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#### A SYSTEMATIC REVIEW OF PROCESS EVALUATIONS OF INTERVENTIONS IN TRIALS INVESTIGATING SEDENTARY BEHAVIOUR IN ADULTS

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#### A SYSTEMATIC REVIEW OF PROCESS EVALUATIONS OF INTERVENTIONS IN TRIALS INVESTIGATING **SEDENTARY BEHAVIOUR IN ADULTS**

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#### 33 Abstract

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34 **Objectives:** To systematically review and synthesise the findings from process evaluations of interventions in 35 trials which measured sedentary behaviour as an outcome in adults to explore: 1) how intervention content, 36 37 implementation, mechanisms of impact and context influence outcomes; 2) how these interventions are 38 experienced from different perspectives (participants, carers, and staff). 39

- Methods: Databases searches were conducted in March 2019 and updated in May 2020 in: CINAHL; 40
- SPORTDiscus; Cochrane Database of Systematic Reviews; Cochrane Central Register of Controlled Trials; 41 42 AMED; EMBASE; PsycINFO; MEDLINE; Web of Science; and ProQuest Dissertations & Theses. Studies meeting 43 the following criteria were included: Process evaluations of trials including interventions where sedentary 44 behaviour was measured as an outcome in adults aged 16 or over from clinical or non-clinical populations.
- 45 Studies were excluded if interventions were delivered in educational settings, a workplace, or if they were 46 47 laboratory-based studies focused on the immediate effects of breaking sitting. The Medical Research Council 48 process evaluation framework underpinned the review, informing the objectives, coding framework and 49 providing a structure for synthesising and reporting the findings.
- 50 **Results:** 17 process evaluations were included. Five interventions focused on reducing sedentary behaviour or 51 52 sitting time, 12 aimed to increase physical activity or promote healthier lifestyles. The process evaluations 53 indicated changes in sedentary behaviour outcomes were shaped by numerous factors including: barriers (e.g. 54 staffing difficulties and scheduling problems) and facilitators (e.g. allowing for flexibility) to intervention 55 delivery; contextual factors (e.g. usual lifestyle and religious events); and individual factors (e.g. pain, tiredness, 56 illness, age, and individual preferences). 57
- 58 Discussion: Changing sedentary behaviour is complex. Intervention requires careful consideration of the
- 59 different factors that could influence changes in outcomes to ensure that interventions can be appropriately 60 tailored to suit different individuals and groups.

#### PROSPERO registration number: CRD42018087403

#### Key words: Sedentary behaviour, systematic review, process evaluation

#### Strengths and limitations of this study

- This systematic review is guided by Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) guidance
- This is the first systematic review which has synthesised data from process evaluations evaluating interventions in trials that measure sedentary behaviour as an outcome in adults
- The Medical Research Council guidance for conducting process evaluations has been used to structure this review and has therefore provided a comprehensive way of identifying factors associated with implementation, mechanisms of impact and context which may influence the effectiveness of randomised controlled trials investigating sedentary behaviour in adults
- Non-English electronic databases were not searched. This limitation may cause language bias.
- There is some inconsistency in the quality in the reporting of the included process evaluations

### INTRODUCTION

Sedentary behaviour is defined as any waking behaviour characterised by energy expenditure  $\leq 1.5$  Metabolic Equivalents (METS) while in a sitting, lying or reclining posture(1). In recent years, research exploring sedentary behaviour in adults has been expanding rapidly, documenting the potential for sedentary behaviour to have detrimental effects on health, wellbeing, and healthcare costs(2). Randomised controlled trials (RCTs) are particularly useful to examine intervention effectiveness(3). However, this approach cannot fully account for how interventions work, and the degree to which intervention components contribute to effectiveness or ineffectiveness(4). 

Interventions targeting sedentary behaviour are typically complex, with multiple interacting components (5). Changes in outcomes following interventions are largely influenced by human behaviours and contextual factors as part of a complex process(6). The value of studying intervention processes, is recognised in the Medical Research Council (MRC) guidelines for developing and evaluating complex interventions(3) and detailed in the guidance for conducting process evaluations of complex interventions(4). Process evaluations are designed to help understand the theoretical assumptions underpinning an intervention, and to disentangle factors which may have contributed to the outcomes of an intervention(4). 

The MRC process evaluation framework states that understanding of causal assumptions underpinning
interventions and evaluation of how interventions work in practice are vital in building an evidence base that
informs policy and practice. The framework outlines key functions of a process evaluation including
investigating implementation, mechanisms of impact and context to understand how outcomes are
interpreted(4).

To date, systematic reviews have synthesised the evidence of effectiveness of interventions aimed at reducing
sedentary behaviour(7, 8). However, it is also important to synthesise findings from process evaluations to
understand the complexity of factors that may influence whether interventions are effective in reducing
sedentary behaviour as these will inform future interventions in this relatively new research area. This paper
seeks to address the following aims and objectives (table 1):

### Aims and objectives

- 1) To identify process evaluations of interventions in trials which measured sedentary behaviour as an outcome in adults, to understand the intervention content, mechanisms of impact, implementation and delivery approaches and contexts, in which interventions were reported to be effective or ineffective.
- 2) To explore experiences of participants, family members/carers and intervention staff in interventions that measured sedentary behaviour as an outcome in adults.

#### **Table 1: Review objectives**

1. To identify and record the trial data (e.g., design of interventions, sample sizes, duration and content of interventions, and primary and secondary outcome data (from the process evaluation publication or associated publications)).

2. Establish whether logic models or theoretical models were used to explain how interventions were intended to work.

3. Establish whether interventions were delivered as intended (as per protocol).

4. Explore intended or unintended mechanisms that influence the extent to which interventions are effective.

5. Understand barriers and facilitators to delivery of, and participation in, interventions and any

recommendations made to address such barriers and facilitators.

6. To synthesise qualitative data concerning the understanding and experiences of interventions from the perspectives of participants, family members/carers and intervention staff.

Qualitative data related to exploring perceptions, views and lived experiences of sedentary behaviour, but not related to receipt or delivery of an intervention were examined in a separate systematic review(9).

The MRC process evaluation framework(4) was the underpinning framework for this review informing the aims and objectives, coding framework, providing a structure for synthesising and reporting findings.

### **METHODS**

### **Protocol and registration**

Reporting of this systematic review is guided by Preferred Reporting Items for Systematic Review and Metaanalysis (PRISMA) guidance, (10) (Supplementary file 1). The review was prospectively registered with PROSPERO (Prospective Register of Systematic Reviews); registration number: CRD42018087403, the protocol has been published (12).

### **Patient and Public Involvement**

No patients involved.

### **Eligibility criteria**

### Study design

Studies explicitly identified as a process evaluation, or studies that aimed to understand the functioning of an intervention by examining implementation, mechanisms of impact, and contextual factors(11). Only process evaluations of RCTs, cluster RCTs, and randomised cross-over trials were included.

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### Participants

Adults aged 16 or over regardless of whether they were recruited from a clinical or nonclinical population.

### Interventions

Interventions in any study which measured sedentary behaviour as an outcome, even if reducing sedentary behaviour was not the primary outcome.

Interventions were excluded if: they were delivered primarily in schools, colleges, universities, or a workplace; or aimed at the acute (immediate) effects of breaking up sitting time as part of a supervised (usually laboratory-based) intervention.

### Comparators

In trials, intervention groups may be compared to: no treatment, usual care, attention control, or waitlist
 control groups.

### Information sources

# 20 *Electronic sources*

In collaboration with information specialist colleagues, comprehensive search strategies were developed using
 controlled vocabulary and free text terms (Supplementary File 2 for the search strategy for the MEDLINE
 database). Searches were conducted in March 2019 and updated in May 2020.

26 We searched the following databases: CINAHL (EBSCOHost); SPORTDiscus (EBSCOHost); Cochrane Database of 27 28 Systematic Reviews (Wiley); Cochrane Central Register of Controlled Trials (Wiley): AMED (OVID); EMBASE 29 (OVID); PsycINFO (OVID); Ovid MEDLINE(R); OVID MEDLINE(R) and Epub Ahead of Print, In-Process & Other 30 Non-Indexed Citations; Web of Science: Sciences Citation Index Expanded (Clarivate); Web of Science: Social 31 Sciences Citation Index Expanded (Clarivate); Web of Science: Conference Proceedings Citation Index- Science 32 33 (Clarivate); Web of Science: Conference Proceedings Citation Index- Social Sciences and Humanities (Clarivate); 34 ProQuest Dissertations & Theses. 35

#### 36 37 Searching other sources

In addition to searching electronic databases, we identified process evaluations through examining included studies from a concurrent systematic review exploring the effects of interventions in reducing sedentary behaviour (Hall et al., submitted manuscript, 2021 (12)). We identified process evaluations reported in the studies included in the Hall et al.,(12) review and related process evaluations through reference list scanning, citation searching and contacting authors of the studies included from the literature searches.

### 45 Study records

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#### 46 47 **Data management**

References identified from electronic databases and other sources were de-duplicated and imported into
 Endnote X7 reference management software. References were then imported in to Covidence
 (www.covidence.org, 28<sup>th</sup> April 2021), a web-based systematic review tool.

### Selection process

Using Covidence, two reviewers (RC, NL) independently assessed titles and abstracts of records from the
 electronic searches against the eligibility criteria and excluded obviously irrelevant studies. The full-text of the
 remaining studies were obtained; then independently assessed, by the same reviewers, against the eligibility
 criteria to determine which studies would be eligible for inclusion. The same process for updated literature
 searches was undertaken (by NL, SO). During the screening process, disagreements were resolved by a
 consensus-based decision between the reviewers, or if necessary, discussion with a third reviewer (DJC).

#### Data extraction and narrative synthesis

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36 37 38 A narrative approach to synthesising the data was undertaken to provide detailed written commentary to address the research aims and objectives. Reviewers (RC, NL, and JFH) independently extracted relevant quantitative and qualitative data from the included studies. All quantitative data was checked by a second reviewer (SO). Fifty percent of the qualitative data was compared by NL and JFH.

#### Developing and refining the framework

To direct data extraction, a framework was produced based on this review's aims, objectives and data to be extracted as specified in the protocol (13). The six themes and relevant subthemes align with the key functions in the MRC process evaluation framework (4) (Table 2). Data extraction items (related to the trial and process evaluations) (13) were coded into the framework then summarised in a series of files focusing on: the characteristics of trials (Supplementary file 3), characteristics of process evaluations (Supplementary file 4), delivery methods and mechanisms of impact (Supplementary file 5), and implementation data including fidelity, recruitment, retention and reach (Supplementary file 6). Within file 6, we have included our definitions of these terms; informed by three key papers (4, 14, 15). Qualitative data from the framework is presented under the subheadings in the 'narrative synthesis findings' section.

To help understand the effects of each included intervention on sedentary behaviour outcomes, the sedentary behaviour measures from the associated RCTs were also extracted (Supplementary file 7). As the review focuses on the findings from the process evaluations, the treatment effects estimated in the RCTs have not been synthesised or analysed. 28

Two reviewers (JFH, NL) independently coded one study to pilot the framework. Following discussion, minor refinements were made before the final framework was agreed. For example, engagement was added in to barriers and facilitators to participation in the intervention, a clearer definition of context was added for clarity, and a 6<sup>th</sup> 'miscellaneous' theme was included to code data about trial procedures and qualitative methods, mainly for context where appropriate. The coding rules were also refined, then used in coding the remainder of the included studies.

Themes and sub-themes	Definition / descriptions of what should be	
	coded	
1. Implementation data		
1a. Intended delivery	How the intervention was intended to be delivered	
	(in main paper or protocol)	
1b. Actual delivery (including when this has been	How the intervention was actually delivered ,	
adapted)	including when it has been adapted from what was	
	intended	
1c. Strategies for achieving delivery	How the intervention delivery was achieved (e.g.	
	tailoring interventions to individuals)	
1d. Measures of adherence	A measure of adherence that was used in the study	
	(NB: may be some overlap with compliance/fidelity).	
	Definition adopted: "The extent to which delivered	
	content, frequency, duration and coverage of	
	intervention components/ material are as intended."	
2. Mechanisms of impact		
2a. Logic models used to explain how the intervention	Coded when a logic model is present	
was intended to work		

#### **Table 2: Coding framework**

	2h Theories underninging the intervention	Theories underninning the intervention e.g. trans-
1		theoretical model social cognitive theory and
2		hehevieur change techniques (PCTe) from the 02
3		benaviour change techniques (BCTS) from the 93-
4 5		item taxonomy used as part of the intervention e.g.
5		goal setting, self-monitoring
7		NB: still coded BCTs even if authors do not make
8		reference to a BCT taxonomy
9	2c. Mediators of change	Factors that explained how the intervention had an
10		effect.
 12	2d. Responses to and interactions with the	Instances where participants or those providing the
13	intervention	intervention talked about how they responded to, or
14		interacted with the intervention
15	2e. Intended mechanisms of action influencing	How the intended mechanisms of action influenced
16	intervention effectiveness	effectiveness (e.g. intended mechanism of effect- self
1/		monitoring of daily activity)
19	2f. Unintended mechanisms of action influencing	Descriptions of how unintended mechanisms of
20	intervention effectiveness	action influenced effectiveness (e.g. if social support
21	intervention encetiveness	increased intervention affectiveness but the intended
22		mechanicm was self monitoring)
23	2. Contoutual factors influencing officiation and in	
24 25	3. Contextual factors influencing effective and if	interventions (Context includes anything
26	external to the intervention that may act as a bar	rier or facilitator to its implementation or its effects
27	(4)).	
28	3a. Influencing implementation	Anything external to the intervention that may have
29		influenced its implementation
30 31	3b. Influencing mechanisms	Anything external to the intervention that may have
32		influenced the mechanisms by which the intervention
33		had an effect (or not)
34	3c. Influencing outcomes	Anything external to the intervention that may have
35		influenced the outcomes of the intervention
30 37	4. Barriers and facilitators	4
38	4a. Barriers to delivery of intervention	Factors that hindered the delivery of the intervention
39		(including internal factors)
40	4b. Facilitators to delivery of intervention	Factors that enhanced the delivery of the intervention
41		(including internal factors)
42	4c Barriers to participation and/or engagement in	Factors that hindered participation or engagement in
45 44	intervention	the intervention: "The extent to which participants
45		understand accept and enact specific components of
46		the programme in their deily lives "
47		The programme in their daily lives.
48	40. racilitators to participation and/or engagement in	ractors that enhanced the delivery of the
49 50	intervention (e.g. incentives)	intervention. Definition as above.
51	4e. Recommendations made to address barriers and	Recommendations made to overcome the barriers
52	facilitators.	and facilitators (from either the study participants
53		(including those delivering)) or the authors of the
54		paper.
55	5. Understanding and experiences of intervention	ons from different perspectives
50 57	5a. Participants' experiences	Experiences from the perspectives of participants
58		that cannot otherwise be coded into context, or
59		barriers and facilitators (likely to be direct
60		quotations)
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5b. Family and carers' experiences	Experiences from the perspectives of family and
	carers that cannot otherwise be coded into context, or
	barriers and facilitators. Carers defined as unpaid and
	informal carers so includes friends and relatives but
	not paid carers.
5c. Staffs' experiences	Experiences from the perspectives of staff that cannot
	otherwise be coded into context, or barriers and
	facilitators. Paid carers that are involved in the
	intervention would be included here.
5d. Control group experiences	Experiences from control group participants if
	reported
6. Miscellaneous	
6a. Trial procedures data	Instances where study includes information that
	might be of use but is more focused on the data
	collection e.g. recruitment and retention, rather than
	the intervention. Agreed not to code any quantitative
	data that is otherwise captured elsewhere in the
	review.
6b. Qualitative methods (to provide	Reports of how qualitative data collection was
context)	undertaken e.g. 'semi-structured interviews were
	conducted with 10 staff.'

#### *Coding into the framework*

Using the framework, JFH independently coded all included studies. Nine studies (every other study listed alphabetically) were coded independently by NL. Coding was managed using NVivo software version 12 Plus(16).

#### *Comparing codes*

JFH and NL compared data from the nine studies coded by both researchers. To enhance the rigour of the process, JFH then re-reviewed all studies coded singly to ensure consistency(17).

#### **Methodological quality**

Methodological quality of included studies was assessed using the Mixed Methods Appraisal Tool (MMAT)(18), which is designed to concurrently assess qualitative, quantitative, and mixed methods studies. Three reviewers (NL, RC, JFH) independently assessed the quality of studies and resolved any discrepancies by making a consensus-based decision, or if necessary, by discussion with a fourth reviewer (DJC). Studies were not excluded from the synthesis based on the outcome of the quality assessment.

#### RESULTS

The PRISMA flow diagram (Figure 1), presents results from all searches. Database searches identified 3,167 records; 116 additional records were identified through other sources. After removing duplicates (n = 1,113), 2,170 titles and abstracts were screened; 2,088 records were excluded as they did not meet the pre-defined eligibility criteria. The full-text reports of the remaining 82 records were assessed for eligibility, of which 24 reports were assessed as ineligible. The results of the process evaluations of six eligible studies (seven reports) were unavailable. In total, 17 process evaluation reports were included for data synthesis. Fifty associated reports were also retained for the purpose of this review (e.g. protocols, trial results) to address objective one.

to occurrences

Figure 1: PRISMA flow diagram

#### **Record of excluded studies**

Supplementary file 8 provides reasons for excluding the 24 studies outlined in Figure 1.

#### Summary of included studies

#### Included randomised controlled trials

To address objective 1, and provide context for the process evaluations, supplementary file 3 presents data from the trials associated with included process evaluations, including: aims, inclusion/exclusion criteria, sample size, participant characteristics, study design, intervention and control descriptions, data collection and follow-up time-points and outcome measures used.

#### RCT aims

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Associated trials where sedentary behaviour was measured as an outcome were published between 2007-2020. Five trials focused specifically on reducing sedentary behaviour (19-21) or sitting time(22, 23). The remaining 12 trials aimed to increase physical activity or promote healthier lifestyles but measured sedentary behaviour as an outcome.

#### Trial location and participant characteristics

23 Seven trials were conducted in the UK(20-22, 24-27), the remainder in the USA(19, 23, 28), Netherlands(29, 24 30), Brazil(31), Ireland(32), Canada(33), Hong Kong(34), and Belgium(35). Participants recruited into the trials 25 varied, including: mothers or parents of infants, pregnant women, adults, older adults, overweight adults, 26 27 individuals with chronic illnesses, and individuals with intellectual disabilities or serious mental illnesses. Most 28 trials included males and females, however three included females only(19, 26, 28). Participants' ages ranged 29 between 30 and 75; the majority of trials included participants aged between 40 and 50 years(19-21, 24, 25, 30 29, 30, 32, 33). 31 32

#### Included process evaluations

Supplementary file 4 presents data specific to the process evaluations including: aims and whether the process
 evaluations were pre-specified, sample size and sampling methods, study design and data collection methods,
 and theoretical frameworks used. These data provide further context for the narrative synthesis.

Thirteen of the 17 process evaluations were pre-specified in published protocols, or trial register records. Five studies(19, 26, 30, 32, 35) were published prior to the MRC guidance for process evaluations(4), the majority were published in the same year or after the guidance was published(20-25, 27-29, 31, 33, 34). Despite this, only four authors cited the MRC guidance(20, 22, 25, 27) and only one reported using this to guide the process evaluation(25). Fourteen out of 17 used the term 'process evaluation' within the publication. Three did not use this term(23, 24, 34).

#### 48 Process evaluation aims

49 There was considerable variation in process evaluation aims. Some studies had a broad focus on participants' 50 experiences for example, Elramli (24) aimed to explore participants' views regarding the effectiveness of a 51 walking intervention for rheumatoid arthritis (RA). Others focused more specifically on barriers to achieving 52 53 activity goals(28), or barriers and facilitators to the sustainability of an intervention(29). Some focused on the 54 feasibility and/or acceptability of interventions among different participant groups, including those at risk of 55 chronic disease (33); older adults(23); individuals with intellectual disabilities(20); and individuals with 56 serious mental illnesses(21). Only two process evaluations were conducted with a view to refine the 57 58 intervention(26, 27). 59

#### Study design and data collection methods

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As outlined in supplementary file 4, sample sizes of participants recruited to the process evaluations varied, from five(21) to 411(29). A total of 1553 participants were included from intervention groups across the 17 studies and 340 from control groups in four studies(26, 29, 34, 35).

Nine studies(19-22, 25-27, 29, 31) used mixed-methods, most commonly combining quantitative questionnaires with semi-structured interviews (telephone and face-to-face). In five studies, questionnaires were used to ask participants about their satisfaction with the intervention, intervention fidelity, and about suggested improvements to interventions(19, 27, 29, 32, 35). In two studies, questionnaires focused on intervention providers experiences of delivering and participating in interventions(25, 30).

Semi-structured interviews explored intervention contexts, barriers and facilitators to intervention delivery, and experiences from the perspectives of intervention providers, participants, and their family members or carers(21-27, 29, 31, 33, 34). Other methods used included: non-participant observations (19), focus groups(20, 25, 27, 31, 34), healthcare professionals' registries and log books(29).

#### Methodological quality

Supplementary file 9 provides an overview of the answers to questions in the relevant categories of the MMAT(18) for all included studies. Options include, 'yes', indicating a positive judgement, 'no', indicating a negative judgement, or 'can't tell,' which is used when there is insufficient information to make a judgement. MMAT authors discourage calculating an overall score and excluding studies based on their methodological quality(18). Therefore all studies remained included in the synthesis and were not weighted. Below is a summary of the assessment of each of the six categories.

- Screening questions

The majority of studies had clear research questions or aims, and appropriate data were collected.

#### 1. Qualitative studies

Thirteen of 17 included studies had a qualitative component. Four(21, 26, 27, 34) were rated as not meeting some of the criteria in this category, because the descriptions of the analysis process lacked detail, and it was unclear how authors arrived at their findings. In these studies, findings were commonly presented as a series of quotes, in tables or supplementary files but interpretation was considered too limited to constitute an in-depth analysis.

#### 2. Randomised controlled trials

Each of the included studies was associated with a RCT. This category of the MMAT was used to assess the quality of the trials. The 'can't' tell' option was most commonly used in this section because authors often provided insufficient information to provide an answer, particularly regarding the randomisation process and blinding. Scoring was more mixed within this category and no studies scored yes for all questions.

#### 3. Non-randomized studies

The associated trials were all RCTs; therefore this category was not applicable.

#### 4. Quantitative descriptive studies

Thirteen studies had a quantitative component. Overall, they were rated positively across all questions.

#### 5. Mixed methods studies

We considered studies which used methods meeting the criteria for both categories 1 and 4 as mixed methods studies. This category was only applicable for nine studies. When studies were rated negatively on either the qualitative or quantitative component, it was reflected in the judgement for this category.

#### Narrative synthesis findings

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This section reports on the findings from the included 17 process evaluations coded into the framework and summarised in narrative form. Subheadings based on the key functions of a process evaluation outlined in MRC guidance by Moore et al.,(4) have been applied to organise the data.

### Description of the interventions and their causal assumptions

According to Moore et al.(4) a clear description of the intervention and its causal assumptions are an important part of understanding how other factors (e.g. implementation, context and mechanisms of impact) influence outcomes.

19 Supplementary file 5 describes the content and delivery methods for all the interventions. Intervention 20 delivery periods ranged between 6 weeks and 18 months. All interventions included multiple components, 21 22 examples include group based educational session combined with email input and self-monitoring tools(19) or 23 one-to-one counselling combined with tailored email input(28). In terms of intervention delivery, 24 interventions commonly incorporated some group based input or support(19, 21, 22, 24-26, 29, 31, 34). 25 Interventions were also delivered by a range of providers including researchers(19), health educators (22, 26 27 28), exercise professionals, including personal trainers(20, 29), coaches(21, 23, 33), advisors and nurses(25, 28 30). 29

30 Supplementary file 5 also includes information about the mechanisms by which the interventions are intended 31 32 to have an effect, and any theoretical underpinnings. All interventions were underpinned by theory or 33 incorporated behaviour change techniques, the most common theory being Social Cognitive Theory(36). 34

#### Implementation and delivery approaches 36

38 Moore et al.(4) recognise that interventions can have limited effects due to weaknesses in how they are 39 designed, or because they are not properly implemented. This section outlines the extent to which 40 interventions were reported to be delivered as intended, common approaches used in intervention delivery, 41 and whether this reportedly translated into changes in outcomes. 42 43

44 As indicated in file 5, in three studies(21-23) interventions were reportedly delivered as intended. In seven 45 studies, (19, 20, 25, 28-30, 33) adaptations were made to the interventions during the course of the trial. In the 46 remaining seven studies, (24, 26, 27, 31, 32, 34, 35) it was difficult to determine whether there were any 47 48 adaptations as authors only reported the actual delivery, not the intended delivery. 49

50 Approaches for achieving intervention delivery included: ensuring staff were appropriately trained and 51 prepared to deliver the intervention with fidelity(19, 31); tailoring aspects of the programme to individuals and 52 their needs (e.g. ensuring activity consultations are appropriate for those with intellectual disabilities (20)); 53 54 and allowing for flexibility in delivery methods. For example, in Poston et al. (26), pregnant women were 55 provided with the option of receiving the intervention via phone or email, rather than sessions delivered at the 56 hospital, and in Berendsen et al.(29) coaching meetings as part of the intervention were planned with 57 consideration of holidays and health issues. 58

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Despite these adaptations for enhancing fidelity, interventions were not always effective in achieving the intended outcomes. For example, in Poston et al.(26) despite flexibility in the delivery mode, objectively measured physical activity and sedentary behaviour did not change in the intervention group. In this particular participant group (pregnant women), the potential to achieve the targeted health outcome, optimal blood glucose level, via dietary changes, was greater than changes in physical activity, including sedentary behaviour, as for some participants increasing their activity led to feelings of discomfort. Similarly, in Matthews et al.(20), although individual tailoring was used, the intervention did not have a significant effect on any of the primary or secondary outcomes including time spent in MVPA and time spent sedentary. It was suggested that the 10 intervention may need to be longer than 12 weeks for individuals with intellectual disabilities. This highlights 11 the importance of understanding more about how an intervention is intended to have an effect, as outlined in 12 the following section. 13

#### Mechanisms of impact influencing intervention effectiveness

17 Moore et al.(4) emphasised the importance of exploring mechanisms through which interventions bring about 18 change, to learn more about how the intervention effects may have occurred and how they may be replicated in similar future interventions. This section outlines the mechanisms were reported across the studies and the 20 extent to which they had an impact on behaviour and outcomes. 22

23 Social Cognitive Theory was the most commonly used theory, and the following mechanisms of action were 24 reported in several studies: enhancing self-efficacy by rating confidence in completing goals(19); using 25 behavioural cues e.g. standing up every hour, and leaving the remote at the TV(19); using resources e.g. 26 27 websites combined with counselling calls to encourage goal setting(28) providing social support in educational 28 sessions or workshops, and input and engagement from carers(19, 20, 22, 24, 28). 29

30 However, across the studies, the extent to which these mechanisms had their intended impact on behaviour 31 change varied. In Elramli (24) where the aim of the intervention was increasing daily step count, social support 32 33 was found to be a key factor in participants who increased their physical activity. However, behaviour change 34 techniques including social support, feedback, and self-monitoring were to a lesser extent associated with 35 reduced sedentary behaviour in those with rheumatoid arthritis (RA). In Matthews et al.(20), where the 36 intervention aimed to increase walking and reduce sedentary behaviour, the component of social support was 37 not effective for adults with intellectual disabilities. In the study by Biddle et al.(22) where the intervention 38 39 aimed to reduce sitting time, there was no difference in sedentary time at 12 months between intervention and 40 control arms. Reasons for a lack of change in sedentary behaviour included: a preference for adopting 41 physically active behaviours rather than sitting less, and motivational drift after three months. In Adams and 42 Gill(19) which focused on reducing sedentary behaviour and increasing light physical activity, self-efficacy was 43 44 not shown to be a predictor of change in sedentary behaviour. Behavioural cues, e.g. leaving the remote at the 45 TV, did not always influence behaviours either, because some participants were already doing the cued 46 behaviour, and some did not have a TV(19). 47

48 Studies underpinned by the Transtheoretical Model, Theory of Planned Behaviour and Self-Determination 49 theory placed emphasis on encouraging participants to be aware of and monitor their own behaviour(20, 29, 50 51 30). Motivational interviewing was used in two studies to prompt participants to find solutions, rather than 52 telling them how to change their behaviour (29, 30). Berendsen et al.(29) found the feasibility of changing 53 physical activity behaviours and dietary habits was not as high as expected and was likely associated with poor 54 adherence. Some participants were unrealistic about how much of their own effort would be required, which 55 56 influenced attendance at meetings. Lakerveld et al.(30) reported that practice nurses were competent and 57 confident in the delivery of motivational interviewing and participants' satisfaction was high, but even so, 58 almost no effects were seen in the determinants of behaviour change in this population of individuals who were 59 at risk of cardiovascular disease and diabetes. 60

In summary, these findings provide some insights into how mechanisms may or may not have an effect on sedentary behaviour, and highlight that it is important to fully understand the complexities of interventions.

#### Factors including context that facilitate or hinder implementation or how participants respond or interact with the intervention

Moore et al.(4) regard understanding context as an important part of interpreting factors influencing whether interventions are effective. They defined context as anything external to the intervention that may act as a barrier to its implementation or effects. They also considered participants responses to and interactions with the intervention as important mechanisms that could influence outcomes. Drawing on the coding framework, this section is divided into include barriers and facilitators to delivery of interventions, barriers and facilitators to participation and engagement, and understanding of participants experiences from different perspectives.

### **Barriers to delivery of interventions**

18 Across the studies, there were a range of barriers to delivering interventions, including administrative or 19 20 scheduling issues and organisational difficulties or challenges. In two studies, planning educational sessions around other commitments including holidays and childcare responsibilities was difficult for staff (24, 34). In 22 Blunt et al.(33) a central research team were involved in scheduling appointments, intending to reduce the workload for coaches. However, this resulted in increasing time spent scheduling and it was recommended that 24 coaches were best placed to take responsibility for their own scheduling(33).

27 Organisational difficulties were apparent across two studies(20, 31). A community health worker from one of 28 the six health centres in Benedetti et al.(31) described the long absence of a doctor as a turbulent time in the 29 unit, which added difficulties in trying to deliver the intervention. In Matthews et al.(20), the intervention was 30 31 implemented at a time of significant change within the local learning disability service. Provision of support 32 was affected by the closure of many day centres, which led to a low morale and increasing work pressures 33 among the staff. In Berendsen et al.(29), there were factors that influenced adherence; additionally suspended 34 government financial and policy support meant the programme could not continue. 35 36

### Barriers to participation and engagement

Across the studies, there was a range of barriers to participation and engagement in the interventions. The most common barriers to engagement were: having a pre-existing illness or injury and associated problems e.g. pain(19, 23-29, 33), having other commitments e.g. work, caring responsibilities(23, 24, 26, 28); and being too tired(22, 26, 33). Other, less common barriers to engagement included loss of accountability for behaviour over time(33), fluctuating mental health(21), and lack of motivation(24).

46 Some participants also experienced difficulties with pedometers and accelerometers used as an outcome 48 measure for the trial., in terms of understanding how to use them, side effects of wearing them e.g. skin irritation(19, 23) and lost devices(19, 22). In Biddle et al.(22) half the participants experienced problems with 50 the software for the 'Gruve' accelerometer, including: computer synchronisation issues, incompatible computers, website navigation problems, device malfunction, short battery life, and charging issues. 52

Some barriers may be more applicable to specific groups. For example, in Benedetti et al.(31), a community health worker perceived some older people to be apprehensive about new things which may have been a barrier to participation. In another study, a participant thought that sitting was deserved in old age and he was looking forward to this aspect of retirement to indulge in some of his passions e.g. reading and studying, which made him resent the idea of standing more(23).

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Some barriers were specific to particular contexts. In Elramli,(24) participants who had RA worried about using the gym because they lacked knowledge of suitable, safe exercises. Although workplace interventions were not included in this review, participants who had received educational based interventions reflected on how this applied to other parts of their lives and therefore provided some insight into how the work setting impacts upon sedentariness. For example, participants felt that it was not appropriate to be standing in a work context which could cause embarrassment, e.g. the expectation to be seated for meetings(19, 22, 23). Further barriers at work included having no access to stairs and no standing desks(22).

The context of other parts of everyday life was also influential for some participants who had developed ingrained sedentary habits, as a result of their usual activities or hobbies e.g. reading, eating, socialising, TV viewing, and knitting(23). Religious festivals had an impact on willingness to reduce sitting time at certain times of the year e.g. Christmas and Ramadan(25).

#### Facilitators to the delivery of interventions

Some of the approaches for achieving implementation and delivery could be regarded as facilitators, including: allowing flexibility in delivery methods, tailoring aspects of the programme to individuals, initial preparation and planning. A range of other factors facilitated intervention delivery.

For example, in Blunt et al.(33), coaches valued the simplicity and structure of the programme. They also appreciated that the programme did not require extensive background knowledge or preparation over and above their existing working requirements. Coaches had the option of referring back to the Canadian Physical Activity Guidelines to ensure they were providing the right level of support to participants. In another study, not requiring too much additional trial focused expertise, and having access to useful trial related resources was valued by social workers(34). In this study the research team prepared and organised most of the materials which facilitated delivery. As a contrast to low morale among staff(20), having a committed team was also important for facilitating delivery(34). 

#### Facilitators to participation or engagement in intervention

There were a range of facilitators to participation and engagement in the interventions. The most common facilitator was support and encouragement from providers and peers; participants valued personal interaction and having someone to keep them on track with the intervention(20, 24, 25, 27, 31, 33).

In some studies, group environments facilitated engagement and provided opportunities for sharing experiences and meeting other peers in a similar situation (21, 24, 27). In Matthews et al. (20), many participants liked one-to-one engagement with intervention providers. This was particularly beneficial to the group who had intellectual disabilities, partly because the conflicting needs of participants in group activities were occasionally disruptive. This group faced challenges to engagement with the intervention, compared to the general population. Matthews et al. suggested the need for providing interventions to people with intellectual disabilities for longer than 12 weeks, so that consultations with providers can address more barriers(20). 

Being accountable to someone, e.g. a health coach, also facilitated engagement in three studies because the
participants felt being monitored provided motivation(20, 23, 25, 33). Whilst use of a step count monitor was a
barrier for some, others found this was a good motivator(23, 24). Adams and Gill(19) recommended that in
order for pedometers to be beneficial they need to be more accurate. It was also suggested that technology
should be tailored to detect movement in older adults which may be different from younger adults (23).

Participants valued textual resources that were considered attractive through using appropriate text and
 images (20, 31). Adams and Gill(19) made recommendations for making resources more accessible including

embedding videos in emails rather than asking participants to use YouTube, and printing cue cards out rather than asking participants to do so themselves. Less common facilitators were: already being involved in health programmes (33), and becoming more aware of the extent of their own sedentary behaviour(23).

### Understanding experiences of interventions from different perspectives

### Participants

 There was some overlap in data coded into barriers and facilitators and participant experiences. The experiences can be divided into positive and negative. Examples of common positive experiences included enjoyment or satisfaction with the intervention programme (19, 21, 31). In some studies, participants described this as life-changing(23, 25) or a new opportunity for learning about how to reduce sedentary behaviour and exercise safely(24). As a result of engaging in the intervention, some participants recognised they had become more aware of the importance of reducing sedentary behaviour(19, 24, 31) and associated benefits e.g. weight loss(21, 23), and reduced stress(23, 34),less fatigue(23), less pain(24), and lower blood sugar(19).

Examples of negative experiences included: feeling stressed or nervous due to wearing a pedometer and a need to check it frequently(24); disliking a type of counselling session because they expected to follow suggestions(30); and feeling nagged by carers to participate(20).

#### Family/carers

Only two studies included data regarding the experiences of families or carers(20, 34). There was a distinction between the carers' or family members' perceptions of participants' experience and their own experiences as part of an intervention or supporting the intervention. In Matthews et al.(20) family carers talked about how much the participants enjoyed their experiences due to reaching their goals and getting a certificate.

The dynamic was different in another study which included a family-based exercise intervention(34). Participants valued reminding each other as a family to do their exercises.

#### Staff

There was also some overlap in data coded into barriers and facilitators and staff experiences. Most of staff's perceptions of the participants' experiences were positive. In two studies, staff perceived participants enjoyed using pedometers and diaries(20, 25). Staff voiced their positive perceptions of the programme, e.g. encouraging others and themselves to fit physical activities into their everyday lives(33), and enhancing the participants' family cohesiveness(34). Being involved in delivering the programme also had benefits for some staff . It helped them understand the complexities associated with having a healthy lifestyle(33); and reminded them to stand and move more in their own roles(34).

Some negative experiences overlapped with the barriers to delivering the interventions. These included difficulties with staffing when they were already overcommitted (20, 31); limited venue space for delivering the programme(31); and lack of psychological training to be able to deliver the intervention(29).

#### DISCUSSION

#### Summary of findings

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This review aimed to synthesise process evaluations of interventions in trials where sedentary behaviour was 1 measured as an outcome to: develop an understanding of intervention content, mechanisms of impact, 2 implementation and delivery approaches and contexts, in which interventions were reported to be effective or 3 4 ineffective and explore the experiences of participants, family/carers and intervention staff in such 5 interventions. To address these aims, we synthesised data from 17 studies including a range of participant 6 groups e.g. mothers or parents of infants, pregnant women, adults, older adults, overweight adults, individuals 7 with chronic illnesses including rheumatoid arthritis, intellectual disabilities and serious mental illnesses. 8 9 Systematic reviews of process evaluations have been conducted in other areas of research e.g. primary 10 care(37) and workplace health promotion programmes(38). However, to our knowledge this review is the first 11 to synthesise data from process evaluations of interventions in trials which measured sedentary behaviour as 12 an outcome in adults. 13

15 The review has highlighted the complexity of factors that contribute to implementing interventions with 16 fidelity, and how this links to outcome effects. Common barriers to delivery were those that may be expected in 17 delivery of complex interventions of any kind, not just reducing sedentary behaviour. These included structural 18 changes and staffing pressures within an organisation, and limited funding for providing interventions. Many 19 20 interventions required some level of input from providers (e.g. researchers, health educators, exercise 21 professionals, coaches and health professionals) to deliver the programme, e.g. scheduled exercise or education 22 sessions. On the other hand, this limited flexibility of a structured intervention posed difficulties amongst some 23 participants who had busy schedules and other priorities. In such cases, delivery was facilitated by providing 24 different options for how the intervention is delivered e.g. via phone or email. However, flexible intervention 25 26 delivery did not guarantee adherence to the intervention, because participants faced other barriers e.g. 27 discomfort during pregnancy, cognitive difficulties; these factors ultimately impacted on sedentariness. 28

29 30 Whilst it was not our primary intention to synthesise the quantitative findings from the RCTs; the quantitative 31 findings (summarised in supplementary file 7), indicate only three studies reported a statistically significant 32 reduction in sedentary behaviour at the end of the intervention (21, 24, 33). The review identified 33 commonalities across these three interventions that were effective in reducing sedentary behaviour; they all 34 included elements of goal setting and access to support or coaching from a professional. All three were 35 36 underpinned by theories (social cognitive theory of self-regulation, social cognitive theory and the COM-B 37 model, including a focus on self-efficacy) which in part explain how these interventions may have had their 38 effects (file 5). However other studies also had similar features, were underpinned by similar social cognitive 39 principles including self-efficacy (19, 22, 26, 28) but reported no statistically significant reduction in sedentary 40 41 behaviour. 42

43 This suggests that the process of changing outcomes e.g. sedentary behaviour is complex and influenced by 44 other factors. Complex interventions were traditionally understood as those comprised of multiple 45 46 components(3). However, context is becoming increasingly recognised as a source of complexity with 47 acknowledgement that interventions are not a discrete package of components, but also a process of changing 48 what complex systems do, including the interactions between individuals (e.g. providers and recipients) (39). 49 Our findings support this notion because whilst all interventions were underpinned by psychological theories 50 focused on individual-level change e.g. social cognitive theory(36), trans-theoretical model(40), theory of 51 52 planned behaviour(41), self-determination theory(42) and habit formation theory(43); it was evident that a 53 range of wider, contextual factors in addition to individual factors also influenced the implementation and 54 delivery of the intervention as part of complex systems. However, within the included process evaluations, 55 programme theories (including logic models) depicting how the intervention would operate in a particular 56 57 context were rarely reported. Only one process evaluation reported a logic model(25). Given the complex 58 nature of the delivery and engagement associated with complex interventions, it is important that influences 59 on outcomes such as reduced sedentary behaviour are understood as individual-level behaviour change 60

processes, and in context, taking into account the complexities of experiences(44). Ensuring logic models are developed and reported would aid in understanding these complexities.

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The identified barriers and facilitators to participation and engagement provide important insights into participants' experiences of interventions and explain what makes interventions more acceptable to some individuals compared to others. The review indicates that social support was important for participants. Some participants valued elements of groups such as meeting others and sharing experiences among similar peers. Others, particularly those with intellectual disabilities, valued one-to one input from providers. Level of 10 motivation was also influential in engagement. Some felt motivated due to being accountable to someone; 11 whilst others felt motivated as a result of tracking activity using a pedometer. However, others disliked 12 pedometers because they struggled to understand the device or experienced skin irritation whilst wearing 13 them. Previous studies have found satisfaction being important for compliance and engagement with tracking 14 15 devices e.g. pedometers (45, 46). Results of a national cross sectional survey conducted in Australia suggested 16 that interventions should make sure the devices align with the preferences of the target groups(47). Our 17 review suggests that individuals with particular conditions could benefit from interventions that are tailored to 18 their symptoms e.g. pain, tiredness and illness. 19

21 Changes across the lifespan should also be considered so that interventions can take into account what is 22 appropriate and acceptable for older adults. Our review findings indicate that older people may be more likely 23 to think that sitting down is deserved, or associated with enjoyable hobbies e.g. reading. A recent review by 24 Compernolle et al.(48) focused on older adults perceptions of sedentary behaviour similarly found that 25 26 sedentariness was motivated by finding enjoyment, and comfort. Their experiences are also shaped by their 27 capabilities, the social opportunities, and motivations in addition to societal expectations that often dictate that 28 for older people sitting is their main mode of living. 29

31 Current lifestyles, regardless of age or other characteristics also influence the extent to which participants are 32 likely to engage in behaviours that reduce sedentary behaviour. Our review evidence adds to, and supports 33 findings from another review exploring qualitative experiences of participating in non-workplace 34 interventions(9). Sedentary behaviour is further complicated by seasons and events e.g. celebrations such as 35 36 Christmas or Ramadan which disrupt normal behaviour patterns, and perhaps lead to less concern with healthy 37 behaviours, even with interventions. A systematic review of factors that influence physical activity and 38 sedentary behaviour in ethnic minority groups in Europe also identified cultural and religious factors as 39 influential in the extent to which individuals were sedentary (49). However, they highlighted that aside from the 40 41 celebrations and events, some parts of religious activity e.g. walking to religious sites for prayers actually 42 facilitated reduced sedentary behaviour and increased physical activity. 43

44 Looking across the barriers and facilitators identified in this review and the wider literature, a range of factors 45 46 need to be considered, highlighting how difficult it is to develop interventions that are suitable for participants, 47 even those with apparently similar characteristics. The consolidated framework for implementation research 48 (CFIR) is an example of a taxonomy of constructs, organised into five domains (intervention, inner setting, 49 outer setting, individual characteristics, and process) that has been devised to understand what influences 50 implementation that could be applied to further understand such complexities(50). Interventions require some 51 52 level of adaptation to the context and may need to be tailored to participants, including those share similar 53 characteristics, e.g. those with rheumatoid arthritis or intellectual disabilities. They also need to consider the 54 dynamic between staff, participants and families as part of working towards a shared goal (e.g. reducing 55 sedentary behaviour). However, tailoring interventions can be challenging. It can be expensive while material 56 57 and staffing resources are often limited. If we are to reach a point where reducing sedentary behaviour 58 becomes habitual once interventions cease, participants will need simple strategies and support to take 59 ownership of their own behaviour so they can sustain the lifestyle changes within the context of their lives and 60 their preferences.

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#### Strengths and limitations

This is the first systematic review to synthesise data from process evaluations evaluating interventions in trials that measure sedentary behaviour as an outcome in adults. Robust methods were used throughout the conduct of the review. A comprehensive search strategy was developed with input from an information specialist; two reviewers independently screened search results and assessed the quality of included studies.

10 Although a large proportion of the trials on which the process evaluations were based were conducted in the 11 UK, the inclusion of studies from other countries (e.g. USA, Netherlands, Brazil, and Hong Kong) mean these 12 findings are relevant for researchers internationally. The inclusion of males and females enhances the 13 applicability of the findings in terms of gender. However with regards to age, the majority of studies included 14 15 participants between 40 and 50 years; therefore not all findings are applicable to other age groups. The 16 inclusion of participants from various groups can be regarded as both a strength and limitation of this review. 17 Findings may be of interest to experts in different research areas; however it is difficult to draw firm 18 conclusions for particular population groups, especially where sample sizes are small. 19

There was an overall lack of consistency in how process evaluations were reported. Fourteen out of 17 used the term 'process evaluation' within the publication. Three did not use this term(23, 24, 34), although they met the criteria for inclusion in that they aimed to explore participants' views on the factors that influence intervention effectiveness (24, 34), including the feasibility and acceptability of the intervention. Others have similarly critiqued process evaluations in primary care(37), suggesting a need for more consistency to produce higher quality evaluations that would inform practice and be more comparable in future reviews of this nature.

29 30 The assessments using the MMAT also indicated some variation in the quality of the process evaluations. The 31 four studies that were considered lowest quality had poorer qualitative components(21, 26, 27, 34) that lacked 32 detail and depth, and had limited interpretation. When studies were rated negatively on the qualitative 33 component, it was reflected in the judgement in the mixed methods category in the MMAT. Only four 34 studies (20, 22, 25, 27) cited the MRC guidance for process evaluations (4) but this did not equate to better 35 36 quality. Only one study(25) used the framework to guide the evaluation whereas the other three only made 37 reference to it in the introduction. 38

39 More than 24 tools are available to assess the quality of systematic reviews; however, there remains no clear 40 41 guidance for which tool to use for assessing the quality of process evaluations (51). The MMAT(18) was a 42 logical choice as it is appropriate for mixed methods studies and those using either qualitative or quantitative 43 data. However, it has not been designed to require detailed commentary about judgements of quality. 44 Therefore a simplified account of quality is presented. Yet, it is difficult to compare studies without looking 45 46 across all the domains because the authors do not recommend calculating an overall score(18). It was also 47 recommended that studies should not be excluded based on their quality(18), accordingly all studies were 48 included in the synthesis. Researchers could benefit from considering the strengths and limitations of the 49 MMAT when interpreting findings from this review. In our view there is also a need to develop guidelines 50 specific to systematically reviewing process evaluations of complex interventions. 51 52

#### CONCLUSIONS

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There is a wealth of existing evidence which synthesises the findings from trials evaluating interventions that have measured sedentary behaviour as an outcome in adults. To our knowledge this review is the first to synthesise data from the process evaluations of such interventions. This review complements existing trial evidence because it highlights a range of factors associated with implementation, context, and participants experiences that can contribute to whether an intervention is effective or not. It is promising that all interventions were underpinned by theory as part of understanding how they were intended to have an effect, however it is important to acknowledge how different contexts and individual level factors e.g. health status, illness, age, and lifestyles can shape levels of engagement and behaviour change. Researchers could benefit from using a process evaluation framework such as Moore et al's,(4) for conducting and reporting process evaluations to ensure all factors are considered. Including logic model as part of the process evaluation would also assist in mapping the range of factors that contribute to changes in intervention outcomes.

