activity.

Consideration of high-level randomised controlled trial evidence was a strength of this review. It is also notable that the large majority of the selected studies (79%; 11/14 studies) that compared the effectiveness of 'stepped-down' models of PA self-management to 'usual care' controls observed positive physical activity changes over 6- to 12-months. Recognising the limitations of the PA measures used, self-report and step count data indicated that programs contributed around a third (10 minutes/day) of the daily physical activity behaviour recommended for older adults.³⁷

These positive effects were observed within heterogeneous groups of service veterans characterised by a range of chronic disease conditions and comorbidities such as diabetes, clinical depression, and obesity. Given the significant barriers these groups encounter when seeking to increase and maintain physical activity levels³⁸, the findings are encouraging. Indeed, intervention effects may be more pronounced in relatively healthy service veterans who look to transition to active lifestyles following health care treatment.

4.2 Strategies to Promote Self-Managed Physical Activity

The overarching purpose of this REA was to use the findings to inform the development of *Active Choices*, a DVA-funded 'stepped-down' program that seeks to facilitate the transition of clients from allied health service provision, to self-managed physical activity preferences, within their local active communities.

Consequently, the third aim of the REA was to:

- Identify key behaviour change techniques that have been used by successful 'stepped-down' interventions to promote self-managed physical activity in service veterans and their dependants.

In regard to this aim:

The current evidence base identified **education, social support, goal setting, goal review, self-monitoring, devices to facilitate change, feedback, and graded task strategies** as key behaviour change techniques for self-managed physical activity in service veterans.

These key techniques complement and support the battery of strategies embedded in *Active Choices*. The only strategy evident in the extant evidence base, which is not proposed as a behaviour change technique in the *Active Choices* program, is use of '*devices to facilitate change*'. These devices include pedometers, and more recently commercial wrist worn monitors linked to smartphone applications, which can provide real-time feedback on movement goals. While such devices have been shown to be effective at promoting ambulatory physical activity,³⁹ they may not be entirely appropriate for non-ambulatory physical activity choices (e.g. Pilates), or older DVA clients averse to using technology to regularly monitor and self-manage behaviours.

4.3 Recommendations and Future Directions

The main limitation of the extant evidence relative to the purpose of the REA, is that the search identified no studies with Australian service veterans and their dependants that met inclusion criteria. While similarities may well exist with the USA populations upon which the findings are solely based, external validity to the Australian context is low, and the generalisability of the effectiveness of interventions to DVA clients currently remains unknown. Therefore, the main recommendation of the REA is that:

Well-controlled, proof of concept studies that test the efficacy of 'stepped-down' physical activity programs with DVA clients are needed as a pre-requisite for larger scalable initiatives.

The review, and specifically the study quality assessment undertaken, identifies key aspects future research should consider.

- **Utilise accelerometers to measure physical activity change:** Most published studies have used self-report questionnaires to assess intervention effects. These measures are less accurate than objective, device-based measures and lack sensitivity to detect change.
- **Base intervention programs on established behaviour change theory, and identify the relative contributions of strategies to interventions:** Very few studies utilised established theory to design, implement and evaluate a comprehensive battery of behaviour change techniques. Linked to this, study analyses did not isolate the relative effectiveness of different types of strategies.
- **Assess the impact of programs on physical function/fitness, psychological health and social impact:** These outcomes were under-represented in the evidence base, and will be important to capture in assessing the benefits and sustainability of programs for clients transiting from treatment.
- **Integrate health care analyses into program evaluation:** Evidence is very limited on the extent to which the implementation of 'stepped-down' programs impact health care utilisation and costs. These data, in combination with comprehensive measures of physical activity change, will be essential in assessing whether self-management programs represent a viable alternative to ongoing usual care by allied health service providers.
- **Test intervention programs with lower risk service veterans:** The current evidence is largely based on high risk participants with chronic conditions and disease comorbidities. Efficacy research is also required with lower risk, relatively healthy service veterans who may transition more effectively to self-managed physical activity.
- **Test intervention programs with dependants of veterans:** The current evidence is largely based on studies of service veterans. Only one study in this review reported on outcomes in dependants, and found no intervention effect. However, the intervention examined in this study was not aimed at dependants and the researchers explored whether the program targeting veterans had an inadvertent effect on improving outcomes for their spouses. Therefore, the effectiveness of 'stepped-down' interventions to promote physical activity in dependants is unknown.