#### FIGURES:

#### Figure 1: PRISMA flow diagram

#### ADDITIONAL

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	<ol> <li>Hassani M, Kivimaki M, Elbaz A, Shipley M, Singh-Manoux A, Sabia S. Non-consent to a wrist-worn ccelerometer in older adults: the role of socio-demographic, behavioural and health factors. PLoS One. 014;9(10):e110816.</li> <li>Alley S, Schoeppe S, Guertler D, Jennings C, Duncan MJ, Vandelanotte C. Interest and preferences for sing advanced physical activity tracking devices: results of a national cross-sectional survey. BMJ open. 016;6(7):e011243.</li> <li>Compernolle S, De Cocker K, Cardon G, De Bourdeaudhuij I, Van Dyck D. Older adults' perceptions of edentary behavior: A systematic review and thematic synthesis of qualitative studies. The Gerontologist. 020;60(8):e572-e82.</li> <li>Langøien LJ, Terragni L, Rugseth G, Nicolaou M, Holdsworth M, Stronks K, et al. Systematic mapping eview of the factors influencing physical activity and sedentary behaviour in ethnic minority groups in Europe: DEDIPAC study. International Journal of Behavioral Nutrition and Physical Activity. 2017;14(1):1-24.</li> <li>Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of ealth services research findings into practice: a consolidated framework for advancing implementation cience. Implementation science. 2009;4(1):1-15.</li> <li>Shea B, Dubé C, Moher D. Assessing the quality of reports of systematic reviews: the QUOROM tatement compared to other tools. Systematic Reviews in Health Care: Meta-Analysis in Context. 2001:122-39.</li> </ol>
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 9 50 51	
53 54 55 56 57	





# Supplementary file 1: PRISMA 2020 Checklist 27.05.21

3 4 5	Section and Topic	ltem #	Checklist item	Location where item is reported
6	TITLE			
/	Title	1	Identify the report as a systematic review.	Title, page 1
0 9	ABSTRACT			
10	Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Pg. 1
11	INTRODUCTION			
12	Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Pg. 2/3
13	Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Pg. 2/3
14	METHODS			
15	Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Pg. 3
17 17	Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Pg. 4
19 20	Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Supplementary file 2
21 22	Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Pg. 4
23 24 25	Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Pgs. 4-7
26 27	, Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	n/a
28 29		10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	n/a
30 31	Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Methodological quality pg. 7
32	Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	n/a
33 34	Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Pgs. 4-7
35 36		13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	n/a
ג כ גר		13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Pgs. 4-7
39 40		13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Pgs. 4-7
41		13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	n/a
42		13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	n/a
43 44	Reporting bias	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Supplementary
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## Supplementary file 1: PRISMA 2020 Checklist 27.05.21

3 4 5	Section and Topic	ltem #	Checklist item	Location where item is reported
6 7	Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	n/a
8 0	RESULTS			
) 10	Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Pg. 8
12 12		16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Supplementary file 4
14 14	Study characteristics	17	Cite each included study and present its characteristics.	Supplementary files 3 and 4
16 17	Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Supplementary file 9
18 19	Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	n/a
20	Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	n/a
21 22	syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	n/a
23		20c	Present results of all investigations of possible causes of heterogeneity among study results.	n/a
24 25		20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	n/a
26 27	Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Supplementary file 9
28 29	Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	n/a
30	DISCUSSION			
31	Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Pgs. 15-17
32 33		23b	Discuss any limitations of the evidence included in the review.	Pg. 18
34		23c	Discuss any limitations of the review processes used.	Pg. 18
35		23d	Discuss implications of the results for practice, policy, and future research.	Pgs. 15-19
36	OTHER INFORMAT	TION		
37 20	Registration and	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Pg. 3
20 39	protocor	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Pg. 3
40		24c	Describe and explain any amendments to information provided at registration or in the protocol.	n/a
41	Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Pg. 19
42 43	Competing interests	26	Declare any competing interests of review authors.	n/a
44 45	Availability of data, code and	27	Report which of the following are publicly available and where they can be found; template data collection forms; data extracted from included studies; data used for all analyses; analysic code; any other materials used in the apple guidelines.xhtml	Pg. 19
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# Supplementary file 1: PRISMA 2020 Checklist 27.05.21

3 4 5	Section and Topic	ltem #	Checklist item	Location where item is reported
6	other materials			
/ - 8 9 10	<i>From:</i> Page MJ, M 10.1136/bmj.n71	IcKenzie	JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2 For more information, visit: <u>http://www.prisma-statement.org/</u>	2021;372:n71. doi:
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45			For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	
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Supplementary file 2_search strategy MEDLINE_27.05.21		
Database: Ovid MEDLINE(R) <1946 to May 2020>		
Sea	arch Strategy:	
1	Sedentary Lifestyle/ (7525)	
2	(sedentary or sitting or sedentariness or sedentarism).ti. (6452)	
3	((sedentary or sitting or seated) adj5 (behavio* or lifestyle or life-style)).tw. (7249)	
4 or i	((inactiv* or no exercise or nonexercise or non exercise) adj3 (adult? or men or women or males or female individuals or people)).tw. (2515)	
5 (48	(sedentary adj3 (adult? or men or women or males or females or individuals or people or population?)).tw (59)	
6 (46	((sitting or sit or seated or stationary or standing) adj3 (task* or time or bout* or work* or break*)).tw. 03)	
7	low energy expenditure.tw. (144)	
8	physical* inactiv*.tw. (6591)	
9	(leisure time adj5 (physical* activ* or passive or inactiv*)).tw. (3445)	
10	"physical activity level*".tw. (6404)	
11	((sitting or lying) adj2 posture*).tw. (998)	
12	(prolong* adj2 (reclin* or sit or sitting or seated)).tw. (564)	
13	chair rise?.tw. (323)	
14	"sit* less".tw. (601)	
15	((light or low) adj "physical activ*").tw. (1853)	
16 ina	((decrease or reduc* or discourag* or lessen*) adj3 (sit or sitting or stand or standing or physical* ctiv*)).tw. (1377)	
17 me	(time adj5 (computer* or television or tv or video game? or videogame? or gaming or screen or dia)).tw. (8936)	
18	((watch* or view*) adj5 (television or tv)).tw. (4240)	
19	(play* adj5 (video game? or videogame? or computer game?)).tw. (1305)	
20 act	((computer* or television or tv or video game? or videogame? or gaming) and (sedentary or physical* ivity* or sitting or seated or underactiv* or under activ*)).ti. (351)	
21	or/1-20 [sedentary behaviour terms] (50991)	
22	Program Evaluat*.mp. (62861)	

23 "Outcome and Process Assessment (Health Care)"/ (25572)

Page 2	29 of	74 BMJ Open
1	24	"Process Assessment (Health Care)"/ (4358)
2 3	25	process evaluat*.mp. (2608)
4 5	26	or/22-25 [process evaluation] (91311)
6 7	27	randomized controlled trial.pt. (476630)
8 9	28	controlled clinical trial.pt. (92914)
10 11	29	randomized.ab. (377791)
12 13	30	placebo.ab. (177752)
14 15	31	drug therapy.fs. (2086845)
16 17	32	randomly.ab. (262246)
18 19	33	trial.ab. (392148)
20 21	34	groups.ab. (1631334)
22 23	35	27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 (4041965)
24 25 26	36	exp animals/ not humans.sh. (4552221)
20 27 28	37	35 not 36 [Cochrane RCT filter 2008, sensitivity maximimising] (3448772)
29 30	38	21 and 26 and 37 [sedentary behaviour and process evaluation and RCTs] (420)
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Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

1	1										
2 3 <b>Random</b>	2 3 Randomised Control Trials										
4 <b>Study</b> 5 (Authors 6 (Year), 7 <b>Country</b> 8 (of 9 process 10 evaluati 12 on 13 report)	Study aims	Inclusion/exclusion criteria	Sample size, n assigned to intervent ion /control	Participant characteristic s (Age (mean (SD) or %), Gender (% female), Ethnicity)	Study design, RCT type, group, setting	Intervention description (Content, duration)	Control descriptio n	Data collectio n and follow ups (time- points)	Outcome measures for treatment effects (pre-specified or those only reported)		
13       2         14       Adams         15       (2012)         16       17         17       USA         18       19         20       21         22       23         24       25         26       27	Reduce sedentary behaviour, increase light physical activity. (Feasibility trial)	Inclusion: 1. Women between the ages of 35-85; 2. BMI >25; 3. Be willing to receive intervention materials and messages by email; 4. Plan to attend all program and data collection sessions. Exclusion: Any reported conditions that prohibited standing or walking.	75 I: 47 C: 28	Age: I: 56.73 (12.64) C: 61.38 (12.1) Gender: 100% Ethnicity: 89% Caucasian 11% African- American	Cluster randomise d controlled Weight- loss support club (cluster unit)	On Our Feet intervention – combination of 2 face-to-face interactive group sessions, and 6 weekly email messages. 6 weeks	Waiting list	Baseline 6 weeks	<ol> <li>Time spent in SB; light and moderate PA (accelerometer; IPAQ, Godin Leisure-Time Activity Questionnaire);</li> <li>Participant's self-rated level of confidence for reducing sitting and increasing PA behaviours;</li> <li>BMI and waist circumference.</li> </ol>		
28       Albrigh         29       t (2015)         30       31         31       USA         32       33         34       35         36       37         38       39         40       41         42       43	Increase moderate to vigorous physical activity.	Inclusion: 1. Mother of infant aged 2-12 months; 2. Inactive (<30 minutes of MVPA/week); 3. Healthy, able to do moderate intensity physical activity; 4. BMI =18.5-40; 5. Not planning to become pregnant in the next 12 months; 6. Aged 18-45; 7. Had health insurance; 8. Read/understood English; Por	311 I: 154 C: 157	Age: I: 31.6 (5.5) C: 32.1 (5.9) Gender: 100% Ethnicity: 31.5% Native Hawaiian/ Pacific Islander 33.8% Asian (Japanese, Filipino, other Asian) My - http://bmjoped	Randomise d controlled Parallel groups Communit y	Tailored telephone counselling, information on website, and pedometer. 12 months	Information in print or standard website.	Baseline 1 month 3 months 6 months 12 months (immediat ely after interventio n) 18 months	<ol> <li>Time spent in MVPA (Active Australia Survey; accelerometer; exercise log);</li> <li>Time spent sitting while travelling; at work; watching TV, etc. (Active Australia Survey);</li> <li>Body mass index;</li> <li>Self-efficacy for PA (instrument designed to assess self-confidence to overcome barriers to PA, modified with questions tailored to new mothers);</li> </ol>		

### Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 <b>Benede</b> 10 <b>tti</b> (2020) 22 23 Brazil 24 25 26 27 28 29 30 31 32 33	Improve physical activity level.	<ul> <li>9. Physician's written approval if history of contraindicated conditions.</li> <li>Exclusion: <ol> <li>Pregnant;</li> <li>Planning to leave Oahu,</li> <li>Hawaii in the next year (permanently move away);</li> <li>Diagnosis of cancer,</li> <li>coronary heart disease (including atrial fibrillation),</li> <li>insulin-dependent diabetes mellitus (IDDM), and other atherosclerotic cardiovascular diseases (e.g., stroke).</li> </ol> </li> <li>Inclusion: <ol> <li>Aged ≥60;</li> <li>No severe physical and/or mental health impairments;</li> <li>Had not participated in physical activity programs in the past 6 months.</li> </ol> </li> <li>Exclusion: <ol> <li>History of heart attack and/or stroke in the past 6 months, cancer diagnosis and/or other severe medical conditions.</li> </ol> </li> </ul>	114 BCG: 36 TEG: 52 C: 26	16.4% Mixed race 15.1% White 2.6% Black/ Native American 0.6% Unknown 0.6% Unknown <b>Age:</b> BCG: 69.7 (6.9) TEG: 71.3 (7.3) C: 67.2 (5.8) <b>Gender:</b> 80.7% <b>Ethnicity:</b> Not reported	Cluster randomise d controlled Public health centres (cluster unit)	BCG: 12 weekly meetings behavioural change programme that was adapted from "Active Living Every Day" from USA. TEG: 12-week (3 times per week) exercise class conducted at	No intervention	Baseline 3 months 6 months 12 months	5. Psychosocial mediators survey. 1. Time spent in SB; light PA; and MVPA (accelerometers); 2. BMI; 3. Quality of life (WHOQOL-BREF and WHOQOL-OLD).
34 35 <b>Berends</b>	Improve	Inclusion:	411	Age:	Cluster	Supervised	Start-up	Activity	1. Time spent PA
36 <b>en</b>	physical	1. Weight-related health risk;		I: 55.9 (12.3)	randomise	exercise	exercise	monitor,	(accelerometer; IPAQ),
37 <b>(2015)</b>	activity and	2. Inactive lifestyle (not doing	I: 247	C: 53.8 (12.4)	d	programme based	programme	physiologi	sedentary, standing or
38	dietary	30 minutes moderate physical	C: 164		controlled	on BeweegKuur –	based on	cal	active (accelerometer);
39 The	behaviour.	activity for at least 5 days per		Gender:		individual and	BeweegKuu	measures:	2. Dietary habits;
40 Netherlan		week);		64.7%	GP	group meetings	r – same	Baseline	3. Quality of Life (EQ-6D);
41 ds		3. Motivated for behavioural			practices	with lifestyle	number of	12 months	4. Medication;
43		change;		Nationality:	(Cluster	advisor, dietitian,	meetings	24 months	5. Side-effects;

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Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

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2		1 BMI- 25 20 with a large		88 80% Dutch	unit)	and intensive	with		6 Direct and indirect
3		4. DMI = 25-30, with a large		00.0% Dutti	unity				o. Direct and mullect
4		waist circumference (men				support from	lifestyle	IPAQ,	COSTS;
5		greater than 102 cm, women				physical therapist.	advisor and	dietary	7. Health risk, e.g. waist
6		greater than 88 cm) with					dietitian as	habits:	circumference, body
7		comorbidity (cardiovascular				12 months	the	Baseline	composition, blood
8		disease and/or T2DM,					intervention	6 months	pressure, resting heart
9		arthrosis and sleep appoea).					group, few	12 months	rate. blood biochemistry.
10		or					numbers of	18 months	and physical fitness.
11		5. $BMI = 30-35$ , with a normal					meeting	24 months	F
12		or large waist circumference					with		
13		with comorbidity or					nhysical	FO-6D	
14		6 RMI- 25 40 with a normal					thorapict	hoalthcaro	
15		or large waist circumforence	6				therapist.		
16		of large waist circumference					12 months	COSIS:	
17		with risk factors for		N			12 months	Basenne,	
18		cardiovascular disease or						then every	
19		T2DM and without other						3 months	
20		comorbidities.						until 24	
21		Exclusion:						months	
22		1. Serious mobility limitations							
23		precluding participation;							
24		2. Pregnancy.							
25 Biddle	Reduce	Inclusion:	187	Age:	Randomis	STAND – A group-	Information	Baseline	1. Time spent in SB;
26 (2017)	sitting time.	1. Age 18-40, BMI ≥30 (≥27.5		I: 32.4 (5.4)	ed	based structured	leaflet	3 months	2. Number of breaks in SB
27		for South Asians).	I: 94	C: 33.3 (5.8)	controlled	education	focusing on	12 months	(SB to upright
28 UK		2. Age 18-40. BMI >25 (>23				workshop	T2DM, the		movement) per day (Both
29		for South Asians) with $>1$	C· 93	Gender	Parallel	workbiropi	importance		by IPAO and
30		additional risk factor for	0. 75	68 50%	groups	6 wooks	of		accelerometer):
31		diabatas		00.3 %	groups	0 WEEKS	increasing		2 Diochomical variables
32				Ethnister	C		inciedsing		5. BIOCHEIIIIcal Valiables
33		Exclusion:		Ethnicity:	Communit		physical		(glucose control, insulin
34		Significant illness, steroid use,		19.8% black	У		activity and		sensitivity, cholesterol
35		diabetes, pregnancy or an		and minority			decreasing		levels);
36		inability to communicate in		ethnic groups			sedentary		4. Anthropometric data
37		English.					behaviour.		(BP, weight, body
38									composition, waist
39									circumference);
40									5. Quality of life (EQ-5D):
41									6. Self-efficacy for SB
42									change:
43 <sup></sup>	1			1		1	I		
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### Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

2									7. Anxiety and
4									depressions (HADS).
<sup>7</sup> <sub>5</sub> Blunt	Increase	Inclusion:	118	Age:	Randomis	3-phases	Usual-care	Baseline	1. Mean daily steps
6 (2018)	physical	1. Age 18-85;		I: 56.8 (12.3)	ed	HealtheSteps™	wait-list	6 months	(pedometer; self-report);
7	activity	2. ≥1 self-reported or	I: 59	C: 58.6 (14.7)	controlled	program – in-	control to	(end of	2. Time spent in PA;
8 Canada	levels.	measured risk factor for	C: 59			person lifestyle	begin	active	sitting (IPAQ);
9		chronic disease including:		Gender:	Parallel	coaching, and	HealtheSte	phase	3. Eating habits (STC;
10		BMI >25, <150 min of		78.8%	group	access to a suite	ps™ 6	interventi	modified DINE);
11		exercise/week, ≥3 hours				of eHealth	months	on)	4. Quality of life (EQ-5D;
12		sitting/day, <8 fruit and		Ethnicity:	Primary	technology	after		EQ-VAS);
13		vegetable servings/day,		97.5% White	care	support.	baseline.	Additiona	5. Weight and body
14		diagnosis of metabolic			health			l for	composition
15		syndrome or T2DM.			centres	18 months		interventi	6. Blood pressure;
17		Exclusion:		0				on group	7. Adverse events.
18		Unable to comprehend the						in	
19		letter of information and						minimally	
20		consent documentation.						-support	
21					$\mathbf{O}$			phase:	
22								12	
23								months	
24								18	
25								months	
<sup>26</sup> Elramli	Increase	Inclusion:	76	Age:	Randomis	Walk for	1 group	Baseline	1. Daily step count
<sup>2</sup> / <sub>20</sub> (2017)	average	1. Aged ≥18;		I: 58.2 (13.5)	ed	Rheumatoid	education	13 weeks	(accelerometer);
20	daily step	2. Confirmed diagnosis of	I: 39	C: 58.6 (15.8)	controlled	Arthritis (WARA)	session on	26 weeks	2. Time spent in SB
29 UK	count.	Rheumatoid Arthritis (RA)	C: 37			– 6 group sessions	importance	52 weeks	(accelerometer);
31		according to ACR/EULAR		Gender:	Parallel	in first 7 weeks, 2	of exercise		3. Time spent in sitting;
32		2010 criteria, within 5 years		83.9%	groups	booster group	and healthy		PA (IPAQ);
33		of diagnosis.				sessions in week	diet; and		4. Disease activity (SDAI);
34		Exclusion:		Ethnicity:	Communit	14 and 28,	written		5. RA Quality of life
35		1. Pregnant, severe		Not reported	У	personal support	educational		(RAQoL);
36		hypertension, joint				from	material. At		6. Functional capacity
37		replacement within last 6				physiotherapist	end of trial		(6MWT; MHAQ; hand grip
38		months, unstable cardiac				on week 7, 9, and	(12-month),		testJ;
39		conditions, or other serious				11. Pedometers	provided		7. Cardiovascular risk
40		pathology which would affect				and PA diaries	pedometer		factors (Blood
41		ability to take part in physical				were given with	and PA		biochemical variables;
42		activity;				instructions.	diaries, with		ASSIGN score Version

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2 3 4 5 6 7		2. Unable to understand written and spoken English or had cognitive impairment.				28 weeks	advice on use.		<ul><li>1.5.1; BMI; waist and hip circumferences);</li><li>8. Dietary assessment (DINE);</li><li>9. PA self-efficacy.</li></ul>
<ul> <li>Harris</li> <li>(2018)</li> <li>(2018)</li> <li>UK</li> <li>UK</li> <li>UK</li> <li>14</li> <li>15</li> <li>16</li> <li>17</li> <li>18</li> <li>19</li> <li>20</li> <li>21</li> <li>22</li> <li>23</li> <li>24</li> <li>25</li> <li>26</li> <li>27</li> <li>28</li> <li>29</li> <li>30</li> <li>31</li> <li>32</li> <li>33</li> <li>34</li> <li>25</li> </ul>	Increase physical activity.	Inclusion: 1. Aged 45-75; 2. Registered at 1 of the 6 participating general practices; 3. Able to walk outside the home and with no contraindications to increasing their moderate intensity physical activity levels. Exclusion: 1. Achieving at least 150 minutes of at least moderate intensity physical activity weekly; 2. Living in residential or nursing home, or housebound; 3. ≥3 falls, or ≥1 fall required attention, within last year; 4. Terminal illness, dementia, significant cognitive impairment, blind, new onset chest pain, MI, pregnant, conditions which GP judged	1,023 I: Postal: 339 Nurse: 346 C: 338	Age: 45-54: 33.2% 55-64: 37.8% 65-75: 28.9% Gender: 64.1% Ethnicity: 80.3% White 10.3% Black 6.9% Asian 2.5% Other	Randomis ed controlled Parallel groups by household Communit y	<ol> <li>Postal – pedometer, physical activity diary, and instructions for a 12-week walking programme sent by post.</li> <li>Nurse support – provided pedometer, physical activity diary, and instructions by a practice nurse, who also provided 3 meetings over 3 months to facilitate participants to be more active.</li> </ol>	Usual physical activity, provided a pedometer and guidance on a 12-week walking programme at end of trial.	Baseline 3 months 12 months	1. Daily step count (accelerometer); 2. Time spent in at least moderate PA (accelerometer); 3. Time spent in SB (accelerometer); 4. Self-reported PA (GPPAQ; IPAQ); 5. Cost-effectiveness to health services; 6. Exercise self-efficacy; 7. Anxiety, depression; 8. Quality of life (EQ-5D); 9. BMI; waist circumference; body fat; 10. Adverse events; 11. Health service use.
36 37 <b>Lakervel</b>	Improve	for exclusion.	622	Age:	Randomis	Cognitive	Provision of	Baseline	1. Cardiovascular risk
38 <b>d (2012)</b>	lifestyle	1. Aged 30-50;	1.214	I: 43.6 (5.1)	ed controlled	behavioural	health brochuros	6 months	SCORE;
40 The	(dietary	2. Moderate or high risk of CVD (according to SCORE) or	1: 314 C: 308	L: 43.4 (5.5 <i>)</i>	controlled	at modifying	only	12 months	2. Diabetes risk score; 3. Dietary behaviour
41 Netherlan	physical	a high risk of T2DM	0.000	Gender:	Parallel	dietary, and/or	01119	- 1 111011113	(Food Frequency
42 ds	activity,	(according to ARIC Study).		58%	groups	physical activity,			Questionnaire);

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2										
2		and/or	Exclusion:				and/or smoking			4. Time spent in PA and
3 ⊿		smoking).	1. Having diabetes;		Ethnicity:	General	behaviour,			SB (SQUASH; a subscale
4 5			2. Previous CVD;		Not reported	Practices	maximum of six			of AQuAA);
5			3. Pregnancy;				individual			5. Smoking behaviour;
7			4. Current malignant disease;				counselling			6. Determinants of
, ጸ			5. (Severe) mobility				sessions of 30			behavioural change;
9			problems.				minutes, followed			7. Medical care
10			1				by 3-monthly			utilisation:
11			$\sim$				booster sessions			8. BMI, waist-hip
12							by phone.			circumferences:
13	8						of phone.			9. Cost-effectiveness and
14	k l						Intervention			cost-utility in the societal
15	5						duration unclear			nerspective:
16	5									10. Quality of life (EQ-
17	7									5D)
18	3									11 Blood pressure
19										12 Blood biochemistry
20	Lane	To assess	Inclusion:	176	Age:	Randomis	2 hooklets	Placebo	Baseline	1 Time spent in sitting
21	(2010)	the impact	1 A nonulation sample of	1,0	21-49.84%	ed	delivered by nost	treatment –	6 weeks	2 Time spent in sufficient
22	(2010)	of a	women participating in a	I· 85	21 19.0170	controlled	– Booklet 1	a healthy	o weeks	PA levels
23 24	Ireland	community	mass 10 km event	C· 91	Gender	controlled	targeted the	eating and		3 Time spent in total PA
25	li cialita	based low-	2 Consented to follow-ups 2	0. 71	100%	Parallel	earliest stages of	nutrition		(All of above by bespoke
26		contact	and 6 months afterwards		10070	groups	motivational	hooklet		self-report
27	7	intervention	3 Those who had relansed to		Fthnicity	groups	readiness and	delivered by		questionnaire)
28	3	on the	insufficient levels of physical		Not reported	Communit	sten-hy-sten	nost		4 Readiness to change
29		nhysical	activity were invited		notreporteu	v	guide to increase	post		(exercise motivational
30		activity	activity were invited.			y	motivation			stage)
31		habits of					Booklet 2 targeted			
32		insufficientl					already motivated			
33		v active					and active stage			
34		women					with information			
35							about moderate			
30 27	7						intensity PA and			
37 38							staving active.			
39	Matson	To decrease	Inclusion:	60	Age:	Randomis	2 health coaching	Healthy	Baseline	1. Time spent in sitting
40	(2018)	sitting;	1. Kaiser Permanente		I: 69.0 (4.7)	ed	sessions; 4 follow-	living	12 weeks	(total time, and number
41		increase	Washington (KPWA)	I: 29	C: 67.8 (5.2)	controlled	up health	intervention	_	of periods of sitting for
42	USA	standing	members;	C: 31			coaching phone	usually		≥30 minutes
43	''	<b>U</b>	· · · · · _ ·							

Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

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1	-		_						
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	time and light physical activity. (Pilot trial)	<ul> <li>2. Age &gt;60;</li> <li>3. BMI 30-50 kg/m<sup>2</sup>;</li> <li>4. Not residing in long-term care or skilled nursing, no diagnosis of dementia, and no serious mental or a potentially terminal illness. Exclusion:</li> <li>1. Unable to stand, were not able to walk one block;</li> <li>2. Participating in another intervention study;</li> <li>3. Reported sitting time of less than 7 hours per day;</li> <li>4. Could not communicate by phone, or speak and read English</li> </ul>		Gender: 68.3% Ethnicity: 95.0% Not Hispanic or Latino 1.7% Hispanic or Latino 3.3% Unknown	Parallel groups KPWA primary care clinics	calls; and written materials, and email reminders. A wrist-worn device programmed to serve as an outward reminder strategy for taking breaks from sitting. 12 weeks	available to the KPWA members 12 weeks		continuously); 2. Daily number of sit-to- stand transitions (breaks from sitting) (Both of above by accelerometer); 3. Short Physical Performance Battery; 4. Blood pressure; 5. Fasting glucose level; 6. Total cholesterol level; 7. Depressive symptoms (PHQ-8); 8.Adverse events.
20 21 <b>Matthew</b> 22 <b>s</b> (2016) 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43	Increase walking, reduce sedentary behaviour.	<ul> <li>Inclusion: <ol> <li>Aged 18-65;</li> <li>Ambulatory and able to</li> <li>walk unaided for 10 minutes</li> <li>at a time, based on self/carer</li> <li>report;</li> <li>Any level of intellectual</li> <li>disabilities;</li> <li>Not currently taking part in</li> <li>any other research study.</li> </ol> </li> <li>Exclusion: <ol> <li>Wheelchair user or</li> <li>significant mobility problems;</li> <li>Severe challenging</li> <li>behaviour, or other needs</li> <li>requiring constant one-to-one</li> <li>support from staff;</li> <li>Involved in regular physical</li> <li>activity - meeting current</li> <li>public health</li> </ol> </li> </ul>	102 I: 54 C: 48	Age: I: 44.9 (13.5) C: 47.7 (12.3) Gender: 44.1% Ethnicity: Not reported	Cluster randomise d controlled Intellectua l disabilities communit y-based organisati ons (cluster unit)	Walk Well programme – 3 face-to-face physical activity consultations, written resources for participants and carers, and an individualised, structured walking programme 12 weeks	12-week waiting list control	Baseline 12 weeks 24 weeks	1. Daily step count (accelerometer); 2. Time spent in SB; MVPA; total PA (accelerometer; IPAQ-S); 3. BMI; waist circumference; 4. Quality of life (EQ-5D; Subjective Vitality Scale); 5. Self-Efficacy for Activity for Persons with Intellectual Disability and Self-Efficacy for Exercise Scale.

# Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

* 6Behavioural (2013)Inclusion: intervention183Age: (2013)Randomis appointment with antenatal (arremarking)Baseline (15*0-18*)1. Attitutinal assessment (15*0-18*)8UKdietary and (2. Singleton pregnancy, pestational age >15*0 weeks' gestation1: 94Solution1: 30.4 (5.7)Randomis (arremarking)antenatal (15*0-18*)Baseline (15*0-18*)I. Attitutinal assessment (15*0-18*)8UKdietary and glycaemic (2. Singleton pregnancy, changes to glycaemic (2. Control in premant premant premant premant1. Solution: (1. Setation -15*** weeks; gestation (1. Setation -15**** (1. Setation -15************************************	2 3			physical activity, for six months or more.							
6 comprising 7 81. Pregnant with booking BMI comprising 30;1. Pregnant with booking BMI 1: 94 230;1. 30.4 (5.7) C. 30.7 (4.9)ed controlledappointment with the health trainer; correr weeks' gestational age >15" weeks gestational age >15" weeks and <17" weeks' gestation.1. 30.4 (5.7) C. 30.7 (4.9)ed controlledappointment with the health trainer; correr weeks' gestation.antenatal (15" - 15"(15" - 15") questional age >15" weeks gestation and <17" weeks' gestation.I. 30.4 (5.7) C. 30.7 (4.9)ed controlledappointment with the health trainer; correr weeks' gestation gestation and <17" weeks' gestationI. The gent and barriers an gestation gestation and <17" weeks' gestationantenatal correr gestation gestation; deitary and 2.4antenatal correr gestation; deitary and 2.4(15" - 15" weeks' gestation gestation gestation; deitary and 2.4eek gestation score (EPDS) 34" - 36" 3.2 (Dality of life (EQ-5D) 34" - 36" 3.2 (Dality of life (EQ-5D) 3.4 (Dality of life (EQ-5D) 	4	Poston	Behavioural	Inclusion:	183	Age:	Randomis	One-to-one	Usual	Baseline	1. Attitudinal assessment
7761:94C: 30.7 (4.9)controlledthe health trainer; weeky groupcareweeks' gestationbenefits and barriers an confidence to carry out8UKdietary and2. Singleton pregnancy, gestation alge > 15° weeks' gestation alge > 15° weeks' gestationC: 89C: 809Parallel groupsParallel groupsParallel groupsParallel gestationC: 809C: 60910changes to glycamicExclusion: 1. Gestation < 15° weeks' and s17° weeks' 3. Pre-existing diabetes; s. 2. Pre-existing diabetes; s. Pre-existing essential hypertension (treated); the licease; thalassemia; celiae disease, current psychosis.Ethnicity: 56.3% White 3.3% OtherAntenatal 3.8% OtherAntenatal aproximately 19 weeks' gestation dietary advice, dietary advice, gestation advice; plus usual antenatal care.Benefits and barriers an weeks' gestation dietary advice, gestationDepression Score (EPDS dietary advice, gestation10metromini, thypeid disease; current psychosis.Pre-existing diabetes; antiphospholipid syndrome, sickle cell disease; current psychosis.Bage: PainterPainter PainterPainter pression Score (EPDS diagnosis of GDM and pre-campsia, gestational weight gain, mode of delivery, blood pressure, routine blood result; r. Neonatal outcomes: diagnosis of GDM and pressure, r	5	(2013)	intervention	1. Pregnant with booking BMI		I: 30.4 (5.7)	ed	appointment with	antenatal	(15+0 -18+6	questionnaire - perceived
8       UK       dietary and physical       2. Singleton pregnancy, gestational age >15*0 weeks and <17*0 weeks' gestation.       C: 89       Gender: fullow       weeks' groups       weeks' sessions for 8 consecutive weeks from approximately 19 weeks' gestation;       gestation (hetary advice, and physical       confidence to carry out the dictary advice, behaviours;         11       changes to ad <17*0 weeks;	7		comprising	≥30;	I: 94	C: 30.7 (4.9)	controlled	the health trainer;	care	weeks'	benefits and barriers and
9physical activitygestational age >15** weeks and <17*6 weeks and >10 changes to improveGender: 100%Parallel groupssessions for 8 consecutive weeks from approximately 19 weeks from activity women.27** - 28*6 behaviours; gestationthe dietary and PA behaviours; gestation12improve improve1. Gestation <15** weeks and >17** weeks;5. Finn 38.3% Black 1.6% Asian 3.8% OtherAntenatal approximately 19 weeks from activity level advice; plus usual antenatal care.27** - 28*6 weeks' gestation; dietary advice, and physical activity level advice; plus usual antenatal care.27** - 28*6 behaviours; gestation; dietary advice, and physical activity level advice; plus usual antenatal care.20************************************	8	UK	dietary and	2. Singleton pregnancy,	C: 89			weekly group		gestation)	confidence to carry out
10activity charges to Location < 15-% weeks' gestation. 11100% control in 2. Pre-existing diabetes; 3. Pre-existing essential hypertension (treated); 4. Pre-existing resential hypertension (treated); 4. Pre-existing resenting resent	9		physical	gestational age >15 <sup>+0</sup> weeks		Gender:	Parallel	sessions for 8		27 <sup>+0</sup> -28 <sup>+6</sup>	the dietary and PA
11changes to improve glycaemicExclusion: 1. Gestation <15 <sup>+0</sup> weeks and 17 <sup>+6</sup> weeks;Ethnicity: 56.3% White 38.3% Black 1.6% Asian 3.8% Otherweeks from Antenatal approximately 19 weeks' gestation; dietary advice, and physical activity level advice; plus usual antenatal care.2. Quality of life (EQ-5D) 3. Edinburgh Post Natal Depression Corre (EPDS) 4. Dietary assessment; 5.7% meshesing 6. Maternal outcomes; diagnosis of GDM and pre-eclampsia, gestational weight gain, multiple prescribed metformin; thyroid disease or current psychosis.Ethnicity: 5.6.3% White 3.8.3% Black 1.6% Asian 3.8% Otherweeks from Antenatal attivity level advice; plus usual antenatal care.2. Quality of life (EQ-5D) 3. Edinburgh Post Natal Depression Corre (EPDN) 4. Dietary assessment; 5.7% mesher in SB; ligh PA; MVPA (accelerometer; RPAQ); 6. Maternal outcomes; diagnosis of GDM and pre-eclampsia, gestational weight gain, mode of delivery, bpade and family history, healt in current pregnancy, early early pregnancy data (ultrasound scan, nucha screening), blood pressure; routine blood results; 7. Neonatal outcomes: birtweight, anthropometry, inpatier nights, statied clinical statied clinical and family history, healt in current pregnancy, inpatier nights, detailed clinical incurrent pregnancy, inpatier nights, detailed clinical <b< td=""><td>10</td><td></td><td>activity</td><td>and &lt;17<sup>+6</sup> weeks' gestation.</td><td></td><td>100%</td><td>groups</td><td>consecutive</td><td></td><td>weeks'</td><td>behaviours:</td></b<>	10		activity	and <17 <sup>+6</sup> weeks' gestation.		100%	groups	consecutive		weeks'	behaviours:
12improve glycamic control in 0 bese pregnant women.1. Gestation <15 <sup>-0</sup> weeks and >1.7 <sup>-6</sup> weeks; 3. Pre-existing diabetes; 3. Pre-existing essential hypertension (treated); 4. Pre-existing readial disease, multiple pregnancies, systemic lupus erythematosus (SLE), antiphospholipid syndrome, sickle cell disease; thalasemia; celiac disease, currently prescribed metformin; thyroid disease or current psychosis.Ethnicity: 56.3% White a. Antenatal clinicsAntenatal clinicsapproximately 19 weeks' gestation; dictary advice, and physical activity level advice; plus usual antenatal care.34-i <sup>0</sup> -36-i <sup>0</sup> weeks' gestation; dive; plus usual antenatal care.34-i <sup>0</sup> -36-i <sup>0</sup> weeks' gestation; diagnosis of GDM and pre-cclampsia, gestational weight gain, mode of delivery, lopadi loss at delivery, lopadi lood pressure, coutine blood results; 7. Neonatal outcomes: birthweight, anthropometry, inpatier mights.34-i <sup>0</sup> -36-i <sup>0</sup> attributer34-i <sup>0</sup> -36-i <sup>0</sup> attributer low pression Score (EPDS) attributer approximater lobod pressure, coutine blood results; 7. Neonatal outcomes: birthweight, anthropometry, inpatier mights.34-i <sup>0</sup> -36-i <sup>0</sup> attributer attributer attributer <br< td=""><td>11</td><td></td><td>changes to</td><td>Exclusion:</td><td></td><td></td><td>0 1</td><td>weeks from</td><td></td><td>gestation</td><td>2. Ouality of life (EO-5D):</td></br<>	11		changes to	Exclusion:			0 1	weeks from		gestation	2. Ouality of life (EO-5D):
13glycaemic control in obese pregnant 3. Pre-existing diabetes; 3. Pre-existing essential hypertension (treated); 4. Dietary assessment; 1.6% Asian 3.8% Otherclinicsweeks' gestation; dietary advice, and physical activity level advice; plus usual antenatal care.weeks' gestation; dietary advice, and physical activity level advice; plus usual antenatal care.bypertension Score (EPDS 4. Dietary assessment; 5. Time spent in SB; ligh PA; MVPA (accelerometer; RPAQ); 6. Maternal outcomes: diagnosis of CDM and pre-eclampsia, gestation; diverse previous sustal antenatal care.weeks' gestation; dietary advice, and physical activity level advice; plus usual antenatal care.betweeks' gestation; dietary advice, and physical activity level diadvice; plus usual antenatal care.betweeks' gestation; dietary advice, and physical advice; plus usual antenatal care.betweeks' gestation; dietary advice, advice; plus usual antenatal care.betweeks' gestation; dietary advice, antenatal care.betweeks' gestation; dietary advice, advice; plus usual antenatal care.betweeks' gestation; dietary advice, advice; plus usual antenatal care.betweeks' gestation; diadvice; plus usual antenatal care.betweeks' gestation; diadvice; plus usual antenatal care.betweeks' gestation;<	12		improve	1. Gestation $<15^{+0}$ weeks and		Ethnicity:	Antenatal	approximately 19		34 <sup>+0</sup> -36 <sup>+0</sup>	3. Edinburgh Post Natal
14Control in obese2. Pre-existing diabetes; assessmential hypertension (treated); 4. Pre-existing essential hypertension (treated); 4. Pre-existing renal disease, multiple pregnancies, systemic lupus erythematosus (SLE), antiphospholipid syndrome, sickle cell disease; currently prescribed metformin; thyroid disease or current psychosis.38.3% Black 1.6% Asian 3.8% Otherdietary advice, and physical activity level advice; plus usual antenatal care.gestation4. Dietary assessment; 5. Time spent in SB; ligh PA; MVPA (accelerometer; RPAQ); 6. Maternal outcomes: diagnosis of GDM and pre-eclampsia, gestational weight gain, mode of delivery, blood loss at delivery, inpatien nights, detailed clinical and family history, healt in current pregnancy, early pregnancy data (ultrasound scan, nucha screening), blood pre-scute; 7. Neonatal outcomes: birthweight, anthropometry, inpatien nights, statient of the server, results; 7. Neonatal outcomes: birthweight, anthropometry, inpatien nights, dataled clinical and family history, healt results; 7. Neonatal outcomes: birthweight, anthropometry, inpatien nights.HealthierHealthierHealthierInclusion:728Age:ClusterPhysical activityHealthyBaseline1. Time spent in SB; PA	13		glycaemic	>17 <sup>+6</sup> weeks:		56.3% White	clinics	weeks' gestation:		weeks'	Depression Score (EPDS):
15obese pregnant women.3. Pre-existing essential hypertension (treated); 4. Pre-existing ernal disease, multiple pregnancies, systemic lupus erythematosus (SLE), antiphospholipid syndrome, sickle cell disease, current prescribed metformin; thyroid disease or current psychosis.1.6% Asian 3.8% Otherand physical activity level advice; plus usual antenatal care.5. Time spent in SB; ligh PA; MVPA (accelerometer; RPAQ); diagnosis of GDM and pre-eclampsia, gestational weight gain, mode of delivery, lood loss at delivery, inpatien nights, detailed loical and family history, healt in current pregnancy, early pregnancy data (ultrasound scan, nucha screening), blood pressure, routine blood result; 7. Neonatal outcomes: birthweight, anthropometry, inpatien nights, atal outcomes: birthweight, anthropometry, inpatien nights, data38SchoolHealthierInclusion:728Age:ClusterPhysical activityHealthyBaselineI. Time spent in SB; PA	14		control in	2. Pre-existing diabetes:		38.3% Black		dietary advice.		gestation	4. Dietary assessment:
16pregnant women.hypertension (treated); 4. Pre-existing renal disease, multiple pregnancies, systemic lupus erythematosus (SLE), antiphospholipid syndrome, sickle cell disease; currently prescribed metformin; thyroid disease or current psychosis.3.8% Otheractivity level advice; plus usual antenatal care.PA; MVPÅ (accelerometer; RPAQ); 6. Maternal outcomes: diagnosis of GDM and pre-eclampsia, gestational weight gain, mode of delivery, pload loss at delivery, inpload early pregnancy, early pregnancy, early pregnancy, early pregnancy, early pregnancy, early pregnancy, early pregnancy, early pregnancy, early pregnancy, the althierPA; MVPÅ (accelerometer; RPAQ); 6. Maternal outcomes: diagnosis of GDM and pre-eclampsia, gestational weight gain, mode of delivery, pload loss at delivery, inpload in current pregnancy, early pregnancy, data (ultrasound scan, nucha screening), blood pressure, routine blood results; 7. Neonatal outcomes: birthweight, anthropometry, inpatier nights.33SchoolHealthierInclusion:728Age:ClusterPhysical activityHealthyBaseline1. Time spent in SB; PA	15		obese	3. Pre-existing essential		1.6% Asian		and physical		0	5. Time spent in SB; light
17women. women.4. Pre-existing renal disease, multiple pregnancies, systemic lupus erythmatosus (SLE), antiphospholipid syndrome, sickle cell disease; currently prescribed metformin; thyroid disease or current psychosis.advice; plus usual antenatal care.advice; plus usual antenatal care.(accelerometer; RPAQ); 6. Maternal outcomes: diagnosis of GDM and pre-eclampsia, gestational weight gain, mode of delivery, blood loss at delivery, inpatien nights, detailed clinical and family history, healt in current pregnancy, early pregnancy data sceneing), blood pressure, routine blood results; 7. Neonatal outcomes: birthweight, anthropometry, inpatien mights.38SchoolHealthierInclusion:728Age:ClusterPhysical activityHealthyBaseline1. Time spent in SB; PA	16		pregnant	hypertension (treated):		3.8% Other		activity level			PA; MVPA
13 19 20multiple pregnancies, systemic lupus erythematosus (SLE), antiphospholipid syndrome, sickle cell disease; thalassemia; celiac disease, currently prescribed metformin; thyroid disease or current psychosis.antenatal care.antenatal care.6. Maternal outcomes: diagnosis of GDM and pre-ectampsia, gestational weight gain, mode of delivery, blood loss at delivery, inpatien nights, detailed clinical and family history, healt in current psychosis.20 21(Feasibility trial)currently prescribed metformin; thyroid disease or current psychosis.and family history, healt in current psychosis.23 23 24	17		women.	4. Pre-existing renal disease,		Co		advice; plus usual			(accelerometer; RPAQ);
120 20 21(Feasibility trial)systemic lupus erythematosus (SLE), antiphospholipid syndrome, sickle cell disease, currently prescribed metformin; thyroid disease or current psychosis.8 weeks8 weeks8 weeks24 25	18			multiple pregnancies,				antenatal care.			6. Maternal outcomes:
21trial)erythematosus (SLE), antiphospholipid syndrome, sickle cell disease; thalassemia; celiac disease, currently prescribed metformin; thyroid disease or current psychosis.8 weekspre-eclampsia, gestational weight gain, mode of delivery, inpatien nights, detailed chincal and family history, healt in current pregnancy, early pregnancy data (ultrasound scan, nucha screening), blood pressure, routine blood results;28	20		(Feasibility	systemic lupus			P				diagnosis of GDM and
22antiphospholipid syndrome, sickle cell disease; thalassemia; celiac disease, currently prescribed metformin; thyroid disease or current psychosis.antiphospholipid syndrome, sickle cell disease, currently prescribed metformin; thyroid disease or current psychosis.antiphospholipid syndrome, sickle cell disease, current psychosis.gestational weight gain, mode of delivery, blood loss at delivery, inpatien nights, detailed clinical and family history, health in current pregnancy, data (ultrasound scan, nucha screening), blood pressure, routine blood results;28	20		trial)	erythematosus (SLE),			0.	8 weeks			pre-eclampsia,
23sickle cell disease; thalassemia; celiac disease, currently prescribed metformin; thyroid disease or current psychosis.mode of delivery, blood loss at delivery, inpatien nights, detailed clinical and family history, healt in current pregnancy, early pregnancy data (ultrasound scan, nucha screening), blood pressure, routine blood results; 7. Neonatal outcomes: birthweight, anthropometry, inpatien nights.38SchoolHealthierInclusion:728Age:ClusterPhysical activityHealthyBaseline1. Time spent in SB; PA	22		-	antiphospholipid syndrome,							gestational weight gain,
24 25 26thalassemia; celiac disease, currently prescribed metformin; thyroid disease or current psychosis.Image: Constant of the system of the s	23			sickle cell disease;							mode of delivery, blood
25 26 27 27 28 29 30 31 31 32 33 34 34 35 38currently prescribed metformin; thyroid disease or current psychosis.image: current psychosis of current psychosis of current psychosis.image: current psychosis of current p	24			thalassemia; celiac disease,							loss at delivery, inpatient
26 27 28 28 29 30 31 32 32 33 34 35 36metformin; thyroid disease or current psychosis.metformin; thyroid disease or current psychosis.and family history, healt in current pregnancy, early pregnancy data (ultrasound scan, nucha screening), blood pressure, routine blood results; 7. Neonatal outcomes: birthweight, anthropometry, inpatier nights.38SchoolHealthierInclusion:728Age:ClusterPhysical activityHealthyBaseline1. Time spent in SB; PA	25			currently prescribed							nights, detailed clinical
27 28 29 30 30 31 32 33 34 35 36current psychosis.Image: current psy	26			metformin; thyroid disease or							and family history, health
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29 30 31 32 33 34 35 36Image: space s	28										early pregnancy data
30 31 32 32 33 33 34 35 34 35 36 3730 31 32 33 33 34 35 36 3731 32 33 33 34 35 36 3732 34 36 3733 34 36 3734 34 36 3735 36 37 3736 37 3737 3836 37 3837 3836 3837 3837 3838 3636 3737 3837 3837 3838 36 3737 3738 3738 3737 3738 3738 3737 3738 3738 3738 3737 3837 3738 3738 3738 3738 3738 3738 3738 3738 3737 3837 38 3738 3738 3738 3738 3738 3738 3738 3737 3738 3738 3738 3737 3738 3738 3737 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738 3738<	29										(ultrasound scan, nuchal
<ul> <li>31 32 3</li> <li>33 4 3</li> <li>34 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4</li></ul>	30										screening), blood
<ul> <li>32</li> <li>33</li> <li>34</li> <li>35</li> <li>36</li> <li>37</li> <li>38</li> <li>School Healthier</li> <li>Inclusion:</li> <li>728</li> <li>Age:</li> <li>Cluster</li> <li>Physical activity</li> <li>Healthy</li> <li>Baseline</li> <li>Time spent in SB; PA</li> </ul>	31										pressure, routine blood
34 35 36 37 38 School Healthier Inclusion: 728 Age: Cluster Physical activity Healthy Baseline 1. Time spent in SB; PA	32 33										results;
35       35       35       36       37       37       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1 </td <td>34</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>7. Neonatal outcomes:</td>	34										7. Neonatal outcomes:
36       37       36       anthropometry, inpatier         37       38       School       Healthier       Inclusion:       728       Age:       Cluster       Physical activity       Healthy       Baseline       1. Time spent in SB; PA	35										birthweight,
37	36										anthropometry, inpatient
38SchoolHealthierInclusion:728Age:ClusterPhysical activityHealthyBaseline1. Time spent in SB; PA	37										nights.
	38	School	Healthier	Inclusion:	728	Age:	Cluster	Physical activity	Healthy	Baseline	1. Time spent in SB; PA
$39 of Public   lifestyle by   1. Aged \ge 18 years;    Majority aged   randomise   intervention - 4   eating   3 months   (IPAQ-C);$	39	of Public	lifestyle by	1. Aged ≥18 years;		Majority aged	randomise	intervention – 4	eating	3 months	(IPAQ-C);
40Health,adopting2. Parents/grandparents withI: 38630-49dgroup sessionsintervention6 months2. Physical fitness	40	Health,	adopting	2. Parents/grandparents with	I: 386	30-49	d	group sessions	intervention	6 months	2. Physical fitness
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	41	HKU	Zero Time	≥1 child/grandchild aged 3–	C:342	I: 87%	controlled	over 12 months;	–similar	12 months	performance (hand grip
42(2017)Exercise17;C: 84%biweekly/structuralstrength; time spent	42	(2017)	Exercise	17;		C: 84%		biweekly/	structural		strength; time spent

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# Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

45 46

<ul> <li>A Randomis ed</li> <li>A Parallel groups</li> <li>Internet</li> <li>Randomis ed</li> </ul>	<ul> <li>a monthly mobile messages to improve physical activity habit.</li> <li>12 months</li> <li>5 Group 1. Online-tailored physical activity advice + 8-week stage-based reinforcement emails.</li> <li>Group 2. Online-tailored physical activity advice.</li> <li>6 months</li> <li>5 ACE (Active, Context or c</li></ul>	<ul> <li>Intervention</li> <li>al group.</li> <li>12 months</li> <li>12 months</li> <li>12 months</li> <li>12 months</li> <li>al tailored</li> <li>standard</li> <li>physical</li> <li>activity</li> <li>advice -</li> <li>based on</li> <li>information</li> <li>present in</li> <li>the</li> <li>computer-</li> <li>tailored</li> <li>programme.</li> </ul>	Baseline 6 months	<ul> <li>standing on T leg; loot</li> <li>pedalling duration);</li> <li>3. Dietary habits;</li> <li>4. Self-reported wellbeing (personal-health; happiness; family harmony).</li> <li>1. Time spent in PA; SB (IPAQ).</li> <li>In addition, in 1 of 6 worksites (n= 57):</li> <li>2. Time spent in MVPA (accelerometer);</li> <li>3. BMI; body fat; blood pressure; heart rate at rest.</li> </ul>
A Randomis ed controllec 3 Parallel groups Internet 5% Randomis ed controllec	<ul> <li>messages to improve physica activity habit.</li> <li>12 months</li> <li>5 Group 1. Online- tailored physical activity advice + 8-week stage- based reinforcement emails.</li> <li>Group 2. Online- tailored physical activity advice.</li> <li>6 months</li> <li>5 ACE (Active, Control of the second second second second second second second second second second second second second second second second second second second second second</li></ul>	<ul> <li>Intervention group.</li> <li>12 months</li> <li>12 months</li> <li>12 months</li> <li>12 months</li> <li>standard physical activity advice – based on information</li> <li>present in l the computer- tailored programme.</li> </ul>	Baseline 6 months	<ul> <li>pedaling duration);</li> <li>3. Dietary habits;</li> <li>4. Self-reported wellbeing (personal-health; happiness; family harmony).</li> <li>1. Time spent in PA; SB (IPAQ).</li> <li>In addition, in 1 of 6 worksites (n= 57):</li> <li>2. Time spent in MVPA (accelerometer);</li> <li>3. BMI; body fat; blood pressure; heart rate at rest.</li> </ul>
d Service Centres (cluster unit) Randomis ed .7 controllec .3 Parallel groups Internet 5% <u>1</u> Randomis ed	<ul> <li>activity habit.</li> <li>12 months</li> <li>Group 1. Online- tailored physical activity advice + 8-week stage- based reinforcement emails.</li> <li>Group 2. Online- tailored physical activity advice.</li> <li>6 months</li> <li>ACE (Active,</li> </ul>	<ul> <li>al group.</li> <li>12 months</li> <li>12 months</li> <li>al activity</li> <li>activity</li> <li>advice -</li> <li>based on</li> <li>information</li> <li>present in</li> <li>the</li> <li>computer-</li> <li>tailored</li> <li>programme.</li> </ul>	Baseline 6 months	<ul> <li>3. Dietary habits;</li> <li>4. Self-reported wellbeing (personal-health; happiness; family harmony).</li> <li>1. Time spent in PA; SB (IPAQ).</li> <li>In addition, in 1 of 6 worksites (n= 57):</li> <li>2. Time spent in MVPA (accelerometer);</li> <li>3. BMI; body fat; blood pressure; heart rate at rest.</li> </ul>
d Centres (cluster unit) Randomis ed .7 controlled .3 Parallel groups Internet 5% <u>1</u> Randomis ed	<ul> <li>activity habit.</li> <li>12 months</li> <li>12 months</li> <li>activity advice + tailored physical activity advice + 8-week stage- based reinforcement emails.</li> <li>Group 2. Online- tailored physical activity advice.</li> <li>6 months</li> <li>ACE (Active,</li> </ul>	<ul> <li>12 months</li> <li>Online non- la tailored</li> <li>standard physical activity advice – based on information</li> <li>present in la the computer- tailored programme.</li> </ul>	Baseline 6 months	<ul> <li>4. Self-reported wellbeing (personal-health; happiness; family harmony).</li> <li>1. Time spent in PA; SB (IPAQ).</li> <li>In addition, in 1 of 6 worksites (n= 57):</li> <li>2. Time spent in MVPA (accelerometer);</li> <li>3. BMI; body fat; blood pressure; heart rate at rest.</li> </ul>
d (cluster unit) Randomis ed controllec .3 Parallel groups Internet 5% <u>1</u> Randomis ed	12 months         12 months         activity advice +         8-week stage-         based         reinforcement         emails.         Group 2. Online-         tailored physical         activity advice.         6 months         5 ACE (Active,	<ul> <li>Online non-</li> <li>tailored</li> <li>standard physical activity advice –</li> <li>based on information</li> <li>present in</li> <li>the computer- tailored programme.</li> </ul>	Baseline 6 months	<pre>(personal-health; happiness; family harmony). 1. Time spent in PA; SB (IPAQ). In addition, in 1 of 6 worksites (n= 57): 2. Time spent in MVPA (accelerometer); 3. BMI; body fat; blood pressure; heart rate at rest.</pre>
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Randomis ed controllec .3 Parallel groups Internet 5% <u>1</u> Randomis ed	<ul> <li>Group 1. Online- tailored physical activity advice + 8-week stage- based reinforcement emails.</li> <li>Group 2. Online- tailored physical activity advice.</li> <li>6 months</li> <li>ACE (Active,</li> </ul>	<ul> <li>Online non-</li> <li>tailored</li> <li>standard</li> <li>physical</li> <li>activity</li> <li>advice -</li> <li>based on</li> <li>information</li> <li>present in</li> <li>the</li> <li>computer-</li> <li>tailored</li> <li>programme.</li> </ul>	Baseline 6 months	<ul> <li>harmony).</li> <li>1. Time spent in PA; SB (IPAQ).</li> <li>In addition, in 1 of 6 worksites (n= 57):</li> <li>2. Time spent in MVPA (accelerometer);</li> <li>3. BMI; body fat; blood pressure; heart rate at rest.</li> </ul>
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Randomis ed .7 controlled .3 Parallel groups Internet 5% <u>1</u> Randomis ed	<ul> <li>Group 1. Online- tailored physical activity advice + 8-week stage- based reinforcement emails.</li> <li>Group 2. Online- tailored physical activity advice.</li> <li>6 months</li> <li>ACE (Active,</li> </ul>	<ul> <li>Online non-</li> <li>tailored</li> <li>standard</li> <li>physical</li> <li>activity</li> <li>advice –</li> <li>based on</li> <li>information</li> <li>present in</li> <li>the</li> <li>computer-</li> <li>tailored</li> <li>programme.</li> </ul>	Baseline 6 months	<ol> <li>Time spent in PA; SB (IPAQ).</li> <li>In addition, in 1 of 6 worksites (n= 57):</li> <li>Time spent in MVPA (accelerometer);</li> <li>BMI; body fat; blood pressure; heart rate at rest.</li> </ol>
ed controlled .3 Parallel groups Internet 5% <u>1</u> Randomis ed	<ul> <li>tailored physical</li> <li>activity advice +</li> <li>8-week stage-</li> <li>based</li> <li>reinforcement</li> <li>emails.</li> <li>Group 2. Online-</li> <li>tailored physical</li> <li>activity advice.</li> <li>6 months</li> <li>5 ACE (Active,</li> </ul>	l tailored standard physical activity advice – based on information present in l the computer- tailored programme. Waiting list	6 months	(IPAQ). In addition, in 1 of 6 worksites (n= 57): 2. Time spent in MVPA (accelerometer); 3. BMI; body fat; blood pressure; heart rate at rest.
.7 controlled .3 Parallel groups Internet 5% <u>1</u> Randomis ed	d activity advice + 8-week stage- based reinforcement emails. Group 2. Online- tailored physical activity advice. 6 months s ACE (Active,	<ul> <li>standard physical activity advice – based on information</li> <li>present in l the computer- tailored programme.</li> </ul>		In addition, in 1 of 6 worksites (n= 57): 2. Time spent in MVPA (accelerometer); 3. BMI; body fat; blood pressure; heart rate at rest.
.3 Parallel groups Internet 5% <u>1</u> Randomis ed	8-week stage- based reinforcement emails. Group 2. Online- tailored physical activity advice. 6 months s ACE (Active,	physical activity advice – based on information - present in l the computer- tailored programme.		In addition, in 1 of 6 worksites (n= 57): 2. Time spent in MVPA (accelerometer); 3. BMI; body fat; blood pressure; heart rate at rest.
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d Randomis ed	6 months s ACE (Active,	programme.		
Randomis	ACE (Active,	Waiting list		
ed		waiting-iist	Baseline	1. Number of out of house
	Connected,	control	6 months	activities;
controlled	d Engaged)	group, and		2. Time spent in SB;
	intervention –	received		lifestyle PA
Parallel	One-to-one	written		(accelerometer);
groups	support from a	materials		3. Lower limb function
	peer volunteer	about local		(SPPB);
Communi	it (activator) to	initiatives.		4. Wellbeing (life-
У	attend local			satisfaction; subjective
	activities			wellbeing; resilience; and
	continuously.			vitality);
				5. Self-perceived barriers
	6 months			to activity in the
				neighbourhood.
	1			
	Communi y	Communit y (activator) to attend local activities continuously. 6 months	Communit y(activator) to attend local activities continuously.initiatives.6 months	Communit y(activator) to attend local activities continuously.initiatives.6 months

#### Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

2 3 4 5			regularly engaging with local groups and Activities.							
6	William	Reduce	Inclusion:	40	Age:	Randomis	WTW	Treatment	Baseline	1. Time spent in SB; light
7	s 2019	sedentary	1. A diagnosis of any serious		I+C: 43 years	ed	intervention	as usual	17 weeks	PA; MVPA
8		behaviour,	mental illness;	I: 20	(20–56)	controlled	including an	which	6 months	(accelerometer);
9	UK	increase	2. Meeting any one of the	C: 20			initial education	consisted of		2. Self-report SB and PA
10		physical	following criteria: i)		Gender:	Parallel	session,	care		(IPAQ);
11		activity.	overweight, ii) at risk of or 🔨		45%	groups	fortnightly	coordinatio		3. Motivation to engage in
12			have diabetes, iii) in the				coaching,	n plus		PA (BREQ-2);
13		(Pilot	clinician's view, have a		Ethnicity:	3	provision of	written		4. Blood biochemistry;
14		study)	sedentary lifestyle, iv) or		50% Black	communit	pedometers and	information		5. Blood pressure;
15			smoke tobacco;		27.5% White	y mental	access to a weekly	on the		6. BMI; waist
16			3. Ability to provide informed		12.5% Mixed	health	walking group.	benefits of		circumference;
1/			consent and understands		7.5 Asian	teams		increasing		7. Mental Wellbeing
10			English;		2.5 Other		17 weeks	activity		(WEMWBS);
20			4. Aged ≥18 years.					levels.		8. Functional mobility
21						0.				(TUG test).

#### 22 **Keys**:

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6MWT = 6-minute Walk Test; ACR/EULAR 2010 criteria = American College of Rheumatology/European League Against Rheumatism 2010 criteria; ARIC = 23 Atherosclerosis Risk in Communities: AOuAA = Activity Questionnaire for Adolescents & Adults: ASSIGN score = a cardiovascular risk score developed by Dundee 24 University (2006); BCG = Behaviour Change Group; BMI = Body Mass Index; BP = blood pressure; BREQ-2 = Behavioural Regulation in Exercise Questionnaire-2; C = 25 26 Control group; CVD = Cardiovascular disease; DINE = Dietary Instrument for Nutrition Education; EPDS = Edinburgh Post Natal Depression Score; EQ-5D/6D = 27 European Quality of Life-5 dimensions/6 dimensions; EQ-VAS = European Quality of Life-Visual Analogue Scale; GI = glycaemic index; GP = General practitioner; 28 GPPAQ = General Practice PA Questionnaire; HADS = Hospital Anxiety and Depression Scale; HCP = Health care provider; I = Intervention group; IDDM = insulin-29 dependent diabetes mellitus; IPAQ = International Physical Activity Questionnaire; IPAQ-C = International Physical Activities Questionnaire-Chinese version; IPAQ-S 30 = International Physical Activity Questionnaire-Short version; KPWA = Kaiser Permanente Washington; MHAQ = Modified Stanford Health Assessment 31 Questionnaire; MI = myocardial infarction; MVPA = Moderate to vigorous physical activity; n = Number of persons; PA = Physical activity; PHQ-8 = Patient Health 32 Questionnaire; RA = Rheumatoid Arthritis; RAQoL = RA Quality of Life; RCT = Randomised Controlled Trial; RPAQ = Recent Physical Activity Questionnaire; SB = 33 Sedentary behaviour; SCORE = Systematic Coronary Risk Evaluation; SD = standard deviation; SDAI = Simple disease activity index; SMART = Specific, Measurable, 34 Achievable, Relevant and Time specific; SPPB = Short Physical Performance Battery; SQUASH = Short Questionnaire to Assess Health Enhancing Physical Activity; 35 STC = Starting the Conversation questionnaire; T2DM = Type 2 Diabetes Mellitus; TEG = Traditional Exercise Group; TUG test = Timed Get Up and Go Test; 36 WEMWBS = Warwick-Edinburgh Mental Wellbeing Scale; WHOQOL = World Health Organization Quality of Life; WTW = Walk this Way 37 38

Study (Author (Year), Country	Aims (whether process evaluation was pre-specified before commencing RCT)	Sample size and sampling method	Study Design (Data collection methods, e.g., mixed methods)	Frameworks for process evaluation
Adams (2012) USA	To explore overweight and obese women's perceptions of benefits, challenges and effectiveness of the intervention to reduce SB and increase PA. (Pre-specified)	<u>I: n= 47</u> All participants in the intervention group were asked to complete the questionnaires at the mid-point of the intervention, and intervention end or withdrawing. <u>1 researcher</u> The researcher leading the PhD project.	Mixed methods: 1. By completing online questionnaires in different weeks during the intervention period, the participants evaluated their perceived benefits and barriers, frequency of using the intervention materials, and the effectiveness and ease of use of the intervention elements; and were asked to provide suggestions for improvement. 2. The researcher recorded her observations of the challenges, benefits, and costs in implementing the intervention. 3. Attendance and retention data were collected to determine attrition	Not specified
<b>Albright</b> (2015) USA	To quantify and compare the barriers to MVPA, frequency of achieving MVPA goals, and the relation of persistent barriers to achievement of goals. (Uncertain whether pre-specified or not)	<u>I: n= 115</u> Study records of all participants in intervention group were used. <u>Staff conducted the telephone counselling</u> <u>sessions</u> Sessions were recorded, then selected for evaluation (Selection method and number of staff included were unclear – assuming random selection of the records).	<ol> <li>Checklist to assess fidelity in 80 of the 1,586 recorded telephone counselling sessions.</li> <li>Quantified information from telephone counselling sessions to evaluate goals set and achieved, and barriers.</li> <li>Study records for assessing the use of intervention materials and attritions.</li> </ol>	Not specified
<b>Benedetti</b> (2020) Brazil	To conduct a comprehensive programme evaluation including all dimensions of RE-AIM using quantitative and qualitative data. (Uncertain whether pre-specified or not)	Participants in the programme Sample size and sampling method not specified, assuming the BCG group only. <u>Staff</u> Professionals delivering the programmes, community health workers, and local and city administrators overseeing public health centers. Sample size and sampling method not	Mixed methods: 1. 12 focus groups and 32 interviews with participants in the programme, staff delivering the intervention, or those overseeing the venues at the end of the trial. 2. Quantitative data in study records about participation, treatment effects, and fidelity. 3. Checklist for assessing implementation. com/site/about/guidelines.xhtml	Framework: RE- AIM Framework (Glasgow et al., 1999)

Berendsen (2015)         To provide an insight into possible barriers and facilitators in execution and sustainability of in primary care. (Pre-specified)         I.n = 247, C, n = 164 (Data principants in intervention and control groups.         Mixed methods: and stratagy for implementation, and sustainability. 2. Questionnaires to participants every 3 months about does and sustainability. 2. Questionnaires to participants every 3 months about does and sustainability. 2. Questionnaires to participants every 3 months about does and sustainability. 2. Questionnaires to participants every 3 months about does and sustainability. 3. HCP registries and logbools completed during the trail about does. fidelity, and attrition.         Frameworks REC (2003); Grant et al (2003); Grant	1		,			1
2       (2015)       into possible barriers and facilitators in advantations in groups.       All participants in intervention and control groups.       1. Face-specifications and second barriers and facilitators in groups.       All Meramework (Giasgow et al., and second barriers) and barriers and facilitators in groups.       All Meramework (Giasgow et al., and second barriers) and barriers and facilitators in groups.       All Participants (Giasgow et al., and second barriers) and barriers (Jointian), and sustainability.       All Participants (Giasgow et al., and second barriers) and barriers (Jointian), and sustainability.       All Participants (Giasgow et al., and second barriers), and second barriers (Jointian), and sustainability.       All Participants (Giasgow et al., and second barriers), and second barriers (Jointian), and sustainability.       All Participants (Giasgow et al., and second barriers), and second barriers (Jointian), and sustainability.       All Participants (Giasgow et al., and second barriers), and second barriers (Jointian), and sustainability.       All Participants (Giasgow et al., and second barriers), and second barriers (Jointian), and sustainability.       All Participants (Giasgow et al., and second barriers), and second barriers (Jointian), and sustainability.       Participants (Giasgow et al., and second barriers), and sustainability.       Participants (Giasgow et al., and second barriers), and second barriers, and facilitators.       Participants (Giasgow et al., and second barriers), and second barriers, and facilitators and end of the trial on facilitator at the end of the trial on facilitator at the end of the trial on facilitators in delivery, anticipate effectiveness of the interview and facilitators in delivering experimenes, parinters, and facilitators in delivering experimenes, an	1	Berendsen	To provide an insight	<u>I: n= 247, C: n= 164</u>	Mixed methods:	Frameworks: RE-
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The       execution and       2. Health Care Providers       and strategy for implementation, and sustainability.       Liman (2002):         Netherlands       sustainability of lifestyle interviews (sampling method not specified).       3. HCP registries and logbooks completed during the intraviews (sampling method not specified).       3. HCP registries and logbooks completed during the intraviews (sampling method not specified).       3. HCP registries and logbooks completed during the intraviews (sampling method not specified).       3. HCP registries and logbooks completed during the intraviews (sampling method not specified).       Framework: MRC Guidance (Zoraj et al. 2008)         10       To understand the trial (2017)       to understand the trial (12 months).       Immediately after the vorkshop, and were ontacted at 6 weeks after the ord of the trial on interviews of weeks after the workshop.       Framework: MRC Guidance (Craig et al. 2008)         11       UK       workshop and participant behaviour change strategies (Pre-specified)       Immediately after the vorkshop, and were interviews of methor exects of the interviews of the end of the trial on intervention, and suggestions for improvement.       Framework: MRC Guidance (Hones).         2       Blunt       To examine the acceptability of the intervention       Immediately after the vorkshop, acceptability of the intervention, and suggestions for improvement.       1. Semi-structured interviews with cache upon programme.       Not specified         2       Coanda       (Pre-specified)       Immediately aftere intervention.       Semi-structur	3		and facilitators in	groups.	HCPs at the end of the trial on fidelity, dose, context	(Glasgow et al.,
Netherlands       sustainability of in primary care. (Pre-specified)       25 Health Care Providers by bystoherapists. 7 dictians, 10 lifestyle advisors (who were practice nurses/ dictiant, physiotherapists). Were selected for the interviews (sampling method not specified).       2.0 eastionnaires to participants every 3 months about dose and satisfaction.       Linnain (2002): should cose and satisfaction.         11       Biddle       To understand the trial outcome findings from workshop, and participant behaviour change strategies. (Pre-specified)       Linnain (2002): strategies.       Linnain (2002): strategies.         11       UK       workshop, and participant behaviour change strategies. (Pre-specified)       Linnain (2002): workshop, ald fare the workshop, ald participants provided feedback immediately after the workshop, ald participant behaviour change strategies. (Pre-specified)       Item 10 and (2002): workshop, ald fare the workshop, ald participants at the end of the trial on interviews at the end of the trial on interview of the strategies. (Pre-specified)       Framework: MRC outcator / Facilitator All participants (n= 39) who attended the interview of all actor and suggestions for improvement. (Pre-specified)       Not specified         12       Canada       (Pre-specified)       Interview, all participants (n= 39) who attended the follow-up assessment at 12 months were interview and suggestions for improvement. (Pre-specified)       Not specified         12       Canada       (Pre-specified)       Interview, and suggestions for improvement. (Pre-specified)       Not specified         12       Canada       (Pre-specified	4 5	The	execution and		and strategy for implementation, and sustainability.	1999); Steckler &
9       Imperview interventions in primary care. in physiotherapists. Y diettians, 10 lifestyle about dose, fidelity, and staristication.       3. HCP registries and logbools completed during the (2013): Grant et al. (2005): Grant et al. (2017)         Biddle (2017)       To understand the trial.       1.m = 71 (Am n = 45 at 6 weeks after the ourcload) workshop. The delivery of the interviews (sampling method not specified).       Mixed methods:       Framework: MRC Guidance (Craig et al. (2005))         10       UK       workshop and participants behaviour change strategies. (Pre-specified)       Contacted at 6 weeks after the workshop, and the trial on following the interviews at the end of the trial on following the intervention, awareness of risk, and suggestions for improvement.       - Framework: MRC Guidance (Craig et al. (2008))         10       To examine the acceptability of the intervention with each workshop educator and facilitator were interviews with each workshop educator and facilitator were interview with coaches upon programme. (Pre-specified)       All participants (n= 39) who attended the follow-up assessment at 12 months were interview with coaches upon programme completion at 6 months, exploring estarcoring to baseline measures, e.g., average step count, and self-rated health.       Not specified         12       Canada       I2 Coaches all rated health.       Intervention, except and subseline measures, e.g., average step count, and self-rated health.       Semi-structured interview with participants at 12 months were for the wavailable due to scheduling conflicts.       Semi-structured interview at 6 months, exploring estarco wi	5	Netherlands	sustainability of	25 Health Care Providers	2. Questionnaires to participants every 3 months	Linnan (2002);
8       in primary care.       advisors (who were practice narses/ dictitany interviews (sampling method not specified).       3. PCP registries and logbooks completed during the trial about dose, fidelity, and attrition.       (2005); Grant et al (2013)         11       Biddle       To understand the trial       1: n = 71 (then n = 45 at 6 weeks after the workshop, n=10 at 12 months)       Mixed methods:       Framework: MRC Guidance (Graig et al, 2008)         13       UK       workshop, n=10 at 12 months)       1: Evaluation sheet completed by participants inmediately after the workshop, and metrate at 0 of the trial on interviews of weeks after the workshop, and participant behaviour change strategies.       (Pre-specified)       Framework: MRC Guidance (Graig et al, 2008)         16       UK       workshop and participant behaviour change strategies.       (Pre-specified)       Framework: MRC (12 months).       Senie trevention, awareness of risk, and suggestions for improvement.       Senie trevention, awareness of risk, and suggestions for improvement.       Senie structured interview with each workshop educator/ facilitator at the end of the trial.       I. Senie structured interview with revention allowing the intervention, awareness of risk, and suggestions for improvement.       Not specified)         26       Canada       programme.       [Pre-specified]       All participants at the end of the trial.       I. Senie structured interview with participants in the view is a facilitator in delivering reparticipants were chosen from the 3 recruiting step count, and self-rated health.       Senie structured 30-minute	7		lifestyle interventions	8 physiotherapists, 7 dietitians, 10 lifestyle	about dose and satisfaction.	Saunders et al.
9       (Pre-specified)       physiotherapists) were selected for the interviews (sampling method not specified).       trial about dose, fidelity, and attrition.       (2013)         Biddle (2017)       To understand the trial Line 7.1 (Interviews (sampling method not specified).       Mixed methods:       Framework: MRC Guidance (Craig et al., 2008)         12       UK       workshop and participants provided feedback immediately after the evorkshop, and were contacted at 6 weeks after workshop, and were contacted at 6 weeks after wards. Invitations sent to 28 participants at the end of the trial.       Denois the end of the trial on following the intervention, awareness of risk, and suggestions for improvement.       2. Educator/ Facilitator were interview at the end of the trial.       Processent at 12 months       4. Face-to-face interview with caches upon programme. correcting to baseline measures, e.g., average step count, and self-rated health.       Not specified       Not specified         2       Euramitic (2017)       To examine the effectiveness of WARA intervention.       1.2 Coaches All caches delivered the intervention, eccept 1 was unavalable due to scheduling conflicts.       Not specified         3       Itervention.       1.2 Coaches All caches delivered after end set the end of the trial, the revention. (Pre-specified)       Not specified         4       Itervention.       1.2 Coaches All caches delivered the intervention. (Pre-specified)       Not specified         4       Itervention.       1.1 m = 10       Semi-structured interview with participants at the	/ 8		in primary care.	advisors (who were practice nurses/dietitian/	3. HCP registries and logbooks completed during the	(2005): Grant et al.
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21       All the workshop educator and suggestions for improvement.         22       Blunt       To examine the interview at the end of the trial.       Interview of the end of the trial.         23       Blunt       To examine the interview at the end of the trial.       Interview of the end of the trial.       Interview of the end of the trial.         24       (2018)       acceptability of the intervention follow-up assessment at 12 months were invited to participants in an interview; 13/32.       I. Semi-structured interviews with coaches upon programme completion at 6 months, exploring the intervention, and suggestions for improvement.       Not specified         29       (Pre-specified)       agreed participants purposefully chosen, according to baseline measures, e.g., average step count, and self-rated health.       Semi-structured interview with participants at 12 months about the experience making health behaviour changes, programme successes and challenges, and suggestions for improving intervention.       Not specified         31       12 Coaches       All coaches delivered the intervention, except       Semi-structured 30-minute phone interview at 6 months to explore participant's views about the effectiveness of WARA hospitals, including both genders, who did and effectiveness of WARA hospitals, including both genders, who did and effectiveness and overall views of the intervention.       Not specified         34       UK       intervention.       Mixed methods: (Pre-specified)       Framework: MRC Guidance (Moore e al., 2015)         34       To examine the effective	20			<u>All the workshop educator and facilitator work</u>	intervention delivery anticipated effectiveness of the	
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24       (2016)       acceptability of the intervention follow-up assessment at 12 months were follow-up assessment at 12 months were experiences, barriers, and facilitators in delivering the intervention, and suggestions for improvement.         26       Canada       (Pre-specified)       agreed participants purposefully chosen, according to baseline measures, e.g., average step count, and self-rated health.       brogramme successes and challenges, and suggestions for improving intervention.         31       12 Coaches       All coaches delivered the intervention, except 1 was unavailable due to scheduling conflicts.       Semi-structured 30-minute phone interview at 6 months to explore participant's views about the effectiveness of WARA intervention.       Not specified         36       (2017)       views regarding the effectiveness of WARA intervention.       Participants were chosen from the 3 recruiting did not change PA level and step counts.       Semi-structured 30-minute phone interviews at 6 months is to explore participant's views about the effectiveness and overall views of the intervention.       Not specified         37       Vik       intervention.       (Jin ot change PA level and step counts.       Framework: MRC Guidance (Moore e articipants at the end of the trial, to explore their al, 2015)       Framework: MRC Guidance (Moore e articipants at the end of the trial, to explore their al, 2015)         34       To examine the by under-standing of participants.       Not specified by misse for participants at the end of the trial, to explore their al, 2015)       Framework: MRC Guidance (Moore e articipants at the end of the trial, t	23		10 examine the	$\frac{1:11=15}{1.11=15}$	1. Selfit-Structured litter views with coaches upon	Not specified
23       Intervention       inforwup assessment at 12 months were invited to participants in an interview; 13/32 according to baseline measures, e.g., average step count, and self-rated health.       experiences, barners, and radinators in derivering the intervention, and suggestions for improvement.         28       (Pre-specified)       agreed participants purposefully chosen, according to baseline measures, e.g., average step count, and self-rated health.       2. Semi-structured interview with participants at 12 months about the experience making health behaviour changes, programme successes and challenges, and suggestions for improving intervention.         31       12 Coaches All coaches delivered the intervention, except 1 was unavailable due to scheduling conflicts.       Semi-structured 30-minute phone interview at 6 months to explore participant's views about the effectiveness of WARA did not change PA level and step counts.       Not specified         36       UK       intervention.       Mixee methods: intervention.       Mixee methods: intervention.         39       UK       intervention.       Framework: MRC Guidance (Moore e al., 2015)         41       To examine the by under-standing of by under-standing of       Nixes-supported group 1: 295 completed by participants, 251 completed by nurses for participants at the end of the trial, to explore their al., 2015)       Framework: MRC Guidance (Moore e al., 2015)         43       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml       al. 2015)	24	(2010)	intervention	All participants (II= 59) who attended the	programme completion at 6 months, exploring	
27       Canada       programme.       invited to participants in an interview; 15/32       the intervention, and suggestions for improvement.         28       (Pre-specified)       agreed participants purposefully chosen, according to baseline measures, e.g., average step count, and self-rated health.       2. Semi-structured interview with participants at 12 months about the experience making health behaviour changes, programme successes and challenges, and suggestions for improving intervention.         31       12 Coaches       12 Coaches         33       12 Coaches       1 was unavailable due to scheduling conflicts.       semi-structured 30-minute phone interview at 6         34       To explore participant       I:n=10       Semi-structured 30-minute phone interview at 6       Not specified         36       UK       intervention.       did not change PA level and step counts.       effectiveness of WARA       Nurse-supported group 1: 295 completed by urses for participants at the end of the trial, to explore their participants at the end of the trial, to explore their       Framework: MRC Guidance (Moore end)         34       Improving introduction of the matheterview only - http://bmjopen.bmj.com/site/about/guidelines.xhtml       Framework: MRC	25	Canada	Intervention	ionow-up assessment at 12 months were	experiences, barriers, and facilitators in delivering	
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29       according to baseline measures, e.g., average step count, and self-rated health.       months about the experience making health behaviour changes, programme successes and challenges, and suggestions for improving intervention.         31       12 Coaches       All coaches delivered the intervention, except 1 was unavailable due to scheduling conflicts.       intervention.         36       Elramli (2017)       To explore participant effectiveness of WARA 0 did and did not change PA level and step counts.       Semi-structured 30-minute phone interview at 6 months to explore participant's views about the effectiveness of WARA 0 did and did not change PA level and step counts.       Not specified         40       Harris       To examine the mechanisms of change by under-standing of participants 251 completed by nurses for participants at the end of the trial, to explore their al., 2015)       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	28		(Pre-specified)	agreed participants purposefully chosen,	2. Semi-structured interview with participants at 12	
30       step count, and self-rated health.       behaviour changes, programme successes and challenges, and suggestions for improving intervention.         31       12 Coaches       intervention, except 1 was unavailable due to scheduling conflicts.       intervention.         33       1 was unavailable due to scheduling conflicts.       Semi-structured 30-minute phone interview at 6 months to explore participant's views about the effectiveness of WARA hospitals, including both genders, who did and did not change PA level and step counts.       Mixed methods:       Not specified         40       Harris (2018)       To examine the mechanisms of change by under-standing of by under-standing of       Nurse-supported group I: 295 completed by participants at the end of the trial, to explore their al, z015)       Framework: MRC         41       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml       Semi-structured phone interviews with explore their       Framework: MRC	29			according to baseline measures, e.g., average	months about the experience making health	
31       12 Coaches       12 Coaches       intervention, except         33       All coaches delivered the intervention, except       intervention.       intervention.         34       Flramli       To explore participant       I: n= 10       Semi-structured 30-minute phone interview at 6       Not specified         36       (2017)       views regarding the effectiveness of WARA       Participants were chosen from the 3 recruiting hospitals, including both genders, who did and intervention.       Semi-structured 30-minute phone interview at 6       Not specified         38       UK       intervention.       did not change PA level and step counts.       Mixed methods:       Framework: MRC         40       Harris       To examine the mechanisms of change by under-standing of by under-standing of participants, 251 completed by nurses for participants at the end of the trial, to explore their al., 2015)       Framework: MRC         41       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml       J. 2015)	30			step count, and self-rated health.	behaviour changes, programme successes and	
32       Image: state of the s	31				challenges, and suggestions for improving	
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34       1 was unavailable due to scheduling conflicts.       Semi-structured 30-minute phone interview at 6       Not specified         35       Elramli       To explore participant       I: n = 10       Participants were chosen from the 3 recruiting       months to explore participant's views about the       Not specified         36       UK       intervention.       did not change PA level and step counts.       effectiveness of WARA       hospitals, including both genders, who did and       effectiveness and overall views of the intervention.       Framework: MRC         39       UK       intervention.       Murse-supported group I: 295 completed by       Mixed methods:       Framework: MRC         40       Harris       To examine the       Nurse-supported group I: 295 completed by       Mixed methods:       Framework: MRC         41       (2018)       mechanisms of change       participants, 251 completed by nurses for       1. Semi-structured phone interviews with       Guidance (Moore end)         43       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml       al., 2015)	33			All coaches delivered the intervention, except		
35Elramli (2017)To explore participant views regarding the effectiveness of WARA hospitals, including both genders, who did and did not change PA level and step counts.Semi-structured 30-minute phone interview at 6 months to explore participant's views about the effectiveness and overall views of the intervention.Not specified36UK (Pre-specified)Intervention. did not change PA level and step counts.Semi-structured 30-minute phone interview at 6 months to explore participant's views about the effectiveness and overall views of the intervention.Not specified40Harris (2018)To examine the mechanisms of change by under-standing ofNurse-supported group I: 295 completed by participants, 251 completed by nurses for participantsMixed methods: 1. Semi-structured phone interviews with participants at the end of the trial, to explore their al., 2015)Framework: MRC Guidance (Moore end al., 2015)44For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtmlFor peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	34			1 was unavailable due to scheduling conflicts.		
36(2017)views regarding the effectiveness of WARA intervention.Participants were chosen from the 3 recruiting hospitals, including both genders, who did and did not change PA level and step counts.months to explore participant's views about the effectiveness and overall views of the intervention.38UKintervention. (Pre-specified)did not change PA level and step counts.effectiveness and overall views of the intervention.40Harris (2018)To examine the mechanisms of change by under-standing ofNurse-supported group I: 295 completed by participants, 251 completed by nurses for participantsMixed methods: 1. Semi-structured phone interviews with participants at the end of the trial, to explore theirFramework: MRC Guidance (Moore end al., 2015)44For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtmlFor peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	35	Elramli	To explore participant	$\frac{1:n=10}{2}$	Semi-structured 30-minute phone interview at 6	Not specified
37 38 39effectiveness of WARA intervention. (Pre-specified)hospitals, including both genders, who did and did not change PA level and step counts.effectiveness and overall views of the intervention.39UK (Pre-specified)intervention. (Pre-specified)did not change PA level and step counts.effectiveness and overall views of the intervention.40 41 42 43Harris (2018)To examine the mechanisms of change by under-standing ofNurse-supported group I: 295 completed by participants, 251 completed by nurses for participantsMixed methods: 1. Semi-structured phone interviews with participants at the end of the trial, to explore theirFramework: MRC Guidance (Moore end al., 2015)44For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtmlFramework: MRC al., 2015)	36	(2017)	views regarding the	Participants were chosen from the 3 recruiting	months to explore participant's views about the	
38       UK       intervention.       did not change PA level and step counts.         39       (Pre-specified)       Image: Completed group I: 295 completed by participants, 251 completed by nurses for participants, 251 completed by nurses for participants at the end of the trial, to explore their       Framework: MRC         40       Image: Completed group I: 295 completed by nurses for participants, 251 completed by nurses for participants at the end of the trial, to explore their       Framework: MRC         41       State of the trial, to explore their       Guidance (Moore end of the trial, to explore their       Guidance (Moore end of the trial, to explore their         42       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	37		effectiveness of WARA	hospitals, including both genders, who did and	effectiveness and overall views of the intervention.	
39       (Pre-specified)       Image: Marris of change by under-standing of by under-standing of by under-standing of state of the trial, to explore their       Nurse-supported group I: 295 completed by nurses for participants, 251 completed by nurses for participants at the end of the trial, to explore their       Framework: MRC Guidance (Moore end of the trial, to explore their al., 2015)         40       Harris (2018)       mechanisms of change participants, 251 completed by nurses for participants at the end of the trial, to explore their al., 2015)       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml       For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	38	UK	intervention.	did not change PA level and step counts.		
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45 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	42 42		by under-standing of	participants	participants at the end of the trial, to explore their	al., 2015)
	45 11			For peer review only - http://bmjopen.bmj.	com/site/about/guidelines.xhtml	

Supplementary file 4. Characteristics of 17 included process evaluations\_27.05.21

Supplementary file 4. Characteristics of 17 included process evaluations\_27.05.21

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UK	how the intervention	All participants (n= 346) and nurses asked to	experiences.	
	was delivered and	complete the alliance questionnaires.	2. Semi-structured focus groups/ interviews with	
	received, and how this		nurses at the end of the trial to explore experiences	
	may have affected the	Nurse-supported group: n= 21, Postal group:	of delivering PA consultations.	
	outcomes.	n= 22	3. Patient alliance questionnaire and nurse alliance	
	(Pre-specified)	Semi-structured interviews: Participants	questionnaire on quality of delivery and participant	
		consented at baseline, completed intervention	responsiveness, covering different intervention	
		at 12 months, selected according to step-count	aspects (e.g., working together and goal-setting.	
		change, and baseline characteristics.	number of appointments).	
			4. Intervention session audio-records and checklists	
		7 Nurses	for fidelity and dose	
		All 8 nurses were invited to focus group/	5 Return of participant's PA diary for participation	
		interviews: 1 was unavailable and did not	fidelity and dose	
		narticinate	6 Trial administrative records about participation	
			dose, and fidelity.	
Lakerveld	To describe the	<u>I: n= 267</u>	1. Trial records for participations, dose, and	Framework: RE-
(2012)	intervention's reach,	All participants (n =314) were asked to	treatment effects.	AIM Framework
	effectiveness in terms	complete the questionnaire.	2. Questionnaires to participants at 6 months to	(Dzewaltowski et
The	of process outcomes,		evaluate satisfaction and effects on determinants of	al., 2004)
Netherlands	adoption, and	<u>8 Practice nurses</u>	lifestyle behavioural change.	
	implementation of	All the nurses delivering the intervention.	3. Questionnaires to nurses at 6 months to evaluate	
	intervention.		the training and their confidence in delivering the	
	(Pre-specified)		intervention.	
			4. 2 counselling sessions conducted by each nurse	
			was tape-recorded to assess the nurse's competence.	
Lane (2010)	To explore the	I: n= 85	3 weeks and 6 weeks after baseline data were	Not specified
	effectiveness and	Participants in the intervention group were	recorded:	-
Ireland	acceptability of	contacted.	Questionnaires were mailed or emailed to	
	intervention booklets.		participants.	
	(Aim is not specified,			
	but assumed			
	according to the			
	reported results; and			
	process evaluation is			
	assumed to be pre-			
	specified)			
Matson	Collecting qualitative	<u>I: n= 22</u>	Semi-structured exit interviews with participants	Not specified
(2018)	results to further	The health coaches reported that 23 of all 29	within 10 days of the final follow-up, to explore their	_
	inform the feasibility	participants were available, interested, or	experiences and perceived health impact of the	
•			· · · · · · · · · · · · · · · · · · ·	

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Supplementar	v file 4.Characteri	istics of 17 includ	ded process evaluations	27.05.21
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USA	and acceptability of	appropriate for the interview, thus the 23	intervention.	
	the interventions.	participants were invited, but 1 participant		
	(Pre-specified)	declined.		
Matthews	To explore the	I: n= 20	Mixed methods:	Frameworks: MRC
(2016)	feasibility of a 12-	Participants who had and did not have	All conducted after the end of intervention:	Guidance (Moore e
	week walking	successful outcomes.	1. Semi-structured interviews or focus groups with	al., 2015), WHO
IK	intervention for adults		participants to explore their attitudes towards	(2001): RE-AIM
	with intellectual	6 Key stakeholders	nhysical activity and walking nerceived henefits	Framework
	disabilities in relation	The health professional delivering the	drawbacks and impact of increased activity	(Glasgow et al
	to context recruitment	intervention: the researcher responsible for	subjective feelings of wellbeing and any changes in	2012). Steckler &
	and retention reach	intervention, the researcher responsible for	view during the intervention period	Linnan (2002)
	implementation and	narticinant with positive study outcomes: 1	2 Interviewe with key stakeholders to gain insight	
	fidality	participant with positive study outcomes, 1	2. Interviews with key stakeholders to gain hisight	
	(Dro gradified)	participant with no significant outcomes; 1	2 Data input approach oct which recorded multiple	
	(Fre-specified)	carer; a uay centre manager	oloments including attendence reasons for	
			elements including attenuance, reasons for	
		N <sub>b</sub>	withdrawal from the study, for gaining insight	
			regarding recruitment, retention and reach of the	
_			intervention.	
Poston	To refine the	$\frac{1: n=9, C: n=12}{2}$	Mixed methods:	Framework:
(2013)	intervention protocol	Participants recruited from each study site,	All conducted after the end of intervention:	Steckler & Linnan
	through process	using a maximum diversity sampling approach,	1. 17 face-to-face and 4 telephone semi-structured	(2002)
UK	evaluation of	following an informed consent procedure.	interviews with participants during their pregnancy,	
	intervention fidelity.		to capture their experiences and perceptions of the	
	(Pre-specified)	130 audio diaries from Health trainers	trial and intervention.	
		Number of Health trainers completed included,	2. Audio diaries of health trainers in which they	
		or sampling method not specified.	reflected on the fidelity and feasibility of the	
			intervention delivery.	
			3. Study database for evaluating attendance.	
School of	To explore the	<u>I: n= 24, C: n= 8</u>	All conducted at the end of the trial:	Not specified.
Public	opinions and	Participants who attended all the 4 sessions	1. Focus groups with participants to explore their	
Health, HKU	experiences of the	were invited.	experiences, and the impact of the intervention on	
(2017)	programme; to		their living habits and wellbeing.	
. ,	evaluate the	8 Social workers and 1 Clerical staff	2. Interviews with staff to collect comments about	
Hong Kong	effectiveness of the	Sampling method not specified.	this study, and suggestions for future improvement.	
0 - 0	programme.		3. Fidelity checks conducted for every session to	
	(Pre-specified)		ensure the quality and implementation of the	
			intervention. Methods and results not reported	
Snittaels	To investigate the	Tailored advice+emails group: n= 128	All completed at the end of intervention:	Not specified
(2007)	effectiveness of	Tailored advice group: $n = 139$ C: $n = 156$	1 Questionnaire to all participants to investigate	in specificu
			$\pm 1$ , $\nabla u \in \mathcal{S}(U)$ $\cap \mathcal{S}(U)$ $\cap \mathcal{S}(U)$ $\cap \mathcal{S}(U)$ $\cap \mathcal{S}(U)$	1

Supplementary file 4. Characteristics of 17 included process evaluations\_27.05.21

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1		intervention outside	All participants were asked to complete the	whether participants remembered the advice, read					
2	Belgium	laboratory.	questionnaire; included participants were	the advice, and considered the advice had had a					
3 ⊿		(Uncertain whether	those responded.	positive impact on their physical activity behaviour.					
4 5		pre-specified or not)		2. Further questions to the Tailored advice+emails					
6				intervention group to investigate the number of					
7				emails received and read, and their opinion on the					
8				provision of emails.					
9	Stathi	To determine the	<u>I: n= 20</u>	Mixed methods:	Framework: MRC				
10	(2019)	relative usefulness of	Sampling method not specified.	All conducted at the end of intervention:	Guidance (Moore et				
11		different intervention		1. Quantitative process evaluation via a self-	al., 2015)				
12	UK	components, to	<u>13 Activators</u>	administered questionnaire which assessed changes					
13		identify ways to refine	Sampling method not specified.	in confidence to get out and about, social support,					
14		or improve the		autonomy, competence, and relatedness.					
15		intervention.	2 Coordinators	2. 14 semi-structured exit interviews and 7 focus					
10 17		(Pre-specified)	Sampling method not specified.	groups conduced with participants, activators and					
18				coordinators, to evaluate the effectiveness and					
19				suggestions of intervention elements.					
20				3. Trial records for evaluating recruitment rate,					
21				attendance, completion rate, and acceptability of the					
22				intervention.					
23	Williams	To establish the	<u>I: n= 5</u>	Mixed methods:	Not specified.				
24	2019	feasibility and	Participants who agreed to be interviewed;	1. Semi-structured interviews to evaluate how					
25		acceptability of the	sampling method unclear.	participants experienced the intervention, and					
26	UK	Walk this Way (WTW)		suggestions for improving the intervention.					
27		intervention		2. Trial records for calculating recruitment rate,					
20 20		(Pre-specified)		attendance, number of participants completed the					
30				intervention and refused outcomes measurements.					
31	Keys: ACR/E	ULAR 2010 criteria = Am	erican College of Rheumatology/ European Lea	gue Against Rheumatism 2010 criteria; ARIC = Atherosc	lerosis Risk in				
32	Communities	; BCG = Behaviour Chang	e Group; BMI = Body Mass Index; C = Control gr	oup; CVD = Cardiovascular disease; GP = General practit	tioner; HCP = Health				
33	care provider; I = Intervention group; IPAQ = International Physical Activity Questionnaire; MRC: Medical Research Council; MVPA = Moderate to vigorous physical								
34	activity; n = n	sumber of persons; $PA = I$	Physical activity; PhD = Doctor of Philosophy; R	CT = Randomised controlled trial; SB = Sedentary behav	iour; SCORE =				
35	Systematic Co	pronary Risk Evaluation;	T2DM = Type 2 Diabetes Mellitus; sTEG = Tradi	tional Exercise Group; WHO: World Health Organisation	l				
36									
37	References for process evaluation theoretical frameworks:								
38 20	Dennelis		The second se						
39 40	Dzewaltowsk	1, D. A., Glasgow, R. E., Kle	esges, L. M., Estabrooks, P. A., & Brock, E. (2004)	. RE-AIM: Evidence-based standards and a web resource	e to improve				
41	translation of	research into practice. A	$\frac{1}{1000}$						
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44			For peer review only - http://bmjopeh.bm	j.com/site/about/guidelines.xntml					

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3 1 -	Study (Year)	Intended delivery (aim/ intervention description)	Actual delivery (difference from the intended delivery)	Intended mechanism (theoretical model/ logic model)
223 24 25	Adams (2012)	<ul> <li>On Our Feet intervention – combination of 2 face-to-face interactive group sessions, and 6 weekly email messages. 1-2 Weeks were led inperson by the researcher. 3-6 Weeks were conducted over the internet, mainly by email.</li> <li>Participants were given feedback on their initial levels of SB and PA, were led through a goal setting activity and provided with selfmonitoring tools, e.g., Actigraph activity monitor. Positively-framed email messages that contained peer-modelled alternatives to sitting and additional behavioural feedback were sent weekly.</li> <li>Control group – waitlist control.</li> </ul>	<ul> <li>(Adaptations)</li> <li>1. Due to schedule conflict for 1 chapter, the initial presentation and the goal setting activity took place at the same meeting instead of respective weeks. Participants received extra email and phone contact to answer any questions during the second week.</li> <li>2. While the same visual aids were used in the initial presentation in each chapter, the depth of explanation for each chapter varied according to the participants' questions.</li> <li>3. Proposed group activity on emotions regarding sitting and some segments of the presentation were reduced or removed because of the time limit for the sessions.</li> <li>4. Software problems causing inaccurate estimates of SB provided to some participants.</li> </ul>	The intervention focused on improving self- efficacy in the Social Cognitive Theory, by addressing 4 self-efficacy construct – mastery experiences, modelling, verbal and social persuasion, and emotional and physiological states. It combined the various stages of changes in the Transtheoretical Model, to reduce SB and increase PA. In the group sessions, video and demonstrations modelled the intervention exercises. Participants set goals and rated their confidence in achieving the goal, which was intended to increase recognition of self-efficacy. The self- monitoring tools assisted the re-evaluation of SB. Tailored feedback on behaviour change facilitated mastery experiences. Group discussions, uses of behavioural cues, and positively-framed emails encouraged and
27 28 29 30 31 32 33 44 55 66 77 88 99 40 11 32 34 55 66 77 89 90 11 32 34 55 66 77 89 90 11 32 34 55 66 77 89 90 11 32 34 45 55 89 90 11 32 34 45 55 80 90 11 32 34 45 55 80 90 11 32 34 45 55 80 90 11 32 34 45 55 80 90 11 32 34 45 55 80 90 11 32 34 45 55 80 90 11 32 34 45 55 80 90 11 32 34 45 55 80 90 11 32 34 45 55 80 90 11 32 34 45 55 80 11 32 34 34 55 80 11 32 34 34 55 55 80 11 32 34 34 34 34 34 34 34 34 34 34 34 34 34	Albright (2015)	<b>TTCW intervention</b> – telephone counselling sessions and a website, tailored to address a woman's specific MVPA benefits and barriers over a 12-month intervention. <i>17 Telephone counselling:</i> The health educator discussed MVPA goals, anticipated barriers and resolutions with participants; tracked MVPA goals (type of activity, duration, and intensity); and provided tailored suggestions on the TTCW website, by email, or mail. <i>Schedule of counselling calls:</i> Phase 1: weekly calls (for month 1); Phase 2: biweekly calls (2 Months and 3 Months); and Phase 3: monthly calls (4 Months to 12	<ul> <li>(Adaptations)</li> <li>1. In TTCW group, only 75% of participants set incremental MVPA goals with a health educator during the intervention period.</li> <li>2. Some initial PA goals were set at light intensity, because the participants were relatively inactive at the beginning of the intervention.</li> </ul>	The tailored TTCW intervention aimed to positively alter the key mediators of PA – personal, social, and environmental factors, to enhance self-efficacy and reduce barriers, using the Social Cognitive theory and Transtheoretical Model theory. Health educators provided counselling calls, using Motivational interviewing, to encourage goals settings, problem-solving, self-monitoring, and self-reinforcement, to integrate PA into daily lives; while preparing the participants to prepare and progress through the stages of change.

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Benedetti (2020)	Months). <i>TTCW website:</i> Contained various resources designed to facilitate MVPA, e.g. behaviour-change tip, calendar listing "baby-friendly" exercise sessions in the community, and newsletters. Participants were informed that the website would be updated 2-3 times per month. <b>SWO (control group)</b> – "standard" PA information was available on the SWO website, e.g., information about how to become more physically active via links to credible sources (i.e., American Heart Association, etc.). Participants in this group did not receive any telephone calls or goal-setting advice about MVPA. Reported as actually delivered interventions.	<ul> <li>BCG - the behavioural change programme that was adapted from "Active Living Every Day" (ALED), delivered by specifically trained nutrition and exercise science professionals working at the HCs. The sessions included a series of topics related to behaviour change, aiming at a more active lifestyle.</li> <li>TEG - received a 12-week exercise class conducted at the local HCs, led by exercise professionals employed by the HCs; 3 times per week for 60 minutes. Each session included warm-up, aerobic exercise at 50–80% of maximum aerobic power, resistance training, and cool-down. Participants' heart rate and ratings of perceived effort were tracked during each session.</li> </ul>	The TTCW website provided information about supportive environments for the participants to exercise; and suggestions about obtaining social support for PA. The BCG was adapted from "Active Living Every Day," or ALED, from the USA (Bors 2009). A series of behaviour change topics were delivered through 12 structured weekly meetings, aiming to achieve a more active lifestyle. The topics included finding new opportunities to be active, overcoming challenges, setting goals and rewarding, gaining confidence, enlisting support, avoiding pitfalls, step by step, positive planning, making lasting changes.
Berendse n (2015)	(Protocol) <b>Supervised programme:</b> 6-7 individual meetings and 26–34 group meetings with PT	<ul> <li>(Differences)</li> <li>1. In both programmes the number of meetings with all HCPs was lower than planned.</li> </ul>	Beweegkuur provided a wide-ranging lifestyle counselling by means of Motivational Interviewing and incorporating the concepts
1 (2015)	meetings, and 26–34 group meetings with PT.	meetings with all HCPs was lower than planned in the protocol. Participants of the Supervised	Interviewing and incorporating the concepts from Self-Determination Theory.