4.4 Limitations

We recognise a number of limitations in presenting the findings of this REA. The search conducted was thorough, but only included studies that were reported in English. It is therefore possible that we may not have identified all published studies in the field. In order to make this review 'rapid', some restrictions on our methodology were also necessary. Although we did evaluate the evidence in terms of its quality, direction and generalisability, these evaluations were not as exhaustive as in a systematic review methodology. For example, to provide a broad overview of the evidence base, we did not segregate secondary analyses from randomised controlled trials that used common databases and intervention programs to report physical activity and/or physical function/fitness outcomes. Finally, we made a qualitative judgement based on the overall strength of the evidence base, and did not use a meta-analysis methodology to combine or synthesise the results statistically.

4.5 Conclusion

In summary, 'promising' support was found for the effectiveness of 'stepped-down' and self-managed interventions to promote physical activity in service veterans. This conclusion was based on the findings of high-level randomised controlled trials, of which the majority were 'good' quality. Our review also identified a range of successful intervention strategies to promote self-managed physical activity in service veterans, including goal setting, self-monitoring, education and social support. We recommend that these intervention strategies are considered in the design of future 'stepped-down' programs targeting self-managed physical activity for this group. Further research is needed to determine the efficacy of 'stepped-down' programs in an Australian context and for dependants of service veterans.

References

1. Australian Government Department of Veterans Affairs. *Review of DVA Dental & Allied Health Arrangements*. Canberra: Commonwealth of Australia, 2018. Available from: https://www.dva.gov.au/sites/default/files/files/health%20and%20wellbeing/research_dev/healthstudies/dentalalliedreport.pdf
2. Brown WJ, Moorhead GE, Marshall AL. *Choose Health, Be Active: A Physical Activity Guide for Older Australians*. Canberra: Commonwealth of Australia, 2005. Available from: [https://www1.health.gov.au/internet/main/publishing.nsf/Content/3244D38BBEBE284CA257BF0001FA1A7/\\$File/choosehealth-brochure.pdf](https://www1.health.gov.au/internet/main/publishing.nsf/Content/3244D38BBEBE284CA257BF0001FA1A7/$File/choosehealth-brochure.pdf)
3. Australian Government Department of Veterans' Affairs. *Treatment Population Statistics: June 2018*. Canberra: Commonwealth of Australia, 2018. Available from: <https://www.dva.gov.au/sites/default/files/files/publications/datastatistical/treatmentpop/TPopDec2018.pdf>
4. U.S. Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: US Department of Health and Human Services, Centres for Disease Control and Prevention, National Centre for Chronic Disease Prevention and Health Promotion, 1996. Available from: <https://www.cdc.gov/nccdphp/sgr/pdf/sgrfull.pdf>
5. 2018 Physical Activity Guidelines Advisory Committee. *2018 Physical Activity Guidelines Advisory Committee Scientific Report*. Washington, DC: US Department of Health and Human Services, 2018. Available from: https://health.gov/paguidelines/second-edition/report/pdf/PAG_Advisory_Committee_Report.pdf
6. Milanese S, Crocker M, Ransom M, Sach E. *What are the physical and mental wellbeing benefits veterans achieve through participating in sporting activities? A Rapid Evidence Assessment*. Technical Report prepared for the Australian Government Department of Veterans Affairs. International Centre for Allied Health Evidence.
7. Michie S, Ashford S, Sniehotta FF, Dombrowski SU, et al. A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: The CALO-RE taxonomy. *Psychology and Health* 2011; 26: 1479-1498.
8. Smart NA, Waldron M, Hashbullah I, Giallauria F, Vigorito C, Cornelissen V, Dieberg G. Validation of a new tool for the assessment of study quality and reporting in exercise training studies: TESTEX. *International Journal of Evidence-Based HealthCare* 2015; 13: 9 – 18.

9. Donta ST, Clauw DJ, Engel CC, Jr., Guarino P, Peduzzi P, Williams DA, et al. Cognitive behavioral therapy and aerobic exercise for Gulf War veterans' illnesses: a randomized controlled trial. *Jama*. 2003;289(11):1396-404.
10. Mori DL, Sogg S, Guarino P, Skinner J, Williams D, Barkhuizen A, et al. Predictors of exercise compliance in individuals with Gulf War Veterans illnesses: Department of Veterans Affairs Cooperative Study 470. *Military Medicine*. 2006;171(9):917-23.
11. Peterson MJ, Sloane R, Cohen HJ, Crowley GM, Pieper CF, Morey MC. Effect of telephone exercise counseling on frailty in older veterans: project LIFE. *American Journal of Men's Health*. 2007;1(4):326-34.
12. Dubbert PM, Morey MC, Kirchner KA, Meydrech EF, Grothe K. Counseling for home-based walking and strength exercise in older primary care patients. *Archives Of Internal Medicine*. 2008;168(9):979-86.
13. Morey MC, Peterson MJ, Pieper CF, Sloane R, Crowley GM, Cowper PA, et al. The veterans learning to improve fitness and function in elders study: A randomized trial of primary care-based physical activity counseling for older men: Clinical investigations. *Journal of the American Geriatrics Society*. 2009;57(7):1166-74.
14. Huffman K, Hall K, Sloane R, Peterson M, Bosworth H, Ekelund C, et al. Is diabetes associated with poorer self-efficacy and motivation for physical activity in older adults with arthritis? *Scandinavian Journal of Rheumatology*. 2010;39(5):380-6.
15. Hall KS, Sloane R, Pieper CF, Peterson MJ, Crowley GM, Cowper PA, et al. Long-term changes in physical activity following a one-year home-based physical activity counseling program in older adults with multiple morbidities. *Journal of Aging Research*. 2011;2011:308407.
16. Morey MC, Pieper CF, Edelman DE, Yancy Jr WS, Green JB, Lum H, et al. Enhanced fitness: A randomized controlled trial of the effects of home-based physical activity counseling on glycemic control in older adults with prediabetes mellitus. *Journal of the American Geriatrics Society*. 2012;60(9):1655-62.
17. Peterson MJ, Pieper CF, Sloane R, Crowley GM, Cowper PA, McConnell ES, et al. Differences between completely physically inactive and low active older men and their response to an exercise intervention: the Veterans LIFE study. *Healthy Aging Research*. 2015;4.
18. Allen KD, Bongiorno D, Bosworth HB, Coffman CJ, Datta SK, Edelman D, et al. Group Versus Individual Physical Therapy for Veterans With Knee Osteoarthritis: Randomized Clinical Trial. *Phys Ther*. 2016b;96(5):597-608.

19. Gao S, Stone RA, Hough LJ, Haibach JP, Marcus BH, Ciccolo JT, et al. Physical activity counseling in overweight and obese primary care patients: Outcomes of the VA-STRIDE randomized controlled trial. *Preventive Medicine Reports*. 2016;3:113-20.
20. Hall KS, Gregg J, Bosworth HB, Beckham JC, Hoerster KD, Sloane R, et al. Physical activity counseling promotes physical and psychological resilience in older veterans with posttraumatic stress disorder. *Mental Health and Physical Activity*. 2016;11:53-9.
21. Richardson CR, Goodrich DE, Larkin AR, Ronis D, Holleman RG, Damschroder LJ, et al. A Comparative Effectiveness Trial of Three Walking Self-monitoring Strategies. *Translational Journal of the American College of Sports Medicine*. 2016;1(15):133-42.
22. Goode AP, Taylor SS, Hastings SN, Stanwyck C, Coffman CJ, Allen KD. Effects of a Home-Based Telephone-Supported Physical Activity Program for Older Adult Veterans With Chronic Low Back Pain. *Phys Ther*. 2018;98(5):369-80.
23. Krein SL, Kadri R, Hughes M, Kerr EA, Piette JD, Holleman R, et al. Pedometer-based internet-mediated intervention for adults with chronic low back pain: randomized controlled trial. *Journal of Medical Internet Research*. 2013;15(8):e181.
24. Moy ML, Collins RJ, Martinez CH, Kadri R, Roman P, Holleman RG, et al. An internet-mediated pedometer-based program improves health-related quality-of-life domains and daily step counts in COPD: A randomized controlled trial. *Chest*. 2015;148(1):128-37.
25. Krein SL, Bohnert A, Kim HM, Harris ME, Richardson CR. Opioid use and walking among patients with chronic low back pain. *Journal of Rehabilitation Research and Development*. 2016;53(1):107-16.
26. Moy ML, Martinez CH, Kadri R, Roman P, Holleman RG, Kim HM, et al. Long-Term Effects of an Internet-Mediated Pedometer-Based Walking Program for Chronic Obstructive Pulmonary Disease: Randomized Controlled Trial. *Journal of Medical Internet Research*. 2016;18(8):e215.
27. Wan ES, Kantorowski A, Homsy D, Teylan M, Kadri R, Richardson CR, et al. Promoting physical activity in COPD: Insights from a randomized trial of a web-based intervention and pedometer use. *Respiratory Medicine*. 2017;130:102-10.
28. Robinson SA, Shimada SL, Quigley KS, Moy ML. A web-based physical activity intervention benefits persons with low self-efficacy in COPD: results from a randomized controlled trial. *Journal of Behavioral Medicine*. 2019.