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	Start-up programme (Control): 6 individual meetings with PT. Both programmes comprised 6 individual coaching meetings LSA, 3 individual meetings with a dietitian, and 7 dietary group meetings, for 1 year. The initial individual meetings with the HCPs were to set personal (exercise and nutritional) goals, and identify barriers to a healthy lifestyle through motivational interviewing, which were the basis for meetings. At the end of the programme, each participant met with the LSA to evaluate the lifestyle changes and conclude the intervention.	<ul> <li>programme attended, compared to participants of the Start-up programme, more meetings with physiotherapists, but fewer with lifestyle advisors and dietitians.</li> <li>2. No PT group meetings were planned in the protocol for the control Start-up group, but some PTs organised over 9 meetings. Some PT of the start-up programme only planned group meetings, instead of the intended individual meetings with each participant.</li> <li>3. For both groups, 3 individual meetings with the dietitians were planned in the protocol, but the Start-up group received a median of 4 meetings (7 meetings at 75<sup>th</sup> percentile). On the other hand, some participants did not prefer individual meetings which added fees to participants.</li> <li>4. Some dietitians did not plan individual meetings, and therefore felt there was no opportunity to set individual goals.</li> <li>5. Not all participants reported that they set goals with the PA and dietitian; nor the LSA had explicitly concluded the intervention.</li> <li>6. Not all HCPs were trained in Motivational Interviewing techniques.</li> </ul>	All HCPs addressed goals and barriers in the different aspects of lifestyle, to promote participant's motivation for behaviour change, problem-solving skills, and thus promoting participant's sustainable self-efficacy and environment to engage in long-term PA and healthy dietary behaviour. It has been hypothesised that the additional amount of guidance within the Supervised programme provided additional contacts and guidance, as a hypothesis that the increase in effects on physical activity would lead to bigger treatment effects.
Biddle (2017)	<ul> <li>(Protocol)</li> <li>A comprehensive health assessment, including blood tests, was conducted at the trial baseline clinic. Results were sent to all participants (intervention and control groups) and discussed in the educational workshops with each participant.</li> <li>STAND Intervention – A 3-hour group-based educational workshop, based on the DESMOND and PREPARE structured education protocols, delivered by trained educators; plus a motivational follow-up phone call (6 Weeks) to</li> </ul>	Delivered as intended.	STAND intervention started with a letter sent to participants at risk of T2DM and an invitation for risk tests, then discussing with an educator about the risk information and amount of SB time, by using the Commonsense Model of Illness. The workshop was based on Commonsense Model and Dual Process Theory, in which the trained educators provided information on risk factors and complications relating to T2DM. Participants were encouraged to assess their own health risk, and to identify their modifiable

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ants, for self-monitoring on time spent ry and in PA, and prompting for break olonged times of inactivity. Text es were sent to participants to age adherence to goals and use of the <b>I group</b> – received an information ocusing on key illness perceptions of t risk of T2DM, the importance of		Social Cognitive Theory and Behavioural Choice Theory were also employed in the workshop content, to aid participants identifying health risks associated with excess SB, strategies to reduce SB in their daily life, identifying barriers, and setting goals and action plans. The self-monitoring tool, the Gruve, was provided to facilitate self-regulation of SB.
ng physical activity and decreasing 🦯	20	
ol)	(Adaptations)	HealtheSteps™ was based on the Social
altheSteps <sup>™</sup> programme – provided ials with a specific plan of action to be their PA levels, healthy eating habits, uce sedentary behaviour. hase (0-6 Months): onthly in-person coaching to set otions for physical activity, exercise, and eating; provided by 1 trained Steps <sup>™</sup> coach throughout this phase. is to a Tyze Personal Networks (an ocial network to connect with coaches er participants); phone coaching :s; and a free HealtheSteps <sup>™</sup> hone app (providing virtual coach, heart nitor, step counter, and tracking option tor progress). nance phase I (7-12 Months): in-person g removed, but participants had access all suite of eHealth technology supports. nance phase II (13-18 Months): access to suite of eHealth technology supports.	The central research team scheduled coaching sessions for some coaches, resulting that some participants had different coaches at each session.	Cognitive theory of self-regulation. The mobile app, online tools and resources, and initial supports from the coaches facilitated positive health behaviour changes and self-management of own risk factors for chronic disease. Individualised lifestyle prescriptions were given to participants in the initial phase, using Motivational Interviewing and SMART goal setting principles (specific, measurable, attainable, realistic, and timely for the participant). These aimed to produce positive behaviour change and overcome potential barriers.
e s n n t n g l n s d	r participants); phone coaching ; and a free HealtheSteps™ one app (providing virtual coach, heart itor, step counter, and tracking option or progress). <i>ince phase I (7-12 Months):</i> in-person ; removed, but participants had access Il suite of eHealth technology supports. <i>ince phase II (13-18 Months):</i> access to uite of eHealth technology supports I, and participants only had access to	r participants); phone coaching ; and a free HealtheSteps™ one app (providing virtual coach, heart .itor, step counter, and tracking option or progress). <i>ince phase I (7-12 Months):</i> in-person ; removed, but participants had access ll suite of eHealth technology supports. <i>ince phase II (13-18 Months):</i> access to uite of eHealth technology supports I, and participants only had access to Ear pear raview only. http://bmiepea.hmi.com/site/about/guidelings.th

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	publicly available resources and tools.		
	<b>Comparator group (waitlist control)</b> – This		
	group continued with usual activities without		
	intervention from the study team for the first		
	6-month period. After the 6 Months follow-up		
	measurements, participants were given the		
	opportunity to start the 6-month		
	HealtheSteps™ programme.		
Elramli	Reported as actually delivered interventions.	The WARA intervention consisted of 2	The WARA programme was based on the Social
(2017)		components – PA component: a pedometer	Cognitive Theory, focusing on self-efficacy; and
		supported walking programme, aiming to	incorporated behaviour change techniques,
		increase participant's average daily step count by	particularly self-monitoring, feedback, and
		3000 steps above their baseline value, on at least	social support.
		5 days of the week by 6 months, and to maintain	
		for up to 12 months; and to comply with the UK	The group education sessions aimed to provide
		physical activity guidelines (2011) recommended	social support; increase the participant s
		of a total of 150 minutes per week.	awareness and knowledge of their condition,
		Educational component: 6 weekly interactive	and encourage PA increase. I herefore, the
		group (up to 6 persons) sessions, each lasted 1	participant's sen-encacy increase.
		Months) providing support to participants to	Sotting goal of stop, count, using padamater and
		evaluate their PA levels and harriers	PA diary facilitated self-monitoring with
		A WARA booklet was provided to participants	feedback from the pedometer thus increased
		describing the importance of walking	individual motivation to achieve behaviour
		strengthening exercise, reducing SB, and a healthy	change.
		diet for health benefits.	ondiger
			The WARA booklet provided health information
		<b>Control group –</b> 1-hour single education group	which further increased the participant's
		session (up to 6 persons), included topic	knowledge and awareness (self-efficacy) of self-
		regarding the importance of physical activity and	management and PA for RA.
		healthy diet.	
Harris	(Protocol)	(Adaptations)	The intervention resources used behaviour
(2018)	Pedometer-plus-nurse-support group –	1. Nurses and participants adapted and	change techniques (BCTs).
	Pedometer and written instructions for a 12-	tailored step count target to individual	
	week walking intervention, based on the	circumstances, e.g., adjustments were made to	3 PA consultations with the practice nurse were
	participant's usual step-count provided. In	the intervention to accommodate religious	divided into 3 stages – First steps, Continuing
	addition, 3 PA consultations with a practice	observances, such as Ramadan and Christmas;	the changes, and Building lasting habits. They

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2 3 4 5		nurse, individually or as a couple. <b>Pedometer-alone group –</b> a pedometer, and a 12-week pedometer-based walking	<ul> <li>during illness; and changes in weather.</li> <li>2. Nurses adapted participant's preferences for interventional materials when tailoring advice, e.g., counting walking by time instead of</li> </ul>	included motivational interviewing, health information about PA, suggestions to increase PA, action planning, goal setting, self- monitoring, relapse prevention, which aimed to
7		programme, posted to the participants. The	step-count; whether to use the optional	effect positive changes in participant's step
8		programme was based on the participant's	handouts or not.	count, PA and SB times; thus longer-term
9		baseline step-count. On study completion (1	3. Not all participants altered their walking	changes in walking habits and health benefits.
10		year from baseline), participants in this group	targets; some might have decreased PA level as	
11		were offered a single practice nurse PA	the target.	The patient handbook provided the same
12		consultation.		information as in the nurse consultations.
13				
14		<b>Control group</b> – No PA intervention. They		Step count diary provided suggestions and
15		were offered to choose either receiving a		instruction for the 12 weeks walking
16		pedometer and the written 12-week 🛛 💦		programme. Participants could set goals, self-
17 10		pedometer-based walking programme, by post,		monitor with feedback from pedometer to
10		or as part of a single practice nurse		increase step count.
20		consultation.	h h	
21	Lakerveld	(Protocol)	(Adaptations)	The cognitive behavioural programme (CBP)
22	(2012)	Intervention group – Each participant was	Actual intervention duration is unclear: The	applied the Theory of Planned Behaviour (TPB)
23		free to choose the own target lifestyle	number of sessions and schedule described in the	and the theory of self-regulation, with 2
24		component(s) (smoking, physical activity or	results report (Lakerveld et al., 2013) matched	counselling techniques - Motivational
25		diet). Nurse practitioner provided the CBP to	the protocol; but the report stated the	interviewing (MI), and problem-solving
26		increase participant's motivation and ability to	intervention generally lasted up to 6 months.	treatment (PST).
27		change their dietary pattern, physical activity		
28		or smoking behaviour, maximum of 6		A nurse practitioner used MI to explore the
29		individual 30-minute counselling sessions		participant's attitude and intention to make
20 21		(weekly then reduced to every 2-3 weeks, for		lifestyle behaviour change, then resolve the
37		2-4 months); then 3-monthly telephone		ambivalence between the goal and the actual
33		booster sessions for 12 months. The total		situation. Afterwards, the nurse practitioner
34		intervention period, including booster calls,		used PST to prompt the participant to find
35		will be 16 months. The MI and PST counselling		solutions for barriers and reinforcing perceived
36		methods were used.		control for behaviour change. When setting new
37				goals was needed, the same process would be
38		<b>Control group</b> – Received written information		started again.
39		about their risk of developing T2DM and CVD,		
40		and brochures of health guidelines regarding		The nurse practitioner guided the participant to
41		physical activity, healthy diet, and smoking		gradually increase the sense of mastery over
4∠ 43		cessation.		difficulties and be more active in planning and

			implementing activities.
Lane	Reported as actually delivered interventions.	Intervention group – Participants answered a	The tailored intervention applied the trans-
(2010)		question about the stages of change at baseline.	theoretical model (TTM), which posits that
		The answer determined either both intervention	individuals move through stages of change while
		booklets or just one of them to be posted. The	learning and adopting new behaviours.
		booklets provided information on physical	
		activities and motivation to change, tailored to the	The intervention consisted of two print
		participant's readiness to change.	booklets, specific to the initial and later stages of motivational readiness. The booklets were
		<b>Control group</b> – Received a healthy eating and	adapted for Irish women to promote physical
		nutrition booklet, developed by the Irish Heart	activity, which were broadly based on the TTM
		Foundation, An Bord Bia and the Health	model.
		Promotion Unit, by post, as placebo treatment.	
			The booklets contained information and
			structured approaches and strategies, designed
			to alter self-efficacy, social support, outcome
		r -	expectancy and barriers to physical activity,
			tailored to the individual's readiness to change
			and may subsequently modify physical activity
			behaviour.
Matson	(Protocol)	Delivered as intended.	I-STAND intervention was based on behavioural
(2018)	<b>STAND intervention</b> – consisted of 6 health		theories, including social cognitive theory, the
	coaching sessions provided by a trained Health	· · ·	ecological model, and habit formation theory.
	Coach, an educational information workbook,		
	SB feedback charts, and a Jawbone UP band.		Health coaching sessions focused on using
	6 health coaching Sessions: 2 in-person sessions		different types of reminders, building self-
	(first 2 weeks, 45-60 minutes each), providing	1	efficacy through motivational interviewing,
	and explaining the workbook, feedback chart,		problem-solving barriers, and setting
	and Jawbone UP wristband to participants;		personalised action plan and graded goals.
	discussing tailored reminder strategies and		(Social cognitive theory, habit formation theory)
	setting goals and action plan.		I ne workbook and coaching sessions included
	After that, 4 bi-weekly phone calls: (20-40		social support, social environment and norms,
	minutes each) from the Health Coach, to review		evaluating participant's environment, to
	progress on goals and action plans, problem-		consider the possible changes. (Ecological
	solve darriers, use the workbook to guide		The uniet were lawhone UD hand device
	participants on different types of reminder.		The wrist-worn Jawbone UP band device
	Pagad on data from nortiginant's activDAL		vibrated every 15 minutes of macuvity. This
	Based on data from participant's activerate wear		served as an outward reminuer strategy for

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2 3 4 5 6 7 8 9 10 11 12 13 14 15		at baseline, SB feedback charts 1 Week, and 6 Week were provided to participants. <b>Healthy Living Control group</b> – 1 in-person health coaching session: Participants were provided a health education workbook containing topics about ageing and instructed to work on 1 topic every 2 weeks using a goal- setting worksheet. Every 2 weeks, participants received a check-in letter and asked to complete and return a review progress form.		disrupting the habitual SB, to promote behaviour change and new habits of taking breaks from sitting (habit formation theory).
16         17         18         19         20         21         22         23         24         25         26         27         28         29         30         31         32         33         34         35         36         37         38         39         40         41         42         43	Matthews (2016)	(Protocol) Walk Well intervention – 12-week community-based walking programme, consisted of 3 physical activity consultations with a walking advisor; aimed to increase walking by 30-minutes on at least 5 days per week. Participants were provided with education booklets, a pedometer and step diary. Waiting list control group – were advised to continue with their daily activity for 12-weeks, following which they were invited to participate in the Walk Well intervention.	<ul> <li>(Adaptations)</li> <li>1. Some participants experienced difficulty in reading the pedometer and recording step counts in the diary, thus adapted the diary to an alternative "tick box" to indicate having walk(s).</li> <li>2. The physical activity consultations were refined and streamlined to focus on the core components, and flexible options of additional behaviour change techniques for adults with intellectual disability.</li> <li>3. Walking groups were not planned, but expected by some participants, thus arranged by the care centres and carers.</li> </ul>	<ul> <li>Walk Well was based on the Social Cognitive theory and Trans-theoretical Model.</li> <li>The PA consultations method focused on 4 core behaviour change techniques: goal setting; self-monitoring; developing self-efficacy; and mobilising social support. Furthermore, the walking advisor tailored the use of additional behaviour change techniques according to the participant's needs. The aim was autonomy and motivation of the participants to lead a more active lifestyle.</li> <li>Input and engagement from carers provided social support from them directly, and their arrangement for group walks among participants.</li> <li>The education booklets with visual images and appropriate text provided and reinforce health information.</li> <li>Pedometer and step diary complemented the PA consultation, to motivate the participant to set goals and self-monitor step count.</li> </ul>

			•
Poston (2013)	Reported as actually delivered interventions.	<ul> <li>Participants were recruited in early 2<sup>nd</sup> trimester (&gt;15<sup>+0</sup> weeks to &lt;17<sup>+6</sup> weeks' gestation) to allow adequate time for the intervention programme that was planned to end at each participant's 27<sup>+0</sup> and 28<sup>+6</sup> weeks' gestation.</li> <li>All women attended routine antenatal care appointments and received advice regarding diet and physical activity (PA) in accordance with local policies, which draw on UK NICE guidelines.</li> <li>Intervention group – participants attended a one-to-one appointment with the HT, provided with a pedometer, a logbook for setting goals and self-monitoring, and a DVD of exercise regime for pregnancy. After that, 8 weekly group sessions from approximately 19 weeks' gestation. The programme included dietary advice choosing low GI food and reducing saturated fats, and increasing daily PA level during pregnancy safely.</li> <li>Control group – standard care, with additional appointments with the study midwife at 27+0 - 28+6 and 34+0-36+6 weeks', where possible coinciding with routine antenatal visits.</li> </ul>	The intervention was based on the Control Theory, and Social Cognitive theory. Participants were provided with a pedometer, logbook, an exercise DVD, to set, self-monitor, and achieve SMART (Specific, Measurable, Achievable, Relevant, and Time Specific) goals for diet and PA, using self-regulation techniques from the Control Theory. The group sessions facilitated self-identification of benefits and barriers to behaviour change, which facilitated self-efficacy, and provided social support.
SPH HKU (2017)	Reported as actually delivered interventions.	<ul> <li>PA group – received 4 group sessions: 2.5-hour interactive knowledge and motivation enhancement core session at baseline, a 1.5-hour experience sharing booster session at 3 Months, 2.5-hour tea gathering family session at 6 Months, and a Holistic Health session at 1 Year. 16 monthly/bi-weekly health-related text messages to mobile phone for knowledge enhancement and as reminders till one year after baseline.</li> <li>Control group – received the same intervention framework and methods and the same number and duration of sessions, about Healthy diet.</li> </ul>	The PA group intervention was guided by the Health Action Process Approach (HAPA), which proposes motivation, goal setting and planning enhance intention, thus promote its conversion to action. The intervention aimed to enhance knowledge, self-efficacy, and motivation in relation to practising ZTEx The conceptual framework proposed that the participants pass the intervention information positively and encourage their family to practise the actions together. Through these family actions and communication, the wellbeing and

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			harmony of the family were enhanced.
		Fidelity evaluated but not reported.	
			The strategies included:
			1. Introducing information on the consequences
			of physical inactivity, obesity and ZTEx (risk
			perception);
			2. Enhancing skills and confidence in the ability
			to do ZTEx (exercise self-efficacy);
			3. Associating the health behaviour to the
			positive outcomes of the trainees (outcome
			expectations); and
			4. Introducing cognitive dissonance, i.e., a
			discrepancy between participants' belief
			(including a pledge to eat) and behaviour
			(failure or potential failure to act) to promote
			intrinsic motivation to change behaviours.
			The mechanism of changes for the Healthy diet
			Intervention (control) was the same, but
Crittaala	Departed as actually delivered interventions	Tailand information and minforgement	According to each individually store of shares
spittaels	Reported as actually derivered interventions.	amoreu information and reinforcement	the tailored advice was provided to participants
(2007)		Tailored advice: Participants completed a	has a din Transtheoretical model. The content
		questionnaire about their PA and neychosocial	applied the constructs of Theory of Planned
		determinants on the study's intervention website	Behaviour i.e. intentions attitudes self-efficacy
		subsequently, the tailored advice containing	social support, knowledge, benefits and barriers
		normative PA feedback and suggestions to	to physical activity.
		increase PA levels were produced from it.	
		Participants having intentions to increase PA	Participants indicated with positive intentions
		levels were encouraged to make an action plan.	to increase their PA levels in the online
			questionnaire were then encouraged by the
		<i>Emails:</i> After receiving the first tailored advice,	website to make a personal action plan to
		participants received regular emails (5 emails in 8	implement behaviour changes.
		weeks), which asked participants to identify their	
		current stages of change, then referred to a	Reinforcement emails assessed and followed the
		corresponding website with personalised	participant's stage of change, then directed the
		information to encourage behaviour changes.	participant to pertinent online advice to further
			encourage behaviour changes.

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		<ul> <li>Tailored information group: Participants received the tailored advice online but did not receive reinforcement emails.</li> <li>Standard advice (Control): Participants received standard physical activity advice from a website, based on information presented to the other 2 groups, but not individually-tailored, e.g., the benefits of PA, current public health recommendations, the difference intensity PAs, and suggestions to be more physically active.</li> </ul>	
Stathi (2019)	Reported as actually delivered interventions.	Activators attended a 2-day training course, and received an intervention delivery manual. They were trained on the protocol for types and frequency of interactions with the participants; also encouraged to be flexible according to individual needs. Each participant was invited to attend a 6-month programme: <i>Motivation stage (first 2 weeks)</i> – 2 one-to-one meetings with an activator to support motivation, build rapport, review local activities, and consider and address any barriers to participation. <i>Action stage (1-3 Months)</i> – $\geq$ 3 visits to local initiatives with the activator. <i>Maintenance stage (3-6 Months)</i> – Support provided by telephone, and $\geq$ 2 further visits with the activator to encourage the participant to attend local activities independently. Participants could engage in a wide range of activities at the Action and Maintenance stage, e.g., bowling, ballroom dancing, lunch clubs, walking groups, and art classes. 2 social events were organised for all participants and activators to facilitate within group support and encourage more local engagement.	Intended processes of behaviour change during the three stages of the ACE intervention followed the principles of Self Determination Theory, to facilitate the participant's developing autonomous motivation, confidence, and competence for getting out and about. In the Motivation stage, the participant engaged in social support from the activator, understood the process, and explored and enhanced motivation for actions. In Action stage, the participant made plans with the activator to try out interested activities and monitored progress. In Maintenance stage, the participant was encouraged to continue with the activities more independently, while the support from the activator was reduced. It was shypothesised that participants in the ACE intervention would attend more out-of- house activities, and better motivation to lead an active lifestyle in the long term.

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		about local initiatives only, but were offered the intervention at the end of study period.	
Williams (2019)	<ul> <li>(Protocol)</li> <li>Walk This Way intervention – amended from the Walk, Address sensations, Learn about exercise, encourage exercise behaviour for persons with schizophrenia spectrum disorders ('WALC-S') programme <i>Initial group education session:</i> 5-10 participants; participants were provided a pedometer for self-monitoring and calendar for recording; setting goals for increasing habitual walking level.</li> <li><i>Continuing support and coaching:</i> every 2 weeks (20-30 minutes), an assigned coach met the participant to review the participant's walking calendar, identify and address barriers and facilitators to increase PA and decrease SB, and provide motivational support to the participant to reach.</li> <li>Weekly walking group: the coaches arranged and invited all participants to an optional weekly group walk (2 hours).</li> <li>Control condition – Received written information on the benefits of increasing activity levels. This advice was given in accordance with the NHS Foundation Trust</li> </ul>	Delivered as intended.	<ul> <li>The Walk this Way intervention employed the COM-B model of behaviour change principles t address capability, opportunity, and motivational barriers to reducing SB and increasing PA.</li> <li>The Initial education session aimed to enhance motivation and self-efficacy to make behaviour change.</li> <li>Health coaching sessions used the REACH© model of coaching, emphasising individual's accountability involves thinking, feeling, and doing to achieve the self-identified goals. Healt information of PA, support and motivation for goal attainment were provided to facilitate the participant to increase walking into daily routine independently.</li> <li>The participant's walking goal was set with SMART (Specific, Measurable, Attainable, Realistic and Timely), self-monitored by pedometer and calendar; the step count and factors affecting attainment were discussed wi the coach.</li> </ul>
	poncy on physical health.		provided social support to the participants

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#### Supplementary file 5. Delivery and mechanisms\_27.05.21

 Relevant, and Time Specific; STAND = Sedentary Time ANd Diabetes; SWO = Standard website-only; TEG = Traditional exercise group; TTCW = Tailored telephone counselling plus website; WARA = Walk for Rheumatoid Arthritis; ZTEx = Zero Time Exercise

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Supplementary file 6. Implementation data\_27.05.21

Study (Year)	Fidelity (delivering the intervention as per protocol)	Recruitment (recruiting participants and sites)	Retention (participants remaining in the intervention or control/usual care group)	Reach (dose received and participant engagement)
Adams (2012)	Only qualitative data reported.	10 clusters invited. 7 clusters recruited (needed active membership n≥12).	I: n= 40 (85.1%) C: n= 24 (85.7%)	23/40 (58%) participants always used 2 of 3 intervention elements
		Forpeerro	<ul> <li>Primary reasons for leaving the study:</li> <li>55% (6/11) Having to wear the activity monitors.</li> <li>18% (2/11) Time commitment too great.</li> <li>18% (2/11) Had not understood length of study.</li> <li>9% (1/11) Went out of town unavagetedly.</li> </ul>	Overall satisfaction with the programme (Likert scale, 1= not at all, 5= very satisfied): 39.5% (17/43) participants rated very satisfied (highest %). 97.7% (42/43) participants rated at least "3= somewhat" or above.
Albright (2015)	<ul> <li>5% (80/1586) recorded telephone counselling sessions evaluated against a checklist of the essential intervention components:</li> <li>88% fidelity over the 12- month intervention to the essential intervention components.</li> <li>96% calls covered barriers to MVPA discussion.</li> <li>97% calls covered assessing participant's previous MVPA goal.</li> <li>100% calls covered setting the</li> </ul>	Community recruitment: 272 via adverts, e.g., magazines, radio stations; 170 randomised, Kaiser Permanente recruitment: 3844 Postcards sent out; 1176 calls made; 419 interested in joining; 141 randomised.	I: n= 115 (74.7%) C: n= 127 (80.9%) Most frequent reasons for failure to complete the intervention: 13% Pregnancy. 9.5% Too busy. 6.1% Discontinued participation, no given reason. 3.5% Family/job issues.	<ul> <li>TTCW group:</li> <li>90.4% of the participants receiving ≥13 of the 17 scheduled calls.</li> <li>78.3% of the participants viewed the website at least once.</li> <li>75% of participants set incremental MVP. goals with a health educator during the counselling sessions over the 12-month intervention period.</li> <li>Level of achieving set MVPA goals in the 3 phases among all participants:</li> <li>High level (≥100% of MVPA goal achieved or exceeded):</li> </ul>

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	frequently not delivered: Pedometer steps (asked in 68.8% calls). MVPA resources (offered in 80% calls).			calls). 42.0% of time during Phase 3 (monthly calls). Moderate level (50-99% MVPA goal achieved): 23.5% of the time during Phase 1. 28.4% of the time during Phase 2.
		Forpo		<ul> <li>21.1% of the time during Phase 3.</li> <li>Low level (0-49% MVPA goal achieved):</li> <li>35.8% of the time during Phase 1.</li> <li>31.7% of the time during Phase 2.</li> <li>36.9% of the time during Phase 3.</li> </ul>
Benedetti (2020)	Checklist to assess implementation, including programme fidelity, instructor knowledge, classroom, schedule, participants' attention and attendance: All analysed items achieved an average of 98% fidelity.	<ul> <li>2 of 5 health districts in Florianopolis were interested in participating, consisting 20 of 50 HCs.</li> <li>6 HCs were interested, and had the physical structure and human resources to offer the programmes, thus were recruited.</li> <li>4,071 older adults across the 6 HCs; 24.2% (985) individuals were considered eligible; 11.5% (114) of eligible participants recruited.</li> </ul>	Post-intervention (3 months): BCG: n= 18 (50%) TEG: n= 33 (63.5%) C: n= 23 (88.5%) 6 months: BCG: n= 17 (47.2%) TEG: n= 32 (61.5%) C: n= 21 (80.8%) 12 months: BCG: n= 13 (36.1%) TEG: n= 28 (53.8%) C: n= 17 (65.4%)	Overall, 49% of participants attended at least 75% of all sessions, with disengagement occurring mostly in the first three weeks of the study (42%). Both intervention groups showed relatively high disengagement rates (BCG 50% vs. TEG 37%) with individuals in the BCG presenting lower rates of overall attendance (27% vs. 47%).
Berendse n (2015)	Fidelity: 24/25 interviewed HCPs were trained in Motivational Interviewing, and applied MI with the participants. 100% PTs made an exercise	30 clusters invited. 411 participants recruited (with 2 to 30 subjects per cluster, 76.9% of participants referred by the GP). Eligibility based on baseline data:	28 clusters remained Participants: I: n= 196 (79.4%) C: n= 126 (76.8%) From recorded data, the	% = median of attended / planned number of meetings: LSA meetings: I: 50.0%; C:66.7% PT group meetings: I: 47.1% to 61.5%; C: 0% (planned n= 0)
	plan with the participants.	- 48.9% met the inclusion criteria. - 10.0% healthy BMI/no comorbidities.	main reasons of drop-outs were health issues (31.5%),	PT individual meetings: I: 0% (planned 6 to 7); C: 33.3%

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2	84.8% of the participants set	- 16.8% higher weight-related risk than the	and personal reasons	Dietitian group meetings:
3	exercise goals or made an	target population.	(10.1%).	I: 42.9%: C: 28.6%
4	exercise plan with an HCP	- 24 3% of participants' eligibility could not		Dietitian individual meetings
5	79.9% Exercise plans or goals	he checked		I. 33 3% (· 133 3%
6	woro mado with PT if	be encered.		1. 55.570, G. 155.570
7	were made with P1, if			Satisfaction (on cools of 1, 10, 10 is heat).
8	participants attended any			Satisfaction (on scale of 1–10, 10 is best):
9	individual meeting with a PT.			Mean range (across meeting types):
10				1: 7.1 – 8.0
11	5/6 dietitians made			C: 7.1 – 7.3
12	nutritional plans with the			Overall programme (Mean (SD)):
13	participants. 73.9% of the			I: 7.7 (1.5)
14	participants made set			C: 7.1 (1.8)
15	nutritional plan or goals with			
16	an HCP. 91.7% of the plans or			
17	goals were made with the	Co		
18	dietitian, if participants			
19	attended any individual			
20	meeting with a dietitian.			
21				
22	96.9% participants reported			
23	I SA had explained the		$\mathbf{Q}$ .	
24	intervention clearly at the			
25	haginning			
20	beginning.			
27				
20	226 participants (from both IG			
30	and CG) completed a			
31	questionnaire after 12			
37	months:			
32	40.7% Reported the LSA had			
34	explicitly concluded the			
35	intervention.			
36	41.2% Reported the			
37	intervention was not			
38	concluded.			
39	18.1% Did not know.			
40				
41	Dose Delivered:			
42	1 PT in start-up programme			
43				1

2 3 4 5 6 7 8 9 10 11 12 13 14		only planned group meetings with all HCPs, instead of the individual meetings intended per protocol. 4 dietitians typically offered individual meetings with participants, as per protocol. The other 4 dietitians only planned individual meetings according to participant's preference.			
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43	Biddle (2017)	Not reported	Not reported	*I: n= 41 (43.6%) *C: n= 68 (73.1%) Reasons for failure to complete the intervention or loss to follow-ups: 24.5% (23/94) Did not receive allocated intervention in the intervention group. 16% (30/187) No longer want to participate. 13.4% (25/187) Failed to attend FU appointment.	<ul> <li>23/94 (24%) allocated to intervention group did not attend the structured education workshop.</li> <li>45/94 (47.9%) took part in Week 6 phone progress reviews</li> <li>26/31 (84%) participants used the accelerometer daily initially, but this fell to 13/31 participants at 6 weeks.</li> <li>25/31 (81%) participants felt the accelerometer as helpful at 6 weeks.</li> <li>Workshop feedback: Behaviour change plans for future (6 weeks): 4/38 (11%) referred to strategies to sit less 17/38 (45%) planned for physical activity Others referred to desired health outcomes</li> <li>"Best bits" of the workshop (mentioned most frequently): 1. information on diabetes; 2. the atmosphere of the workshop; 3. Receiving personal data on</li> </ul>

## Supplementary file 6. Implementation data\_27.05.21

				sitting levels and health.
				Behaviour change strategies attempted reported by participants: 18 strategies mentioned to sit less and 8 strategies to move more
Blunt (2018)	Only qualitative data reported	*How recruited participants heard about the study: 51 (45%) from posters or handouts; 28 (25%) received an email from the study site advertising the project; 15 (13%) from an in-person study recruiter; 12 (11%) referred by their health care provider (HCP) and/or HCP team; 6 (5%) by word of mouth; 1 (1%) other unspecified methods Five did not specify how they heard about the study	*6 months: I: n= 44 (74.6%) C: n= 46 (78.0%) 3.4% (I: n= 2) Did not attend any session 6.8% (I: n= 5, C: n= 3) Personal/health reasons 3.4% (I: n= 3, C: n= 1) Time commitment 5.9% (I: n= 2, C: n= 5) No longer interested *12 months: I: n= 37 (63%) *18 months: I: n= 35 (59%)	<ul> <li>*Attendance:</li> <li>5% attended no sessions;</li> <li>17% attended 1 session;</li> <li>10% attended 2 sessions;</li> <li>20% attended 3 sessions;</li> <li>48% attended all 4 sessions.</li> <li>Across all sites, 40 participants (68%)</li> <li>were classified as programme complete</li> <li>Among participants who completed the</li> <li>intervention programme, 30% attended</li> <li>in-person sessions, 70% attended all 4</li> <li>sessions.</li> </ul>
Elramli (2017)	Not reported	<ul> <li>320 participants invited:</li> <li>106 (33.1%) did not respond;</li> <li>122 (38.1%) ineligible;</li> <li>92 (28.8%) assessed for eligibility;</li> <li>76 (23.8%) randomised</li> </ul>	3 months: I: n= 36 (92.3%) C: n= 26 (70.3%) 6 months: I: n= 37 (94.9%) C: n= 22 (59.5%)	Intervention attendance: 26 (66.7%) participants attended all 8 education sessions (6 sessions and 2 booster sessions) 28 (71.8%) attended 6 sessions 71.8% attended the first booster session 76.9% attended the second booster session Control group attendance: 21 (56.8%) participants attended the single group advantion account
Harris (2018)	Nurse session attendance and session content delivered	11,015 people invited to participate; 6,399 did not respond;	3 months: Postal: n= 335 (98.8%)	Diary returned: Postal: 268/339 (79%)

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2		recorded by the nurses after	548 were excluded as a result of self-	Nurse: n= 335 (96.8%)	Nurse: 281/346 (81%)
3 ∧		each session.	reported PA guideline achievement;	C: n= 335 (99.1%)	
4 5			1,023/10,467 (10%) were randomised.		Pedometer use (every day or most days)
6		Fidelity to content delivered		12 months:	during 12-week intervention:
7		was high in all sessions; the		Postal: n= 319 (94.1%)	Postal: 238/294 (81%)
8		mean number of items		Nurse: n= 317 (91.6%)	Nurse: 269/303 (89%)
9		delivered in session one was		C: n= 329 (97.3%)	
10		11 (range 10–11); six (range	*		Attending nurse sessions:
11		5–6) in sessions 2 and 3.		4.3% (Postal: n=15/339,	255/346 (74%) attended all three
12				Nurse: n=25/346, C:	sessions.
13		Duration of sessions reported		n=4/338) Withdrawn	258/263 (98%) attended session 3, and
14		by nurses and measured from		1.4% (Postal: n=5/339,	reported still using the pedometer and
15		records were not very far from		Nurse: n=4/346, C:	diary every day or sometimes.
16		the recommendation ( $\pm \le 30\%$		n=5/338) Not able to be	
/ 10		difference maximum).		contacted	
10 10	Lakerveld	Only qualitative data reported	8,193 people of 12 general practices were	End of intervention (6	*207 (66%) participants received at least
20	(2012)		invited according the age (30-50 years) and	months):	1 face-to-face session, 78% of them were
21			absence of DM or CVD.	I: n= 267 (85.0%)	content with the sessions.
22				C: n= 269 (87.3%)	
23			2,401 (29.3%) responded positively;		The median number of attended sessions
24			1,186 (14.5%) declined;	12 months:	was 2 (out of a max of 6).
25			921 (11.2%) of those who accepted	I: n= 249 (79.3%)	
26			invitation met the waist circumference	C: n= 253 (82.1%)	
27			inclusion criterion;		
28			772 (9.4%) attended screening at clinic and	24 months:	
29			consented;	I: n= 236 (75.2%)	
30 21			622 (7.6%) fully eligible and randomised.	C: n= 244 (79.2%)	
21 22					
33				Reasons for loss to follow-	
34				up:	
35				15.1% (I: n=42/308, C:	
36				n=52/314) Unable to attend	
37				3.7% (I: n=9/308, C:	
38				n=14/314) Withdrew	
39				consent	
40				1.1% (I: n=5/308, C:	
41				n=2/314) Became pregnant	
42				1.3% (IG n=5/308, C:	

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			n=3/314) Unable to contact 0.2% (I: n=1/308, C: n=0/314) Died 1.4% (I: n=2/308, C: n=7/314) Diagnosed type 2 DM	
Lane (2010)	Not reported	<ul> <li>11,205 women registered for the Women's Mini Marathon completed a survey about their PA habits.</li> <li>Consented respondents were followed up 2 months and 6 months afterwards respectively:</li> <li>2,020 of them provided records of PA changes at both follow-ups;</li> <li>414 of them were identified as having relapsed to insufficient levels of PA and invited to participate in the trial;</li> <li>176 consented to participate.</li> </ul>	Follow-up response rate (end of trial at 6 Weeks): I: n= 55 (65%) C: n= 57 (63%)	<ul> <li>76% of Intervention group participants responded at 3 Weeks:</li> <li>97% received the booklet(s)</li> <li>90% found the booklet(s) useful</li> <li>50% reported increase in PA levels</li> <li>28.5% felt greater levels of motivation which led to PA increase</li> <li>16% felt they had more knowledge on being active which led to PA increase</li> <li>5% attributed the PA increase to training for the Mini Marathon for the following year</li> <li>At end of trial (6 Weeks), receipt and use of materials provided:</li> <li>95% of intervention group participants</li> <li>80% of control group participants</li> </ul>
Matson (2018)	Not reported	Not reported	*I: n= 29 (100%) *C: n= 25 (80.6%)	Only qualitative data reported
Matthews (2016)	Only qualitative data reported	Sample was deemed representative of adults with intellectual disabilities: 91% (n = 93) had mild or moderate intellectual disability.	*End of intervention (12 weeks): I: n= 45 (83.3%) C: n= 43 (89.6%) *24 weeks: I: n= 42 (77.8%) C: n= 40 (83.3%) Reasons for loss to follow- up:	<ul> <li>*54 participants were assigned to intervention, and received the intervention.</li> <li>*71% took part in all 3 planned face-to- face physical activity consultations.</li> <li>*26% took part in 2 consultations</li> <li>*3% took part in 1 consultation</li> </ul>

			continue 1% (I: n=1/54) Ill-health	
Poston	Goals were set at all group	According to information from the Health	End of intervention:	82/94 (88%) attended at least one group
(2013)	sessions, of which 88% were	and Social Care Information Centre (2013).	I: n = 79 (84.0%)	session, and 60 (64%) attended 4 or more.
()	considered SMART by HTs	approximately 1:5 pregnant women would	C: n = 75 (84.3%)	
	according to their diaries.	be eligible for inclusion.		42 women (45%) received material from
				all eight sessions, 6 by full attendance
		473/656 (72%) eligible people declined to		(6%) and 36 when partly/wholly covered
		participate (43.0% of those who declined		by subsequent phone contact.
		were in the lowest quintile for Index of		
		deprivation indicating the most severe		Mean of 6.1 (SD 2.6) sessions were
		deprivation);		attended or partly/wholly covered for the
		38% participated.		intervention group.
School of	Fidelity checks were	8 participating Integrated Family Service	Trial Core session (baseline):	Physical activity group: (386 randomised)
Public	conducted for every session of	Centres to recruit around 600 eligible	I: n= 357 (92.5%)	357 (92.5%) attended core (1st) session
Health,	the programmes, which	parents.	C: n= 316 (92.4%)	355 (92.0%) attended booster session at 3
HKU	ensured the quality of the			months
(2017)	intervention and the	728 (121.3% of target) randomised.	3 months:	313 (81.1%) attended tea gathering at 6
	implementation of the key		I: n= 335 (86.8%)	months
	elements in the intervention.		C: n= 306 (89.5%)	281 (72.8%) attended Family Holistic
				Health session at 1 year.
			6 months:	
			1: n = 328 (85.0%)	Healthy diet group: (342 randomised)
			C: n = 298 (87.1%)	316 (92.4%) attended core (1st) session
			End of intermedian 12	306 (89.5%) attended booster session at 3
			End of Intervention -12	$\frac{1}{202} (95.40\%) \text{ attended to a gathering at } 6$
			11011015:	292 (65.4%) attenued tea gathering at 6
			$\begin{array}{c} 1: 11 = 509 (60.1\%) \\ 0.1 = 284 (83.0\%) \end{array}$	11011115 268 (78 406) attended Family Helistic
			C. II- 204 (83.0%)	Health session at 1 year
			Reasons for absence from	ficalti session at 1 year.
1			sessions included occupied	Participant's feedback at end of Physical
			with other activities, took	activity programme (on a scale of 0-10, 10
1			care of family, illness, could	is best) (Mean (SD)):
1			not be contacted, and	9.0 (1.2) Quality of intervention content
1			abroad; the exact number of	9.0 (1.2) Level of utility of the intervention
1			participants dropped out for	
			each of these reasons cannot	100% participants would recommend this

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## Supplementary file 6. Implementation data\_27.05.21

Spittades     Not reported     8,000 employees targeted via 6 worksites     End of intervention: Tailored advice + emails: n= 116 (66.7%)     and families       Spittades     Recalled having received the tailored advice (% participants): 570 (71%) responded positively; 562 (7.0%) returned the baseline questionnaire with the informed consent, and then randomised.     Find of intervention: Tailored advice + emails: n= 116 (66.7%)     Recalled having received the tailored advice (% participants): 570 (71%) responded positively; 562 (7.0%) returned the baseline questionnaire with the informed consent, and then randomised.     Find of intervention: Tailored advice + emails group       12	2				be ascertained.	intervention programme to their friends
Spittaels       Not reported       8,000 employees targeted via 6 worksites:       End of intervention:       Recalled having received the tailored advice (verted the tailored advice (verted the tailored advice (verted the tailored advice (verted the tailored advice)         0       570 (7.1%) responded positively;       562 (7.0%) returned the baseline questionnaire with the informed tonsent, and then randomised.       Tailored advice: n= 122 (69.7%)       97% Tailored advice +emails group satisfaction (% participants):         2       -65% of participants met the minimal recommendations for physical activity at baseline despite explicit recruitment of inactive participants were female, males comprising the majority of employees in the two biggest worksites for recruitment       Tailored advice: n= 122 (9.7%) (advice) emails advice (% participants):         3       31% participants were female, males comprising the majority of employees in the two biggest worksites for recruitment       Tailored advice: n= 122 (7.9%) (advice) emails advice (% participants):         31% participants already had high baseline physical activity scores compared to the general male population (72% vs. 74% meeting the recommendations), whereas female participants were delivered in the target areas resulting in 230 responses from potential participants and activators: Te (3.0%) people returnet apacify advice).       All participants who completed the intervention: Activator: 15 (7.7%) requests for information packs. 65 (3.3%) people returnet regularity by phone.         12       Stathi       Not reported       ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returnet reply forms. A0 (2.0%) recruited after	4					and families
(2007)       using cmail messages, posters and internal messages, posters and inthe informatin pasks, 15 (0.8%) recruited anere commendations, pos	5	Spittaels	Not reported	8,000 employees targeted via 6 worksites	End of intervention:	Recalled having received the tailored
Stathi     Not reported     2.000 mailed invitations were more representative of the population (72% vs. 57% meeting the recommendations).     End of intervention     All participants who dropped out: 2 meeting in 230% Reported the intervention engaged with their activator information packs. 15 (0.8%) recruited after completing the recommends     All participants were delivered in a for information packs. 15 (0.8%) recruited after completing the recommendations.     All participants were delivered in a for information packs. 15 (0.8%) recruited after completing the recommendations.     All participants were delivered in a for information packs. 15 (0.8%) recruited after completing the recommendations.     All participants were delivered in a for information packs. 15 (0.8%) recruited after commendations.     All participants were commendations.	б	(2007)		using email messages, posters and internal	Tailored advice+emails: n=	advice (% participants):
1     570 (7.1%) responded positively;     Failored advice: n= 122 (69.7%)     94% Tailored advice group       0     562 (7.0%) returned the baseline questionnaire with the informed consent, and then randomised.     53% (Control group       2     ~65% of participants met the minimal recommendations for physical activity at baseline despite explicit recruitment of inactive participants were female, males comprising the majority of employees in the two biggest worksites for recruitment Male participants already had high baseline physical activity scores compared to the general male population (72% vs. 57% meeting the recommendations).     77% Read them completely       31     Not reported     2,000 mailed invitations were delivered in the target areas resulting in 230 responses from potential participants: 154 (7.7%) requests for information packs. 15 (0.8%) recruited activity scores (75, 33%) participants: 15 (17, 7%) scores (75, 37%) groupset from potential participants: 15 (0.2%)     All participants who completed the intervention:       34     Activators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited active completing error from potential participants and cuivators for morphy active active commendations.     All participants who dropped out: 2       34     Activators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited after completing the target frames form portion information packs. 15 (0.8%) recruited after completing error framesures: 7.7% (3/39) III-health after completing the target framesur	7			newsletters;	116 (66.7%)	97% Tailored advice+emails group
Stathi       Not reported       2,000 mailed inivitations were delivered in formore competation parks: 15 (0.5%)       53% Control group         Stathi       Not reported       2,000 mailed inivitations were delivered in formotedions).       53% Control group         C: n = 141 (79.7%)       73% Control group       73% Control group         C: n = 141 (79.7%)       73% Received at least 3 of the 5         P23% Received at least 3 of the 5       92% Received at least 3 of the 5         P3% Statisfied by number of emails       87% Satisfied by number of emails         B4% Satisfied by frequency of emails       87% Satisfied by number of emails         B4% Satisfied by number of emails       87% Satisfied by number of emails         B4% Satisfied by requency of emails       87% Satisfied by number of emails         B4% Satisfied by number of emails       87% Satisfied by number of emails         B4% Satisfied by number of emails       87% Satisfied by number of emails         B4% Satisfied by number of emails       87% Satisfied by number of emails         B4% Satisfied by number of emails       87% Satisfied by number of emails         B4% Satisfied by number of emails       87% Satisfied by number of emails         B4% Satisfied by number of emails       87% Satisfied by number of emails         B4% meeting the recommendations).       87% Satisfied by number of emails         B4% meeting	3			570 (7.1%) responded positively;	Tailored advice: n= 122	94% Tailored advice group
0       justionalize with the informed consent, and then randomised.       C: n= 141 (79.7%)         1       and then randomised.       Tailored advice+emails group satisfaction (% participants):         2       -65% of participants met the minimal recommendations for physical activity at baseline despite explicit recruitment of inactive participants       Participants were female, males comprising the majority of employees in the two biggest worksites for recruitment physical activity scores compared to the general male population (72% vs. 57% meeting the recommendations), whereas female participants were delivered in the target areas resulting in 230 responses from potential participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited       End of intervention: All participants who dropped out: 2 met their activator at least 7 times as planned.         8       ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited after completing the racionage of the first activator information packs. 15 (0.8%) recruited after completing the racing of the rativator for final massers: 7.7% (3/39) Ill-health 5.1% (2/39) Carer contacted regularly by phone.	9			562 (7.0%) returned the baseline	(69.7%)	53% Control group
1       and then randomised.       Tailored advice-remails group satisfaction (% participants):         3       -65% of participants met the minimal recommendations for physical activity at baseline despite explicit recruitment of inactive participants       92% Received at least 3 of the 5         6       -65% of participants were female, males comprising the majority of employees in the two biggest worksites for recruitment of physical activity scores compared to the general male population (72% vs. 57% meeting the recommendations). Whereas female participants were nere representative of the population (47% vs. 48% meeting the recommendations). Whereas female participants aready had high baseline physical activity scores compared to the general male population (72% vs. 57% meeting the recommendations). Whereas female participants were nore representative of the population (47% vs. 48% meeting the recommendations).       End of intervention:       All participants who completed the intervention: at least 7 times as planned.         7       A00 mailed invitations were delivered in information packs. 65 (3.3%) people in form potential participants and activators information packs. 65 (3.3%) people information packs. 15 (0.8%) recruited information packs. 15 (0.8%) recru	10			questionnaire with the informed consent,	C: n= 141 (79.7%)	
<ul> <li>Additional and the second secon</li></ul>	1 2			and then randomised.		Tailored advice+emails group satisfaction (% participants):
<ul> <li>Stathi (2019)</li> <li>Stathi (2019)</li> <li>Not reported</li> <li>2,000 mailed invitations were delivered in the target areas resulting in 230 responses from potential participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited after completing the training.</li> </ul>	13			$\sim$ 65% of participants met the minimal		92% Received at least 3 of the 5
5       baseline despite explicit recruitment of inactive participants       77% Read them completely         8       87% Satisfied by number of emails         80%       31% participants were female, males comprising the majority of employees in the two biggest worksites for recruitment       31% participants already had high baseline physical activity scores compared to the general male population (72% vs. 57% meeting the recommendations), whereas female participants were more representative of the population (72% vs. 48% meeting the recommendations).       All participants who completed the intervention: All participants who completed the intervention engaged with their activator at least 7 times as planned.         7       ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited after completing the raining.       All participants who dropped out: 2 meet contacted regularly by phone.	14			recommendations for physical activity at		reinforcement emails
66 78 99 90 101 12 12 12 12 12 12 12 12 12 12 12 12 12	15			baseline despite explicit recruitment of		77% Read them completely
7       8       86% Satisfied by frequency of emails         8       31% participants were female, males       31% participants were female, males         9       1       Male participants already had high baseline         9       physical activity scores compared to the         9       general male population (72% vs. 57%         10       Mate participants already had high baseline         11       physical activity scores compared to the         12       general male population (72% vs. 57%         13       Not reported         14       2,000 mailed invitations were delivered in         15       the target areas resulting in 230 responses         16       from potential participants and activators         17       ACE participants: 154 (7.7%) requests for         18       ACE participants: 154 (7.7%) requests for         19       Reasons for dropping out         10       Activators: 76 (3.8%) people         11       returned reply forms. 40 (2.0%) recruited         11       after completing the training.	16			inactive participants		87% Satisfied by number of emails
8       31% participants were female, males comprising the majority of employees in the two biggest worksites for recruitment       45% Felt emails were useful 33% Reported behavioural changes         8       Male participants already had high baseline physical activity scores compared to the general male population (72% vs. 57% meeting the recommendations), whereas female participants were more representative of the population (47% vs. 48% meeting the recommendations).       End of intervention: ACtivator: n= 15 (100.0%)       All participants who completed the intervention engaged with their activator at least 7 times as planned.         7       8       ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited after completing the training.       End of intervention: ACtivators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited after completing the training.       Of the 3 participants who dropped out: 2 met their activator less than 5 times but were contacted regularly by phone.	17					86% Satisfied by frequency of emails
9       9       33% Reported behavioural changes         11       21       33% Reported behavioural changes         22       33% Reported behavioural changes         23       33% Reported behavioural changes         24       33% Reported behavioural changes         25       6         26       8         27       8         28       8         29       8         200       meeting the recommendations).         200       male participants were more representative of the population (72% vs. 5% meeting the recommendations).         200       2,000 mailed invitations were delivered in the target areas resulting in 230 response from potential participants and activators (response rate 11.5%).       End of intervention: ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited.       Activator: n = 15 (100.0%) Participants: I: n = 19 (86.4%) C: n = 13 (76.5%)         28       ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited.       Reasons for dropping out prior to final measures: 7.7% (3/39) III-health 5.1% (2/39) Carer after completing the training.       Final (20.3%)	18			31% participants were female, males		45% Felt emails were useful
31 12 23 34 44 45 55 66 67 77 78 88 84 44 44 45 56 66 77 78 88 80 77 78 80 77 78 88 80 77 78 80 77 78 80 77 78 80 77 78 80 77 78 80 77 78 80 77 78 80 77 78 80 77 78 80 77 78 80 77 78 78 77 78 78 77 78 78 78 78 78 78	19			comprising the majority of employees in		33% Reported behavioural changes
2       Male participants already had high baseline physical activity scores compared to the general male population (72% vs. 57% meeting the recommendations), whereas female participants were more representative of the population (47% vs. 48% meeting the recommendations).       All participants who completed the intervention: All participants who completed the intervention engaged with their activator at least 7 times as planned.         7       Stathi (2019)       Not reported       2,000 mailed invitations were delivered in the target areas resulting in 230 responses from potential participants: and activators (response rate 11.5%).       End of intervention: Activator: n = 15 (100.0%)         3       ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited.       Participants: 1: n = 19 (86.4%)       Of the 3 participants who dropped out: 2 met their activator less than 5 times but were contacted regularly by phone.         8       Activators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited after completing the training.       Stathi (2/39) Ill-health 5.1% (2/39) Ill-health	20 01			the two biggest worksites for recruitment		
33       Male participants already had high baseline physical activity scores compared to the general male population (72% vs. 57% meeting the recommendations), whereas female participants were more representative of the population (47% vs. 48% meeting the recommendations).       All participants who completed the intervention engaged with their activator at least 7 times as planned.         88       Stathi (2019)       Not reported       2,000 mailed invitations were delivered in the target areas resulting in 230 responses from potential participants and activators (response rate 11.5%).       End of intervention: Activator: n = 15 (100.0%)       All participants who completed the intervention engaged with their activator at least 7 times as planned.         77       ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited.       Participants: 13 (76.5%)       Of the 3 participants who dropped out: 2 met their activator less than 5 times but were contacted regularly by phone.         89       Activators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited after completing the training.       5.1% (2/39) Carer       Of the 3 participants who dropped out: 2 met their activator less than 5 times but were contacted regularly by phone.	21 22				•	
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55       general male population (72% vs. 57% meeting the recommendations), whereas female participants were more representative of the population (47% vs. 48% meeting the recommendations).       All participants who completed the intervention: At8% meeting the recommendations).         56       2,000 mailed invitations were delivered in the target areas resulting in 230 responses from potential participants and activators (response rate 11.5%).       End of intervention: ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited after completing the training.       All participants who completed the intervention engaged with their activator at least 7 times as planned.         90       ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited after completing the training.       Reasons for dropping out prior to final measures: 7.7% (3/39) Ill-health 5.1% (2/39) Carer       Of the 3 participants who dropped out: 2 met their activator less than 5 times but were contacted regularly by phone.	24			physical activity scores compared to the	$\mathbf{N}$	
Matrix       meeting the recommendations), whereas female participants were more representative of the population (47% vs. 48% meeting the recommendations).       End of intervention:       All participants who completed the intervention engaged with their activator at least 7 times as planned.         Stathi       Not reported       2,000 mailed invitations were delivered in the target areas resulting in 230 responses from potential participants and activators (response rate 11.5%).       End of intervention:       All participants who completed the intervention engaged with their activator at least 7 times as planned.         ACE participants:       154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited.       Participants:       0f the 3 participants who dropped out: 2 met their activator least 7 times as planned.         Reasons for dropping out prior to final measures:       Activators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited after completing the training.       7.7% (3/39) Ill-health formation packs. 15 (0.8%) recruited       5.1% (2/39) Carer	25			general male population (72% vs. 57%		
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9948% meeting the recommendations).All participants who completed the intervention engaged with their activator at least 7 times as planned.1 1 2(2019)Not reported2,000 mailed invitations were delivered in the target areas resulting in 230 responses from potential participants and activators (response rate 11.5%).End of intervention: Activator: n = 15 (100.0%)All participants who completed the intervention engaged with their activator at least 7 times as planned.34Activator: n = 19 (86.4%)Of the 3 participants who dropped out: 2 met their activator less than 5 times but were contacted regularly by phone.36Activators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited after completing the training.Reasons for dropping out prior to final measures: 7.7% (3/39) Ill-health 5.1% (2/39) Carer commitmentsOf the 3 participants who dropped out: 2 met their activator less than 5 times but were contacted regularly by phone.	8			representative of the population (47% vs.		
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(2019)the target areas resulting in 230 responses from potential participants and activators (response rate 11.5%).Activator: n= 15 (100.0%)intervention engaged with their activator at least 7 times as planned.4	0	Stathi	Not reported	2,000 mailed invitations were delivered in	End of intervention:	All participants who completed the
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A 44(response rate 11.5%).Participants: I: n= 19 (86.4%)Of the 3 participants who dropped out: 2 met their activator less than 5 times but were contacted regularly by phone.66ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited.C: n= 13 (76.5%)Met their activator less than 5 times but were contacted regularly by phone.77ACE participants: 154 (7.7%) requests for information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited.Reasons for dropping out prior to final measures:78Activators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited after completing the training.7.7% (3/39) Ill-health 5.1% (2/39) Carer commitments	92 13			from potential participants and activators		at least 7 times as planned.
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71information packs. 65 (3.3%) people returned reply forms. 40 (2.0%) recruited.Were contacted regularly by phone.9000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000<	6			ACE participants: 154 (7.7%) requests for	C: n= 13 (76.5%)	met their activator less than 5 times but
89111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111	7			information packs. 65 (3.3%) people		were contacted regularly by phone.
Pprior to final measures:DActivators: 76 (3.8%) requests for information packs. 15 (0.8%) recruited after completing the training.7.7% (3/39) Ill-health 5.1% (2/39) Carer commitments	8			returned reply forms. 40 (2.0%) recruited.	Reasons for dropping out	
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1information packs. 15 (0.8%) recruited5.1% (2/39) Carer2after completing the training.commitments	0			Activators: 76 (3.8%) requests for	7.7% (3/39) Ill-health	
after completing the training.	1			information packs. 15 (0.8%) recruited	5.1% (2/39) Carer	
	2			after completing the training.	commitments	

### Supplementary file 6. Implementation data\_27.05.21

			2.6% (1/39) Lack of time 2.6% (1/39) Moving to a different city	
Williams (2019)	Not reported	<ul><li>215 eligible service users contacted by</li><li>letter and phone;</li><li>71 not interested;</li></ul>	I: n= 16 (80.0%) C: n= 17 (85.0%)	<ul><li>13 (65%) received intervention:</li><li>5 did not engage with intervention;</li><li>2 did not engage with intervention after</li></ul>
		104 not contactable; 40 (18.6%) recruited.		education session.

Keys: \* = Data from associated publications; ACE = Active, Connected, Engaged intervention; BCG = Behaviour change group; BMI = Body Mass Index; C = Control is; FU = r.c. isor; MVPA = Mouc. cific, Measurable, Achievaα. group; CVD = Cardiovascular disease; DM = Diabetes Mellitus; FU = Follow-up; GP = General practitioner; HC = Health centre; HCP = Health care provider; HT = Health trainer; I = Intervention group; LSA = Lifestyle advisor; MVPA = Moderate-to-vigorous physical activity; n = number of persons; PA = Physical activity; PT = Physiotherapist; SD = Standard deviation; SMART = Specific, Measurable, Achievable, Relevant, and Time Specific; TEG = Traditional exercise group; vs = versus

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# Supplementary file 7\_SB results from RCTs associated with included PEs\_27.05.21

2 3 1 5	<b>Study (Year)</b> Number of participants randomised	Unit of outcome	Outcome measure(s) for SB	Intervention group Baseline	Control group Baseline	Intervention group End of intervention <sup>a</sup>	Control group End of intervention <sup>a</sup>
5 7 3 9	Adams (2012)	1. Mean % of SB time per day (SD) 2. Mean sitting	1. Accelerometer	(n= 40) SB: 47.42% (10.77)	(n= 24) SB: 50.7% (13.78)	(n= 40) SB: 49.16% (10.23)	(n= 24) SB: 50.39% (14.92)
10 11 12	I: 47 C: 28	hours per week (SD)	2. IPAQ	Sitting time: 57.99 (29.70)	Sitting time: 45.18 (34.88)	Sitting time: 46.00 (28.91)	Sitting time: 40.33 (40.68)
13 14 15 16 17 18 19 20 21 22 23 22 23 22 24 25 26	<b>Albright (2015)</b> I: 138 C:140	Mean sitting hours per day (SD)	Active Australia Survey	Traveling to/from work: 1.19 (0.71)* While at work: 2.02 (2.18) Watching TV: 2.05 (1.33) Using a computer at home: 1.27 (0.98) Other leisure time (movies, dining out): 1.38 (1.01) While holding/feeding baby: 2.93 (1.78)	Traveling to/from work: 1.41 (0.82)* While at work: 2.52 (2.5) Watching TV: 1.91 (1.36) Using a computer at home: 1.41 (1.18) Other leisure time (movies, dining out): 1.31 (1.05) While holding/feeding baby: 3.20 (2.08)	Not published	Not published
27 28 29 30 31 32 33 34 35 36 37 38	<b>Benedetti (2020)</b> BCG: 36 TEG: 52 C: 26	Baseline: Mean SB minutes per week (SD) End of trial: Mean SB minutes per day (SE)	Accelerometer	BCG: 498.5 (113.6) TEG: 529.8 (107.3)	522.8 (86.7)	Change between baseline and end of intervention (3 months): BCG: -14.3 (56.3) ° TEG: -4.1 (62.2) ° <i>Change between</i> baseline and end of trial (12 months): BCG: -10.9 (59.9) ° TEG: 4.2 (78.6) °	Change between baseline and end of intervention (3 months): -25.6 (77.9) ° <i>Change between</i> <i>baseline and end of</i> <i>trial (12 months): -26.7</i> <i>(68.3)</i> °
89 10 11 12	Berendsen (2015) I: 247 C: 164	Not published	Accelerometer	Not published	Not published	Not published	Not published

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# Supplementary file 7\_SB results from RCTs associated with included PEs\_27.05.21

<b>Biddle (2017)</b> 1: 94 C:93	Mean SB hours per day (95% CI)	1. Actigraph (worn on waistband) 2. ActivPAL (worn on thigh)	Actigraph (n= 76): 10.83 (10.50, 11.17) ° ActivPal (n= 60): 8.91 (8.59, 9.24) °	Actigraph (n= 80): 11.01 (10.76, 11.26) ° ActivPal (n= 57): 9.02 (8.73, 9.30) °	Outcomes not measured at end of intervention (6 Weeks). Change between baseline and end of trial (12 months) Actigraph (n= 38): -0.29 (-0.75, 0.17) c ActivPal (time change, n=32): 0.64 (0.13, 1.16) c	Outcomes not measured at end of intervention (6 Weeks). Change between baseline and end of trial (12 months) Actigraph n= 49): -0.23 (-0.60, 0.14) ° ActivPal (n=29): 0.58 (0.06, 1.09) °
<b>Blunt (2018)</b> I: 59 C:59	Mean sitting minutes per day (SD)	IPAQ	360 (315)	360 (240)	Mean difference between groups (only measured at end of active intervention phase – 6 months): -0.08 (-0.16, -0.006)* <sup>c</sup>	
<b>Elramli (2017)</b> I: 39 C: 37	Mean SB hours per day (SE)	1. ActivPal 2. IPAQ	ActivPal SB: 18.0 (0.27) c IPAQ weekday sitting: 5.3 (0.31) IPAQ weekend sitting: 5.3 (0.36)	ActivPal SB: 18.5 (0.2) <sup>c</sup> IPAQ weekday sitting: 4.7 (0.41) IPAQ weekend sitting: 4.6 (0.38)	ActivPal SB: 17.2 (0.3) <sup>c</sup> IPAQ weekday sitting: 4.2 (0.33)** IPAQ weekend sitting: 3.9 (0.33)	ActivPal SB: 18.7 (0.41) <sup>c</sup> IPAQ weekday sitting: 5.7 (0.53)** IPAQ weekend sitting: 5.1 (0.63)
Harris (2018) Postal: 339 Nurse: 346 C: 338	Mean SB minutes per day (SD, or 95% CI)	Accelerometer	Postal: 614 (71) Nurse: 619 (78)	613 (86)	Mean difference between groups at end of intervention (3 months)Postal versus control: -2 (-12, 7) °Nurse versus control: -7 (-16, 3) °Nurse versus Postal: -4 (-13, 5) °Mean difference between groups at end of trial (12 months)Postal versus control: 1 (-8, 10) °Nurse versus Postal: -1 (-10, 8) °	
Lakerveld (2012) I: 314 C: 308	Mean SB minutes per day (SD)	A subscale of AQuAA	253.7 (146.9) °	255.4 (124.5) °	Outcomes not measured at end of intervention End of trial (Month 24): 231.5 (122.2) <sup>c</sup>	Outcomes not measured at end of intervention End of trial (Month 24): 233.0 (140.7) <sup>c</sup>
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## Supplementary file 7\_SB results from RCTs associated with included PEs\_27.05.21

2 3 4 5 6 7 8 9 10	<b>Lane (2010)</b> I: 85 C: 91	Mean sitting time minutes per week (SD)	Frequently used validated questions selected for the trial from other population-level PA interventions.	335.9 (194.9)	310.1 (224.7)	371.4 (170.1)	369.5 (152.6)
11 12 13 14	<b>Matson (2018)</b> I: 29 C: 31	Mean sitting time minutes over last 7 days (SD) <sup>b</sup>	ActivPAL	Not published	Not published	Change between baseline and end of intervention (n= 29): -70.1 (104) <sup>b</sup>	Change between baseline and end of intervention (n= 25): 6.5 (69) <sup>b</sup>
15 16 17 18	<b>Matthews</b> (2016) I: 54 C: 48	Mean% of time per day spent in SB (SD)	Accelerometer	64.2% (10.5)	66.9% (11.3)	(n= 42) 66.4% (10.0) <sup>c</sup>	(n= 40) 65.9% (12.0) °
20 21 22 23	<b>Poston (2013)</b> I: 94 C: 89	Mean SB time minutes per day (SD)	1. Accelerometer 2. RPAQ	Accelerometer (n= 68): 1165 (91) ° RPAQ (n= 79): 1009 (187) °	Accelerometer (n= 72): 1172 (95) <sup>c</sup> RPAQ (n= 80): 1007 (207) <sup>c</sup>	Accelerometer (n= 36): 1197 (77) <sup>c</sup> RPAQ (n= 56): 1020 (226) <sup>c</sup>	Accelerometer (n= 39): 1175 (86) <sup>c</sup> RPAQ (n= 54): 1068 (177) <sup>c</sup>
24 25 26 27 28	School of Public Health HKU (2017) I: 357 C:316	Mean sitting hours in a working day (SD)	IPAQ-C	4.47 (2.47)*	4.11 (2.38)*	4.3	4.2
29 30 31 32 33 34 35 36 37 38 39	Spittaels (2007) I: Group 1 (tailored advice + email): 116 Group 2 (tailored advice): 122 C: 141	Mean sitting minutes per day (SD)	IPAQ	Group 1: Weekday: 482 (183) Weekend day: 308 (160) Group 2: Weekday: 492 (202) Weekend day: 296 (160)	Weekday: 470 (217) Weekend day: 309 (182)	Group 1: Weekday: 443 (168) Weekend day: 276 (131) Group 2: Weekday: 438 (172) Weekend day: 268 (141)	Weekday: 419 (181) Weekend day: 271 (139)
40 41 42 43	<b>Stathi (2019)</b> I: 22 C: 17	Mean SB minutes per day (SD, +/ 95% CI)	Accelerometer	681.5 (74.9)	616.2 (112.3)	Change between baseline and end of intervention:	Change between baseline and end of intervention:

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#### Supplementary file 7\_SB results from RCTs associated with included PEs\_27.05.21

					13.1 (77.2) (-26.6, 52.8)	-8.7 (70.7) (-57.6, 75.1)
Williams (2019) I: 20 C: 20	Mean SB minutes	Accelerometer	577.2 (9.8)	549.2 (19.1)	End of intervention (17 weeks, n= 16): 520.9 (36.2)*	End of intervention (17 weeks, n= 17): 637.9 (30.4)*
					End of trial (6 months, n= 8): 508.2 (19.4)*	End of trial (6 months, n= 13): 661.2 (33.5)*

## Supplementary file 3: Sedentary behaviour measured (at baseline and end of the trial) in the randomised controlled trials associated with the included process evaluation studies

**Keys:** <sup>a</sup> = Results available from the assessment immediately after the intervention, unless otherwise specified; <sup>b</sup> = unclear if adjusted for covariates; <sup>c</sup> = data were adjusted for covariates; \* = p value <0.05 for comparison between intervention and control groups (where reported); \*\* = p value <0.025 for comparison between intervention and control groups (where reported); \*\* = p value <0.025 for comparison between intervention and control groups (where reported); \*\* = p value <0.025 for comparison between intervention and control groups reported as accepted statistical significance ; *Italic font* = End of trial results, if available from publications; AQuAA = Activity Questionnaire for Adolescents & Adults; BCG = Behaviour Change Group; C = Control group; FU = Follow-up; I = Intervention group; IPAQ = International Physical Activity Questionnaire; IPAQ-C = International Physical Activities Questionnaire-Chinese version; n = number of persons included in the analysis; RPAQ = Recent Physical Activity Questionnaire; SB = Sedentary behaviour; SD = Standard deviation; SE = Standard error; TEG = Traditional Exercise Group

#### Supplementary file 8\_characteristics of 24 excluded studies\_27.05.21

Study	Reason for exclusion					
Ashe 2013	Results of process evaluation not available.					
Burton 1995	Ineligible study design: The study did not involve process evaluation.					
Cohen 2017	Ineligible study design: The participants were not all assessed at all timepoints					
	throughout the trial. The data from each time point were not obtained from the					
	same sample group throughout the study.					
Coll-Planas 2019	Results of process evaluation not available.					
Douglas 2019	Ineligible study design: The study is not RCT.					
Gray 2018	Sedentary behaviour was not measured in the RCT.					
Gummelt 2017	Sedentary behaviour was not measured in the RCT.					
Hammerback 2012	Sedentary behaviour was not measured in the RCT.					
Harvey 2016	Ineligible study design: The study did not involve process evaluation of					
	exploration of the intervention.					
Holt 2019	Sedentary behaviour was not measured in the RCT.					
Hsu 2013	Sedentary behaviour was not measured in the RCT.					
Jayaprakash 2016	Sedentary behaviour was not measured in the RCT: Sedentary behaviour was					
	measured at baseline, but not throughout the trial as an outcome.					
Lai 2019	Ineligible study design: The study was not a RCT.					
Maddison 2020	Sedentary behaviour was not measured in the RCT.					
McAuley 2013	Ineligible study design: The study did not involve process evaluation.					
Orme 2017	Ineligible study design: The evaluation of feasibility did not involve process					
	evaluation or qualitative evaluation.					
Rovniak 2014	Sedentary behaviour was not measured in the RCT.					
Sazlina 2015	Results of process evaluation not available.					
Seguin 2019	Sedentary behaviour was not measured in the RCT.					
Sheppard 2016	Sedentary behaviour was not measured in the RCT.					
Stevens 2015	Sedentary behaviour was not measured in the RCT.					
Thomsen 2016	Ineligible study design: The study did not involve process evaluation or					
	qualitative evaluation.					
Thompson 2008	Results of process evaluation not available.					
Thornton 2018	Ineligible comparator: The eligible intervention was assigned to the control group,					
	not the experimental intervention group in this study.					
Tiedemann 2015	Sedentary behaviour was not measured in the RCT.					
van de Glind 2017	Results of process evaluation not available.					
van der Wardt 2019	Sedentary behaviour was not measured in the RCT.					
Varela-Mato 2016	Ineligible setting: The intervention was delivered at workplace.					
Voorn 2016	Sedentary behaviour was not measured in the RCT.					
Yeung 2020	Ongoing: Study not completed.					
Zabaleta-Del-Olmo 2018	Results of process evaluation not available.					

**Keys:** RCT = Ramdomised Controlled Trial

Supplementary	y file 9	_Quality	y asses	sment	: MMA	T_27.0	)5.21				BMJ (	Dpen														Pa	<u>ge 74</u>
SCREENING QUESTION			1. QI	JALIT	ATIVE	E STUI	DIES	CC	2. RA ONTR	ANDON OLLEI	MIZED D TRIA	LS		3 RAN ST	. NO DOM [UD]	N- IIZEI IES	)	4 DES	. QUA Scrif	ANTI PTIVI	TATIV E STUI	'E DIES	5.	MIX S	ED MI TUDI	ETHOI ES	DS
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Adams (2012)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Albright (2015)	No	Can't tell						Can't tell	Yes	Can't tell	No	No						Yes	Yes	Yes	Yes	Yes					
Benedetti 2015	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Can't tell	Can't tell	No						Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes	Yes	Yes
Berendsen (2015)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	Can't tell						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Biddle (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Blunt (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No															
Elramli (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No															
Harris (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lakerveld (2012)	Yes	No						Yes	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	Yes					
Lane (2010)	Yes	Yes						Can't tell	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	Yes					
Matson (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Can't tell															
Matthews (2006)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Poston (2013)	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Can't tell	Yes						Yes	Yes	Yes	Yes	Yes	Yes	No	No	Can't tell	No
SPH HKU (2017)	Yes	Yes	Yes	Yes	No	No	No	Can't tell	No	Yes	Can't tell	No															
Spittaels (2007)	Yes	Yes						Can't tell	Yes	Yes	Can't tell	Yes						Yes	Yes	Yes	Yes	Yes					
Stathi (2019)	Yes	Yes	Yes	Yes	No	No	No	Can't tell	No	Yes	Can't tell	Yes						Yes	Yes	Yes	Yes	Yes	Yes	No	No	Can't tell	No
Williams (2019)	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No	Yes	No						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No

S1. Are there clear research questions? S2. Do the collected data allow to address the research questions? 1.1. Is the qualitative approach appropriate to answer the research question? 1.2. Are the qualitative data collection methods adequate to address the research question? 1.3. Are the findings adequately derived from the data? 1.4. Is the interpretation of results sufficiently substantiated by data? 1.5. Is there coherence between qualitative data sources, collection, analysis and For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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interpretation? 2.1. Is randomization appropriately performed? 2.2. Are the groups comparable at baseline? 2.3. Are there complete outcome data? 2.3. Are there complete outcome data? 2.4. Are outcome assessors blinded to the intervention provided? 2.5 Did the participants adhere to the assigned intervention? 3.1 Are the participants representative of the target population? 3.2 Are measurements appropriate regarding both the outcome and intervention? 3.3 Are there complete analy analy analy ane set her research question. ane integration of qualitative and q. aver results adequately addressed? 5.5. Do to the set of the s outcome data? 3.4 Are the confounders accounted for in the design and analysis? 3.5 During the study period, is the intervention administered (or exposure occurred) as intended? 4.1. Is the sampling strategy relevant to address the research question? 4.2. Is the sample representative of the target population? 4.3. Are the measurements appropriate? 4.4. Is the risk of nonresponse bias low? 4.5. Is the statistical analysis appropriate to answer the research question? 5.1. Is there an adequate rationale for using a mixed methods design to address the research question? 5.2. Are the different components of the study effectively integrated to answer the research question? 5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted? 5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed? 5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved? 

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#### A SYSTEMATIC REVIEW OF PROCESS EVALUATIONS OF INTERVENTIONS IN TRIALS INVESTIGATING SEDENTARY BEHAVIOUR IN ADULTS

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#### A SYSTEMATIC REVIEW OF PROCESS EVALUATIONS OF INTERVENTIONS IN TRIALS INVESTIGATING SEDENTARY BEHAVIOUR IN ADULTS

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#### Abstract

**Objectives:** To systematically review and synthesise findings from process evaluations of interventions in trials which measured sedentary behaviour as an outcome in adults to explore: 1) how intervention content, implementation, mechanisms of impact and context influence outcomes; 2) how these interventions are experienced from different perspectives (participants, carers, staff).

**Design:** Systematic review and narrative synthesis underpinned by the Medical Research Council (MRC) process evaluation framework.

**Data sources:** Databases searches were conducted in March 2019 then updated in May 2020 and October 2021 in: CINAHL; SPORTDiscus; Cochrane Database of Systematic Reviews; Cochrane Central Register of Controlled Trials; AMED; EMBASE; PsycINFO; MEDLINE; Web of Science; and ProQuest Dissertations & Theses. **Eligibility criteria:** We included: Process evaluations of trials including interventions where sedentary behaviour was measured as an outcome in adults aged 16 or over from clinical or non-clinical populations. We excluded studies if interventions were delivered in educational or workplace settings, , or if they were laboratory studies focused on immediate effects of breaking sitting.

**Data extraction and synthesis:** Two independent reviewers extracted and coded data into a framework and assessed the quality of studies using the Mixed Methods Appraisal Tool. We synthesised findings using a narrative approach.

**Results:** 17 process evaluations were included. Five interventions focused on reducing sedentary behaviour or sitting time, 12 aimed to increase physical activity or promote healthier lifestyles. Process evaluations indicated changes in sedentary behaviour outcomes were shaped by numerous factors including: barriers (e.g. staffing difficulties and scheduling problems) and facilitators (e.g. allowing for flexibility) to intervention delivery; contextual factors (e.g. usual lifestyle and religious events); and individual factors (e.g. pain, tiredness, illness, age, and individual preferences).

**Discussion:** Intervention requires careful consideration of different factors that could influence changes in sedentary behaviour outcomes to ensure that interventions can be tailored to suit different individuals and groups.

PROSPERO registration number: CRD42018087403

Key words: Sedentary behaviour, systematic review, process evaluation

#### Strengths and limitations of this study

- This systematic review is guided by Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) guidance.
- This is the first systematic review which has synthesised data from process evaluations evaluating interventions in trials that measure sedentary behaviour as an outcome in adults.
- The Medical Research Council guidance for conducting process evaluations has been used to structure this review and provided a comprehensive way of identifying factors associated with implementation, mechanisms of impact and context which may influence the effectiveness of randomised controlled trials investigating sedentary behaviour in adults.
- Non-English electronic databases were not searched. This limitation may cause language bias.
- There is some inconsistency in the quality of the reporting of the process evaluations included in the review .

#### INTRODUCTION

Sedentary behaviour is defined as any waking behaviour characterised by energy expenditure ≤1.5 Metabolic Equivalents (METS) while in a sitting, lying or reclining posture(1). In recent years, research exploring sedentary behaviour in adults has been expanding rapidly, documenting the potential for sedentary behaviour to have detrimental effects on health, wellbeing, and healthcare costs(2). Randomised controlled trials (RCTs) are particularly useful to examine intervention effectiveness(3). However, this approach cannot fully account for how interventions work, and the degree to which intervention components contribute to effectiveness or ineffectiveness(4).

Interventions targeting sedentary behaviour are typically complex, with multiple interacting components (5). Changes in outcomes following interventions are largely influenced by human behaviours and contextual factors as part of a complex process(6). The value of studying intervention processes, is recognised in the Medical Research Council (MRC) guidelines for developing and evaluating complex interventions(3) and detailed in the guidance for conducting process evaluations of complex interventions(4). Process evaluations are designed to help understand the theoretical assumptions underpinning an intervention, and to disentangle factors which may have contributed to the outcomes of an intervention(4).

The MRC process evaluation framework states that understanding of causal assumptions underpinning interventions and evaluation of how interventions work in practice are vital in building an evidence base that informs policy and practice. The framework outlines key functions of a process evaluation including investigating implementation, mechanisms of impact and context to understand how outcomes are interpreted(4).

To date, systematic reviews have synthesised the evidence of effectiveness of interventions aimed at reducing sedentary behaviour(7, 8). However, it is also important to synthesise findings from process evaluations to

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- 95 understand the complexity of factors that may influence whether interventions are effective in reducing
- g6 sedentary behaviour as these will inform future interventions in this relatively new research area. This paper
- **9**7 seeks to address the following aims and objectives (table 1): 98

#### **9**9 Aims and objectives 100 101

- 1) To identify process evaluations of interventions in trials which measured sedentary behaviour as an outcome in adults, to understand the intervention content, mechanisms of impact, implementation and delivery approaches and contexts, in which interventions were reported to be effective or ineffective.
  - 2) To explore experiences of participants, family members/carers and intervention staff in interventions that measured sedentary behaviour as an outcome in adults.

## 104 105 106 107 **Table 1: Review objectives**

16 1. To identify and record the trial data (e.g., design of interventions, sample sizes, duration and content of 17 interventions, and primary and secondary outcome data (from the process evaluation publication or associated 18 publications). 19

2. Establish whether logic models or theoretical models were used to explain how interventions were intended 20 21 to work.

3. Establish whether interventions were delivered as intended (as per protocol).

4. Explore intended or unintended mechanisms that influence the extent to which interventions are effective.

5. Understand barriers and facilitators to delivery of, and participation in, interventions and any

recommendations made to address such barriers and facilitators.

6. To synthesise qualitative data concerning the understanding and experiences of interventions from the perspectives of participants, family members/carers and intervention staff.

Qualitative data related to exploring perceptions, views and lived experiences of sedentary behaviour, but not related to receipt or delivery of an intervention were examined in a separate systematic review(9).

The MRC process evaluation framework(4) was the underpinning framework for this review informing the aims and objectives, coding framework, providing a structure for synthesising and reporting findings.

#### **METHODS**

#### **Protocol and registration**

Reporting of this systematic review is guided by Preferred Reporting Items for Systematic Review and Metaanalysis (PRISMA) guidance, (10) (Supplementary file 1). The review was prospectively registered with PROSPERO (Prospective Register of Systematic Reviews); registration number: CRD42018087403, the protocol has been published (11).

#### **Patient and Public Involvement**

No patients involved.

## **Eligibility criteria**

#### Study design

Studies explicitly identified by authors as a process evaluation, or studies that aimed to understand the functioning of an intervention by examining implementation, mechanisms of impact, and contextual

129 130 factors(12). Only process evaluations of RCTs, cluster RCTs, and randomised cross-over trials were included.

Cohort and uncontrolled before- and- after studies were excluded.

## 3 1341 **Participants** $1\frac{5}{6}$ $1\frac{7}{8}$

Adults aged 16 or over regardless of whether they were recruited from a clinical or nonclinical population.

## Interventions

1334 Interventions which measured sedentary behaviour as an outcome, even if reducing sedentary behaviour was 139 not the primary outcome.

136 13<u>7</u> 13<u>7</u> Interventions were excluded if: they were delivered primarily in schools, colleges, universities, or a workplace; 138 or aimed at the acute (immediate) effects of breaking up sitting time as part of a supervised (usually 1**39** 16 laboratory-based) intervention.

## **Comparators**

140 18 14,5 In trials, intervention groups may be compared to: no treatment, usual care, attention control, waitlist control 1**422** 21 groups, or alternative treatments.

## **Information sources**

## *Electronic sources*

 $1\frac{23}{23}$  $1\frac{4}{24}$  $1\frac{4}{25}$  $1\frac{4}{26}$  $1\frac{4}{27}$  $1\frac{4}{27}$ In collaboration with information specialist colleagues, comprehensive search strategies were developed using controlled vocabulary and free text terms (Supplementary File 2 for the search strategy for the MEDLINE database). Searches were conducted in March 2019 then updated in May 2020 and October 2021. 1**48** We searched the following databases: CINAHL (EBSCOHost); SPORTDiscus (EBSCOHost); Cochrane Database of 149 150 153 153 Systematic Reviews (Wiley); Cochrane Central Register of Controlled Trials (Wiley): AMED (OVID); EMBASE (OVID); PsycINFO (OVID); Ovid MEDLINE(R); OVID MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations; Web of Science: Sciences Citation Index Expanded (Clarivate); Web of Science: Social Sciences Citation Index Expanded (Clarivate); Web of Science: Conference Proceedings Citation Index- Science (Clarivate); Web of Science: Conference Proceedings Citation Index- Social Sciences and Humanities (Clarivate); ProQuest Dissertations & Theses.

## Searching other sources

In addition to searching electronic databases, we identified process evaluations through examining included studies from a concurrent systematic review and meta-analysis of RCTs that explored the effects of interventions in reducing sedentary behaviour, using the same eligibility criteria for participants, interventions 15494 and comparators (Hall et al., 2021 (13)). For each included study in the systematic review and meta-analysis 1**60** 16¶ 47 of RCTs, we identified whether a process evaluation was conducted alongside the RCT and included all those identified. If the process evaluation results were not available, we contacted study authors for results.

#### 1648 1643 **Study records**

#### 163 Data management

164 165 References identified from electronic databases and other sources were de-duplicated and imported into Endnote X7 reference management software. References were then imported in to Covidence 166 (www.covidence.org, 28th April 2021), a web-based systematic review tool. 55

## Selection process

1ල්⁄ව 57 16දි Using Covidence, two reviewers (RC, NL) independently assessed titles and abstracts of records from the 169 electronic searches against the eligibility criteria and excluded obviously irrelevant studies. The full-text of the 1760 remaining studies were obtained; then independently assessed, by the same reviewers, against the eligibility

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criteria to determine which studies would be eligible for inclusion. The same process for updated literature 171 172 173 searches was undertaken (by NL, SO). During the screening process, disagreements were resolved by a consensus-based decision between the reviewers, or if necessary, discussion with a third reviewer (DJC).

#### 4 1754 Data extraction and narrative synthesis 6

175 A narrative approach to synthesising data was undertaken to provide detailed written commentary to address 176 177 the research aims and objectives. Reviewers (RC, NL, and JFJ) independently extracted relevant quantitative and qualitative data from included studies. All quantitative data was checked by a second reviewer (SO). Fifty 178 percent of the qualitative data was compared by NL and JFJ. 1719

#### Developing and refining the framework

To direct data extraction, a framework was produced based on this review's aims, objectives and data to be extracted as specified in the protocol (11). The six themes and relevant subthemes align with the key functions in the MRC process evaluation framework (4) (Table 2). Data extraction items (related to the trial and process evaluations) (11) were coded into the framework then summarised in a series of files focusing on: the characteristics of trials (Supplementary file 3), characteristics of process evaluations (Supplementary file 4), delivery methods and mechanisms of impact (Supplementary file 5), and implementation data including fidelity, recruitment, retention and reach (Supplementary file 6). Within file 6, we have included definitions of these terms; informed by three key papers (4, 14, 15). Qualitative data from the framework is presented in the 'narrative synthesis findings' section.

To help understand the effects of each included intervention on sedentary behaviour outcomes, the sedentary behaviour measures from the associated RCTs were also extracted (Supplementary file 7). As the review focuses on the findings from the process evaluations, the treatment effects estimated in the RCTs have not been synthesised or analysed.

1 <b>96</b>	Two reviewers (JFJ, NL) independe	ently coded one study to pilot the framework. Following discussion, minor							
refinements were made before the final framework was agreed. For example, engagement was adde									
198	barriers and facilitators to participation in the intervention, a clearer definition of context was added and a 'miscellaneous' theme was included to code data about trial procedures and qualitative methods, mainly for								
1999									
200	context where appropriate. The co	context where appropriate The coding rules were also refined then used in coding the remainder of the							
2019	included studies								
202	included studies.								
-42 202	Table 2. Coding from owork								
∠vq-3 //	Themes and such themes	Definition / descriptions of what should be so dod							
44 45	I nemes and sub-themes	Definition / descriptions of what should be coded							
46	1. Implementation data								
47	1a. Intended delivery	How the intervention was intended to be delivered (in main paper or							
48		protocol)							
49	1b. Actual delivery (including	How the intervention was actually delivered , including when it has been							
50 51	when adapted)	adapted from what was intended							
52	1c. Strategies for achieving	How the intervention delivery was achieved (e.g. tailoring interventions to							
53	delivery	individuals)							
54	1d. Measures of adherence	A measure of adherence that was used in the study (NB: may be some							
55		overlap with compliance/fidelity). Definition adopted: "The extent to which							
56		delivered content, frequency, duration and coverage of intervention							
57 58		components/material are as intended "							
59	2 Machanisms of impact								
60	2. Mechanishis of impact								
	2a. Logic models used to explain	Loded when a logic model is present							

#### Table 2. Coding framework

how the intervention was						
intended to work						
2b. Theories underpinning the intervention	Theories underpinning the intervention e.g. trans-theoretical model, social cognitive theory and behaviour change techniques (BCTs) from the 93-item taxonomy used as part of the intervention e.g. goal setting, self-monitoring NB: still coded BCTs even if authors do not make reference to a BCT taxonomy					
2c. Mediators of change	Factors that explained how the intervention had an effect.					
2d. Responses to and interactions with the intervention	Instances where participants or those providing the intervention talked about how they responded to, or interacted with the intervention					
2e. Intended mechanisms of action influencing intervention effectiveness	How the intended mechanisms of action influenced effectiveness (e.g. intended mechanism of effect- self monitoring of daily activity)					
2f. Unintended mechanisms of	Descriptions of how unintended mechanisms of action influenced					
action influencing intervention effectiveness	effectiveness (e.g. if social support increased intervention effectiveness but the intended mechanism was self-monitoring)					
3. Contextual factors influence	ng effective and ineffective interventions (Context includes anything					
external to the intervention th	at may act as a barrier or facilitator to its implementation or its effects (4)).					
3a. Influencing implementation	Anything external to the intervention that may have influenced its implementation					
3b. Influencing mechanisms	Anything external to the intervention that may have influenced the					
	mechanisms by which the intervention had an effect (or not)					
3c. Influencing outcomes	Anything external to the intervention that may have influenced the outcomes of the intervention					
4. Barriers and facilitators						
4a. Barriers to delivery of	Factors that hindered the delivery of the intervention (including internal					
intervention	factors)					
4b. Facilitators to delivery of intervention	Factors that enhanced the delivery of the intervention (including internal factors)					
4c. Barriers to participation	Factors that hindered participation or engagement in the intervention:					
and/or engagement in	"The extent to which participants understand, accept and enact specific					
intervention	components of the programme in their daily lives."					
4d. Facilitators to participation	Factors that enhanced the delivery of the intervention. Definition as above.					
and/or engagement in						
intervention (e.g. incentives)						
4e. Recommendations made to	Recommendations made to overcome the barriers and facilitators (from					
address barriers and facilitators.	either the study participants (including those delivering)) or the authors of					
i	the paper.					
5. Understanding and experien	nces of interventions from different perspectives					
5a. Participants' experiences	Experiences from the perspectives of participants that cannot otherwise be					
	coded into context, or barriers and facilitators (likely to be direct					
	quotations)					
5b. Family and carers'	Experiences from the perspectives of family and carers that cannot					
experiences	otherwise be coded into context, or barriers and facilitators. Carers defined					
	as unpaid and informal carers so includes friends and relatives but not paid carers.					
5c. Staffs' experiences	Experiences from the perspectives of staff that cannot otherwise be coded					
	into context, or barriers and facilitators. Paid carers that are involved in the					

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intervention would be included here.					
Experiences from control group participants if reported					
6. Miscellaneous					
Instances where study includes information that is more focused on the					
data collection e.g. recruitment and retention, rather than the intervention.					
Agreed not to code any quantitative data that is otherwise captured					
elsewhere in the review.					
Reports of how qualitative data collection was undertaken e.g. 'semi-					
structured interviews were conducted with 10 staff.'					

#### Coding into the framework

Using the framework, JFJ independently coded all included studies. Nine studies (every other study listed alphabetically) were coded independently by NL. Coding was managed using NVivo software version 12 Plus(16).

#### Comparing codes

JFJ and NL compared data from the nine studies coded by both researchers. To enhance the rigour of the process, JFJ then re-reviewed all studies coded singly to ensure consistency(17).

#### Methodological quality

Methodological quality of included studies was assessed using the Mixed Methods Appraisal Tool (MMAT)(18), which is designed to concurrently assess qualitative, quantitative, and mixed methods studies. Three reviewers (NL, RC, JFJ) independently assessed the quality of studies and resolved any discrepancies by making a consensus-based decision, or if necessary, by discussion with a fourth reviewer (DJC). Studies were not excluded from the synthesis based on the outcome of the quality assessment.

#### RESULTS

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2 2231 The PRISMA flow diagram (Figure 1), presents results from all searches. Database searches identified 3,167 records; 116 additional records were identified through other sources. After removing duplicates (n = 1,113), 224 225 226 229 2,170 titles and abstracts were screened; 2,088 records were excluded as they did not meet the pre-defined eligibility criteria. The full-text reports of the remaining 82 records were assessed for eligibility, of which 24 reports were assessed as ineligible. The results of process evaluations of six eligible studies (seven reports) were unavailable. In total, 17 process evaluation reports were included for data synthesis. Fifty associated reports were also retained to address objective one. 228 229 230

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Figure 1: PRISMA flow diagram

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#### 269 Record of excluded studies

Supplementary file 8 provides reasons for excluding the 24 studies outlined in Figure 1.

#### Summary of included studies

#### Included randomised controlled trials

To address objective 1, and provide context for the process evaluations, supplementary file 3 presents data from trials with included process evaluations, including: aims, inclusion/exclusion criteria, sample size, participant characteristics, study design, intervention and control descriptions, data collection and follow-up time-points and outcome measures used.

#### RCT aims

Associated trials where sedentary behaviour was measured as an outcome were published between 2007-2020. Five trials focused specifically on reducing sedentary behaviour (19-21) or sitting time(22, 23). The remaining 12 trials aimed to increase physical activity or promote healthier lifestyles but measured sedentary behaviour as an outcome (Supplementary file 3).

#### Trial location and participant characteristics

Seven trials were conducted in the UK(20-22, 24-27), the remainder in the USA(19, 23, 28), Netherlands(29, 30), Brazil(31), Ireland(32), Canada(33), Hong Kong(34), and Belgium(35). Participants recruited into the trials varied, including: mothers or parents of infants, pregnant women, adults, older adults, overweight adults, individuals with chronic illnesses, and individuals with intellectual disabilities or serious mental illnesses. Most trials included males and females, however three included females only(19, 26, 28). Participants' ages ranged between 30 and 75; the majority of trials included participants aged between 40 and 50 years(19-21, 24, 25, 29, 30, 32, 33). Only nine trials reported ethnicity, the most ethnically diverse study was by Albright et al., (28) which reported the following ethnicities: Native Hawaiian, Pacific Islander, Asian, mixed race, white, black-Native American.

#### Included process evaluations

Supplementary file 4 presents data specific to the process evaluations including: aims and whether process evaluations were pre-specified, sample size and sampling methods, study design and data collection methods, and theoretical frameworks used. These data provide further context for the narrative synthesis.

Thirteen process evaluations were pre-specified in published protocols, or trial register records. Five studies(19, 26, 30, 32, 35) were published prior to the MRC guidance (4), which was developed to provide a more systematic approach for planning and conducting process evaluations. The majority were published in the same year or after the guidance was published(20-25, 27-29, 31, 33, 34). Despite this, nine studies did not report using a framework or guidance (19, 21, 23, 24, 28, 32-35) only four authors cited the MRC guidance(20, 22, 25, 27) and only one reported using this to guide the process evaluation(25). As shown in supplementary file 4, five studies cited other frameworks (20, 26, 29-31) the most common alternative to the MRC framework being the RE-AIM framework (36). Fourteen used the term 'process evaluation' within the publication. Three did not use this term(23, 24, 34).

#### Process evaluation aims

There was considerable variation in process evaluation aims. Some studies had a broad focus on participants' experiences for example, Elramli (24) aimed to explore participants' views regarding the effectiveness of a walking intervention for rheumatoid arthritis (RA). Others focused more specifically on barriers to achieving activity goals(28), or barriers and facilitators to the sustainability of an intervention(29). Some focused on the feasibility and/or acceptability of interventions among different participant groups, including those at risk of

318 chronic disease (33); older adults(23); individuals with intellectual disabilities(20); and individuals with 319 320 serious mental illnesses(21). Only two process evaluations were conducted with a view to refine the intervention(26, 27). 321

# 322 323 324 325 326 Study design and data collection methods

As outlined in supplementary file 4, sample sizes of participants recruited to the process evaluations varied, from five(21) to 411(29). A total of 1553 participants were included from intervention groups across the 17 studies and 340 from control groups in four studies(26, 29, 34, 35).

Nine studies(19-22, 25-27, 29, 31) used mixed-methods, most commonly combining quantitative questionnaires with semi-structured interviews (telephone and face-to-face). In five studies, questionnaires were used to ask participants about their satisfaction with the intervention, intervention fidelity, and about suggested improvements to interventions (19, 27, 29, 32, 35). In two studies, questionnaires focused on intervention providers' experiences of delivering and participating in interventions(25, 30).

Semi-structured interviews explored intervention contexts, barriers and facilitators to intervention delivery, and experiences from the perspective of intervention providers, participants, and their family members or carers(21-27, 29, 31, 33, 34). Other methods used included: non-participant observations (19), focus groups(20, 25, 27, 31, 34), healthcare professionals' registries and log books(29).

#### Methodological quality

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364 369 Supplementary file 9 provides an overview of answers to questions in relevant categories of the MMAT(18) for all included studies. Options include, 'yes', indicating a positive judgement, 'no', indicating a negative judgement, or 'can't tell,' which is used when there is insufficient information to make a judgement. MMAT authors discourage calculating an overall score and excluding studies based on their methodological quality(18). Therefore all studies remained included in the synthesis and were not weighted. Below is a summary of the assessment of each of the six categories.

Screening questions

The majority of studies had clear research questions or aims, and appropriate data were collected.

#### 1. Qualitative studies

Thirteen of 17 included studies had a qualitative component. Four(21, 26, 27, 34) were rated as not meeting some of the criteria in this category, because descriptions of the analysis process lacked detail, and it was unclear how authors arrived at their findings. In these studies, findings were commonly presented as a series of quotes, in tables or supplementary files but interpretation was considered too limited to constitute an in-depth analysis.

#### 2. Randomised controlled trials

Each of the included studies was associated with a RCT. This category of the MMAT was used to assess the quality of the trials. The 'can't' tell' option was most commonly used in this section because authors often provided insufficient information to provide an answer, particularly regarding the randomisation process and blinding. Scoring was more mixed within this category and no studies scored yes for all questions.

3. Non-randomized studies

The associated trials were all RCTs; therefore this category was not applicable.

#### 4. Quantitative descriptive studies

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Thirteen studies had a quantitative component. Overall, they were rated positively across all questions.

### 5. Mixed methods studies

We considered studies which used methods meeting the criteria for both categories 1 and 4 as mixed methods studies. This category was only applicable for nine studies. When studies were rated negatively on either the qualitative or quantitative component, it was reflected in the judgement for this category.

## Narrative synthesis findings

This section reports on the findings from the 17 process evaluations coded into the framework and summarised in narrative form. Subheadings based on the key functions of a process evaluation outlined in MRC guidance by Moore et al.,(4) have been applied to organise the data. Figure 2 (based on Moore et al (4)) outlines summary findings for each subheading in the synthesis and identifies some key findings.

## Description of the interventions and their causal assumptions

According to Moore et al.(4) a clear description of the intervention and its causal assumptions are an important part of understanding how other factors (e.g. implementation, context and mechanisms of impact) influence outcomes.

Supplementary file 5 describes the content and delivery methods for all interventions. Intervention delivery periods ranged between 6 weeks and 18 months. All interventions included multiple components, examples include group based educational sessions combined with email input and self- monitoring tools(19) or one-to-one counselling combined with tailored email input(28). In terms of delivery, interventions commonly incorporated some group based input or support(19, 21, 22, 24-26, 29, 31, 34). Interventions were delivered by a range of providers including researchers(19), health educators (22, 28), exercise professionals, including personal trainers(20, 29), coaches(21, 23, 33), advisors and nurses(25, 30).

Supplementary file 5 also includes information about the mechanisms by which the interventions are intended to have an effect, and any theoretical underpinnings. All interventions were underpinned by theory or incorporated behaviour change techniques, the most common theory being Social Cognitive Theory(37).

## Implementation and delivery approaches

Moore et al.(4) recognise that interventions can have limited effects due to weaknesses in how they are designed, or because they are not properly implemented. This section outlines the extent to which interventions were reported to be delivered as intended, common approaches used in intervention delivery, and whether this reportedly translated into changes in outcomes.

As indicated in file 5, in three studies(21-23) interventions were reportedly delivered as intended. In seven studies,(19, 20, 25, 28-30, 33) adaptations were made to the interventions during the course of the trial. In the remaining seven studies,(24, 26, 27, 31, 32, 34, 35) it was difficult to determine whether there were any adaptations as authors only reported the actual delivery, not the intended delivery.

Approaches for achieving intervention delivery included: ensuring staff were appropriately trained and prepared to deliver the intervention with fidelity(19, 31); tailoring aspects of the programme to individuals and their needs (e.g. ensuring activity consultations are appropriate for those with intellectual disabilities (20)); and allowing for flexibility in delivery methods. For example, in Poston et al.(26), pregnant women were provided with the option of receiving the intervention via phone or email, rather than sessions delivered at the

hospital, and in Berendsen et al.(29) coaching meetings as part of the intervention were planned with
 consideration of holidays and health issues.

Despite these adaptations for enhancing fidelity, interventions were not always effective in achieving the intended outcomes. For example, in Poston et al.(26) despite flexibility in the delivery mode, objectively 4£9 measured physical activity and sedentary behaviour did not change in the intervention group. In this particular 4ź0 participant group (pregnant women), the potential to achieve the targeted health outcome, optimal blood glucose level, via dietary changes, was greater than changes in physical activity, including sedentary behaviour, **2** as for some participants increasing their activity led to feelings of discomfort. Similarly, in Matthews et al.(20), 12 423 although individual tailoring was used, the intervention did not have a significant effect on any of the primary or secondary outcomes including time spent in MVPA and time spent sedentary. It was suggested that this intervention may need to be longer than 12 weeks for individuals with intellectual disabilities. This highlights the importance of understanding more about how an intervention is intended to have an effect, as outlined in 428 the following section.

#### Mechanisms of impact influencing intervention effectiveness

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Moore et al.(4) emphasised the importance of exploring mechanisms through which interventions bring about change, to learn more about how the intervention effects may have occurred and how they may be replicated in similar future interventions. This section outlines the mechanisms reported across the studies and the extent to which they impacted on behaviour and outcomes.

Social Cognitive Theory was the most commonly used theory, and the following mechanisms of action were reported in several studies: enhancing self-efficacy by rating confidence in completing goals(19); using behavioural cues e.g. standing up every hour, and leaving the remote at the TV(19); using resources e.g. websites combined with counselling calls to encourage goal setting(28) providing social support in educational sessions or workshops, and input and engagement from carers(19, 20, 22, 24, 28).

However, across the studies, the extent to which these mechanisms had their intended impact on behaviour change varied. In Elramli (24) the intervention aim was increasing daily step count, social support was found to be a key factor in participants who increased their physical activity. However, behaviour change techniques including social support, feedback, and self-monitoring were to a lesser extent associated with reduced sedentary behaviour in those with rheumatoid arthritis (RA). In Matthews et al.(20), where the intervention aimed to increase walking and reduce sedentary behaviour, the social support component was not effective for adults with intellectual disabilities. In Biddle et al.(22) where the intervention aimed to reduce sitting time, there was no difference in sedentary time at 12 months between intervention and control arms. Reasons for a lack of change in sedentary behaviour included: a preference for adopting physically active behaviours rather than sitting less, and motivational drift after three months. In Adams and Gill(19) which focused on reducing sedentary behaviour. Behavioural cues, e.g. leaving the remote at the TV, did not always influence behaviours either, because some participants were already doing the cued behaviour, and some did not have a TV(19).

Studies underpinned by the Transtheoretical Model, Theory of Planned Behaviour and Self-Determination
theory placed emphasis on encouraging participants to be aware of and monitor their own behaviour(20, 29, 30). Motivational interviewing was used in two studies to prompt participants to find solutions, rather than
telling them how to change their behaviour (29, 30). Berendsen et al.(29) found the feasibility of changing
physical activity behaviours and dietary habits was not as high as expected and was likely associated with poor
adherence. Some participants were unrealistic about how much of their own effort would be required, which
influenced attendance at meetings. Lakerveld et al.(30) reported that practice nurses were competent and
confident in the delivery of motivational interviewing and participants' satisfaction was high, but even so,

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almost no effects were seen in the determinants of behaviour change in this population of individuals who were
 at risk of cardiovascular disease and diabetes.
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In summary, these findings provide some insights into how mechanisms may or may not have an effect on sedentary behaviour, highlighting that it is important to fully understand the complexities of interventions.

#### Factors including context that facilitate or hinder implementation or how participants respond or interact with the intervention

Moore et al.(4) regard understanding context as an important part of interpreting factors influencing whether
interventions are effective. They defined context as anything external to the intervention that may act as a
barrier to its implementation or effects. They also considered participants' responses to and interactions with
the intervention as important mechanisms that could influence outcomes. Drawing on the coding framework,
this section is divided into include barriers and facilitators to delivery of interventions, barriers and facilitators
to participation and engagement, and understanding of participants experiences from different perspectives.

#### Barriers to delivery of interventions

Across the studies, there were a range of barriers to delivering interventions, including administrative or scheduling issues and organisational difficulties or challenges. In two studies, planning educational sessions around other commitments including holidays and childcare responsibilities was difficult for staff (24, 34). In Blunt et al.(33) a central research team were involved in scheduling appointments, intending to reduce the workload for coaches. However, this resulted in increasing time spent scheduling and it was recommended that coaches were best placed to take responsibility for their own scheduling(33).

Organisational difficulties were apparent across two studies(20, 31). A community health worker from one of the six health centres in Benedetti et al.(31) described the long absence of a doctor as a turbulent time in the unit, which added difficulties in trying to deliver the intervention. In Matthews et al.(20), the intervention was implemented at a time of significant change within the local learning disability service. Provision of support was affected by the closure of many day centres, which led to a low morale and increasing work pressures among the staff. In Berendsen et al.(29), there were factors that influenced adherence; additionally suspended government financial and policy support meant the programme could not continue.

#### Barriers to participation and engagement

Across the studies, there was a range of barriers to participation and engagement in the interventions. The most common barriers to engagement were: having a pre-existing illness or injury and associated problems e.g. pain(19, 23-29, 33), having other commitments e.g. work, caring responsibilities(23, 24, 26, 28); and being too tired(22, 26, 33). Other, less common barriers to engagement included loss of accountability for behaviour over time(33), fluctuating mental health(21), and lack of motivation(24).

Some participants also experienced difficulties with pedometers and accelerometers used as an outcome measure for the trial., in terms of understanding how to use them, side effects of wearing them e.g. skin irritation(19, 23) and lost devices(19, 22). In Biddle et al.(22) half the participants experienced problems with the software for the 'Gruve' accelerometer, including: computer synchronisation issues, incompatible computers, website navigation problems, device malfunction, short battery life, and charging issues.

Some barriers may be more applicable to specific groups. For example, in Benedetti et al.(31), a community
 health worker perceived some older people to be apprehensive about new things which may have been a
 barrier to participation. In another study, a participant thought that sitting was deserved in old age and he was

looking forward to this aspect of retirement to indulge in some of his passions e.g. reading and studying, which 508 5d9 530 made him resent the idea of standing more(23).

Some barriers were specific to particular contexts. In Elramli,(24) participants who had RA worried about 5**∮**2 using the gym because they lacked knowledge of suitable, safe exercises. Although workplace interventions 51/3 51/4 51/5 51/0 were not included in this review, participants who had received educational based interventions reflected on how this applied to other parts of their lives and therefore provided some insight into how the work setting impacts upon sedentariness. For example, participants felt that it was not appropriate to be standing in a work context which could cause embarrassment, e.g. the expectation to be seated for meetings(19, 22, 23). Further 517 517 518 519 barriers at work included having no access to stairs and no standing desks(22).

The context of other parts of everyday life was also influential for some participants who had developed ingrained sedentary habits, as a result of their usual activities or hobbies e.g. reading, eating, socialising, TV viewing, and knitting(23). Religious festivals had an impact on willingness to reduce sitting time at certain times of the year e.g. Christmas and Ramadan(25).

#### Facilitators to the delivery of interventions

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Some of the approaches for achieving implementation and delivery could be regarded as facilitators, including: allowing flexibility in delivery methods, tailoring aspects of the programme to individuals, initial preparation and planning. A range of other factors facilitated intervention delivery.

For example, in Blunt et al.(33), coaches valued the simplicity and structure of the programme. They also appreciated that the programme did not require extensive background knowledge or preparation over and above their existing working requirements. Coaches had the option of referring back to the Canadian Physical Activity Guidelines to ensure they were providing the right level of support to participants. In another study, not requiring too much additional trial focused expertise, and having access to useful trial related resources was valued by social workers(34). In this study the research team prepared and organised most of the materials which facilitated delivery. As a contrast to low morale among staff(20), having a committed team was also important for facilitating delivery(34).

#### Facilitators to participation or engagement in intervention

There were a range of facilitators to participation and engagement in the interventions. The most common facilitator was support and encouragement from providers and peers; participants valued personal interaction and having someone to keep them on track with the intervention (20, 24, 25, 27, 31, 33).

In some studies, group environments facilitated engagement and provided opportunities for sharing experiences and meeting other peers in a similar situation(21, 24, 27). In Matthews et al.(20), many participants liked one-to-one engagement with intervention providers. This was particularly beneficial to the group who had intellectual disabilities, partly because the conflicting needs of participants in group activities were occasionally disruptive. This group faced challenges to engagement with the intervention, compared to the general population. Matthews et al. suggested the need for providing interventions to people with intellectual disabilities for longer than 12 weeks, so that consultations with providers can address more barriers(20).

Being accountable to someone, e.g. a health coach, also facilitated engagement in three studies because the participants felt being monitored provided motivation (20, 23, 25, 33). Whilst use of a step count monitor was a barrier for some, others found this was a good motivator (23, 24). Adams and Gill (19) recommended that in order for pedometers to be beneficial they need to be more accurate. It was also suggested that technology should be tailored to detect movement in older adults which may be different from younger adults (23).

Participants valued textual resources that were considered attractive through using appropriate text and images (20, 31). Adams and Gill(19) made recommendations for making resources more accessible including embedding videos in emails rather than asking participants to use YouTube, and printing cue cards out rather than asking participants to do so themselves. Less common facilitators were: already being involved in health programmes (33), and becoming more aware of the extent of their own sedentary behaviour(23).

#### Understanding experiences of interventions from different perspectives

#### Participants

There was some overlap in data coded into barriers and facilitators and participant experiences. The experiences can be divided into positive and negative. Examples of common positive experiences included enjoyment or satisfaction with the intervention programme (19, 21, 31). In some studies, participants described this as life-changing(23, 25) or a new opportunity for learning about how to reduce sedentary behaviour and exercise safely(24). As a result of engaging in the intervention, some participants recognised they had become more aware of the importance of reducing sedentary behaviour(19, 24, 31) and associated benefits e.g. weight loss(21, 23), and reduced stress(23, 34),less fatigue(23), less pain(24), and lower blood sugar(19).

Examples of negative experiences included: feeling stressed or nervous due to wearing a pedometer and a need to check it frequently(24); disliking a type of counselling session because they expected to follow suggestions(30); and feeling nagged by carers to participate(20).

#### Family/carers

Only two studies included data regarding the experiences of families or carers(20, 34). There was a distinction between the carers' or family members' perceptions of participants' experience and their own experiences as part of an intervention or supporting the intervention. In Matthews et al.(20) family carers talked about how much the participants enjoyed their experiences due to reaching their goals and getting a certificate.

The dynamic was different in another study which included a family-based exercise intervention(34). Participants valued reminding each other as a family to do their exercises.

#### Staff

There was also some overlap in data coded into barriers and facilitators and staff experiences. Most staffs' perceptions of participants' experiences were positive. In two studies, staff perceived participants enjoyed using pedometers and diaries(20, 25). Staff voiced positive perceptions of the programme, e.g. encouraging others and themselves to fit physical activities into their everyday lives(33), and enhancing the participants' family cohesiveness(34). Being involved in delivering the programme also had benefits for some staff . It helped them understand the complexities associated with having a healthy lifestyle(33); and reminded them to stand and move more in their own roles(34).

Some negative experiences overlapped with the barriers to delivering the interventions. These included difficulties with staffing when they were already overcommitted (20, 31); limited venue space for delivering the programme(31); and lack of psychological training to be able to deliver the intervention(29).

#### DISCUSSION

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## **Summary of findings**

6Ø7 This review aimed to synthesise process evaluations of interventions in trials where sedentary behaviour was 608 measured as an outcome to: develop an understanding of intervention content, mechanisms of impact, implementation and delivery approaches and contexts, in which interventions were reported to be effective or 6190 ineffective and explore the experiences of participants, family/carers and intervention staff in such 619 interventions. To address these aims, we synthesised data from 17 studies including a range of participant 612 12 613 groups e.g. mothers or parents of infants, pregnant women, adults, older adults, overweight adults, individuals with chronic illnesses including rheumatoid arthritis, intellectual disabilities and serious mental illnesses. 614 Systematic reviews of process evaluations have been conducted in other areas of research e.g. primary 61**5** care(38) and workplace health promotion programmes(39). However, to our knowledge this review is the first 616 17 617 to synthesise data from process evaluations of interventions in trials which measured sedentary behaviour as an outcome in adults. 618)

The review has highlighted the complexity of factors that contribute to implementing interventions with fidelity, and how this links to outcome effects. Common barriers to delivery were those that may be expected in delivery of complex interventions of any kind, not just reducing sedentary behaviour. These included structural changes and staffing pressures within an organisation, and limited funding for providing interventions. Many interventions required some level of input from providers (e.g. researchers, health educators, exercise professionals, coaches and health professionals) to deliver the programme, e.g. scheduled exercise or education sessions. On the other hand, this limited flexibility of a structured intervention posed difficulties amongst some participants who had busy schedules and other priorities. In such cases, delivery was facilitated by providing different options for how the intervention is delivered e.g. via phone or email. However, flexible intervention delivery did not guarantee adherence to the intervention, because participants faced other barriers e.g. discomfort during pregnancy, cognitive difficulties; these factors ultimately impacted on sedentariness.