29. Cohen LB, Taveira TH, Khatana SA, Dooley AG, Pirraglia PA, Wu WC. Pharmacist-led shared medical appointments for multiple cardiovascular risk reduction in patients with type 2 diabetes. *The Diabetes Educator*. 2011;37(6):801-12.
30. Damush TM, Ofner S, Yu Z, Plue L, Nicholas G, Williams LS. Implementation of a stroke self-management program: A randomized controlled pilot study of veterans with stroke: A randomized controlled pilot study of veterans with stroke. *Translational Behavioral Medicine*. 2011;1(4):561-72.
31. Goldberg RW, Reeves G, Tapscott S, Medoff D, Dickerson F, Goldberg AP, et al. "MOVE!": Outcomes of a weight loss program modified for veterans with serious mental illness. *Psychiatric Services*. 2013;64(8):737-44.
32. Voils CI, Coffman CJ, Yancy WS, Jr., Weinberger M, Jeffreys AS, Datta S, et al. A randomized controlled trial to evaluate the effectiveness of CouPLES: a spouse-assisted lifestyle change intervention to improve low-density lipoprotein cholesterol. *Prev Med*. 2013;56(1):46-52.
33. King HA, Jeffreys AS, McVay MA, Coffman CJ, Voils CI. Spouse health behavior outcomes from a randomized controlled trial of a spouse-assisted lifestyle change intervention to improve patient low-density lipoprotein cholesterol. *Journal of Behavioral Medicine*. 2014;37(6):1102-7.
34. Allen KD, Yancy WS, Jr., Bosworth HB, Coffman CJ, Jeffreys AS, Datta SK, et al. A Combined Patient and Provider Intervention for Management of Osteoarthritis in Veterans: A Randomized Clinical Trial. *Ann Intern Med*. 2016a;164(2):73-83.
35. Erickson ZD, Kwan CL, Gelberg HA, Arnold IY, Chamberlin V, Rosen JA, et al. A Randomized, Controlled Multisite Study of Behavioral Interventions for Veterans with Mental Illness and Antipsychotic Medication-Associated Obesity. *J Gen Intern Med*. 2017;32(Suppl 1):32-9.
36. Viglione C, Bouwman D, Rahman N, Fang Y, Beasley JM, Sherman S, et al. A technology-assisted health coaching intervention vs. enhanced usual care for Primary Care-Based Obesity Treatment: a randomized controlled trial. *BMC Obes*. 2019;6:4.
37. Australian Government Department of Health. *Physical Activity Recommendations for Older Australians (65 years and older)*. Available from: <https://www1.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines#npa%2065>

38. Korhakangas EE, Alahuhta MA, Laitinen JH. Barriers to regular exercise among adults at high risk or diagnosed with Type 2 diabetes: A systematic review. *Health Promotion International* 2009; 24: 416-427.

39. Bort-Roig J, Gilson ND, Puig-Ribera A, et al. Measuring and Influencing Physical Activity with Smartphone Technology: A Systematic Review. *Sports Medicine* 2014; 44: 671-686.

Appendix A

Definitions of behaviour change strategies (adapted from Michie's [2011]⁷ taxonomy).

Behaviour change strategy	Definition
Education about behaviour (generic)	<p>Providing education about the behaviour (e.g., information about the beneficial consequences of the behaviour for the individual).</p> <p>Used when a study did not provide detail about the educational type.</p>
Goal setting	Setting behavioural goals directed towards encouraging people to initiate or maintain behavioural change.
Graded tasks/ progressive goal setting	Breaks down the target behaviour into smaller, easier to achieve tasks or goals, and enables the person to build on small successes to achieve the target behaviour.
Review of goals/ goal progress	A review of the extent to which previously set behavioural goals were achieved, and is typically followed by a revision or readjustment of goals, or the setting of new goals.
Feedback on performance	Provides feedback on performance in achieving the target behaviour and typically utilises behavioural data collected through self-monitoring.
Behavioural contracts	A written agreement on the performance of an explicitly specified behaviour.
Action planning	Detailed planning of what the person will do, including when, how often, in which situation and where.
Barrier identification	Identification of potential barriers to performing the target behaviour.
Problem-solving	Generating solutions to perceived or potential barriers to performing the target behaviour. May also include coping planning, for instance, identifying in advance situations in which the changed behaviour may not be