Whilst it was not our primary intention to synthesise the quantitative findings from the RCTs; the quantitative findings (summarised in supplementary file 7), indicate only three studies reported a statistically significant reduction in sedentary behaviour at the end of the intervention (21, 24, 33). The review identified commonalities across these three interventions that were effective in reducing sedentary behaviour; they all included elements of goal setting and access to support or coaching from a professional. All three were underpinned by theories (social cognitive theory of self-regulation, social cognitive theory and the COM-B model, including a focus on self-efficacy) which in part explain how these interventions may have had their effects (file 5). However other studies also had similar features, were underpinned by similar social cognitive principles including self-efficacy (19, 22, 26, 28) but reported no statistically significant reduction in sedentary behaviour. In three of these four studies, control group participants still commonly received some form of information e.g. a leaflet or workbook which could be regarded as informational support. This may account for not finding a statistically significant effect when compared to the interventions, if their mechanisms of effect are quite similar. These findings identify that the process of changing outcomes e.g. sedentary behaviour is complex and influenced by other factors, aside from intervention components.

Complex interventions were traditionally understood as those comprised of multiple components(3). However, context is becoming increasingly recognised as a source of complexity with acknowledgement that interventions are not a discrete package of components, but also a process of changing what complex systems do, including the interactions between individuals (e.g. providers and recipients)(40). Our findings support this notion because whilst all interventions were underpinned by psychological theories focused on individual-level change e.g. social cognitive theory(37), trans-theoretical model(41), theory of planned behaviour(42), selfdetermination theory(43) and habit formation theory(44); it was evident that a range of wider, contextual

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factors in addition to individual factors also influenced the implementation and delivery of the intervention as 653 654 part of complex systems. However, within the included process evaluations, programme theories (including 655 logic models) depicting how the intervention would operate in a particular context were rarely reported. Only 6546 one process evaluation reported a logic model (25). Given the complex nature of the delivery and engagement 657 associated with complex interventions, it is important that influences on outcomes such as reduced sedentary 658 behaviour are understood as individual-level behaviour change processes, and in context, taking into account 65⁄9 the complexities of experiences (45). Ensuring logic models are developed and reported would aid in 660 understanding these complexities.

The identified barriers and facilitators to participation and engagement provide important insights into participants' experiences of interventions and explain what makes interventions more acceptable to some individuals compared to others. The review indicates that social support was important. Some participants valued elements of groups such as meeting others and sharing experiences among similar peers. Others, particularly those with intellectual disabilities, valued one-to one input from providers. Level of motivation was also influential in engagement. Some felt motivated due to being accountable to someone; whilst others felt motivated as a result of tracking activity using a pedometer. However, others disliked pedometers because they struggled to understand the device or experienced skin irritation whilst wearing them. Previous studies have found satisfaction being important for compliance and engagement with tracking devices e.g. pedometers(46, 47). Results of a national cross sectional survey conducted in Australia suggested that interventions should make sure the devices align with the preferences of the target groups(48). Our review suggests that individuals with particular conditions could benefit from interventions that are tailored to their symptoms e.g. pain, tiredness and illness.

Changes across the lifespan should also be considered so that interventions can take into account what is appropriate and acceptable for older adults. Our review findings indicate that older people may be more likely to think that sitting down is deserved, or associated with enjoyable hobbies e.g. reading. A recent review by Compernolle et al.(49) focused on older adults perceptions of sedentary behaviour similarly found that sedentariness was motivated by finding enjoyment, and comfort. Their experiences are also shaped by their capabilities, the social opportunities, and motivations in addition to societal expectations that often dictate that for older people sitting is their main mode of living.

Current lifestyles, regardless of age or other characteristics also influence the extent to which participants are likely to engage in behaviours that reduce sedentary behaviour. Our review evidence adds to, and supports findings from another review exploring qualitative experiences of participating in non-workplace interventions(9). Sedentary behaviour is further complicated by seasons and events e.g. celebrations such as Christmas or Ramadan which disrupt normal behaviour patterns, and perhaps lead to less concern with healthy behaviours, even with interventions. A systematic review of factors that influence physical activity and sedentary behaviour in ethnic minority groups in Europe also identified cultural and religious factors as influential in the extent to which individuals were sedentary(50). However, they highlighted that aside from the celebrations and events, some parts of religious activity e.g. walking to religious sites for prayers actually facilitated reduced sedentary behaviour and increased physical activity. It is possible that people from different ethnicities may also experience sedentary behaviour and physical activity differently, however it is difficult to determine based on the data available in this review given that only nine of the 17 studies reported ethnicity, and only three of those nine provided commentary on ethnicity. Albright et al. (28) identified that non-white racial or ethnic groups were less likely to meet their goals compared to white participants. Poston et al. (26) and Harris et al., (25) both included commentary on ethnicity in the context of recruitment to the trials and process evaluations. In Poston et al. (26) the process evaluation included women in urban hospitals in areas where socio-economic deprivation was high, they also highlighted that obesity rates are higher among those with lower socio-economic status, less qualifications and African and black Caribbean groups. The relatively low uptake (1 third approached for recruitment) was consistent with other studies with low uptake in

healthcare. Harris et al. (25) reported that participation was only 11% among adults and older adults in a
socially and ethnically diverse population, with lower rates in more deprived Asian subgroups. This limited the
ability to investigate differential effects in important subgroups. These authors have not drawn firm
conclusions about how ethnicity and race may effect outcomes but Harris et al. (25) highlighted that differential
uptake of interventions that are found to be successful in trials could lead to increases in inequalities in
physical activity levels so this needs to be monitored.
Looking across the barriers and facilitators identified in this review and the wider literature, a range of factors

Looking across the barriers and facilitators identified in this review and the wider literature, a range of factors need to be considered, highlighting how difficult it is to develop interventions that are suitable for participants, even those with apparently similar characteristics. The Consolidated Framework for Implementation Research (CFIR) is an example of a taxonomy of constructs, organised into five domains (intervention, inner setting, outer setting, individual characteristics, and process) that has been devised to understand what influences implementation that could be applied to further understand such complexities(51). Interventions require some level of adaptation to the context and may need to be tailored to participants, including those share similar characteristics, e.g. those with rheumatoid arthritis or intellectual disabilities. They also need to consider the dynamic between staff, participants and families as part of working towards a shared goal (e.g. reducing sedentary behaviour).

Proctor et al., (52) outlined a conceptual framework to understand interrelated outcomes in implementation research including: 1) implementation outcomes e.g. appropriateness, sustainability and costs; 2) service outcomes e.g. safety and timelines; and 3) client outcomes e.g. satisfaction. This is another example of a framework which incorporates outcomes that are not already included in the MRC framework for process evaluations. This framework could be applied as part of understanding the complex dynamics of implementing and tailoring interventions and would assist in highlighting some of the challenges associated with tailoring interventions e.g. material and staffing resource limitations, and what might be required for sustainability.

Based on the current findings, if we are to reach a point where reducing sedentary behaviour becomes habitual once interventions cease, participants will need simple strategies and support to take ownership of their own behaviour so they can sustain the lifestyle changes within the context of their lives and their preferences.

## Strengths and limitations

This is the first systematic review to synthesise data from process evaluations evaluating interventions in trials that measure sedentary behaviour as an outcome in adults. Robust methods were used throughout the conduct of the review. A comprehensive search strategy was developed with input from an information specialist; two reviewers independently screened search results and assessed the quality of included studies.

Although a large proportion of the trials on which the process evaluations were based were conducted in the UK, the inclusion of studies from other countries (e.g. USA, Netherlands, Brazil, and Hong Kong) mean these findings are relevant for researchers internationally. The inclusion of males and females enhances the applicability of the findings in terms of gender. However, with regards to age, the majority of studies included participants between 40 and 50 years; therefore not all findings are applicable to other age groups. The inclusion of participants from various groups can be regarded as both a strength and limitation of this review. Findings may be of interest to experts in different research areas; however, it is difficult to draw firm conclusions for particular population groups, especially where sample sizes are small.

There was an overall lack of consistency in how process evaluations were reported, this was also the case in a review of process evaluations in primary care (38). Fourteen out of 17 used the term 'process evaluation' within the publication. Three did not use this term(23, 24, 34), although they met the criteria for inclusion in

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that they aimed to explore participants' views on the factors that influence intervention effectiveness (24, 34),
 including the feasibility and acceptability of the intervention.
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The assessments using the MMAT also indicated some variation in the quality of the process evaluations. The four studies that were considered lowest quality had poorer qualitative components(21, 26, 27, 34) that lacked 758 758 detail and depth, and had limited interpretation. When studies were rated negatively on the qualitative component, it was reflected in the judgement in the mixed methods category in the MMAT. Only four studies(20, 22, 25, 27) cited the MRC guidance for process evaluations (4) but this did not always equate to better quality. Only one study by Harris (25) used the framework to guide the evaluation, whereas the other 763 three only made reference to it in the introduction. Harris et al. (25) was one of the higher quality studies overall, suggesting that using a framework to guide the whole process evaluation can be beneficial. However, the quality of the other studies that included frameworks such as RE-AIM (36) and Steckler and Linnan's (53) process evaluation framework was variable. 766

Figure 2 indicates that the studies reported a lot of data about the factors including context that influence implementation and how participants respond or interact with the intervention. However, only one process evaluation included a logic model outlining how the intervention intended to have an effect (25). This means the theoretical understandings are more limited, making learning from previous evaluations more difficult. The importance of programme theories and logic models have been emphasised in recent MRC guidance (54), researchers should incorporate this in future evaluations of complex interventions.

More than 24 tools are available to assess the quality of systematic reviews; however, there remains no clear guidance for which tool to use for assessing the quality of process evaluations (55). The MMAT(18) was a logical choice as it is appropriate for mixed methods studies and those using either qualitative or quantitative data. However, it has not been designed to require detailed commentary about judgements of quality. Therefore a simplified account of quality is presented. Yet, it is difficult to compare studies without looking across all the domains because the authors do not recommend calculating an overall score(18). It was also recommended that studies should not be excluded based on their quality(18), accordingly all studies were included in the synthesis. In our view there is also a need to develop guidelines specific to systematically reviewing process evaluations of complex interventions.

The initial searches for this review were conducted in May 2019 and were repeated in May 2020. We acknowledge that this area of research is experiencing considerable growth in numbers of publications. Studies published since May 2020 were not included in the current synthesis. Recognising this limitation, we repeated the searches in October 2021 using the same parameters as previously. We have presented these new searches in supplementary file 10.

Overall 464 unique articles were identified once 14 duplicates were removed. Two reviewers completed title and abstract screening identifying 29 for full text screening; of these, 21 met our criteria, eight are ongoing studies (56-63), eight are completed trials where a process evaluation was conducted but results are not available(64-71), and five are completed studies with process evaluation results available (72-76). As with the studies that were synthesised in our review, these included participants from a range of different ages and health conditions e.g. insomnia disorder, diabetes, heart disease, hip fracture, and obesity and generally focused on increasing physical activity, reducing sedentary behaviour or were lifestyle or weight loss interventions.

Of the five eligible studies where process evaluation results are available, one study (72) was guided by the MRC framework (4), none of the other studies used this or other frameworks to guide their evaluation. This study by Blackburn et al. (2021) was the only one where the intervention (SITLESS) aimed to reduce sedentary behaviour in addition to increasing physical activity and physical function. The other four included a measure of sedentary behaviour but the intervention primarily aimed to increase physical activity (75, 76) or promote

lifestyle changes including weight loss (73, 74). These process evaluations have different aims, one explored
older adults experiences of an intervention (SITLESS) which combined an exercise referral scheme plus selfmanagement strategies (72), one explored factors that support older people to increase their physical activity
levels in a primary care based intervention (PACE-Lift) (76); one explored how participants of different ages
with a range of conditions experienced and engaged with the e-coachER intervention which combined support
and an exercise referral scheme (75); one focused on the feasibility and satisfaction of an email lifestyle
intervention aimed at minority breast cancer survivors (74); another explored engagement and compliance
with a community weight loss intervention for obese males (SHED-IT) (73).

The findings from our updated search demonstrate the growing literature on testing and evaluating interventions including understand the factors that influence experiences, engagement, compliance, satisfaction and how interventions are implemented. Whilst the reported findings of these studies appear to be largely consistent with those included in our narrative synthesis, the iterative nature of coding data into the framework that was undertaken as part of this process means that it would not be appropriate to attempt to merge these findings into our already completed analysis. However, it is important to be aware of these recent studies when considering factors that influence how interventions focused on reducing sedentary behaviour are implemented, and how they are experienced.

#### CONCLUSIONS

There is a wealth of existing evidence which synthesises the findings from trials evaluating interventions that have measured sedentary behaviour as an outcome in adults. This review complements existing trial evidence because it highlights a range of factors associated with implementation, context, and participants experiences that can impact on whether an intervention is effective or not.

It is promising that all interventions were underpinned by theory as part of understanding how they were intended to have an effect, however it is important to acknowledge how different contexts and individual level factors e.g. health status, illness, age, and lifestyles can shape levels of engagement and behaviour change. Researchers could benefit from using a process evaluation framework such as Moore et al's,(4) for conducting and reporting process evaluations to ensure all factors are considered. Including logic model as part of the process evaluation would also assist in mapping the range of factors that contribute to changes in intervention outcomes.

#### FIGURES:

#### Figure 1: PRISMA flow diagram Figure 2: Key findings mapped to the diagram from the MRC guidance for process evaluations

#### ADDITIONAL

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#### Patient consent for publication: Not required

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- 59 60



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Factors influencing context that facilitate or hinder implementation or how participants respond or interact with the intervention (Review objectives 5 &	k 6)
	/

- Barriers to delivery of interventions: administrative or scheduling issues, organisational challenges, absence of staff, closure of services, work pressures for staff, financial difficulties
- Barriers to participation and engagement: most common examples included: pre-existing illness or injury e.g. pain, other commitments e.g. work or caring responsibilities, being too tired. Other examples included difficulties using accelerometers or pedometers, technology problems, context specific expectations or norms, being worried about specific environments e.g. gyms due to safety risks, influence of usual everyday life routines, religious festivals at certain times of year
- Facilitators to the delivery of interventions: simplicity in structure of the programme, little need for preparation in addition to usual working requirements, having access to trial related resources, having a committed team
- Facilitators to participation and engagement: most common example- support and encouragement from providers and peers to keep on track mixed preference for one to one vs face to face interactions. Other examples- being accountable to someone, having accurate step monitors, access to textual resources
- Experiences of interventions from different perspectives: positive experiences included opportunities for learning (participants and staff), becoming more aware of sedentary behaviour (participants and staff), negative experiences included disliking particular part of intervention (participants), or limited space for delivering programmes (staff)

KEY FINDING – A range of contextual and other factors influenced whether the interventions could be implemented or how participants responded. These need to be considered so that interventions can be adapted to different contexts and participant groups

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14         15         16         17         18         19         20         21         22         23         24         25         26         27         28         30         31         32         33         34         35         36         37         38         39         40         41	<ul> <li>Description of the interventions and their causal assumptions (review objectives 1 and 2)</li> <li>All interventions have multiple components (See supplementary file 5)</li> <li>Group based input or support common</li> <li>Delivered by a range of providers e.g. researchers, health educators, exercise professionals, coaches, advisors and nurses</li> <li>All underpinned by theory or incorporated BCTS- most common theory – Social Cognitive Theory (SCT)</li> <li>KEY FINDING: Only one study included a logic model outlining causal assumptions</li> </ul>	<ul> <li>Implementation and delivery approaches (review objective 3)</li> <li>Interventions delivered as intended in 3 studies</li> <li>7 interventions were adapted, 7 difficult to determine</li> <li>Approaches for achieving intervention delivery:         <ul> <li>Staff training</li> <li>Tailoring interventions to individual needs</li> <li>Allowing for flexibility in delivery methods</li> </ul> </li> <li>KEY FINDING- enhancing fidelity with adaptations did not always lead to interventions being effective in achieving the intended outcomes. Need to understand more about the mechanisms of intended effect</li> </ul>	Mechanisms of impact influencing intervention effectiveness (Review objectives 2 and 4)         • Mechanisms of action were reported, examples related to the most commonly used theory (SCT) included: self-efficacy, behavioural cues, using resources e.g. websites and counselling calls, social support         • Variation in how much these intended mechanisms had an effect on reducing sedentary behaviour. For example in one study, social support did not have the intended effect for those with intellectual disabilities as it was not appropriate for this population         KEY FINDING - it is important to fully understand the context and complexities associated with how interventions will work to understand more about the mechanisms of effect	come: ucing entary aviour
42 43 44 <b>Fi</b>	gure 2: Key findings mapped to the diagram from	For peer review only - http://bmjopen.bmj.com the MRC guidance for process evaluations	om/site/about/guidelines.xhtml	
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## Supplementary file 1: PRISMA 2020 Checklist 27.05.21

3 4 5 5	ion and c	ltem #	Checklist item	Location where item is reported
6 TITL	E			
7 Title		1	Identify the report as a systematic review.	Title, page 1
8 ABS	ABSTRACT			
9 Abstr	ract	2	See the PRISMA 2020 for Abstracts checklist.	Pg. 1
	RODUCTION			
Ratio	onale	3	Describe the rationale for the review in the context of existing knowledge.	Pg. 2/3
13 Obje	ctives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Pg. 3
14 MET	HODS			
15 Eligib	bility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Pg. 4
16 Inforr 17 sourc	mation ces	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Pg. 4
18 Sear 19	ch strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Supplementary file 2
20 Selec 21	ction process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Pg. 4/5
22 Data 23 proce 24	collection ess	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Pgs. 4-7
25 26 27	items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	n/a
27 28 20		10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	n/a
30 Study	y risk of bias ssment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Methodological quality pg. 7
32 Effec	ct measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	n/a
33 Synth 34 meth	hesis 10ds	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Pgs. 5-7
35 36	-	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	n/a
37		13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Pgs. 5-7
38 39		13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Pgs. 5-7
40 41		13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	n/a
42		13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	n/a
43 Repo 44 asses	orting bias ssment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Supplementary file 9
45 Certa 46	ainty	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	n/a


# Supplementary file 1: PRISMA 2020 Checklist 27.05.21

3 4 5	ection and opic	ltem #	Checklist item	Location where item is reported
5 a	ssessment			
7 <b>R</b>	ESULTS			
8 S 9	tudy selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Pg. 9
10 11		16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Supplementary file 4
12 S 13 c	tudy haracteristics	17	Cite each included study and present its characteristics.	Supplementary files 3 and 4
14 R 15 s	tisk of bias in tudies	18	Present assessments of risk of bias for each included study.	Supplementary file 9
16 R 17 ir	tesults of ndividual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	n/a
19 R	tesults of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	n/a
20 21	yntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	n/a
22		20c	Present results of all investigations of possible causes of heterogeneity among study results.	n/a
23		20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	n/a
24 25	eporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Supplementary file 9
20 27 C	Certainty of vidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	n/a
	ISCUSSION			
30 C	Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Pgs. 17-21
31		23b	Discuss any limitations of the evidence included in the review.	Pg. 19/20
32		23c	Discuss any limitations of the review processes used.	Pg. 19/20
33 34		23d	Discuss implications of the results for practice, policy, and future research.	Pgs. 17/21
, <b>c</b>	THER INFORMA	TION		
36 R	Registration and	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Pg. 2
37 P	1010001	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Pg. 2
38		24c	Describe and explain any amendments to information provided at registration or in the protocol.	n/a
59 S	Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Pg. 22
4 C 4 ir	competing nterests	26	Declare any competing interests of review authors.	n/a
43 A 44 d 45 0	vailability of ata, code and ther materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. For peer review only - http://bmiopen.bmi.com/site/about/guidelines.xhtml	Pg. 22

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi:



### Supplementary file 1: PRISMA 2020 Checklist 27.05.21

10.1136/bmj.n71 For more information, visit: http://www.prisma-statement.org/ For beer review only For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml 

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## Supplementary file 2\_search strategies May 11<sup>th</sup> 2020

Database: CINAHL (ESCODDS1), search modes - Boolean/Phrase, 1982-:         1       (Mi "Life Style, Sedentary")         2       TI, Sedentary or Sitting or seated) NS (behavio" or lifestyle or life-style)))         3       TX ( (sedentary or sitting or seated) NS (behavio" or lifestyle or life-style)))         5       TX ( (sedentary or sitting or seated or stationary or standing) N3 (task" or time or bout" or work" or break"))         5       TX ( (sedentary or sitting or seated or stationary or standing) N3 (task" or time or bout" or work" or break"))         6       TX ( 'sedentary or sitting or seated or stationary or standing N3 (task" or time or bout" or work" or break"))         7       TX 'we encrey expenditure"         8       TX 'physical active" or secretics or nonexercise or inactive"))         7       TX 'we encrey expenditure"         9       TX ( (isting or king) N2 (positine")         11       TX ( (fight or low) N3 "physical active")         121       TX (cononucle" or televestion or to or wideo game" or videogame" or gaming) and (sedentary or "physical" activity" or sitting or stand or standing or "physical" activity" or sitting or searce or media:)         11       TX ( (fight or low) N3 "physical active")         12       TX (fight or low) N1 "physical active")         12       TX (ifight or low) N3 "physical active")         12       TX (ifight or low) N1 "physical active")         12<	2		
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<ul> <li>Jaliana Charlow Charl</li></ul>	11	66	or sit or seated or stationary or standing) N3 (task* or time or bout* or work* or break*)) )
<ul> <li>Individuals of people()</li> <li>TX "how energy expenditure"</li> <li>TX "physical "inactiv*"</li> <li>TX (low energy expenditure")</li> <li>TX (low energy expenditure")</li> <li>TX (prolong* NZ (reclin* or sitor sitting or seated))</li> <li>TX (prolong* NZ (reclin* or sitor sitting or seated))</li> <li>TX (prolong* NZ (reclin* or sitor sitting or seated))</li> <li>TX (loronute* or television or tv or video game? or videogame? or gaming) and (sedentary or "physical* activity*" or sitting or seated on underactiv* or under activ*))</li> <li>TX (hair rise**</li> <li>TX (light or low) N1 "physical activ*")</li> <li>TX ((light or view*) NS (lelevision or tv or "video game*" or videogame* or gaming or screen or media))</li> <li>TX ((watch* or view*) NS (lelevision or tv or "video game*" or videogame* or videogame* or "computer game*"))</li> <li>TX (modon*</li> <li>TX (andom* activation or view or "computer game*")) OR AB (play* NS ("video game*" or videogame* or "computer game*"))</li> <li>TX (nandom*</li> <li>TX (andom* activation or view or scale or scale</li></ul>	12	56	IX((Inactive or no exercise or nonexercise or non exercise) N3 (adulte or men or women or males or temales or individuals or nonexercise)
<ul> <li>1. Novenergy experiments</li> <li>3. TX (byteside "inactive")</li> <li>3. TX (leisure time NS ("physical" active" or passive or inactive"))</li> <li>3. TX (physical "active level"*</li> <li>3. TX (computer* or television or tv or video game? or videogame? or gaming) and (sedentary or "physical* activity*" or sitting or seated or underactive" or under active"))</li> <li>3. TX (informuter* or television or tv or video game? or videogame? or gaming) and (sedentary or "physical* activity*" or sitting or seated or underactive or under active"))</li> <li>3. TX ('informuter* or television or tv or video game? or videogame* or gaming or screen or media))</li> <li>3. TX ((igencrase or reduc* or discourag* or lessen*) N3 (sit or sitting or stand or standing or "physical* inactive"))</li> <li>3. TX ((idecrase or reduc* or discourag* or lessen*) N3 (sit or sitting or stand or standing or "physical* inactive"))</li> <li>3. TX ((idecrase or reduc* or discourag* or lessen*) N3 (sit or sitting or stand or standing or screen or media))</li> <li>3. TX ((idecrase or reduc* or discourag* or "computer game*") / OR AB (play* N5 ("video game*" or videogame* or "computer game*"))</li> <li>3. TX (locat* random*</li> <li>3. TX (locat* random*</li> <li>3. TX (locat* random*</li> <li>3. TX (locat* random*</li> <li>3. Andomi* control* trial*</li> <li>3. TX (inice* n1 trial*</li> <li>3. St 1 or S2 or S2 or S24 or S25 or S26 or S27 or S28 or S29 or S30 or S31</li> <li>3. MH "Random Assignment"</li> <li>3. St 1 Or S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S14 OR S15 OR S16 OR S17 OR S18 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S20 OR S31</li> <li>3. S31 OR S34 OR S35 OR S36</li> <li>3. S37 AND S38 AND S39</li> <li>3. Database: SPORTDiscus (EBSCOhost), search modes - Boolean/Phrase;</li> <li>3. S1 OR S24 OR S30 or S36</li> <li>3. S37 AND S38 AND S39</li> <li>3. TI (sedentary or sitting or sedentarines or sedentarism)</li> <li>3. TI (sedentary or sitting or sedentarines or sedentarism</li></ul>	13	67	TV "low energy expenditure"
<ul> <li>b. L. physical "induity</li> <li>TX (physical activity level**</li> <li>TX (lisiume time NS ("physical* activity" or passive or inactiv"))</li> <li>TX (stima or ying) N2 posture*)</li> <li>TX (stima or ying) N2 posture*)</li> <li>TX (lisium or under activ or under activ*))</li> <li>TX (light or low) N1 "physical activity"</li> <li>TX (time NS ("physical* activity")</li> <li>TX (light or low) N1 "physical activ*)</li> <li>TX (light or low) N1 "physical activ*)</li> <li>TX (time NS (computer* or television or tv or 'video game*' or videogame? or gaming) and (sedentary or "physical* inactiv*"))</li> <li>TX (light or low) N1 "physical activ*)</li> <li>TX (time NS (computer* or television or tv or 'video game*' or videogame* or gaming or screen or media))</li> <li>TX (light or view?) NS (television or tv or 'video game*' or videogame* or videogame* or videogame* or "computer game*"))</li> <li>TX (laght NS ("video game*' or videogame* or "computer game*"))</li> <li>OR AB (play* NS ("video game*' or videogame* or "computer game*"))</li> <li>TX random*</li> <li>CI (Inda* NS ("video game*' or videogame* or "computer game*"))</li> <li>OR AB (play* NS ("video game*' or videogame*</li> <li>TX random*</li> <li>CI (Inda* NS ("video game*' or videogame* or "computer game*"))</li> <li>OR AB (play* NS ("video game*' or videogame*</li> <li>TX random*</li> <li>CI (Inda* NS ("video game*' or videogame* or "computer game*"))</li> <li>AB randomized</li> <li>AB randomized</li> <li>AB randomized</li> <li>S2 21 or S22 or S23 or S24 or S25 or S26 or S27 or S28 or S29 or S30 or S31</li> <li>MH "Process Assessment (Health Care)")</li> <li>S3 CI (program* evaluat*))</li> <li>S3 CI (program* evaluat*))</li> <li>S3 CI (program* evaluat*))</li> <li>S3 S3 OR S34 OR S3 OR S50 OR S27 OR S28 OR S29 OR S30 OR S31</li> <li>S3 S3 OR S34 OR S35 or S36</li> <li>S37 AND S38 AND S39</li> </ul>	14	5/	TX Tow energy expenditure
<ul> <li>TX (explored interest projection as the originative of inductor y))</li> <li>TX (spiked activity level**</li> <li>TX (sitting or ying) N2 posture*)</li> <li>TX (computer* or television or tv or video game? or videogame? or gaming) and (sedentary or "physical* activity*" or sitting or seated or underactiv* or under activ*))</li> <li>TX (for on the set or underactiv* or under activ*))</li> <li>TX (tight or low) N1 "physical activit*")</li> <li>TX (tight or low) N1 "physical activi*")</li> <li>TX (tight or low) N1 "physical activ*")</li> <li>TX (tight or low) N1 "physical activ*</li> <li>TX (andom* activation or two or "low or "computer game*") OR AB (play* N5 ("video game*" or videogame*</li> <li>TX (low the activation or two or "low or "low or "low or "low or low or lifestyle or lifestyle or lifestyle or lifestyle or lifestyle or lifes</li></ul>	15	50	TX privilar induliv
<ul> <li>Jun TX, prystanatolini (even)</li> <li>TX (I prolong* N2 (reclin* or sit or siting or seated))</li> <li>TX (computer* or television or tv or video game? or videogame? or gaming) and (sedentary or "physical* activity*" or sitting or seated or underactiv* or under activ*))</li> <li>TX 'Chair rise*'</li> <li>TX 'Chair rise*'</li> <li>TX 'Chair rise*'</li> <li>TX (light or low) N1 "physical activ*")</li> <li>TX (light or light activation or ligh</li></ul>	6	59 610	TX ( leisure time NS ( physical active of passive of mactive)) )
<ul> <li>11 TA ((studie of nyme) nz posude ')</li> <li>12 TX (reprolong* NZ (reclin* or sit or sitting or seated))</li> <li>13 TI((computer* or television or tv or video game? or videogame? or gaming) and (sedentary or "physical* activity*" or sitting or seated or underactiv* or under activ*))</li> <li>14 TX 'chair rise*'</li> <li>15 TX 'sit* [sss''</li> <li>15 TX 'sit* [sss''</li> <li>16 TX ((light or low) N1 "physical activ*")</li> <li>17 X ((decrease or reduc* or discourag* or lessen*) N3 (sit or sitting or stand or standing or "physical* inactiv*"))</li> <li>18 TX (time NS (computer* or television or tv or 'Video game*' or videogame* or gaming or screen or media))</li> <li>17 X ((decrease or reduc* or discourag* or lessen*) N3 (sit or sitting or stand or standing or "physical* inactiv*"))</li> <li>18 TX (time NS (computer*) NS (television or tv or 'Video game*' or videogame* or gaming or screen or media))</li> <li>17 X allocat* random*</li> <li>17 X allocat* random*</li> <li>22 (MH "Placebos")</li> <li>23 TX placebo*</li> <li>24 TX random* allocat*</li> <li>25 TX randomi* control* trial*</li> <li>25 TX randomi* control* trial*</li> <li>26 TX (inic* n1 trial*</li> <li>27 PT Clinical trial</li> <li>28 (MH "Clinical Trials*")</li> <li>29 AB randomixed</li> <li>31 MH "Process Assessment (Health Care)")</li> <li>33 TX ((proces* evaluat*))</li> <li>34 TX ((proces* evaluat*))</li> <li>35 TX ((proces* evaluat*))</li> <li>36 S3 OR S4 OR S5 OR S5 OR S5 OR S2 OR S20 OR S20 OR S31 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S30 OR S31</li> <li>33 GN S34 OR S35 or S36</li> <li>33 S3 OR S44 OR S35 or S36</li> <li>34 TX (cleentary or sitting or sedentariness or sedentarism)</li> <li>37 T ((sedentary or sitting or sedentariness or sedentarism)</li> <li>37 T ((sedentary or sitting or sedentariness or sedentarism)</li> <li>37 T ((sedentary or sitting or sedentariness or sedentarism)</li> <li>37 T ((sedentary or sitting or sedentariness or sedentarism)</li> <li>37 T ((sedentary or sitting or sedentarines</li></ul>	7	510	TX physical activity level
<ul> <li>11. Tr( protong Vz (recur) vs at of a construction of video game? or video game? or gaming) and (sedentary or "physical* activity*" or sitting or seated or underactiv* or under activ*))</li> <li>12. TX (rohan' rise************************************</li></ul>	8	511	TX ( (sitting of lying) N2 posture )
<ul> <li>stituconductor of retervision of Vol video game of indegame of gaming) and (secientary of physical activity of stitutors) and (secientary of physical activity of stitutors).</li> <li>TX "chair rises"</li> <li>TX ((light or low) N1 "physical activit")</li> <li>TX ((light or low) N1 "physical activit")</li> <li>TX ((decrease or reduct or discourage or fessen*) N3 (sit or sitting or stand or standing or "physical* inactivit"))</li> <li>TX ((decrease or reduct or discourage to relevant or "video game*" or video game*" or gaming or screen or media))</li> <li>TX ((decrease or reduct or discourage to relevant or "video game*")) OR AB (play* N5 ("video game*" or videogame* or "computer game*"))</li> <li>TX allocat* random*</li> <li>TX placebos*)</li> <li>TX clinic* n1 trial*</li> <li>TX clinic* n1 trial*</li> <li>TX clinic* n1 trial*</li> <li>AB randomized</li> <li>AB randomized</li> <li>AB randomized</li> <li>S2 (for close valuat*))</li> <li>S3 (MH "Process Assessment (Health Care)")</li> <li>S3 (MH "Process Assessment (Health Care)")</li> <li>S3 (MH "Process Assessment (Health Care)")</li> <li>S3 (S1 or S22 or S33 or S4 or S25 or S26 or S27 or S28 or S29 or S30 or S31</li> <li>S3 (MH "Process Assessment (Health Care)")</li> <li>S3 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S30 OR S31</li> <li>S3 GN S34 OR S35 or S36</li> <li>S3 S3 OR S34 OR S35 or S36</li> <li>S3 S3 OR S34 OR S35 or S36</li> <li>S3 S7 AND S38 AND S39</li> </ul>	9	51Z 612	TX (prototing "N2 (rectiff" of sitting of seated))
<ul> <li>String of searce of directive of directive ()</li> <li>14 TX "str* less"</li> <li>15 TX "str* less"</li> <li>15 TX ((light or low) N1 "physical activ*")</li> <li>17 TX ((decrease or reduc* or discourag* or lessen*) N3 (sit or sitting or stand or standing or "physical* inactiv*") )</li> <li>18 TX (time N5 (computer* or television or tv or "video game*" or video game*" or "computer game*") )</li> <li>19 TX ((twatch or view*) N5 (television or tv))</li> <li>10 TX (time N5 (computer* or video game*" or "computer game*") ) OR AB (play* N5 ("video game*" or videogame* or "computer game*") )</li> <li>11 TX allocat* random*</li> <li>12 TX allocat* random* allocat*</li> <li>12 TX random* allocat*</li> <li>13 TX (inci n1 trial*</li> <li>14 TX (inci n1 trial*</li> <li>15 S2 S1 C ro S2 or S2 or S2 or S2 or S26 or S27 or S28 or S29 or S30 or S31</li> <li>13 TX (iprogram* evaluat*))</li> <li>13 S1 TX (ifrogram evaluat*))</li> <li>14 TX (ifrocess* evaluat*))</li> <li>15 S2 S2 OR S20 OR S20 OR S20 OR S20 OR S30 OR S31 OR S31 OR S14 OR S15 OR S16 OR S17 OR S18 OR S20</li> <li>13 S3 OR S34 OR S35 or S36</li> <li>13 S1 C R S2 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31</li> <li>13 S3 S3 OR S34 OR S35 or S36</li> <li>14 TX (iscentary or sitting or seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyl</li></ul>	20	313	sitting or seated or underactive or under active))
<ul> <li>J. T. Visit* less<sup>1</sup></li> <li>J. T. Yisit* less<sup>1</sup></li> <li>T. X. (light or low) N1 "physical activ*")</li> <li>T. X. (time N5 (computer* or television or tv or "video game*" or videogame* or gaming or screen or media)</li> <li>T. X. (time N5 (computer* or television or tv or "video game*") OR AB (play* N5 ("video game*" or videogame* or "computer game*")</li> <li>T. X. (time N5 (computer* or television or tv or "computer game*") OR AB (play* N5 ("video game*" or videogame* or "computer game*")</li> <li>T. X. allocat* random*</li> <li>X. T. Yalocat* random*</li> <li>T. X. random* allocat*</li> <li>T. X. random* allocat*</li> <li>T. X. random* allocat*</li> <li>T. X. random* control * trial*</li> <li>T. X. finical trial</li> <li>T. K. (incical trial</li> <li>T. K. (process* evaluat*))</li> <li>S. T. K. (process* evaluat*))</li> <li>S. S. 10 R S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S30 OR S31</li> <li>S33 (MH * Process Assessment (Health Care)")</li> <li>S33 S. S3 OR S34 OR S35 OR S6 OR S7 OR S28 OR S29 OR S30 OR S31</li> <li>S33 OR S34 OR S35 or S36</li> <li>S34 OR S37 AND S38 AND S39</li> </ul>	1 1	<b>S</b> 1 <i>1</i>	TY "chair rise*"
<ul> <li>John States</li> <li></li></ul>	2	S14 S15	
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<ul> <li>11 Tr (Etter NS (computer* or television or tv or "video game*" or videogame* or gaming or screen or media)</li> <li>12 TX ((watch or view*) NS (television or tv))</li> <li>13 TX ((watch or view*) NS (television or tv))</li> <li>14 TX ((watch or view*) NS (television or tv))</li> <li>15 TX ((watch or view*) NS (television or tv))</li> <li>15 TX allocat* random*</li> <li>16 TX (Inite* nation*)</li> <li>17 X allocat* random*</li> <li>17 X allocat*</li> <li>17 X random* allocat*</li> <li>17 X clinic* nation*</li> <li>17 X clinic* nation*</li> <li>17 X clinic* nation*</li> <li>17 X clinic* nation*</li> <li>18 TX (Inite* nation*)</li> <li>19 X TX random*</li> <li>10 X clinic* nation*</li> <li>10 X clinic* nation*</li> <li>11 X clinic* nation*</li> <li>12 X clinic* nation*</li> <li>13 X clinic* nation*</li> <li>14 X clinic* nation*</li> <li>15 X clinic*</li> <li>15 X c</li></ul>	25	S10	TX ( (decrease or reduct or discourage or lessent) N3 (sit or sitting or stand or standing or "physical* inactiv*") )
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<ul> <li>S20 Ti ((bat's N5 ("video game" or videogame* or "computer game*") ) OR AB (play* N5 ("video game*" or videogame* or "computer game*") ) OR AB (play* N5 ("video game*" or videogame* or "computer game*") ) OR AB (play* N5 ("video game*" or videogame* or "computer game*") ) OR AB (play* N5 ("video game*" or videogame* or "computer game*") ) OR AB (play* N5 ("video game*" or videogame* or "computer game*") ) OR AB (play* N5 ("video game*" or videogame*</li> <li>S21 TX allocat* random*</li> <li>S22 TX placebo*</li> <li>S23 TX placebo*</li> <li>S24 TX random* allocat*</li> <li>S25 TX random* control* trial*</li> <li>S26 TX clinic* n1 trial*</li> <li>S27 PT Clinical trial</li> <li>S28 (MH "Clinical Trials+")</li> <li>S29 AB randomized</li> <li>S30 AB randomly</li> <li>S31 MH "Random Assignment"</li> <li>S32 S21 or S22 or S23 or S25 or S25 or S26 or S27 or S28 or S29 or S30 or S31</li> <li>S33 (MH "Process* evaluat*))</li> <li>S34 TX ((program* evaluation")</li> <li>S35 TX ((program* evaluation")</li> <li>S35 TX ((program* evaluation")</li> <li>S36 (MH "Process Assessment (Health Care)")</li> <li>S37 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20</li> <li>S33 OR S34 OR S35 or S36</li> <li>S40 S37 AND S38 AND S39</li> </ul> Database: SPORTDiscus (EBSCOhost), search modes - Boolean/Phrase: <ul> <li>S1 SU Sedentary Lifestyle</li> <li>S1 ((sedentary or sitting or seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seat</li></ul>	27	S10	TX ( (watch* or view*) N5 (television or tv) )
<ul> <li>So in (pix) (in (c) (accepting an e<sup>*</sup>))</li> <li>TX allocat* random*</li> <li>(MH "Placebos")</li> <li>TX random* allocat*</li> <li>TX (process* evaluat*))</li> <li>TX ((process* evaluat*))</li> <li>TX ((process*)</li> <li>TX ((process*)</li> <li>TX ((process*)</li> <li>TX ((process*)</li> <li>TX (process*)</li> <li>TX ((process</li></ul>	8	S20	TI ( play* N5 ("video game*" or videogame* or "computer game*") ) OB AB ( play* N5 ("video game*" or videogame*
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<ul> <li>S24 TX random* allocat*</li> <li>S25 TX randomi* control* trial*</li> <li>S26 TX clinic* n1 trial*</li> <li>S27 PT Clinical trial</li> <li>S28 (MH "Clinical Trials+")</li> <li>S29 AB randomized</li> <li>S30 AB randomized</li> <li>S31 MH "Random Assignment"</li> <li>S22 S21 or S22 or S23 or S24 or S25 or S26 or S27 or S28 or S29 or S30 or S31</li> <li>S33 (MH "Program Evaluation")</li> <li>S34 Tx ((process* evaluat*))</li> <li>S35 TX ((program* evaluat*))</li> <li>S36 (MH "Process Assessment (Health Care)")</li> <li>S37 S1 OR S2 OR S30 R S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S30 OR S31</li> <li>S33 (S33 OR S34 OR S20 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31</li> <li>S33 S33 OR S34 OR S35 or S36</li> <li>S40 S37 AND S38 AND S39</li> </ul> Database: SPORTDiscus (EBSCOhost), search modes - Boolean/Phrase: S1 Cl (sedentary or sitting or seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5 (behavio* or lifestyle or life-style)) OR AB (seated) N5	2	S23	TX placebo*
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<ul> <li>S3 TI ( (sedentary or sitting or seated) N5 (behavio* or lifestyle or life-style)) ) OR AB ( seated) N5 (behavio* or lifestyle or life-style) ) OR AB ( seated) N5 (behavio* or lifestyle or life-style) ) OR AB ( seated) N5 (behavio* or lifestyle or life-style) ) OR AB ( seated) N5 (behavio* or lifestyle or lifestyle or life-style) )</li> <li>S4 TI ( (sedentary N3 (adult* or men or women or males or females or individuals or people or population*)) ) OR AB (</li> </ul>	8	S2	TI (sedentary or sitting or sedentariness or sedentarism)
<ul> <li>life-style) ) OR AB ( (sedentary or sitting or seated) N5 (behavio* or lifestyle or life-style)) ) OR AB ( seated) N5 (behavio* or lifestyle or life-style) )</li> <li>S4 TI ( (sedentary N3 (adult* or men or women or males or females or individuals or people or population*)) ) OR AB (</li> </ul>	9	S3	TI ( (sedentary or sitting or seated) N5 (behavio* or lifestyle or life-style)) ) OR AB ( seated) N5 (behavio* or lifestyle or
S4 TI ( (sedentary N3 (adult* or men or women or males or females or individuals or people or population*)) ) OR AB (	U		life-style) ) OR AB ( (sedentary or sitting or seated) N5 (behavio* or lifestyle or life-style)) ) OR AB ( seated) N5 (behavio* or lifestyle or life-style) )
		S4	TI ( (sedentary N3 (adult* or men or women or males or females or individuals or people or population*)) ) OR AB (

(sedentary N3 (adult\* or men or women or males or females or individuals or people or population\*))) 1 S5 TI ( ((sitting or sit or seated or stationary or standing) N3 (task\* or time or bout\* or work\* or break\*)) ) OR AB ( ((sitting 2 or sit or seated or stationary or standing) N3 (task\* or time or bout\* or work\* or break\*))) 3 S6 TX(inactiv\* or no exercise or nonexercise or non exercise) N3 (adult\* or men or women or males or females or 4 individuals or people)) 5 S7 TI "low energy expenditure" OR AB "low energy expenditure" 6 TI "physical\* inactiv\*" OR AB "physical\* inactiv\*" S8 7 S9 TI (leisure time N5 ("physical\* activ\*" or passive or inactiv\*))) OR AB (leisure time N5 ("physical\* activ\*" or passive or 8 inactiv\*)) 9 S10 TI "physical activity level\*" OR AB "physical activity level\*" 10 S11 TI ( (sitting or lying) N2 posture\* ) OR AB ( (sitting or lying) N2 posture\* ) 11 TI (prolong\* N2 (reclin\* or sit or sitting or seated)) OR AB (prolong\* N2 (reclin\* or sit or sitting or seated)) S12 12 TX((computer\* or television or tv or video game? or videogame? or gaming) and (sedentary or physical\* activity\* or S13 13 sitting or seated or underactiv\* or under activ\*)) 14 S14 TI "chair rise\*" OR AB "chair rise\*" 15 16 S15 TI "sit\* less" OR AB "sit\* less" 17 S16 TI ( (light or low) N1 "physical activ\*" ) OR AB ( (light or low) N1 "physical activ\*" ) 18 TI ( (decrease or reduc\* or discourag\* or lessen\*) N3 (sit or sitting or stand or standing or "physical\* inactiv\*") ) OR AB S17 19 ((decrease or reduc\* or discourag\* or lessen\*) N3 (sit or sitting or stand or standing or "physical\* inactiv\*")) 20 S18 TI ( time N5 (computer\* or television or tv or "video game\*" or videogame\* or gaming or screen or media) ) OR AB ( 21 time N5 (computer\* or television or tv or "video game\*" or videogame\* or gaming or screen or media) ) 22 S19 TI ( (watch\* or view\*) N5 (television or tv) ) OR AB ( (watch\* or view\*) N5 (television or tv) ) 23 S20 TI ( play\* N5 ("video game\*" or videogame\* or "computer game\*") ) OR AB ( play\* N5 ("video game\*" or videogame\* 24 or "computer game\*")) 25 S21 ((DE "RANDOMIZED controlled trials"))) 26 S22 TX allocat\* random\* 27 S23 DE "QUANTITATIVE research" 28 S24 DE "PLACEBOS (Medicine)" 29 S25 TX placebo\* 30 S26 TX random\* allocat\* 31 S27 TX random\* assign\* 32 S28 TX randomi\* control\* trial\* 33 S29 TX clinic\* n1 trial\* 34 S30 DE "CLINICAL trials" 35 36 S31 AB randomly 37 S32 AB randomized 38 S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 S33 39 S34 SU program evaluation 40 S35 TX program\* evaluat\* 41 S36 TI process\* evaluat\* 42 S37 S34 OR S35 OR S36 43 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S38 44 S18 OR S19 OR S20 45 S39 S33 AND S37 AND S38 46 47 48 49 Database: Cochrane Database of Systematic Reviews (Wiley): 50 51 #1 MeSH descriptor: [Sedentary Behavior] this term only 52 #2 sedentary or sitting or sedentariness or sedentarism:ti 53 #3 (sedentary or sitting or seated) near/5 (behavio\* or lifestyle or life-style):ti,ab,kw (Word variations have been searched) 54 #4 sedentary near/3 (adult\* or men or women or males or females or individuals or people or population\*):ti,ab,kw (Word 55 variations have been searched) 56 (sitting or sit or seated or stationary or standing) near/3 (task\* or time or bout\* or work\* or break\*):ti,ab,kw (Word #5 57 variations have been searched) 58 #6 ((inactiv\* or no exercise or nonexercise or non exercise) near/3 (adult\* or men or women or males or females or 59 individuals or people)):ti,ab,kw 60 "low energy expenditure":ti,ab,kw (Word variations have been searched) #7 ("physical\* inactive" or "physical inactivity"):ti,ab,kw (Word variations have been searched) #8 #9 "leisure time" near/5 ("physical\* activ\*" or passive or inactiv\*):ti,ab,kw (Word variations have been searched)

- #10 "physical activity level\*":ti,ab,kw (Word variations have been searched)
- 1 #11 (sitting or lying) near/2 posture\*:ti,ab,kw (Word variations have been searched)
- 2 #12 prolong\* near/2 (reclin\* or sit or sitting or seated):ti,ab,kw (Word variations have been searched)
- 3 #13 "chair rise\*":ti,ab,kw (Word variations have been searched) 4
- #14 "sit\* less":ti,ab,kw (Word variations have been searched) 5
- #15 (light or low) near/1 "physical activ\*":ti,ab,kw (Word variations have been searched) 6

#16 time near/5 (computer\* or television or tv or "video game\*" or videogame\* or gaming or screen or media):ti,ab,kw (Word 7 variations have been searched)

- 8 #17 (watch\* or view\*) near/5 (television or tv):ti,ab,kw (Word variations have been searched) 9
- #18 play\* near/5 ("video game\*" or videogame\* or "computer game\*"):ti,ab,kw (Word variations have been searched) 10
- #19 (decrease or reduc\* or discourag\* or lessen\*) near/3 (sit or sitting or stand or standing or "physical\* inactiv\*"):ti,ab,kw 11 (Word variations have been searched)
- 12 #20 ((computer\* or television or tv or video game\* or videogame\* or gaming) and (sedentary or physical\* activity\* or sitting or 13
- seated or underactiv\* or under activ\*)):ti 14
- #21 {or #1-#20} 15
- #22 MeSH descriptor: [Program Evaluation] this term only 16
- #23 ("program\* evaluation\*"):ti,ab,kw 17
- #24 "process\* evaluation\*":ti,ab,kw 18
- #25 MeSH descriptor: [Process Assessment, Health Care] this term only 19
- #26 {or #22-#25} 20
- #27 #21 and #26 21
- 22

#### 23 Database: Cochrane Central Register of Controlled Trials (Wiley): 24

- 25 #1 MeSH descriptor: [Sedentary Behavior] this term only 26
- #2 sedentary or sitting or sedentariness or sedentarism:ti 27
- (sedentary or sitting or seated) near/5 (behavio\* or lifestyle or life-style):ti,ab,kw (Word variations have been searched) #3 28
- #4 sedentary near/3 (adult\* or men or women or males or females or individuals or people or population\*):ti,ab,kw (Word 29 variations have been searched) 30
- (sitting or sit or seated or stationary or standing) near/3 (task\* or time or bout\* or work\* or break\*):ti,ab,kw (Word #5 31 variations have been searched) 32
- #6 ((inactiv\* or no exercise or nonexercise or non exercise) near/3 (adult\* or men or women or males or females or 33 individuals or people)):ti,ab,kw 34
- "low energy expenditure":ti,ab,kw (Word variations have been searched) #7 35
- #8 ("physical\* inactive" or "physical inactivity"):ti,ab,kw (Word variations have been searched) 36
- "leisure time" near/5 ("physical\* activ\*" or passive or inactiv\*):ti,ab,kw (Word variations have been searched) 37 #9
- #10 "physical activity level\*":ti,ab,kw (Word variations have been searched) 38
- #11 (sitting or lying) near/2 posture\*:ti,ab,kw (Word variations have been searched) 39
- #12 prolong\* near/2 (reclin\* or sit or sitting or seated):ti,ab,kw (Word variations have been searched) 40
- #13 "chair rise\*":ti,ab,kw (Word variations have been searched) 41
- #14 "sit\* less":ti,ab,kw (Word variations have been searched) 42
- #15 (light or low) near/1 "physical activ\*":ti,ab,kw (Word variations have been searched) 43
- 44 #16 time near/5 (computer\* or television or tv or "video game\*" or videogame\* or gaming or screen or media):ti,ab,kw (Word 45 variations have been searched)
- 46 #17 (watch\* or view\*) near/5 (television or tv):ti,ab,kw (Word variations have been searched)
- 47 #18 play\* near/5 ("video game\*" or videogame\* or "computer game\*"):ti,ab,kw (Word variations have been searched) 478
- 48 #19 (decrease or reduc\* or discourag\* or lessen\*) near/3 (sit or sitting or stand or standing or "physical\* inactiv\*"):ti,ab,kw 49 (Word variations have been searched)
- 50 #20 ((computer\* or television or tv or video game\* or videogame\* or gaming) and (sedentary or physical\* activity\* or sitting or 51 seated or underactiv\* or under activ\*)):ti
- 52 #21 {or #1-#20}
- 53 #22 MeSH descriptor: [Program Evaluation] this term only
- 54 #23 ("program\* evaluation\*"):ti,ab,kw
- 55 #24 "process\* evaluation\*":ti,ab,kw
- 56 #25 MeSH descriptor: [Process Assessment, Health Care] this term only 57
- #26 {or #22-#25}
- 58 #27 #21 and #26
- 59 60

AMED (Allied and Complementary Medicine) (OVID) <1985 to May 2020>:

1 Sedentary Lifestyle/

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29 30 31

- 2 (sedentary or sitting or sedentariness or sedentarism).ti.
- 3 ((sedentary or sitting or seated) adj5 (behavio\* or lifestyle or life-style)).tw.
- 4 ((inactiv\* or no exercise or nonexercise or non exercise) adj3 (adult? or men or women or males or females or individuals or people)).tw.
- 5 (sedentary adj3 (adult? or men or women or males or females or individuals or people or population?)).tw.
- 6 ((sitting or sit or seated or stationary or standing) adj3 (task\* or time or bout\* or work\* or break\*)).tw.
- 7 low energy expenditure.tw.
- 8 8 physical\* inactiv\*.tw.
- 9 (leisure time adj5 (physical\* activ\* or passive or inactiv\*)).tw.
   10 "hereical activity laws!\*" two
- 10 "physical activity level\*".tw.
- 12 11 ((sitting or lying) adj2 posture\*).tw.
- 12 (prolong\* adj2 (reclin\* or sit or sitting or seated)).tw.
- 13 chair rise?.tw.
- 14 "sit\* less".tw.
- 15 ((light or low) adj "physical activ\*").tw.
- 16 ((decrease or reduc\* or discourag\* or lessen\*) adj3 (sit or sitting or stand or standing or physical\* inactiv\*)).tw.
- 17 (time adj5 (computer\* or television or tv or video game? or videogame? or gaming or screen or media)).tw.
- 19 18 ((watch\* or view\*) adj5 (television or tv)).tw.
- 19 (play\* adj5 (video game? or videogame? or computer game?)).tw.
- 20 ((computer\* or television or tv or video game? or videogame? or gaming) and (sedentary or physical\* activity\* or sitting or seated or underactiv\* or under activ\*)).ti.
- 22 sealed of underactive of under active )).ti. 22 21 or/1-20 [sedentary behaviour terms]
- 23 21 of/1-20 [sedentary be 24 22 process evaluat\*.mp.
- 25 23 "Outcome and Process Assessment"/
- 26 24 program evaluat\*.mp.
- 27 25 or/22-24 [process evaluation]
- 26 21 and 25 [sedentary behaviour and process evaluation]
- 2 Database: Embase Classic+Embase (OVID) <1947 to 2020 May 08>:
- 33 34 1 Sedentary Lifestyle/
- 2 (sedentary or sitting or sedentariness or sedentarism).ti.
- 36 3 ((sedentary or sitting or seated) adj5 (behavio\* or lifestyle or life-style)).tw.
- 4 ((inactiv\* or no exercise or nonexercise or non exercise) adj3 (adult? or men or women or males or females or individuals or people)).tw.
- 5 (sedentary adj3 (adult? or men or women or males or females or individuals or people or population?)).tw.
- 6 ((sitting or sit or seated or stationary or standing) adj3 (task\* or time or bout\* or work\* or break\*)).tw.
- 41 7 low energy expenditure.tw.
- 42 8 physical\* inactiv\*.tw.
- 43 9 (leisure time adj5 (physical\* activ\* or passive or inactiv\*)).tw.
- 44 10 "physical activity level\*".tw.
- 45 11 ((sitting or lying) adj2 posture\*).tw.
- 46 12 (prolong\* adj2 (reclin\* or sit or sitting or seated)).tw.
- 47 13 chair rise?.tw.
- 48 14 "sit\* less".tw.
- 49 15 ((light or low) adj "physical activ\*").tw.
- 50 16 ((decrease or reduc\* or discourag\* or lessen\*) adj3 (sit or sitting or stand or standing or physical\* inactiv\*)).tw.
- 51 17 (time adj5 (computer\* or television or tv or video game? or videogame? or gaming or screen or media)).tw.
- 52 18 ((watch\* or view\*) adj5 (television or tv)).tw.
- 53 19 (play\* adj5 (video game? or videogame? or computer game?)).tw.
- 54 20 ((computer\* or television or tv or video game? or videogame? or gaming) and (sedentary or physical\* activity\* or sitting or 55 seated or underactiv\* or under activ\*)).ti.
- 56 21 or/1-20 [sedentary behaviour terms]
- 57 22 Randomized controlled trial/
- 58 23 Controlled clinical study/59 24 22 or 23
- 59 24 22 or 23 60 25 Random\*
  - 25 Random\*.tw.
    - 26 randomization/
    - 27 intermethod comparison/
    - 28 placebo.tw.

#### **BMJ** Open

- (compare or compared or comparison).ti.
- ((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab.
- (open adj label).tw.
- ((double or single or doubly or singly) adj (blind or blinded or blindly)).tw.
- double blind procedure/
- parallel group\*1.tw.
- (crossover or cross over).tw.
- ((assign\* or match or matched or allocation) adj5 (alternate or group\*1 or intervention\*1 or patient\*1 or subject\*1 or participant\*1)).tw.
- (assigned or allocated).tw.
- (controlled adj7 (study or design or trial)).tw.
- (volunteer or volunteers).tw.
- human experiment/
- trial.ti.
- or/25-41
- 43 42 or 24
- 44 (random\* adj sampl\* adj7 ("cross section\*" or questionnaire\*1 or survey\* or database\*1)).tw. not (comparative study/ or controlled study/ or randomi?ed controlled.tw. or randomly assigned.tw.)
- 45 Cross-sectional study/ not (randomized controlled trial/ or controlled clinical study/ or controlled study/ or randomi?ed controlled.tw. or control group\*1.tw.)
- (((case adj control\*) and random\*) not randomi?ed controlled).tw.
- (Systematic review not (trial or study)).ti.
- (nonrandom\* not random\*).tw.
- "Random field\*".tw.
- (random cluster adj3 sampl\*).tw.
- (review.ab. and review.pt.) not trial.ti.
- "we searched".ab. and (review.ti. or review.pt.)
- "update review".ab.
- (databases adj4 searched).ab.
- (rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset\*1).ti. and animal experiment/ (1058538)
- Animal experiment/ not (human experiment/ or human/)
- or/44-56
- 43 not 57 [Cochrane Embase RTC search filter Jan 2015]
- program evaluat\*.mp.
- health care quality/
- process\* evaluat\*.mp.
- or/59-61 [process evaluation]
- 21 and 58 and 62 [sedentary behaviour and RCTs and process evaluations]
- 64 remove duplicates from 63

- Database: APA PsycInfo (OVID) <1806 to May Week 1 2020>:
- SEDENTARY BEHAVIOR/
- (sedentary or sitting or sedentariness or sedentarism).ti.
- ((sedentary or sitting or seated) adj5 (behavio\* or lifestyle or life-style)).tw.
- ((inactiv\* or no exercise or nonexercise or non exercise) adj3 (adult? or men or women or males or females or individuals
  - or people)).tw.
- (sedentary adj3 (adult? or men or women or males or females or individuals or people or population?)).tw.
- ((sitting or sit or seated or stationary or standing) adj3 (task\* or time or bout\* or work\* or break\*)).tw.
- low energy expenditure.tw.
- physical\* inactiv\*.tw.
- (leisure time adj5 (physical\* activ\* or passive or inactiv\*)).tw.
- "physical activity level\*".tw.
- ((sitting or lying) adj2 posture\*).tw.
- (prolong\* adj2 (reclin\* or sit or sitting or seated)).tw.
- chair rise?.tw.
  - "sit\* less".tw.
    - ((light or low) adj "physical activ\*").tw.
    - ((decrease or reduc\* or discourag\* or lessen\*) adj3 (sit or sitting or stand or standing or physical\* inactiv\*)).tw.
      - (time adj5 (computer\* or television or tv or video game? or videogame? or gaming or screen or media)).tw. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

- ((watch\* or view\*) adj5 (television or tv)).tw.
- (play\* adj5 (video game? or videogame? or computer game?)).tw.
- ((computer\* or television or tv or video game? or videogame? or gaming) and (sedentary or physical\* activity\* or sitting or
  - seated or underactiv\* or under activ\*)).ti.
- 21 or/1-20 [sedentary behaivour ]
- 22 Treatment Effectiveness Evaluation/
- exp Treatment Outcomes/
  - 24 Psychotherapeutic Outcomes/
- PLACEBO/

- exp Followup Studies/
- placebo\*.tw.
- random\*.tw.
- comparative stud\*.tw.
- (clinical adj3 trial\*).tw.
- (research adj3 design).tw.
- (evaluat\* adj3 stud\*).tw.
- (prospectiv\* adj3 stud\*).tw.
- ((singl\* or doubl\*or trebl\* or tripl\*) adj3 (blind\* or mask\*)).tw.
- or/22-34 [RCT filter adapted from Watson RJ, Richardson PH 1999]
- program evaluat\*.mp.
- process\* evaluat\*.mp.
- evaluation/

- or/36-38 [process evaluation terms]
- 40 21 and 35 and 39 [sedentary behaviour and rcts and process evalutions]

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily <1946 to May 08, 2020>: 

- Sedentary Lifestyle/
- (sedentary or sitting or sedentariness or sedentarism).ti.
  - ((sedentary or sitting or seated) adj5 (behavio\* or lifestyle or life-style)).tw.
- ((inactiv\* or no exercise or nonexercise or non exercise) adj3 (adult? or men or women or males or females or individuals or people)).tw.
- (sedentary adj3 (adult? or men or women or males or females or individuals or people or population?)).tw.
- ((sitting or sit or seated or stationary or standing) adj3 (task\* or time or bout\* or work\* or break\*)).tw.
- low energy expenditure.tw.
- physical\* inactiv\*.tw.
- (leisure time adj5 (physical\* activ\* or passive or inactiv\*)).tw.
- "physical activity level\*".tw.
- ((sitting or lying) adj2 posture\*).tw.
- (prolong\* adj2 (reclin\* or sit or sitting or seated)).tw.
- chair rise?.tw.
- "sit\* less".tw.
- ((light or low) adj "physical activ\*").tw.
- ((decrease or reduc\* or discourag\* or lessen\*) adj3 (sit or sitting or stand or standing or physical\* inactiv\*)).tw.
- (time adj5 (computer\* or television or tv or video game? or videogame? or gaming or screen or media)).tw.
- ((watch\* or view\*) adj5 (television or tv)).tw.
- (play\* adj5 (video game? or videogame? or computer game?)).tw.
- ((computer\* or television or tv or video game? or videogame? or gaming) and (sedentary or physical\* activity\* or sitting or
- seated or underactiv\* or under activ\*)).ti.
- 21 or/1-20 [sedentary behaviour terms]
- Program Evaluat\*.mp. (62861)
- "Outcome and Process Assessment (Health Care)"/
- "Process Assessment (Health Care)"/
- process evaluat\*.mp.
- or/22-25 [process evaluation]
- randomized controlled trial.pt.
- controlled clinical trial.pt.
  - randomized.ab.
    - placebo.ab.
    - drug therapy.fs.

	32	randomly.ab.
1	<b>33</b> 1	trial.ab.
2	34	groups.ab.
3	35	27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
4 5	36	exp animals/ not humans.sh.
5	37	35 not 36 [Cochrane RCT filter 2008, sensitivity maximimising]
7	38	21 and 26 and 37 [sedentary behaviour and process evaluation and RCTs]
8		
9		
10	Datab	ase: Web of Science: Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH, ESCI (Clarivate), Timespan= 1900-2020:
11		
12	#1	TI=( (sedentary or sitting or sedentariness or sedentarism))
13	# 2	TS=(((sedentary or sitting or seated) NEAR/5 (behavio* or lifestyle or life-style)))
14 15	#3	TS=((inactive* or "non exercise" or "nonexercise" or "no exercise") near/3 (adult* or men or women or males or
16		females or individuals or people))
17	#4	TS=((sedentary) near/3 (adult* or men or women or males or females or individuals or people or population*))
18	# 5	TS=(("leisure time" NEAR/5 ("physical* activ*" or passive or inactiv*)))
19	#6	TS=("physical activity level*" or "physical* inactiv*")
20	#7	TOPIC: (((sitting or lying) near/2 posture*))
21	#8	TOPIC: ((nonexercis* or "non exercis*")
22	#9	TOPIC: ("chair rise")
25 74	# 10	TS=((sitting or sit or seated or stationary or standing) NEAR/3 (task* or time or bout* or work* or break*))
25	# 11	TS=("sit*less")
26	# 12	TOPIC: (((light or low) near/1 "physical activ*"))
27	# 13	TS=//decrease or reduct or discourage or lesson*) NEAP/2/(sit or sitting or stand or standing or "physical"
28	. 10	inactiv*")))
29	# 14	TS=/time NEAP/5 (computer* or television or twor "video game*" or videogame* or gaming or screen or media))
30	# 15	TS=/(watch* or viow*) NEAP/E (tolovision or tv))
31 32	# 16	$TS = (n \log x N E A D (E ("wideo games") or "wideo games") or "some uter games"))$
33	# 10	TS = (play * NEAR/S ( video game * or video game * or computer game * ))
34	#1/	II=((computer* or television or tv or video game? or videogame? or gaming) and (sedentary or physical* activity*
35	# 10	TORIC: (registered of underactive of under active))
36	# 10 # 10	TOPIC: (random* or RCT or placebo or clinical Near/1 trial*)
37	# 19	IS=("program* evaluat*")
38	# 20	IS=("process evaluat*")
39	# 21	#20 OR #19
40 41	# 22	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17
42	# 23	#22 AND #21 AND #18
43		
44		
45	Datab	ases: ProQuest Dissertations & Theses A&I, from January 01, 1990 to March 15, 2019:
46		
4/ 10	ti((co	mputer* OR television OR tv OR "video game" OR "videogame*" OR gaming) AND (sedentary OR physical* activity* OR
40 49	sitting	g OR seated OR underactiv* OR under activ*)) OR ti(sedentary OR sitting OR elementariness OR sedentary OR (sedentary
50	UK SIt	ting UK seated) NJ (Denavio" UK IITestyle UK IITe-style)) UK ti((Sitting UK sit UK seated UK stationary UK standing) N3
51	(LdSK"  pcc")	OR till(watch* OR view*) N5 (television OR tv)) OR tillar N5 ("video game*" OR videogame* OR "computer game*")) OR
52	ti(tim	e N5 (computer* OR television OR ty OR "video game*" OR videogame* OR gaming OR screen OR media)) OR
53	ti((co	mputer* OR television OR tv OR "video game" OR "videogame*" OR gaming) AND (sedentary OR physical* activity* OR
54	sitting	g OR seated OR underactiv* OR "under activ*")) AND ti("process* evaluation*" OR "program* evaluation*") AND
55	ti(Ran	dom* OR RCT OR clinical N1 trial*)

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- 58
- 59

Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

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45 46

4 Study	Study	Inclusion /exclusion	Sample size	Particinant	Study	Interventio	Control	Data	Outcome measures for
5 (Authors 6 (Year), 7 <b>Country</b> 8 (of 9 process 1 evaluation 1 sreport)	aims	criteria	n assigned to intervention /control	characteristic (Age (mean (SD) or %), Gender (% female), Ethnicity)	design, RCT type, group, setting	n description (Content, duration)	description	collection and follow ups (time- points)	treatment effects (pre-specified or those only reportedidentified in the study reports)
Adams	Reduce	Inclusion:	75	Age:	Cluster	On Our Feet	Waiting list	Baseline	1. Time spent in SB: light and
14 <b>(2012)</b> 15 16USA 17 18 19 20 21 22 23 24 25 26 27	sedentary behaviour, increase light physical activity. (Feasibility trial)	<ol> <li>Women between the ages of 35-85;</li> <li>BMI &gt;25;</li> <li>Be willing to receive intervention materials and messages by email;</li> <li>Plan to attend all program and data collection sessions.</li> <li>Exclusion:</li> <li>Any reported conditions that prohibited standing or walking.</li> </ol>	I: 47 C: 28	I: 56.73 (12.64) C: 61.38 (12.1) Gender: 100% Ethnicity: 89% Caucasian 11% African- American	randomised controlled Weight-loss support club (cluster unit)	intervention - combination of 2 face-to- face interactive group sessions, and 6 weekly email messages. 6 weeks	waiting itst	6 weeks	<ul> <li>and the spent in 3B, light and moderate PA (accelerometer; IPAQ, Godin Leisure-Time Activity Questionnaire);</li> <li>Participant's self-rated level of confidence for reducing sitting and increasing PA behaviours;</li> <li>BMI and waist circumference.</li> </ul>
28Albright	Increase	Inclusion:	311	Age:	Randomised	Tailored 💛	Information in	Baseline	1. Time spent in MVPA
29 <b>(2015)</b> 30 31USA 32 33 34 35 36 37 38 39 40 41 42 4 <u>3</u>	moderate to vigorous physical activity.	<ol> <li>Mother of infant aged 2- 12 months;</li> <li>Inactive (&lt;30 minutes of MVPA/week);</li> <li>Healthy, able to do moderate intensity physical activity;</li> <li>BMI =18.5-40;</li> <li>Not planning to become pregnant in the next 12 months;</li> <li>Aged 18-45;</li> <li>Had health insurance;</li> <li>Read/understood</li> </ol>	I: 154 C: 157	I: 31.6 (5.5) C: 32.1 (5.9) Gender: 100% Ethnicity: 31.5% Native Hawaiian/ Pacific Islander 33.8% Asian (Japanese, Filipino, other	controlled Parallel groups Community	telephone counselling, information on website, and pedometer. 12 months	print or standard website.	1 month 3 months 6 months 12 months (immediately after intervention 18 months	<ul> <li>(Active Australia Survey; accelerometer; exercise log)</li> <li>2. Time spent sitting while travelling; at work; watching TV, etc. (Active Australia Survey);</li> <li>3. Body mass index;</li> <li>4. Self-efficacy for PA (instrument designed to assess self-confidence to overcome barriers to PA, modified with questions tailored to new mothers);</li> <li>5. Psychosocial mediators</li> </ul>

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# Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

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2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 Benedett 23i (2020) 24 25Brazil 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43	Improve physical activity level.	English; 9. Physician's written approval if history of contraindicated conditions. <b>Exclusion:</b> 1. Pregnant; 2. Planning to leave Oahu, Hawaii in the next year (permanently move away); 3. Diagnosis of cancer, coronary heart disease (including atrial fibrillation), insulin- dependent diabetes mellitus (IDDM), and other atherosclerotic cardiovascular diseases (e.g., stroke). <b>Inclusion:</b> 1. Aged $\geq 60$ ; 2. No severe physical and/or mental health impairments; 3. Had not participated in physical activity programs in the past 6 months. <b>Exclusion:</b> History of heart attack and/or stroke in the past 6 months, cancer diagnosis and/or other severe medical conditions.	114 BCG: 36 TEG: 52 C: 26	Asian) 16.4% Mixed race 15.1% White 2.6% Black/ Native American 0.6% Unknown Age: BCG: 69.7 (6.9) TEG: 71.3 (7.3) C: 67.2 (5.8) Gender: 80.7% Ethnicity: Not reported	Cluster randomised controlled Public health centres (cluster unit)	BCG: 12 weekly meetings behavioural change programme that was adapted from "Active Living Every Day" from USA. TEG: 12- week (3 times per week) exercise class conducted at	No intervention	Baseline 3 months 6 months 12 months	survey. 1. Time spent in SB; light PA; and MVPA (accelerometers); 2. BMI; 3. Quality of life (WHOQOL- BREF and WHOQOL-OLD).

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2							local HCs.			
3										
4 5 1	Berendse	Improve	Inclusion:	411	Age:	Cluster	Supervised	Start-up	Activity	1. Time spent PA
61	n (2015)	physical	1. Weight-related health		I: 55.9 (12.3)	randomised	exercise	exercise	monitor,	(accelerometer; IPAQ),
7		activity and	risk;	I: 247	C: 53.8 (12.4)	controlled	programme	programme	physiologi	sedentary, standing or
8	Гhe	dietary	2. Inactive lifestyle (not	C: 164			based on	based on	cal	active (accelerometer);
9	Netherland	behaviour.	doing 30 minutes		Gender:	GP	BeweegKuur	BeweegKuur –	measures:	2. Dietary habits;
10	5		moderate physical activity		64.7%	practices	– individual	same number	Baseline	3. Quality of Life (EQ-6D);
11			for at least 5 days per			(Cluster	and group	of meetings	12 months	4. Medication;
12			week);		Nationality:	unit)	meetings	with lifestyle	24 months	5. Side-effects;
18			3. Motivated for		88.8% Dutch	-	with lifestyle	advisor and		6. Direct and indirect costs;
14			behavioural change;				advisor,	dietitian as the	IPAQ,	7. Health risk, e.g. waist
			4. BMI= 25-30, with a				dietitian, and	intervention	dietary	circumference, body
10			large waist circumference				intensive	group, few	habits:	composition, blood
18			(men greater than 102 cm,				support from	numbers of	Baseline	pressure, resting heart rate,
19			women greater than 88				physical	meeting with	6 months	blood biochemistry, and
20			cm) with comorbidity				therapist.	physical	12 months	physical fitness.
21			(cardiovascular disease			$\mathbf{O}$ .	-	therapist.	18 months	
22			and/or T2DM, arthrosis				12 months	•	24 months	
23			and sleep apnoea), or					12 months		
24			5. BMI= 30-35, with a						EQ-6D,	
25			normal or large waist						healthcare	
26			circumference with						costs:	
27			comorbidity, or					6	Baseline,	
28			6. BMI= 35-40, with a						then every	
29			normal or large waist						3 months	
30			circumference with risk						until 24	
31 20			factors for cardiovascular						months	
32			disease or T2DM and							
34			without other							
35			comorbidities.							
36			Exclusion:							
37			1. Serious mobility							
38			limitations precluding							
39			participation;							
40			2. Pregnancy.							
4	Biddle	Reduce	Inclusion:	187	Age:	Randomise	STAND – A	Information	Baseline	1. Time spent in SB;
4 <b>P</b>	(2017)	sitting time.	1. Age 18-40, BMI ≥30		I: 32.4 (5.4)	d controlled	group-based	leaflet focusing	3 months	2. Number of breaks in SB
4 <del>5</del> 44	-			For peer review of	only - http://bmjo	pen.bmj.com/s	ite/about/guideli	nes.xhtml		

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Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

22 3 4 5 6 7 7 8 9 9 10 11 12 22 24 25 22 22 22 22 22 22 22 22 22	UK Blunt (2018) Canada	Increase physical activity levels.	<pre>(≥27.5 for South Asians). 2. Age 18-40, BMI ≥25 (≥23 for South Asians), with ≥1 additional risk factor for diabetes. Exclusion: Significant illness, steroid use, diabetes, pregnancy or an inability to communicate in English.</pre> Inclusion: 1. Age 18-85; 2. ≥1 self-reported or measured risk factor for chronic disease including: BMI >25, <150 min of exercise/week, ≥3 hours sitting/day, <8 fruit and vegetable servings/day, diagnosis of metabolic syndrome or T2DM. Exclusion: Unable to comprehend the letter of information and consent documentation.	I: 94 C: 93 118 I: 59 C: 59	C: 33.3 (5.8) Gender: 68.5% Ethnicity: 19.8% black and minority ethnic groups Age: I: 56.8 (12.3) C: 58.6 (14.7) Gender: 78.8% Ethnicity: 97.5% White	Parallel groups Community Community Randomise d controlled Parallel group Primary care health centres	structured education workshop. 6 weeks 3-phases HealtheSteps ™ program – in-person lifestyle coaching, and access to a suite of eHealth technology support. 18 months	on T2DM, the importance of increasing physical activity and decreasing sedentary behaviour. Usual-care wait-list control to begin HealtheSteps™ 6 months after baseline.	12 months 12 months Baseline 6 months (end of active phase interventio n) Additional for interventio n group in minimally- support phase: 12 months 18 months Baseline	<ul> <li>(SB to upright movement) per day (Both by IPAQ and accelerometer);</li> <li>3. Biochemical variables (glucose control, insulin sensitivity, cholesterol levels);</li> <li>4. Anthropometric data (BP, weight, body composition, waist circumference);</li> <li>5. Quality of life (EQ-5D);</li> <li>6. Self-efficacy for SB change;</li> <li>7. Anxiety and depressions (HADS).</li> <li>1. Mean daily steps (pedometer; self-report);</li> <li>2. Time spent in PA; sitting (IPAQ);</li> <li>3. Eating habits (STC; modified DINE);</li> <li>4. Quality of life (EQ-5D; EQ-VAS);</li> <li>5. Weight and body composition</li> <li>6. Blood pressure;</li> <li>7. Adverse events.</li> </ul>
39 39 40 41 42 41	2017) PUK	average daily step count.	<ol> <li>Aged ≥18;</li> <li>Confirmed diagnosis of Rheumatoid Arthritis (RA) according to ACR/EULAR 2010 criteria, within 5</li> </ol>	I: 39 C: 37	I: 58.2 (13.5) C: 58.6 (15.8) Gender: 83.9%	d controlled Parallel groups	Rheumatoid Arthritis (WARA) – 6 group sessions in	education session on importance of exercise and healthy diet;	13 weeks 26 weeks 52 weeks	(accelerometer); 2. Time spent in SB (accelerometer); 3. Time spent in sitting; PA (IPAQ);

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2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 20 20 20 20 20 20 20 20 20		years of diagnosis. <b>Exclusion:</b> 1. Pregnant, severe hypertension, joint replacement within last 6 months, unstable cardiac conditions, or other serious pathology which would affect ability to take part in physical activity; 2. Unable to understand written and spoken English or had cognitive impairment.		Ethnicity: Not reported	Community	first 7 weeks, 2 booster group sessions in week 14 and 28, personal support from physiotherapi st on week 7, 9, and 11. Pedometers and PA diaries were given with instructions. 28 weeks	and written educational material. At end of trial (12-month), provided pedometer and PA diaries, with advice on use.		<ul> <li>4. Disease activity (SDAI);</li> <li>5. RA Quality of life (RAQoL);</li> <li>6. Functional capacity (6MWT; MHAQ; hand grip test);</li> <li>7. Cardiovascular risk factors (Blood biochemical variables; ASSIGN score Version 1.5.1; BMI; waist and hip circumferences);</li> <li>8. Dietary assessment (DINE);</li> <li>9. PA self-efficacy.</li> </ul>
21 Harris 22(2018)	Increase physical	Inclusion: 1. Aged 45-75; 2. Registered at 1 of the 6	1,023	<b>Age:</b> 45-54: 33.2%	Randomise d controlled	1. Postal – pedometer,	Usual physical activity, provided a	Baseline 3 months	1. Daily step count (accelerometer);
28 24UK	activity.	participating general	Postal: 339	65-75: 28.9%	Parallel	activity diary,	pedometer and	12 1110111115	moderate PA
25		practices;	Nurse: 346		groups by	and	guidance on a		(accelerometer);
26 27		3. Able to walk outside the	6 220	Gender:	household	instructions	12-week		3. Time spent in SB
27 28		home and with no	C: 338	64.1%	Community	for a 12-week	walking		(accelerometer);
29		increasing their moderate		Fthnicity	Community	nrogramme	end of trial		IPAO).
30		intensity physical activity		80.3% White		sent by post.	chu or trial.		5. Cost-effectiveness to
31		levels.		10.3% Black		some sy post.			health services;
32		Exclusion:		6.9% Asian		2. Nurse			6. Exercise self-efficacy;
20 34		1. Achieving at least 150		2.5% Other		support –			7. Anxiety, depression;
35		minutes of at least				provided			8. Quality of life (EQ-5D);
36		moderate intensity				pedometer,			9. BMI; waist circumference;
37		physical activity weekly;				physical			body fat;
38		2. Living in residential or				activity diary,			10. Adverse events;
39		nursing home, or				and			11. Health service use.
40		housebound;				instructions			
41 40		$3. \ge 3$ falls, or $\ge 1$ fall				by a practice			
7 <u>4</u> /3		required attention, within				nurse, who			

## Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

1	,		_						
2 3 4 5 6 7 8 9 10 1 Lakerveld 12(2012) 13 14 The 15 Netherland 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38	Improve lifestyle behaviour (dietary, physical activity, and/or smoking).	last year; 4. Terminal illness, dementia, significant cognitive impairment, blind, new onset chest pain, MI, pregnant, conditions which GP judged for exclusion. Inclusion: 1. Aged 30-50; 2. Moderate or high risk of CVD (according to SCORE), or a high risk of T2DM (according to ARIC Study). Exclusion: 1. Having diabetes; 2. Previous CVD; 3. Pregnancy; 4. Current malignant disease; 5. (Severe) mobility problems.	622 I: 314 C: 308	<b>Age:</b> I: 43.6 (5.1) C: 43.4 (5.5) <b>Gender:</b> 58% <b>Ethnicity:</b> Not reported	Randomise d controlled Parallel groups General Practices	also provided 3 meetings over 3 months to facilitate participants to be more active. Cognitive behavioural programme aimed at modifying dietary, and/or physical activity, and/or smoking behaviour, maximum of six individual counselling sessions of 30 minutes, followed by 3-monthly booster sessions by phone. Intervention duration unclear	Provision of health brochures only	Baseline 6 months 12 months 24 months	<ol> <li>Cardiovascular risk score;</li> <li>Diabetes risk score;</li> <li>Dietary behaviour (Food Frequency Questionnaire);</li> <li>Time spent in PA and SB (SQUASH; a subscale of AQuAA);</li> <li>Smoking behaviour;</li> <li>Determinants of behavioural change;</li> <li>Medical care utilisation;</li> <li>BMI, waist-hip circumferences;</li> <li>Cost-effectiveness and cost-utility in the societal perspective;</li> <li>Quality of life (EQ-5D);</li> <li>Blood pressure;</li> <li>Blood biochemistry.</li> </ol>
<sup>39</sup> Lane 40(2010)	To assess	Inclusion:	176	Age:	Kandomise	2 booklets	Placebo	Baseline	1. Time spent in sitting;
ייγ(∠010) 41	of a	1. A population sample of	1.95	21-49: 84%	u controlled	nost –	healthy acting	o weeks	2. Time spent in sumcient
	of a	women participating in a	1: 85	Condor	Danallal	post –	nealtny eating		PA IEVEIS;
' <u>fireiand</u>	community	mass 10 km event;	L: 91	Gender:	Parallel	BOOKIET I	and nutrition		3. Time spent in total PA (All

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2 3		based, low-	2.Consented to follow-ups		100%	groups	targeted the	booklet,		of above by bespoke self-
4		contact	2 and 6 months		Full and altern	C	earliest	delivered by		report questionnaire);
5		interventio	afterwards;		Ethnicity:	Community	stages of	post.		4. Readiness to change
6		n on the	3. I nose who had relapsed		Not reported		motivational			(exercise motivational
7		physical	to insufficient levels of				readiness,			stage).
8		activity	physical activity were				and step-by-			
9		habits of	invited.				step guide to			
10		insufficient					increase			
1		ly active					motivation.			
12	-	women.					Booklet 2			
15				$O_{h}$			targeted			
14	•						already			
16							motivated			
17	,						and active			
18	8						stage with			
19	)						information			
20	)						about			
21						$\mathbf{N}$	moderate			
22	2						intensity PA,			
23	;						and staying			
24		-		<u> </u>			active.	<b>TT</b> 1.1 1. 1		
25	Matson	То	Inclusion:	60	Age:	Randomise	2 health	Healthy living	Baseline	1. Time spent in sitting
20	(2018)	decrease	1. Kaiser Permanente	1.00	1: 69.0 (4.7)	d controlled	coaching	intervention	12 weeks	(total time, and number of
21		sitting;	Washington (KPWA)	1: 29	C: 67.8 (5.2)		sessions; 4	usually		periods of sitting for $\geq 30$
20	USA	increase	members;	C: 31		Parallel	follow-up	available to the		minutes continuously J;
30	)	standing	2. Age $>60$ ;		Gender:	groups	nealth	KPWA		2. Daily number of sit-to-
31		time and	3. BMI 30–50 kg/m <sup>2</sup> ;		68.3%		coacning	members		stand transitions (breaks
-										1 1 1 7 7 Y 1 1 1 1 1 1 1 1 1 1 1 1 1 1
32	<u>)</u>	ngin	4. Not residing in long-		Ethnicity	KPWA	phone calls;	12 yya alva		hy a apple memory atom.
32 33	<u>-</u>	physical	4. Not residing in long- term care or skilled		Ethnicity:	KPWA primary	phone calls; and written	12 weeks		by accelerometer);
32 33 34	<u>-</u> 	physical activity.	4. Not residing in long- term care or skilled nursing, no diagnosis of		Ethnicity: 95.0% Not	KPWA primary care clinics	phone calls; and written materials,	12 weeks		by accelerometer); 3. Short Physical
32 33 34 35	<u>-</u> 	physical activity.	4. Not residing in long- term care or skilled nursing, no diagnosis of dementia, and no serious		Ethnicity: 95.0% Not Hispanic or	RPWA primary care clinics	phone calls; and written materials, and email	12 weeks		by accelerometer); 3. Short Physical Performance Battery;
32 33 34 35 36		physical activity. (Pilot trial)	4. Not residing in long- term care or skilled nursing, no diagnosis of dementia, and no serious mental or a potentially		Ethnicity: 95.0% Not Hispanic or Latino	KPWA primary care clinics	phone calls; and written materials, and email reminders. A	12 weeks		by accelerometer); 3. Short Physical Performance Battery; 4. Blood pressure;
32 33 34 35 36 37		physical activity. (Pilot trial)	4. Not residing in long- term care or skilled nursing, no diagnosis of dementia, and no serious mental or a potentially terminal illness.		Ethnicity: 95.0% Not Hispanic or Latino 1.7% Hispanic	KPWA primary care clinics	phone calls; and written materials, and email reminders. A wrist-worn	12 weeks		by accelerometer); 3. Short Physical Performance Battery; 4. Blood pressure; 5. Fasting glucose level; 6. Total shelestered level;
32 33 34 35 36 37 38		physical activity. (Pilot trial)	4. Not residing in long- term care or skilled nursing, no diagnosis of dementia, and no serious mental or a potentially terminal illness. <b>Exclusion:</b>		Ethnicity: 95.0% Not Hispanic or Latino 1.7% Hispanic or Latino	KPWA primary care clinics	phone calls; and written materials, and email reminders. A wrist-worn device	12 weeks		by accelerometer); 3. Short Physical Performance Battery; 4. Blood pressure; 5. Fasting glucose level; 6. Total cholesterol level; 7. Depressive symptoms
32 33 34 35 36 37 38 39		physical activity. (Pilot trial)	<ul> <li>4. Not residing in long- term care or skilled nursing, no diagnosis of dementia, and no serious mental or a potentially terminal illness.</li> <li>Exclusion:</li> <li>1. Unable to stand, were</li> </ul>		Ethnicity: 95.0% Not Hispanic or Latino 1.7% Hispanic or Latino 3.3%	KPWA primary care clinics	phone calls; and written materials, and email reminders. A wrist-worn device programmed	12 weeks		by accelerometer); 3. Short Physical Performance Battery; 4. Blood pressure; 5. Fasting glucose level; 6. Total cholesterol level; 7. Depressive symptoms
32 33 34 35 36 37 38 39 40 41		physical activity. (Pilot trial)	<ul> <li>4. Not residing in long- term care or skilled nursing, no diagnosis of dementia, and no serious mental or a potentially terminal illness.</li> <li>Exclusion: <ol> <li>Unable to stand, were not able to walk one block;</li> </ol> </li> </ul>		Ethnicity: 95.0% Not Hispanic or Latino 1.7% Hispanic or Latino 3.3% Unknown	KPWA primary care clinics	phone calls; and written materials, and email reminders. A wrist-worn device programmed to serve as an	12 weeks		by accelerometer); 3. Short Physical Performance Battery; 4. Blood pressure; 5. Fasting glucose level; 6. Total cholesterol level; 7. Depressive symptoms (PHQ-8); 8. Adverse guests
32 33 35 36 37 38 39 41 47		physical activity. (Pilot trial)	<ul> <li>4. Not residing in long- term care or skilled nursing, no diagnosis of dementia, and no serious mental or a potentially terminal illness.</li> <li>Exclusion: <ol> <li>Unable to stand, were not able to walk one block;</li> <li>Participating in another intermention study.</li> </ol> </li> </ul>		Ethnicity: 95.0% Not Hispanic or Latino 1.7% Hispanic or Latino 3.3% Unknown	KPWA primary care clinics	phone calls; and written materials, and email reminders. A wrist-worn device programmed to serve as an outward	12 weeks		by accelerometer); 3. Short Physical Performance Battery; 4. Blood pressure; 5. Fasting glucose level; 6. Total cholesterol level; 7. Depressive symptoms (PHQ-8); 8.Adverse events.

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# Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

2 3 4 5 6 7 8 9 (2016) 1 1 1 1 1 1 1 1 1 1 1 1 1	Increase walking, reduce sedentary behaviour.	<ul> <li>3. Reported sitting time of less than 7 hours per day;</li> <li>4. Could not communicate by phone, or speak and read English.</li> <li>Inclusion: <ol> <li>Aged 18-65;</li> <li>Ambulatory and able to walk unaided for 10 minutes at a time, based on self/carer report;</li> <li>Any level of intellectual disabilities;</li> <li>Not currently taking part in any other research study.</li> </ol> </li> <li>Exclusion: <ol> <li>Wheelchair user or significant mobility problems;</li> <li>Severe challenging behaviour, or other needs requiring constant one-to-one support from staff;</li> <li>Involved in regular physical activity - meeting current public health recommendations for physical activity, for six</li> </ol> </li> </ul>	102 I: 54 C: 48	Age: I: 44.9 (13.5) C: 47.7 (12.3) Gender: 44.1% Ethnicity: Not reported	Cluster randomised controlled Intellectual disabilities community -based organisatio ns (cluster unit)	strategy for taking breaks from sitting. <u>12 weeks</u> Walk Well programme – 3 face-to-face physical activity consultations, written resources for participants and carers, and an individualise d, structured walking programme 12 weeks	12-week waiting list control	Baseline 12 weeks 24 weeks	1. Daily step count (accelerometer); 2. Time spent in SB; MVPA; total PA (accelerometer; IPAQ-S); 3. BMI; waist circumference; 4. Quality of life (EQ-5D; Subjective Vitality Scale); 5. Self-Efficacy for Activity for Persons with Intellectual Disability and Self-Efficacy for Exercise Scale.
33 34		months or more.				-	-		
34 ScPoston	Behavioura	months or more.	183	Age:	Randomise	One-to-one	Usual	Baseline	1 Attitudinal assessment
<sub>36</sub> (2013)	1	1. Pregnant with booking		I: 30.4 (5.7)	d controlled	appointment	antenatal care	(15+0 -18+6	questionnaire - perceived
37	interventio	BMI ≥30;	I: 94	C: 30.7 (4.9)	י וויים	with the		weeks'	benefits and barriers and
38UK	n	2. Singleton pregnancy,	L: 89	Condor	Parallel	health		gestation) $27+0$ $20+6$	confidence to carry out the
27 40	comprising	gestational age >15 <sup>+<math>v</math></sup>		<b>Genuer:</b>	groups	trainer;		2/** -28**	uletary and PA benaviours;
41	netary and	weeks allu <1/** weeks		100%0	Antonatal	weekiy group		weeks	2. Quality of file (EQ-5D); 2. Edinburgh Doct Notel
42	physical	gestation.		Ethnicity	Alleliatal	sessions for 8			5. Euliibui gii Post Natai
, <u> </u>	activity	Exclusion:		Ethnicity:	CIINICS	consecutive		34 <sup>+0</sup> -36 <sup>+0</sup>	Depression Score (EPDS);

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1	,								
2	changes to	1. Gestation <15 <sup>+0</sup> weeks		56.3% White		weeks from		weeks'	4. Dietary assessment;
3	improve	and $>17^{+6}$ weeks;		38.3% Black		approximatel		gestation	5. Time spent in SB; light PA;
4	glycaemic	2. Pre-existing diabetes;		1.6% Asian		y 19 weeks'		0	MVPA (accelerometer;
5	control in	3. Pre-existing essential		3.8% Other		gestation;			RPAO):
7	obese	hypertension (treated);				dietary			6. Maternal outcomes:
7	pregnant	4. Pre-existing renal				advice. and			diagnosis of GDM and pre-
9	women.	disease, multiple				physical			eclampsia, gestational
10		pregnancies, systemic				activity level			weight gain, mode of
11	(Feasibility	lupus ervthematosus				advice: plus			delivery, blood loss at
12	trial)	(SLE), antiphospholipid				usual			delivery, inpatient nights.
13		syndrome, sickle cell				antenatal			detailed clinical and family
14		disease: thalassemia:				care.			history, health in current
15		celiac disease. currently							pregnancy, early pregnancy
16		prescribed metformin:				8 weeks			data (ultrasound scan.
17		thyroid disease or current							nuchal screening), blood
18		psychosis.							pressure, routine blood
19		1 5							results:
20									7. Neonatal outcomes:
21					$\mathbf{C}$				birthweight, anthropometry,
28									inpatient nights.
24School of	Healthier	Inclusion:	728	Age:	Cluster	Physical	Healthy eating	Baseline	1. Time spent in SB; PA
25Public	lifestyle by	1. Aged $\geq$ 18 years;		Majority aged	randomised	activity	intervention –	3 months	(IPAQ-C);
<sup>26</sup> Health,	adopting	2. Parents/grandparents	I: 386	30-49	controlled	intervention	similar	6 months	2. Physical fitness
27 <b>HKU</b>	Zero Time	with $\geq 1$ child/grandchild	C:342	I: 87%		– 4 group	structural	12 months	performance (hand grip
<sup>28</sup> (2017)	Exercise	aged 3–17;		C: 84%	Integrated	sessions over	design as		strength; time spent
29	(ZTEx), and	3. Primary education or			Family	12 months;	intervention		standing on 1 leg; foot
<sup>30</sup> Hong	enhance	higher; and able to read		Gender:	Service	biweekly/	group.		pedalling duration);
Kong	positive	and write Chinese;		92.1%	Centres	monthly			3. Dietary habits;
34 - 22	family	Exclusion:			(cluster	mobile	12 months		4. Self-reported wellbeing
30	communica	Serious health conditions		Ethnicity:	unit)	messages to			(personal-health; happiness;
35	tion and	that might prevent from		Not reported		improve			family harmony).
36	personal	participating in low		-		physical			
37	and family	intensity physical activity.				activity habit.			
38	wellbeing.								
39						12 months			
40Spittaels	Increase	Inclusion:	526	Age:	Randomise	Group 1.	Online non-	Baseline	1. Time spent in PA; SB
4 4	1 1 1 1	1 Agod 2E EE.		T.	d controlled	Online	tailarad	6 months	
<sup>4</sup> (2007)	physical	1. Ageu 25-55;		1:	a controllea	Unine-	tanoreu	o monuis	(IPAQ).
4 <b> (2007)</b> 42	physical activity.	2. No history of	I:	1: Group 1: 39.7	a controllea	tailored	standard	o monuis	(IPAQ).

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Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

2	Belgium		cardiovascular disease;	Group 1: 174	(8.9)	Parallel	physical	physical		In addition, in 1 of 6
3 ⊿			3. Internet access	Group 2: 175	Group 2: 39.3	groups	activity	activity advice		worksites (n= 57):
+ 5			(including email access)		(8.7)		advice + 8-	– based on		2. Time spent in MVPA
5			either at home or at work.	C: 177		Internet	week stage-	information		(accelerometer);
7					C: 40.9 (8.0)		based	present in the		3. BMI; body fat; blood
8			Exclusion:				reinforcemen	computer-		pressure; heart rate at rest.
9			Not specified.		Gender:		t emails.	tailored		
1(	)				30.6%			programme.		
1							Group 2.			
11	2				Ethnicity:		Online-			
1	3			$()_{L}$	Not reported		tailored			
	+						physical			
1							activity			
1	7				0		advice.			
1	3				$\mathbf{V}\mathbf{O}$					
19	)					-	6 months			
20	Stathi	Promote	Inclusion:	39	Age:	Randomise	ACE (Active,	Waiting-list	Baseline	1. Number of out of house
2	(2019)	active	1. Sedentary retired adults	Participants:	1: 72.9 (7.3)	d controlled	Connected,	control group,	6 months	activities;
21	<u>)</u>	ageing in	aged $\geq 65$ , reported	1.00	L: /5 (6.4)	D	Engaged)	and received		2. Time spent in SB; lifestyle
2	BUK	socially	spending <20 min per	1: 22		Parallel	intervention	written		PA (accelerometer);
24	+	disengaged	week in the past month in	C: 17	Gender:	groups	-	materials		3. Lower limb function
2		, inactive	MVPA;	(1 ]	43.6%	C	Une-to-one	about local		(SPPB);
20	7	older	2. Capable of walking at	(15 voluntary	Ethnisity	Community	support from	initiatives.		4. Wellbeing (life-
2	3	adults.	least 200111.	Activators	Contraction Contra		a peel	61		satisfaction; subjective
29	)	(Foosibility	Evelucion		97% White		(activator) to			withelity).
30	)	(reasibility	1 Disease or disability				activator j to			5 Solf-perceived barriers to
3		ulaij	that seriously precluded				activities			activity in the
31	2		narticipation in out-of-				continuously			neighbourhood
31	3		house activities diagnosis				continuousiy.			neighbournoou.
34	+		of dementia:				6 months			
51 54			2. Already meeting current							
סנ 21	7		PA recommendations, and							
38	3		regularly engaging with							
39	)		local groups and							
40	)		Activities.							
4	Williams	Reduce	Inclusion:	40	Age:	Randomise	WTW	Treatment as	Baseline	1. Time spent in SB; light PA;
41	2019	sedentary	1. A diagnosis of any		I+C: 43 years	d controlled	intervention	usual which	17 weeks	MVPA (accelerometer);
43 47	3 I			For peer review o	only - http://bmjo	pen.bmj.com/s	ite/about/guideli	nes.xhtml		

Supplementary file 3. Characteristics of 17 included RCTs\_27.05.21

2		behaviour,	serious mental illness;	I: 20	(20-56)		including an	consisted of	6 months	2. Self-report SB and PA
3	UK	increase	2. Meeting any one of the	C: 20		Parallel	initial	care		(IPAQ);
4 5		physical	following criteria: i)		Gender:	groups	education	coordination		3. Motivation to engage in
6		activity.	overweight, ii) at risk of or		45%		session,	plus written		PA (BREQ-2);
7			have diabetes, iii) in the			3	fortnightly	information on		4. Blood biochemistry;
8		(Pilot	clinician's view, have a		Ethnicity:	community	coaching,	the benefits of		5. Blood pressure;
9		study)	sedentary lifestyle, iv) or		50% Black	mental	provision of	increasing		6. BMI; waist circumference;
10			smoke tobacco;		27.5% White	health	pedometers	activity levels.		7. Mental Wellbeing
11			3. Ability to provide		12.5% Mixed	teams	and access to			(WEMWBS);
12			informed consent and 🦯 🦯		7.5 Asian		a weekly			8. Functional mobility (TUG
13			understands English;		2.5 Other		walking			test).
14			4. Aged ≥18 years.				group.			
10				N			17 weeks			
18	Keys:									
19	6MWT = 6-minute Walk Test; ACR/EULAR 2010 criteria = American College of Rheumatology/ European League Against Rheumatism 2010 criteria; ARIC =									
20	Atherosclerosis Risk in Communities; AQuAA = Activity Questionnaire for Adolescents & Adults; ASSIGN score = a cardiovascular risk score developed by Dundee									
21	Univers	ity (2006); B	CG = Behaviour Change Gro	up; BMI = Body	Mass Index; BP	= blood pres	sure; BREQ-2 =	Behavioural Reg	gulation in Ex	<pre>cercise Questionnaire-2; C =</pre>
22	Control group; CVD = Cardiovascular disease; DINE = Dietary Instrument for Nutrition Education; EPDS = Edinburgh Post Natal Depression Score; EQ-5D/6D =									

European Quality of Life-5 dimensions/6 dimensions; EQ-VAS = European Quality of Life-Visual Analogue Scale; GI = glycaemic index; GP = General practitioner; GPPAO = General Practice PA Questionnaire; HADS = Hospital Anxiety and Depression Scale; HCP = Health care provider; I = Intervention group; IDDM = insulin-dependent diabetes mellitus; IPAQ = International Physical Activity Questionnaire; IPAQ-C = International Physical Activities Questionnaire-Chinese version; IPAQ-S = International Physical Activity Questionnaire-Short version; KPWA = Kaiser Permanente Washington; MHAQ = Modified Stanford Health Assessment Questionnaire; MI = myocardial infarction; MVPA = Moderate to vigorous physical activity; n = Number of persons; PA = Physical activity; PHO-8 = Patient Health Questionnaire; RA = Rheumatoid Arthritis; RAQoL = RA Quality of Life; RCT = Randomised Controlled Trial; RPAQ = Recent Physical Activity Questionnaire; SB = Sedentary behaviour; SCORE = Systematic Coronary Risk Evaluation; SD = standard deviation; SDAI = Simple disease activity index; SMART = Specific, Measurable, Achievable, Relevant and Time specific; SPPB = Short Physical Performance Battery; SQUASH = Short Questionnaire to Assess Health Enhancing Physical Activity; STC = Starting the Conversation questionnaire; T2DM = Type 2 Diabetes Mellitus; TEG = Traditional Exercise Group; TUG test = Timed Get Up and Go Test; WEMWBS = Warwick-Edinburgh Mental Wellbeing Scale; WHOQOL = World Health Organization Quality of Life; WTW = Walk this Way 

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# Supplementary file 4. Characteristics of 17 included process evaluations\_27.05.21

Study (Author (Year), Country	Aims (whether process evaluation was pre-specified before commencing RCT)	Sample size and sampling method	Study Design (Data collection methods, e.g., mixed methods)	Frameworks for process evaluation
<b>Adams</b> (2012) USA	To explore overweight and obese women's perceptions of benefits, challenges and effectiveness of the intervention to reduce SB and increase PA. (Pre-specified)	<u>I: n= 47</u> All participants in the intervention group were asked to complete the questionnaires at the mid-point of the intervention, and intervention end or withdrawing. <u>1 researcher</u> The researcher leading the PhD project.	Mixed methods: 1. By completing online questionnaires in different weeks during the intervention period, the participants evaluated their perceived benefits and barriers, frequency of using the intervention materials, and the effectiveness and ease of use of the intervention elements; and were asked to provide suggestions for improvement. 2. The researcher recorded her observations of the challenges, benefits, and costs in implementing the intervention. 3. Attendance and retention data were collected to determine attrition.	Not specified
<b>Albright</b> (2015) USA	To quantify and compare the barriers to MVPA, frequency of achieving MVPA goals, and the relation of persistent barriers to achievement of goals. (Uncertain whether pre-specified or not)	I: n= 115 Study records of all participants in intervention group were used. <u>Staff conducted the telephone counselling</u> <u>sessions</u> Sessions were recorded, then selected for evaluation (Selection method and number of staff included were unclear – assuming random selection of the records).	<ol> <li>Checklist to assess fidelity in 80 of the 1,586 recorded telephone counselling sessions.</li> <li>Quantified information from telephone counselling sessions to evaluate goals set and achieved, and barriers.</li> <li>Study records for assessing the use of intervention materials and attritions.</li> </ol>	Not specified
<b>Benedetti</b> (2020) Brazil	To conduct a comprehensive programme evaluation including all dimensions of RE-AIM using quantitative and qualitative data. (Uncertain whether pre-specified or not)	Participants in the programme         Sample size and sampling method not         specified, assuming the BCG group only.         Staff         Professionals delivering the programmes,         community health workers, and local and city         administrators overseeing public health         centers. Sample size and sampling method not         specified.	Mixed methods: 1. 12 focus groups and 32 interviews with participants in the programme, staff delivering the intervention, or those overseeing the venues at the end of the trial. 2. Quantitative data in study records about participation, treatment effects, and fidelity. 3. Checklist for assessing implementation. com/site/about/guidelines.xhtml	Framework: RE- AIM Framework (Glasgow et al., 1999)

ouppicmenta				1
Berendsen	To provide an insight	<u>I: n= 247, C: n= 164</u>	Mixed methods:	Frameworks: RE-
(2015)	) into possible barriers All participants in intervention and control 1		1. Face-to-face, semi-structured interviews with	AIM Framework
and facilitators in		groups.	HCPs at the end of the trial on fidelity, dose, context	(Glasgow et al.,
The execution and a		and strategy for implementation, and sustainability.	1999); Steckler &	
Netherlands	sustainability of	25 Health Care Providers	2. Questionnaires to participants every 3 months	Linnan (2002);
	lifestyle interventions	8 physiotherapists, 7 dietitians, 10 lifestyle	about dose and satisfaction.	Saunders et al.
	in primary care.	advisors (who were practice nurses/ dietitian/	3. HCP registries and logbooks completed during the	(2005); Grant et al.
	(Pre-specified)	physiotherapists) were selected for the	trial about dose, fidelity, and attrition.	(2013)
		interviews (sampling method not specified).		
Biddle	To understand the trial	<u>I: n= 71 (then n= 45 at 6 weeks after the</u>	Mixed methods:	Framework: MRC
(2017)	outcome findings from	<u>workshop; n=10 at 12 months)</u>	1. Evaluation sheet completed by participants	Guidance (Craig et
	the delivery of the	All participants provided feedback	immediately after the educational workshop.	al., 2008)
UK	workshop and	immediately after the workshop, and were	2. Phone interviews 6 weeks after the workshop.	
	participant behaviour	contacted at 6 weeks afterwards. Invitations	3. Phone interviews at the end of the trial on	
	change strategies.	sent to 28 participants at the end of the trial	following the intervention, awareness of risk, and	
	(Pre-specified)	(12 months).	suggestions for improvement.	
			4. Face-to-face interview with each workshop	
		<u>2 Educator/ Facilitator</u>	educator/ facilitator at the end of the trial on	
		All the workshop educator and facilitator were	intervention delivery, anticipated effectiveness of the	
		interviewed at the end of the trial.	intervention, and suggestions for improvement.	
Blunt	To examine the	<u>I: n= 13</u>	1. Semi-structured interviews with coaches upon	Not specified
(2018)	acceptability of the	All participants (n= 39) who attended the	programme completion at 6 months, exploring	
	intervention	follow-up assessment at 12 months were	experiences, barriers, and facilitators in delivering	
Canada	programme.	invited to participate in an interview; 13/32	the intervention, and suggestions for improvement.	
	(Pre-specified)	agreed participants purposefully chosen,	2. Semi-structured interview with participants at 12	
		according to baseline measures, e.g., average	months about the experience making health	
		step count, and self-rated health.	behaviour changes, programme successes and	
			challenges, and suggestions for improving	
		<u>12 Coaches</u>	intervention.	
		All coaches delivered the intervention, except		
		1 was unavailable due to scheduling conflicts.		
Elramli	To explore participant	<u>I: n= 10</u>	Semi-structured 30-minute phone interview at 6	Not specified
(2017)	views regarding the	Participants were chosen from the 3 recruiting	months to explore participant's views about the	
-	effectiveness of WARA	hospitals, including both genders, who did and	effectiveness and overall views of the intervention.	
UK	intervention.	did not change PA level and step counts.		
	(Pre-specified)			
Harris	To examine the	Nurse-supported group I: 295 completed by	Mixed methods:	Framework: MRC
(2018)	mechanisms of change	participants, 251 completed by nurses for	1. Semi-structured phone interviews with	Guidance (Moore et
	by under-standing of	participants	participants at the end of the trial, to explore their	al., 2015)
L				