	maintained, and developing strategies to manage those situations.
Information on how to perform the behaviour	Instruction, in written or verbal form, on how to perform the target behaviour.
Modelling	How to perform a behaviour, through physical or visual demonstrations of behavioural performance.
Devices to facilitate behaviour change	Technology that facilitates and motivates behaviour change (e.g., a pedometer).
Social support and reinforcement	Provision of social support, positive reinforcement and encouragement to support behavioural change.
Self-monitoring	Keeping a record of specified behaviour(s) as a method for changing those behaviours (e.g., completing a diary log of exercise performed each day).
Relapse prevention	Identifying situations that increase the likelihood of the behaviour not being performed, and applying coping strategies to those situations.
Motivational messages	Messages that encourage performance of the target behaviour.
Motivational interviewing	A clinical method that utilises conversation/communication to minimise resistance and resolve ambivalence towards change.
Normative/social comparisons	Provides the person with feedback on their behavioural performance in comparison to the performances of others.
Cognitive restructuring/reframing	Information about the positive consequences of performing the target behaviour (e.g., enhanced health), and the negative consequences of not performing that behaviour (e.g., poor health).
Rewards for successful behaviour	Incentives (usually extrinsic) for successfully performing the target behaviour and/or achieving behavioural goals.
Reminders to perform behaviour	Prompts (e.g., text messages or phone calls) to perform the target behaviour.

Appendix B

Matrix of intervention strategies utilised in each study.

Paper	Intervention Type	Control/Comparator	Education about behaviour (generic category)																				
			Goal setting	Graded tasks / progressive goal setting	Review of goals / goal progress	Feedback on performance	Behavioural contracts	Action planning	Barrier identification	Problem-solving	Information on how to perform behaviour	Modelling	Objects to facilitate behaviour change	Social support and reinforcement	Self-monitoring	Relapse prevention	Motivational messages	Motivational interviewing	Normative/ social comparisons	Cognitive restructuring/ reframing	Rewards for successful behaviour	Reminders to perform behaviour	
Hall et al (2011)	PA	SSM	Control - UC																				
Hall et al (2016)	PA	SSM	Control - UC																				
Morey et al (2009)	PA	SSM	Control - UC																				
Huffman et al (2010)	PA	SSM	Control - UC																				
Peterson et al (2015)	PA	SSM	Control - UC																				
Krein et al (2013)	PA	SM	Control - UC																				
Krein et al (2016)	PA	SM	Control - UC																				
Moy et al (2015)	PA	SM	Control - WL																				
Moy et al (2016)	PA	SM	Control - WL																				
Robinson et al (2019)	PA	SM	Comparator																				
Wan et al (2017)	PA	SM	Comparator																				
Donta et al (2003)	PA	SSM	Comparator																				
Mori et al (2006)	PA	SSM	Comparator																				
King et al (2014)	GB	SSM	Control - UC																				
Voils et al (2013)	GB	SSM	Control - UC																				
Peterson et al (2007)	PA	SSM	Comparator																				
Dubbert et al (2008)	PA	SSM	Comparator																				
Morey et al (2012)	PA	SSM	Control - UC																				
Allen et al (2016b)	PA	SSM	Comparator																				
Gao et al (2016)	PA	SSM	Control - UC																				
Richardson et al (2016)	PA	SSM	Comparator																				
Goode et al (2018)	PA	SSM	Control - WL																				
Cohen et al (2011)	GB	SSM	Control - UC																				
Damush et al (2011)	GB	SSM	Control - AP																				
Goldberg et al (2013)	GB	SSM	Comparator																				
Allen et al (2016a)	GB	SSM	Control - UC																				
Erickson et al (2017)	GB	SSM	Control - UC																				
Viglione et al (2019)	GB	SSM	Comparator																				

Notes. PA = Physical Activity Specific Program; GB = General Behavioural Program; SSM = Supervised + Self-Management (i.e., 'Stepped-down'); SM = Self-Management; UC = Usual Care; WL = Waitlist; AP = Attention Placebo.

Appendix C

Matrix of direction of effects for primary outcomes in each study.

Paper	Intervention Type		Control/Comparator	PA Measure	PA Direction	PF Measure	PF Direction
Hall et al (2011)	PA	SSM	Control - UC	SR	Positive (I > C)	N/A	N/A
Hall et al (2016)	PA	SSM	Control - UC	SR	Positive (I > C)	Obj Perf	Positive (I > C)
Morey et al (2009)	PA	SSM	Control - UC	SR	Positive (I > C)	Obj Perf	Positive (I > C)
Huffman et al (2010)	PA	SSM	Control - UC	SR	Positive (I > C)	N/A	N/A
Peterson et al (2015)	PA	SSM	Control - UC	SR	Positive (I > C)	N/A	N/A
Krein et al (2013)	PA	SM	Control - UC	Ped	None (I=C)	N/A	N/A
Krein et al (2016)	PA	SM	Control - UC	Ped	Positive (I > C)	N/A	N/A
Moy et al (2015)	PA	SM	Control - WL	Ped	Positive (I > C)	N/A	N/A
Moy et al (2016)	PA	SM	Control - WL	Ped	None (I=C)	N/A	N/A
Robinson et al (2019)	PA	SM	Comparator	Ped	Positive (I > C)	Obj Perf	None (I=C)
Wan et al (2017)	PA	SM	Comparator	Ped	Positive (I > C)	Obj Perf	None (I=C)
Donta et al (2003)	PA	SSM	Comparator	N/A	N/A	SR	None (I=C)
Mori et al (2006)	PA	SSM	Comparator	SR	None (I=C)	N/A	N/A
King et al (2014)	GB	SSM	Control - UC	SR	None (I=C)	N/A	N/A
Voils et al (2013)	GB	SSM	Control - UC	SR	Positive (I > C)	N/A	N/A
Peterson et al (2007)	PA	SSM	Comparator	SR	Positive (I > C)	N/A	N/A
Dubbert et al (2008)	PA	SSM	Comparator	Acc	None (I=C)	Obj Perf	Positive (I > C)
Morey et al (2012)	PA	SSM	Control - UC	SR	Positive (I > C)	Obj Perf	None (I=C)
Allen et al (2016b)	PA	SSM	Comparator	SR	None (I=C)	Obj Perf	None (I=C)
Gao et al (2016)	PA	SSM	Control - UC	Acc	Positive (I > C)	N/A	N/A
Richardson et al (2016)	PA	SSM	Comparator	Acc	None (I=C)	N/A	N/A
Goode et al (2018)	PA	SSM	Control - WL	N/A	N/A	Obj Perf	Positive (I > C)
Cohen et al (2011)	GB	SSM	Control - UC	SR	Positive (I > C)	N/A	N/A
Damush et al (2011)	GB	SSM	Control - AP	SR	None (I=C)	N/A	N/A
Goldberg et al (2013)	GB	SSM	Comparator	SR	None (I=C)	N/A	N/A
Allen et al (2016a)	GB	SSM	Control - UC	SR	Positive (I > C)	Obj Perf	None (I=C)
Erickson et al (2017)	GB	SSM	Control - UC	SR	None (I=C)	N/A	N/A
Viglione et al (2019)	GB	SSM	Comparator	SR	None (I=C)	N/A	N/A

Notes. PA = Physical Activity Specific Program; GB = General Behavioural Program; SSM = Supervised + Self-Management (i.e., 'Stepped-down'); SM = Self-Management; UC = Usual Care; WL = Waitlist; AP = Attention Placebo; SR = Self-report; Ped = Pedometer; Acc = Accelerometer; Obj Perf = Objective Performance Test.

Appendix D

Matrix of direction of effects for secondary outcomes in each study.

Paper	Intervention Type		Control/Comparator	Mental Health Direction	Social Support Direction	H/Care Costs Direction
Hall et al (2016)	PA	SSM	Control - UC	None (I=C)	N/A	N/A
Wan et al (2017)	PA	SM	Comparator	None (I=C)	None (I=C)	N/A
Donta et al (2003)	PA	SSM	Comparator	Positive (I > C)	N/A	N/A
Voils et al (2013)	GB	SSM	Control - UC	N/A	N/A	None (I=C)
Dubbert et al (2008)	PA	SSM	Comparator	N/A	N/A	None (I=C)
Goldberg et al (2013)	GB	SSM	Comparator	None (I=C)	N/A	N/A
Allen et al (2016a)	GB	SSM	Control - UC	None (I=C)	N/A	N/A
Erickson et al (2017)	GB	SSM	Control - UC	None (I=C)	N/A	N/A

Notes. PA = Physical Activity Specific Program; GB = General Behavioural Program; SSM = Supervised + Self-Management (i.e., 'Stepped-down'); SM = Self-Management; UC = Usual Care; WL = Waitlist; AP = Attention Placebo.