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ו ר	UK	how the intervention	All participants (n= 346) and nurses asked to	experiences.	
2		was delivered and	complete the alliance questionnaires.	2. Semi-structured focus groups/ interviews with	
<u>л</u>		received, and how this		nurses at the end of the trial to explore experiences	
т 5		may have affected the	Nurse-supported group: n= 21, Postal group:	of delivering PA consultations.	
6		outcomes.	<u>n= 22</u>	3. Patient alliance questionnaire and nurse alliance	
7		(Pre-specified)	Semi-structured interviews: Participants	questionnaire on quality of delivery and participant	
8			consented at baseline, completed intervention	responsiveness, covering different intervention	
9			at 12 months, selected according to step-count	aspects (e.g., working together and goal-setting,	
10			change, and baseline characteristics.	number of appointments).	
11				4. Intervention session audio-records and checklists	
12			7 Nurses	for fidelity and dose.	
13			All 8 nurses were invited to focus group/	5. Return of participant's PA diary for participation,	
14			interviews; 1 was unavailable and did not	fidelity, and dose.	
15			participate.	6. Trial administrative records about participation,	
16				dose, and fidelity.	
1/	Lakerveld	To describe the	<u>I: n= 267</u>	1. Trial records for participations, dose, and	Framework: RE-
10	(2012)	intervention's reach,	All participants ( $n = 314$ ) were asked to	treatment effects.	AIM Framework
20		effectiveness in terms	complete the questionnaire.	2. Questionnaires to participants at 6 months to	(Dzewaltowski et
20	The	of process outcomes,		evaluate satisfaction and effects on determinants of	al., 2004)
22	Netherlands	adoption, and	8 Practice nurses	lifestyle behavioural change.	-
23		implementation of	All the nurses delivering the intervention.	3. Questionnaires to nurses at 6 months to evaluate	
24		intervention.		the training and their confidence in delivering the	
25		(Pre-specified)		intervention.	
26				4. 2 counselling sessions conducted by each nurse	
27				was tape-recorded to assess the nurse's competence.	
28	Lane (2010)	To explore the	<u>I: n= 85</u>	3 weeks and 6 weeks after baseline data were	Not specified
29		effectiveness and	Participants in the intervention group were	recorded:	
30	Ireland	acceptability of	contacted.	Questionnaires were mailed or emailed to	
31 22		intervention booklets.		participants.	
22 22		(Aim is not specified,			
34		but assumed			
35		according to the			
36		reported results; and			
37		process evaluation is			
38		assumed to be pre-			
39		specified)			
40	Matson	Collecting qualitative	<u>I: n= 22</u>	Semi-structured exit interviews with participants	Not specified
41	(2018)	results to further	The health coaches reported that 23 of all 29	within 10 days of the final follow-up, to explore their	
42		inform the feasibility	participants were available, interested, or	experiences and perceived health impact of the	
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Supplementary file 4. Characteristics of 17 included process evaluations\_27.05.21

USA	and acceptability of	appropriate for the interview, thus the 23	intervention.	
	the interventions.	participants were invited, but 1 participant		
	(Pre-specified)	declined.		
Matthews	To explore the	<u>I: n= 20</u>	Mixed methods:	Frameworks: MRC
(2016)	feasibility of a 12-	Participants who had and did not have	All conducted after the end of intervention:	Guidance (Moore et
	week walking	successful outcomes.	1. Semi-structured interviews or focus groups with	al., 2015), WHO
UK	intervention for adults		participants to explore their attitudes towards	(2001); RE-AIM
	with intellectual	<u>6 Key stakeholders</u>	physical activity and walking, perceived benefits,	Framework
	disabilities, in relation	The health professional delivering the	drawbacks and impact of increased activity,	(Glasgow et al.,
	to context, recruitment	intervention; the researcher responsible for	subjective feelings of wellbeing, and any changes in	2012); Steckler &
	and retention, reach,	intervention delivery and management; 1	view during the intervention period.	Linnan (2002)
	implementation and	participant with positive study outcomes; 1	2. Interviews with key stakeholders to gain insight	
	fidelity.	participant with no significant outcomes; 1	from a variety of individuals involved in the study.	
	(Pre-specified)	carer; a day centre manager	3. Data input spreadsheet which recorded multiple	
			elements including attendance, reasons for	
			withdrawal from the study, for gaining insight	
			regarding recruitment, retention and reach of the	
		· · · · ·	intervention.	
Poston	To refine the	<u>I: n= 9, C: n= 12</u>	Mixed methods:	Framework:
(2013)	intervention protocol	Participants recruited from each study site,	All conducted after the end of intervention:	Steckler & Linnan
	through process	using a maximum diversity sampling approach,	1. 17 face-to-face and 4 telephone semi-structured	(2002)
UK	evaluation of	following an informed consent procedure.	interviews with participants during their pregnancy,	
	intervention fidelity.		to capture their experiences and perceptions of the	
	(Pre-specified)	<u>130 audio diaries from Health trainers</u>	trial and intervention.	
		Number of Health trainers completed included,	2. Audio diaries of health trainers in which they	
		or sampling method not specified.	reflected on the fidelity and feasibility of the	
			intervention delivery.	
	<b>m</b> 1 1		3. Study database for evaluating attendance.	
School of	To explore the	1: n = 24, C: n = 8	All conducted at the end of the trial:	Not specified.
Public	opinions and	Participants who attended all the 4 sessions	1. Focus groups with participants to explore their	
Health, HKU	experiences of the	were invited.	experiences, and the impact of the intervention on	
(2017)	programme; to	0 Carriel mandrene and 1 Classical staff	their living nabits and wellbeing.	
11	evaluate the	8 Social Workers and 1 Cierical staff	2. Interviews with staff to collect comments about	
Hong Kong	effectiveness of the	Sampling method not specified.	this study, and suggestions for future improvement.	
	(Drogramme.		3. Fidelity checks conducted for every session to	
	(Pre-specified)		ensure the quality and implementation of the	
Spittagla	To invoctigate the	Toilorad advice Lomaila group, n= 120	All completed at the end of intervention.	Not aposified
(2007)	offectiveness of	Tailored advice + emails group: n= 128,	All completed at the end of intervention:	Not specified
[2007]	enectiveness of	<u>  1 anoreu auvice group: II- 157, C: II- 150</u>	1. Questionnaire to an participants to investigate	<u> </u>

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## Supplementary file 4 Characteristics of 17 included process evaluations 27 05 21

1	Cappioniente								
ו ר		intervention outside	All participants were asked to complete the	whether participants remembered the advice, read					
2	Belgium	laboratory.	questionnaire; included participants were	the advice, and considered the advice had had a					
<u>л</u>		(Uncertain whether	those responded.	positive impact on their physical activity behaviour.					
4 5		pre-specified or not)		2. Further questions to the Tailored advice+emails					
5				intervention group to investigate the number of					
7				emails received and read, and their opinion on the					
, 8				provision of emails.					
9	Stathi	To determine the	<u>I: n= 20</u>	Mixed methods:	Framework: MRC				
10	(2019)	relative usefulness of	Sampling method not specified.	All conducted at the end of intervention:	Guidance (Moore et				
11		different intervention		1. Quantitative process evaluation via a self-	al., 2015)				
12	UK	components, to	13 Activators	administered questionnaire which assessed changes					
13		identify ways to refine	Sampling method not specified.	in confidence to get out and about, social support,					
14		or improve the		autonomy, competence, and relatedness.					
15		intervention.	2 Coordinators	2. 14 semi-structured exit interviews and 7 focus					
16		(Pre-specified)	Sampling method not specified.	groups conduced with participants, activators and					
17				coordinators, to evaluate the effectiveness and					
18				suggestions of intervention elements.					
20				3. Trial records for evaluating recruitment rate,					
20				attendance, completion rate, and acceptability of the					
22			C C	intervention.					
23	Williams	To establish the	<u>I: n= 5</u>	Mixed methods:	Not specified.				
24	2019	feasibility and	Participants who agreed to be interviewed;	1. Semi-structured interviews to evaluate how	-				
25		acceptability of the	sampling method unclear.	participants experienced the intervention, and					
26	UK	Walk this Way (WTW)		suggestions for improving the intervention.					
27		intervention		2. Trial records for calculating recruitment rate,					
28		(Pre-specified)		attendance, number of participants completed the					
29				intervention and refused outcomes measurements.					
30	Kevs: ACR/E	ULAR 2010 criteria = Am	erican College of Rheumatology/ European Lea	ague Against Rheumatism 2010 criteria; ARIC = Atherosc	clerosis Risk in				
31	Communities	; BCG = Behaviour Chang	CG = Behaviour Change Group: BMI = Body Mass Index: C = Control group: CVD = Cardiovascular disease: GP = General practitioner: HCP = Health						
32 22	care provider	r; I = Intervention group;	IPAQ = International Physical Activity Question	nnaire; MRC: Medical Research Council; MVPA = Moderat	te to vigorous physical				
33	activity; $n = n$	number of persons; PA = 1	Physical activity; PhD = Doctor of Philosophy; R	CT = Randomised controlled trial; SB = Sedentary behav	iour; SCORE =				
35	Systematic Co	oronary Risk Evaluation;	T2DM = Type 2 Diabetes Mellitus; sTEG = Trad	itional Exercise Group; WHO: World Health Organisatior	1				
36	-	-							
37	<u>References f</u>	for process evaluation t	<u>heoretical frameworks:</u>						
38									
39	Dzewaltowski, D. A., Glasgow, R. E., Klesges, L. M., Estabrooks, P. A., & Brock, E. (2004). RE-AIM: Evidence-based standards and a web resource to improve								
40	translation of	f research into practice. A	nnals of Behavioral Medicine, 28(2), 75-80.		-				
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43			For poor raviow only http://bmianon.hr	ai com/sita/about/guidolings.yhtml					

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44	For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml
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44 45 46 Supplementary file 5. Delivery and mechanisms\_27.05.21

Study (Year)	Intended delivery (aim/ intervention description)	Actual delivery (difference from the intended delivery)	Intended mechanism (theoretical model/ logic model)
Adams	<b>On Our Feet intervention</b> – combination of 2	(Adaptations)	The intervention focused on improving self-
(2012)	face-to-face interactive group sessions, and 6	1. Due to schedule conflict for 1 chapter, the	efficacy in the Social Cognitive Theory, by
	weekly email messages. 1-2 Weeks were led in-	initial presentation and the goal setting activity	addressing 4 self-efficacy construct – mastery
	person by the researcher. 3-6 Weeks were	took place at the same meeting instead of	experiences, modelling, verbal and social
	conducted over the internet, mainly by email.	respective weeks. Participants received extra	persuasion, and emotional and physiological
	Deutisia auto auto sissa fa a dha alasa thair	email and phone contact to answer any	states. It combined the various stages of change
	Participants were given feedback on their	questions during the second week.	In the Transtneoretical Model, to reduce SB and
	and provided with self	2. While the same visual alds were used in the initial presentation in each chapter, the	Increase PA.
	monitoring tools e.g. Actigraph activity	denth of explanation for each chapter varied	In the group sessions, video and demonstration
	monitor. Positively-framed email messages	according to the participants' questions.	modelled the intervention exercises.
	that contained peer-modelled alternatives to	3. Proposed group activity on emotions	Participants set goals and rated their confidence
	sitting and additional behavioural feedback	regarding sitting and some segments of the	in achieving the goal, which was intended to
	were sent weekly.	presentation were reduced or removed because	increase recognition of self-efficacy. The self-
		of the time limit for the sessions.	monitoring tools assisted the re-evaluation of
	Control group – waitlist control.	4. Software problems causing inaccurate	SB. Tailored feedback on behaviour change
		estimates of SB provided to some participants.	facilitated mastery experiences. Group
			discussions, uses of behavioural cues, and
			positively-framed emails encouraged and
Albright	TTCW intervention telephone councelling	(Adaptationa)	The teilered TTCW intervention simed to
(2015)	sessions and a website tailored to address a	1 In TTCW group only 75% of participants	nositively alter the key mediators of PA –
(2015)	woman's specific MVPA benefits and barriers	set incremental MVPA goals with a health	personal social and environmental factors to
	over a 12-month intervention.	educator during the intervention period.	enhance self-efficacy and reduce barriers, using
	17 Telephone counselling:		the Social Cognitive theory and Transtheoretica
	The health educator discussed MVPA goals,	2. Some initial PA goals were set at light	Model theory.
	anticipated barriers and resolutions with	intensity, because the participants were	
	participants; tracked MVPA goals (type of	relatively inactive at the beginning of the	Health educators provided counselling calls,
	activity, duration, and intensity); and provided	intervention.	using Motivational interviewing, to encourage
	tailored suggestions on the TTCW website, by		goals settings, problem-solving, self-monitoring
	email, or mail.		and self-reinforcement, to integrate PA into
	Schedule of counselling calls:		daily lives; while preparing the participants to
	Phase 1: weekly calls (for month 1); Phase 2:		prepare and progress through the stages of
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	Months). <i>TTCW website:</i> Contained various resources designed to facilitate MVPA, e.g. behaviour-change tip, calendar listing "baby-friendly" exercise sessions in the community, and newsletters. Participants were informed that the website would be updated 2-3 times per month. <b>SWO (control group)</b> – "standard" PA information was available on the SWO website, e.g., information about how to become more physically active via links to credible sources (i.e., American Heart Association, etc.). Participants in this group did not receive any telephone calls or goal-setting advice about MVPA.		The TTCW website provided information about supportive environments for the participants to exercise; and suggestions about obtaining social support for PA.
Benedetti (2020)	Reported as actually delivered interventions.	<ul> <li>BCG – the behavioural change programme that was adapted from "Active Living Every Day" (ALED), delivered by specifically trained nutrition and exercise science professionals working at the HCs. The sessions included a series of topics related to behaviour change, aiming at a more active lifestyle.</li> <li>TEG - received a 12-week exercise class conducted at the local HCs, led by exercise professionals employed by the HCs; 3 times per week for 60 minutes. Each session included warm-up, aerobic exercise at 50–80% of maximum aerobic power, resistance training, and cool-down. Participants' heart rate and ratings of perceived effort were tracked during each session.</li> </ul>	The BCG was adapted from "Active Living Every Day," or ALED, from the USA (Bors 2009). A series of behaviour change topics were delivered through 12 structured weekly meetings, aiming to achieve a more active lifestyle. The topics included finding new opportunities to be active, overcoming challenges, setting goals and rewarding, gaining confidence, enlisting support, avoiding pitfalls, step by step, positive planning, making lasting changes.
Berendse n (2015)	(Protocol) <b>Supervised programme:</b> 6-7 individual meetings, and 26–34 group meetings with PT.	<ul> <li>(Differences)</li> <li>1. In both programmes the number of meetings with all HCPs was lower than planned in the protocol. Participants of the Supervised</li> </ul>	Beweegkuur provided a wide-ranging lifestyle counselling by means of Motivational Interviewing and incorporating the concepts from Self-Determination Theory.

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	Start-up programme (Control): 6 individual meetings with PT. Both programmes comprised 6 individual coaching meetings LSA, 3 individual meetings with a dietitian, and 7 dietary group meetings, for 1 year. The initial individual meetings with the HCPs were to set personal (exercise and nutritional) goals, and identify barriers to a healthy lifestyle through motivational interviewing, which were the basis for meetings. At the end of the programme, each participant met with the LSA to evaluate the lifestyle changes and conclude the intervention.	<ul> <li>programme attended, compared to participants of the Start-up programme, more meetings with physiotherapists, but fewer with lifestyle advisors and dietitians.</li> <li>2. No PT group meetings were planned in the protocol for the control Start-up group, but some PTs organised over 9 meetings. Some PT of the start-up programme only planned group meetings, instead of the intended individual meetings with each participant.</li> <li>3. For both groups, 3 individual meetings with the dietitians were planned in the protocol, but the Start-up group received a median of 4 meetings (7 meetings at 75<sup>th</sup> percentile). On the other hand, some participants did not prefer individual meetings which added fees to participants.</li> <li>4. Some dietitians did not plan individual meetings, and therefore felt there was no opportunity to set individual goals.</li> <li>5. Not all participants reported that they set goals with the PA and dietitian; nor the LSA had explicitly concluded the intervention.</li> </ul>	All HCPs addressed goals and barriers in the different aspects of lifestyle, to promote participant's motivation for behaviour change, problem-solving skills, and thus promoting participant's sustainable self-efficacy and environment to engage in long-term PA and healthy dietary behaviour. It has been hypothesised that the additional amount of guidance within the Supervised programme provided additional contacts and guidance, as a hypothesis that the increase in effects on physical activity would lead to bigger treatment effects.
Biddle (2017)	<ul> <li>(Protocol)         A comprehensive health assessment, including blood tests, was conducted at the trial baseline clinic. Results were sent to all participants (intervention and control groups) and discussed in the educational workshops with each participant.     </li> <li>STAND Intervention – A 3-hour group-based educational workshop, based on the DESMOND and PREPARE structured education protocols, delivered by trained educators; plus a motivational follow-up phone call (6 Weeks) to</li> </ul>	Interviewing techniques. Delivered as intended.	STAND intervention started with a letter sent to participants at risk of T2DM and an invitation for risk tests, then discussing with an educator about the risk information and amount of SB time, by using the Commonsense Model of Illness. The workshop was based on Commonsense Model and Dual Process Theory, in which the trained educators provided information on risk factors and complications relating to T2DM. Participants were encouraged to assess their own health risk, and to identify their modifiable

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2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	Blunt	review and support participants' behaviour change progress. The 'Gruve' (MUVE, Inc., USA: <u>www.muveinc.com</u> ) was provided to participants, for self-monitoring on time spent sedentary and in PA, and prompting for break from prolonged times of inactivity. Text messages were sent to participants to encourage adherence to goals and use of the Gruve. <b>Control group</b> – received an information leaflet focusing on key illness perceptions of being at risk of T2DM, the importance of increasing physical activity and decreasing sedentary behaviour. (Protocol)	(Adaptations)	risks. Social Cognitive Theory and Behavioural Choice Theory were also employed in the workshop content, to aid participants identifying health risks associated with excess SB, strategies to reduce SB in their daily life, identifying barriers, and setting goals and action plans. The self-monitoring tool, the Gruve, was provided to facilitate self-regulation of SB. HealtheSteps <sup>™</sup> was based on the Social
19         20         21         22         23         24         25         26         27         28         29         30         31         32         33         34         35         36         37         38         39         40         41         42	(2018)	The HealtheSteps <sup>™</sup> programme – provided individuals with a specific plan of action to improve their PA levels, healthy eating habits, and reduce sedentary behaviour. Active phase (0-6 Months): <ol> <li>bi-monthly in-person coaching to set prescriptions for physical activity, exercise, and healthy eating; provided by 1 trained</li> <li>HealtheSteps<sup>™</sup> coach throughout this phase.</li> <li>Access to a Tyze Personal Networks (an online social network to connect with coaches and other participants); phone coaching supports; and a free HealtheSteps<sup>™</sup> smartphone app (providing virtual coach, heart rate monitor, step counter, and tracking option to monitor progress). Maintenance phase I (7-12 Months): in-person coaching removed, but participants had access to the full suite of eHealth technology supports. Maintenance phase II (13-18 Months): access to the full suite of eHealth technology supports</li></ol>	The central research team scheduled coaching sessions for some coaches, resulting that some participants had different coaches at each session.	Cognitive theory of self-regulation. The mobile app, online tools and resources, and initial supports from the coaches facilitated positive health behaviour changes and self-management of own risk factors for chronic disease. Individualised lifestyle prescriptions were given to participants in the initial phase, using Motivational Interviewing and SMART goal setting principles (specific, measurable, attainable, realistic, and timely for the participant). These aimed to produce positive behaviour change and overcome potential barriers.

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2 3		publicly available resources and tools.		
4				
5		<b>Comparator group (waitlist control)</b> – This		
6		group continued with usual activities without		
7		intervention from the study team for the first		
8		6-month period. After the 6 Months follow-up		
9		measurements, participants were given the		
10		opportunity to start the 6-month		
11		HealtheSteps <sup>™</sup> programme.		
12	Elramli	Reported as actually delivered interventions.	The WARA intervention consisted of 2	The WARA programme was based on the Social
13	(2017)		components – PA component: a pedometer	Cognitive Theory, focusing on self-efficacy; and
14 15			supported walking programme, aiming to	incorporated behaviour change techniques,
15 16			increase participant's average daily step count by	particularly self-monitoring, feedback, and
17			3000 steps above their baseline value, on at least	social support.
18			5 days of the week by 6 months, and to maintain	
19			for up to 12 months; and to comply with the UK	The group education sessions aimed to provide
20			physical activity guidelines (2011) recommended	social support; increase the participant's
21			of a total of 150 minutes per week.	awareness and knowledge of their condition,
22			Educational component: 6 weekly interactive	and encourage PA increase. Therefore, the
23			group (up to 6 persons) sessions, each lasted 1	participant's self-efficacy increase.
24			hour; and two booster sessions (at 3 and 6	
25			Months) providing support to participants to	Setting goal of step-count, using pedometer and
26			evaluate their PA levels and barriers.	PA diary, facilitated self-monitoring with
27			A WARA booklet was provided to participants,	feedback from the pedometer, thus increased
28			describing the importance of walking,	individual motivation to achieve behaviour
29			strengthening exercise, reducing SB, and a healthy	change.
30			diet for health benefits.	
31 22				The WARA booklet provided health information
32 33			<b>Control group –</b> 1-hour single education group	which further increased the participant's
32			session (up to 6 persons), included topic	knowledge and awareness (self-efficacy) of self-
35			regarding the importance of physical activity and	management and PA for RA.
36			healthy diet.	
37	Harris	(Protocol)	(Adaptations)	The intervention resources used behaviour
38	(2018)	Pedometer-plus-nurse-support group –	1. Nurses and participants adapted and	change techniques (BCTs).
39		Pedometer and written instructions for a 12-	tailored step count target to individual	
40		week walking intervention, based on the	circumstances, e.g., adjustments were made to	3 PA consultations with the practice nurse were
41		participant's usual step-count provided. In	the intervention to accommodate religious	divided into 3 stages – First steps, Continuing
42		addition, 3 PA consultations with a practice	observances, such as Ramadan and Christmas;	the changes, and Building lasting habits. They
43				

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		denter allocate and share as the set location	
	nurse, individually or as a couple.	auring liness; and changes in weather.	included motivational interviewing, health
		2. Nurses adapted participant's preferences	Information about PA, suggestions to increase
	<b>redometer-alone group</b> – a pedometer, and a	for interventional materials when tailoring	PA, action planning, goal setting, self-
	12-week pedometer-based walking	advice, e.g., counting walking by time instead of	monitoring, relapse prevention, which aimed to
	programme, posted to the participants. The	step-count; whether to use the optional	effect positive changes in participant's step
	programme was based on the participant's	handouts or not.	count, PA and SB times; thus longer-term
	baseline step-count. On study completion (1	3. Not all participants altered their walking	changes in walking habits and health benefits.
	year from baseline), participants in this group	targets; some might have decreased PA level as	
	were offered a single practice nurse PA	the target.	The patient handbook provided the same
	consultation.		information as in the nurse consultations.
	<b>Control group</b> – No PA intervention. They		Step count diary provided suggestions and
	were offered to choose either receiving a		instruction for the 12 weeks walking
	pedometer and the written 12-week 🥂 🥂		programme. Participants could set goals, self-
	pedometer-based walking programme, by post,		monitor with feedback from pedometer to
	or as part of a single practice nurse		increase step count.
	consultation.	L. L.	
Lakerveld	(Protocol)	(Adaptations)	The cognitive behavioural programme (CBP)
(2012)	Intervention group – Each participant was	Actual intervention duration is unclear: The	applied the Theory of Planned Behaviour (TPB)
	free to choose the own target lifestyle	number of sessions and schedule described in the	and the theory of self-regulation, with 2
	component(s) (smoking, physical activity or	results report (Lakerveld et al., 2013) matched	counselling techniques - Motivational
	diet). Nurse practitioner provided the CBP to	the protocol; but the report stated the	interviewing (MI), and problem-solving
	increase participant's motivation and ability to	intervention generally lasted up to 6 months.	treatment (PST).
	change their dietary pattern, physical activity	U L	
	or smoking behaviour, maximum of 6		A nurse practitioner used MI to explore the
	individual 30-minute counselling sessions		participant's attitude and intention to make
	(weekly then reduced to every 2-3 weeks, for		lifestyle behaviour change, then resolve the
	2-4 months); then 3-monthly telephone		ambivalence between the goal and the actual
	booster sessions for 12 months. The total		situation. Afterwards, the nurse practitioner
	intervention period, including booster calls,		used PST to prompt the participant to find
	will be 16 months. The MI and PST counselling		solutions for barriers and reinforcing perceived
	methods were used.		control for behaviour change. When setting new
			goals was needed, the same process would be
	<b>Control group</b> – Received written information		started again.
	about their risk of developing T2DM and CVD,		
	and brochures of health guidelines regarding		The nurse practitioner guided the participant to
	physical activity, healthy diet, and smoking		gradually increase the sense of mastery over
	cessation.		difficulties and be more active in planning and
	physical activity, healthy diet, and smoking cessation.		gradually increase the sense of mastery over difficulties and be more active in planning and

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			implementing activities.
ane 2010)	Reported as actually delivered interventions.	<b>Intervention group</b> – Participants answered a question about the stages of change at baseline. The answer determined either both intervention booklets or just one of them to be posted. The booklets provided information on physical	The tailored intervention applied the trans- theoretical model (TTM), which posits that individuals move through stages of change while learning and adopting new behaviours.
		<ul> <li>Control group – Received a healthy eating and nutrition booklet, developed by the Irish Heart Foundation, An Bord Bia and the Health</li> <li>Promotion Unit, by post, as placebo treatment.</li> </ul>	booklets, specific to the initial and later stages of motivational readiness. The booklets were adapted for Irish women to promote physical activity, which were broadly based on the TTM model.
			The booklets contained information and structured approaches and strategies, designed to alter self-efficacy, social support, outcome expectancy and barriers to physical activity, tailored to the individual's readiness to change and may subsequently modify physical activity behaviour.
Aatson 2018)	(Protocol) <b>STAND intervention</b> – consisted of 6 health coaching sessions provided by a trained Health Coach, an educational information workbook, SB feedback charts, and a Jawbone UP band. <i>6 health coaching Sessions:</i> 2 in-person sessions (first 2 weeks, 45-60 minutes each), providing and explaining the workbook, feedback chart, and Jawbone UP wristband to participants; discussing tailored reminder strategies and setting goals and action plan. After that, <i>4 bi-weekly phone calls:</i> (20-40 minutes each) from the Health Coach, to review progress on goals and action plans, problem- solve barriers, use the workbook to guide participants on different types of reminder.	Delivered as intended.	I-STAND intervention was based on behavioural theories, including social cognitive theory, the ecological model, and habit formation theory. Health coaching sessions focused on using different types of reminders, building self- efficacy through motivational interviewing, problem-solving barriers, and setting personalised action plan and graded goals. (Social cognitive theory, habit formation theory) The workbook and coaching sessions included social support, social environment and norms, evaluating participant's environment, to consider the possible changes. (Ecological model). The wrist-worn Jawbone UP band device vibrated every 15 minutes of inactivity. This

	at baseline, SB feedback charts 1 Week, and 6 Week were provided to participants. <b>Healthy Living Control group</b> – 1 in-person health coaching session: Participants were provided a health education workbook containing topics about ageing and instructed to work on 1 topic every 2 weeks using a goal- setting worksheet. Every 2 weeks, participants received a check-in letter and asked to complete and return a review progress form.		disrupting the habitual SB, to promote behaviour change and new habits of taking breaks from sitting (habit formation theory).
Matthews (2016)	<ul> <li>(Protocol)</li> <li>Walk Well intervention – 12-week community-based walking programme, consisted of 3 physical activity consultations with a walking advisor; aimed to increase walking by 30-minutes on at least 5 days per week. Participants were provided with education booklets, a pedometer and step diary.</li> <li>Waiting list control group – were advised to continue with their daily activity for 12-weeks, following which they were invited to participate in the Walk Well intervention.</li> </ul>	<ul> <li>(Adaptations)</li> <li>Some participants experienced difficulty in reading the pedometer and recording step counts in the diary, thus adapted the diary to an alternative "tick box" to indicate having walk(s).</li> <li>The physical activity consultations were refined and streamlined to focus on the core components, and flexible options of additional behaviour change techniques for adults with intellectual disability.</li> <li>Walking groups were not planned, but expected by some participants, thus arranged by the care centres and carers.</li> </ul>	<ul> <li>Walk Well was based on the Social Cognitive theory and Trans-theoretical Model.</li> <li>The PA consultations method focused on 4 core behaviour change techniques: goal setting; self-monitoring; developing self-efficacy; and mobilising social support. Furthermore, the walking advisor tailored the use of additional behaviour change techniques according to the participant's needs. The aim was autonomy and motivation of the participants to lead a more active lifestyle.</li> <li>Input and engagement from carers provided social support from them directly, and their arrangement for group walks among participants.</li> <li>The education booklets with visual images and appropriate text provided and reinforce health information.</li> <li>Pedometer and step diary complemented the PA consultation, to motivate the participant to set goals and self-monitor step count.</li> </ul>

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Poston (2013)	Reported as actually delivered interventions.	Participants were recruited in early 2 <sup>nd</sup> trimester (>15 <sup>+0</sup> weeks to <17 <sup>+6</sup> weeks' gestation) to allow	The intervention was based on the Control Theory, and Social Cognitive theory.
		that was planned to end at each participant's 27 <sup>+0</sup> and 28 <sup>+6</sup> weeks' gestation.	Participants were provided with a pedometer, logbook, an exercise DVD, to set, self-monitor, and achieve SMART (Specific Measurable
		All women attended routine antenatal care appointments and received advice regarding diet and physical activity (PA) in accordance with local	Achievable, Relevant, and Time Specific) goals for diet and PA, using self-regulation techniques from the Control Theory.
		<b>Intervention group</b> – participants attended a one-to-one appointment with the HT, provided with a pedometer, a logbook for setting goals and self-monitoring, and a DVD of exercise regime for pregnancy. After that, 8 weekly group sessions from approximately 19 weeks' gestation. The programme included dietary advice choosing low GI food and reducing saturated fats, and increasing daily PA level during pregnancy safely.	The group sessions facilitated self-identification of benefits and barriers to behaviour change, which facilitated self-efficacy, and provided social support.
		<b>Control group</b> – standard care, with additional appointments with the study midwife at 27+0 - 28+6 and 34+0-36+6 weeks', where possible coinciding with routine antenatal visits.	
SPH HKU (2017)	Reported as actually delivered interventions.	<b>PA group</b> – received 4 group sessions: 2.5-hour interactive knowledge and motivation enhancement core session at baseline, a 1.5-hour experience sharing booster session at 3 Months, 2.5-hour tea gathering family session at 6 Months, and a Holistic Health session at 1 Year. 16 monthly/bi-weekly health-related text messages to mobile phone for knowledge enhancement and	The PA group intervention was guided by the Health Action Process Approach (HAPA), which proposes motivation, goal setting and planning enhance intention, thus promote its conversion to action. The intervention aimed to enhance knowledge, self-efficacy, and motivation in relation to practising ZTEx
		as reminders till one year after baseline. <b>Control group</b> – received the same intervention framework and methods and the same number and duration of sessions, about Healthy diet.	The conceptual framework proposed that the participants pass the intervention information positively and encourage their family to practise the actions together. Through these family actions and communication, the wellbeing and

			harmony of the family were enhanced.
		Fidelity evaluated but not reported.	
			The strategies included:
			1. Introducing information on the consequences
			of physical inactivity, obesity and ZTEx (risk
			perception);
			2. Enhancing skills and confidence in the ability
			to do ZTEx (exercise self-efficacy);
			3. Associating the health behaviour to the
			positive outcomes of the trainees (outcome
			expectations); and
			4. Introducing cognitive dissonance, i.e., a
			discrepancy between participants' belief
			(including a pledge to eat) and behaviour
			(failure or potential failure to act) to promote
			intrinsic motivation to change behaviours.
			The mechanism of changes for the Healthy diet
			intervention (control) was the same, but
			focusing on healthy diet only.
Spittaels	Reported as actually delivered interventions.	l allored information and reinforcement	According to each individual's stage of changes,
(2007)		emails group:	the tailored advice was provided to participants
		<i>Tailored davice:</i> Participants completed a	based in Transtneoretical model. The content
		determinante about their PA and psychosocial	applied the constructs of Theory of Planned
		determinants on the study's intervention website;	Benaviour, i.e., intentions, attitudes, self-enicacy,
		subsequently, the tailored advice containing	social support, knowledge, benefits and barriers
		increase DA levels were produced from it	to physical activity.
		Darticipants having intentions to increase PA	Participants indicated with positive intentions
		lovels were encouraged to make an action plan	to increase their PA levels in the online
		levels were encouraged to make an action plan.	questionnaire were then encouraged by the
		<i>Emails:</i> After receiving the first tailored advice	website to make a personal action plan to
		narticinants received regular emails (5 emails in 8	implement behaviour changes
		weeks) which asked participants to identify their	implement benaviour enanges.
		current stages of change, then referred to a	Reinforcement emails assessed and followed the
		corresponding website with personalised	narticipant's stage of change, then directed the
		information to encourage behaviour changes	participant to pertinent online advice to further
		internation to encourage benaviour enanges.	encourage behaviour changes.
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	К <sub>О</sub> ,	Tailored information group: Participants received the tailored advice online but did not receive reinforcement emails. Standard advice (Control): Participants received standard physical activity advice from a website, based on information presented to the other 2 groups, but not individually-tailored, e.g., the benefits of PA, current public health recommendations, the difference intensity PAs, and suggestions to be more physically active.	
Stathi (2019)	Reported as actually delivered interventions.	Activators attended a 2-day training course, and received an intervention delivery manual. They were trained on the protocol for types and frequency of interactions with the participants; also encouraged to be flexible according to individual needs. Each participant was invited to attend a 6-month programme: <i>Motivation stage (first 2 weeks)</i> – 2 one-to-one meetings with an activator to support motivation, build rapport, review local activities, and consider and address any barriers to participation. <i>Action stage (1-3 Months)</i> – ≥3 visits to local initiatives with the activator. <i>Maintenance stage (3-6 Months)</i> – Support provided by telephone, and ≥2 further visits with the activator to encourage the participant to attend local activities independently. Participants could engage in a wide range of activities at the Action and Maintenance stage, e.g., bowling, ballroom dancing, lunch clubs, walking groups, and art classes. 2 social events were organised for all participants and activators to facilitate within group support and encourage more local engagement.	Intended processes of behaviour change during the three stages of the ACE intervention followed the principles of Self Determination Theory, to facilitate the participant's developing autonomous motivation, confidence, and competence for getting out and about. In the Motivation stage, the participant engaged in social support from the activator, understood the process, and explored and enhanced motivation for actions. In Action stage, the participant made plans with the activator to try out interested activities and monitored progress. In Maintenance stage, the participant was encouraged to continue with the activities more independently, while the support from the activator was reduced. It was shypothesised that participants in the ACE intervention would attend more out-of- house activities, and better motivation to lead an active lifestyle in the long term.

Williams	(Protocol)	intervention at the end of study period.	The Walk this Way intervention employed the
williams (2019)	<ul> <li>(Protocol)</li> <li>Walk This Way intervention – amended from the Walk, Address sensations, Learn about exercise, encourage exercise behaviour for persons with schizophrenia spectrum disorders ('WALC-S') programme <i>Initial group education session:</i> 5-10 participants; participants were provided a pedometer for self-monitoring and calendar for recording; setting goals for increasing habitual walking level.</li> <li><i>Continuing support and coaching:</i> every 2 weeks (20-30 minutes), an assigned coach met the participant to review the participant's walking calendar, identify and address barriers and facilitators to increase PA and decrease SB, and provide motivational support to the participant to reach.</li> <li>Weekly walking group: the coaches arranged and invited all participants to an optional weekly group walk (2 hours).</li> <li>Control condition – Received written information on the benefits of increasing activity levels. This advice was given in accordance with the NHS Foundation Trust policy on physical health.</li> </ul>	Delivered as intended.	<ul> <li>The Walk this way intervention employed the COM-B model of behaviour change principles to address capability, opportunity, and motivational barriers to reducing SB and increasing PA.</li> <li>The Initial education session aimed to enhance motivation and self-efficacy to make behaviour change.</li> <li>Health coaching sessions used the REACH© model of coaching, emphasising individual's accountability involves thinking, feeling, and doing to achieve the self-identified goals. Health information of PA, support and motivation for goal attainment were provided to facilitate the participant to increase walking into daily routine independently.</li> <li>The participant's walking goal was set with SMART (Specific, Measurable, Attainable, Realistic and Timely), self-monitored by pedometer and calendar; the step count and factors affecting attainment were discussed wit the coach.</li> <li>Weekly regular group walk was optional, which provided social support to the participants.</li> </ul>

trainer; I = Intervention group; LSA = Lifestyle advisor; MVPA = Moderate-to-vigorous physical activity; PA = Physical activity; PREPARE = Prediabetes risk education and physical activity recommendation and encouragement; PT = Physiotherapist; SD = Standard deviation; SMART = Specific, Measurable, Achievable, Page 69 of 93

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Relevant, and Time Specific; STAND = Sedentary Time ANd Diabetes; SWO = Standard website-only; TEG = Traditional exercise group; TTCW = Tailored telephone counselling plus website; WARA = Walk for Rheumatoid Arthritis; ZTEx = Zero Time Exercise

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Study (Year)	Fidelity (delivering the intervention as per protocol)	Recruitment (recruiting participants and sites)	Retention (participants remaining in the intervention or control/usual care group)	Reach (dose received and participant engagement)
Adams (2012)	Only qualitative data reported.	10 clusters invited. 7 clusters recruited (needed active membership n≥12).	I: n= 40 (85.1%) C: n= 24 (85.7%) Primary reasons for leaving the study: 55% (6/11) Having to wear the activity monitors. 18% (2/11) Time commitment too great. 18% (2/11) Had not understood length of study. 9% (1/11) Went out of town unexpectedly.	<ul> <li>23/40 (58%) participants always used 2 of 3 intervention elements</li> <li>Overall satisfaction with the programme (Likert scale, 1= not at all, 5= very satisfied):</li> <li>39.5% (17/43) participants rated very satisfied (highest %).</li> <li>97.7% (42/43) participants rated at least "3= somewhat" or above.</li> </ul>
Albright (2015)	<ul> <li>5% (80/1586) recorded telephone counselling sessions evaluated against a checklist of the essential intervention components:</li> <li>88% fidelity over the 12- month intervention to the essential intervention components.</li> <li>96% calls covered barriers to MVPA discussion.</li> <li>97% calls covered assessing participant's previous MVPA goal.</li> <li>100% calls covered setting the participant's next MVPA goal.</li> <li>The two components most</li> </ul>	Community recruitment: 272 via adverts, e.g., magazines, radio stations; 170 randomised, Kaiser Permanente recruitment: 3844 Postcards sent out; 1176 calls made; 419 interested in joining; 141 randomised.	I: n= 115 (74.7%) C: n= 127 (80.9%) Most frequent reasons for failure to complete the intervention: 13% Pregnancy. 9.5% Too busy. 6.1% Discontinued participation, no given reason. 3.5% Family/job issues.	<ul> <li>TTCW group:</li> <li>90.4% of the participants receiving ≥13 of the 17 scheduled calls.</li> <li>78.3% of the participants viewed the website at least once.</li> <li>75% of participants set incremental MVPA goals with a health educator during the counselling sessions over the 12-month intervention period.</li> <li>Level of achieving set MVPA goals in the 3 phases among all participants:</li> <li>High level (≥100% of MVPA goal achieved or exceeded):</li> <li>40.6% of the time during Phase 1 (weekly calls).</li> <li>39.9% of time during Phase 2 (biweekly</li> </ul>

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## Supplementary file 6. Implementation data\_27.05.21

	frequently not delivered: Pedometer steps (asked in 68.8% calls). MVPA resources (offered in 80% calls).			<ul> <li>calls).</li> <li>42.0% of time during Phase 3 (monthly calls).</li> <li>Moderate level (50-99% MVPA goal achieved):</li> <li>23.5% of the time during Phase 1.</li> <li>28.4% of the time during Phase 2.</li> <li>21.1% of the time during Phase 3.</li> <li>Low level (0-49% MVPA goal achieved):</li> <li>35.8% of the time during Phase 1.</li> <li>21.7% of the time during Phase 2.</li> </ul>
Benedetti (2020)	Checklist to assess implementation, including programme fidelity, instructor knowledge, classroom, schedule, participants' attention and attendance: All analysed items achieved an average of 98% fidelity.	<ul> <li>2 of 5 health districts in Florianopolis were interested in participating, consisting 20 of 50 HCs.</li> <li>6 HCs were interested, and had the physical structure and human resources to offer the programmes, thus were recruited.</li> <li>4,071 older adults across the 6 HCs;</li> <li>24.2% (985) individuals were considered eligible;</li> <li>11.5% (114) of eligible participants recruited.</li> </ul>	Post-intervention (3 months): BCG: n= 18 (50%) TEG: n= 33 (63.5%) C: n= 23 (88.5%) 6 months: BCG: n= 17 (47.2%) TEG: n= 32 (61.5%) C: n= 21 (80.8%) 12 months: BCG: n= 13 (36.1%) TEG: n= 28 (53.8%) C: n= 17 (65.4%) 28 clusters remained	36.9% of the time during Phase 3.         Overall, 49% of participants attended at least 75% of all sessions, with disengagement occurring mostly in the first three weeks of the study (42%).         Both intervention groups showed relatively high disengagement rates (BCG 50% vs. TEG 37%) with individuals in the BCG presenting lower rates of overall attendance (27% vs. 47%).         % = median of attended / planned
n (2015)	24/25 interviewed HCPs were trained in Motivational Interviewing, and applied MI with the participants. 100% PTs made an exercise plan with the participants.	411 participants recruited (with 2 to 30 subjects per cluster, 76.9% of participants referred by the GP). Eligibility based on baseline data: - 48.9% met the inclusion criteria.	Participants: I: n= 196 (79.4%) C: n= 126 (76.8%) From recorded data, the main reasons of drop-outs	<ul> <li>number of meetings:</li> <li>LSA meetings:</li> <li>I: 50.0%; C:66.7%</li> <li>PT group meetings:</li> <li>I: 47.1% to 61.5%; C: 0% (planned n= 0)</li> <li>PT individual meetings:</li> <li>I: 0% (planned 6 to 7): C: 33.3%</li> </ul>

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84.8% of the participants set exercise goals or made an exercise plan with an HCP. 79.9% Exercise plans or goals were made with PT, if participants attended any individual meeting with a PT.5/6 dietitians made nutritional plans with the participants. 73.9% of the participants made set nutritional plan or goals with an HCP. 91.7% of the plans or goals were made with the dietitian, if participants attended any individual meeting with a dietitian.96.9% participants reported LSA had explained the intervention clearly at the beginning.226 participants (from both IG and CG) completed a questionnaire after 12 months: 40.7% Reported the LSA had explicitly concluded the intervention. 41.2% Reported the Intervention was not concluded. 18.1% Did not know.Dose Delivered: L DT in start was not concluded.	- 16.8% higher weight-related risk than the target population. - 24.3% of participants' eligibility could not be checked.	and personal reasons (10.1%).	Dietitian group meetings: I: 42.9%; C: 28.6% Dietitian individual meetings: I: 33.3%; C: 133.3% Satisfaction (on scale of 1–10, 10 is best): Mean range (across meeting types): I: 7.1 – 8.0 C: 7.1 – 7.3 Overall programme (Mean (SD)): I: 7.7 (1.5) C: 7.1 (1.8) Substrate the state of the state o
1 PT in start-up programme			

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Biddle (2017)       Not reported       *I: n = 41 (43.6%)       23/94 (24%) allocated to intervention group did not attend the structured education workshop.         18       *I: n = 68 (73.1%)       group did not attend the structured education workshop.         19       Not reported       *I: n = 41 (43.6%)       23/94 (24%) allocated to intervention group did not attend the structured education workshop.         20       Not reported       *I: n = 41 (43.6%)       23/94 (24%) allocated to intervention group did not attend the structured education workshop.         21       Not reported       *I: n = 68 (73.1%)       25/94 (47.9%) took part in Week 6 phone progress reviews         23       Iso to follow-ups: 24.5% (23/94) Did not receive allocated intervention in the intervention group.       26/31 (84%) participants used the accelerometer daily initially, but this fell to 13/31 participants at 6 weeks.         26       Iso to follow-ups: 24.5% (25/187) Failed to attend FU appointment.       25/31 (81%) participants felt the accelerometer as helpful at 6 weeks.         23       Iso to follow-ups: 24.38       25/31 (24%) planned for physical activity Others referred to desired health outcomes         24       Iso to fit workshop (mentioned most frequently): 1. information on diabetes; 2. the atmosphere of the workshop; 3. Receiving personal data on	2 3 4 5 6 7 8 9 10 11 12 13 14		only planned group meetings with all HCPs, instead of the individual meetings intended per protocol. 4 dietitians typically offered individual meetings with participants, as per protocol. The other 4 dietitians only planned individual meetings according to participant's preference.			
	15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42	Biddle (2017)	Not reported	Not reported	*I: n= 41 (43.6%) *C: n= 68 (73.1%) Reasons for failure to complete the intervention or loss to follow-ups: 24.5% (23/94) Did not receive allocated intervention in the intervention group. 16% (30/187) No longer want to participate. 13.4% (25/187) Failed to attend FU appointment.	<ul> <li>23/94 (24%) allocated to intervention group did not attend the structured education workshop.</li> <li>45/94 (47.9%) took part in Week 6 phone progress reviews</li> <li>26/31 (84%) participants used the accelerometer daily initially, but this fell to 13/31 participants at 6 weeks.</li> <li>25/31 (81%) participants felt the accelerometer as helpful at 6 weeks.</li> <li>Workshop feedback: Behaviour change plans for future (6 weeks): 4/38 (11%) referred to strategies to sit less</li> <li>17/38 (45%) planned for physical activity Others referred to desired health outcomes</li> <li>"Best bits" of the workshop (mentioned most frequently): 1. information on diabetes; 2. the atmosphere of the workshop; 3. Receiving personal data on</li> </ul>

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				sitting levels and health.
				Behaviour change strategies attempted as reported by participants: 18 strategies mentioned to sit less and 8 strategies to move more.
Blunt (2018)	Only qualitative data reported	*How recruited participants heard about the study: 51 (45%) from posters or handouts; 28 (25%) received an email from the study site advertising the project; 15 (13%) from an in-person study recruiter; 12 (11%) referred by their health care provider (HCP) and/or HCP team; 6 (5%) by word of mouth; 1 (1%) other unspecified methods Five did not specify how they heard about the study	*6 months: I: n= 44 (74.6%) C: n= 46 (78.0%) 3.4% (I: n= 2) Did not attend any session 6.8% (I: n= 5, C: n= 3) Personal/health reasons 3.4% (I: n= 3, C: n= 1) Time commitment 5.9% (I: n= 2, C: n= 5) No longer interested *12 months: I: n= 37 (63%) *18 months: I: n= 35 (59%)	*Attendance: 5% attended no sessions; 17% attended 1 session; 10% attended 2 sessions; 20% attended 3 sessions; 48% attended all 4 sessions. Across all sites, 40 participants (68%) were classified as programme completers Among participants who completed the intervention programme, 30% attended 3 in-person sessions, 70% attended all 4 sessions.
Elramli (2017)	Not reported	<ul> <li>320 participants invited:</li> <li>106 (33.1%) did not respond;</li> <li>122 (38.1%) ineligible;</li> <li>92 (28.8%) assessed for eligibility;</li> <li>76 (23.8%) randomised</li> </ul>	3 months: I: n= 36 (92.3%) C: n= 26 (70.3%) 6 months: I: n= 37 (94.9%) C: n= 22 (59.5%)	Intervention attendance: 26 (66.7%) participants attended all 8 education sessions (6 sessions and 2 booster sessions) 28 (71.8%) attended 6 sessions 71.8% attended the first booster session 76.9% attended the second booster session Control group attendance: 21 (56.8%) participants attended the single group education session
Harris (2018)	Nurse session attendance and session content delivered	11,015 people invited to participate; 6,399 did not respond;	3 months: Postal: n= 335 (98.8%)	Diary returned: Postal: 268/339 (79%)

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2		recorded by the nurses after	548 were excluded as a result of self-	Nurse: n= 335 (96.8%)	Nurse: 281/346 (81%)
3 ⊿		each session.	reported PA guideline achievement;	C: n= 335 (99.1%)	
- 5			1,023/10,467 (10%) were randomised.		Pedometer use (every day or most days)
6		Fidelity to content delivered		12 months:	during 12-week intervention:
7		was high in all sessions; the		Postal: n= 319 (94.1%)	Postal: 238/294 (81%)
8		mean number of items		Nurse: n= 317 (91.6%)	Nurse: 269/303 (89%)
9		delivered in session one was		C: n= 329 (97.3%)	
10		11 (range 10–11); six (range	A.		Attending nurse sessions:
11		5–6) in sessions 2 and 3.		4.3% (Postal: n=15/339,	255/346 (74%) attended all three
12				Nurse: n=25/346, C:	sessions.
13		Duration of sessions reported		n=4/338) Withdrawn	258/263 (98%) attended session 3, and
14		by nurses and measured from		1.4% (Postal: n=5/339,	reported still using the pedometer and
15		records were not very far from		Nurse: n=4/346, C:	diary every day or sometimes.
16		the recommendation ( $\pm \le 30\%$		n=5/338) Not able to be	
17 10		difference maximum).		contacted	
10 19	Lakerveld	Only qualitative data reported	8,193 people of 12 general practices were	End of intervention (6	*207 (66%) participants received at least
20	(2012)		invited according the age (30-50 years) and	months):	1 face-to-face session, 78% of them were
21			absence of DM or CVD. 🛛 🗸 🚫 📐	I: n= 267 (85.0%)	content with the sessions.
22				C: n= 269 (87.3%)	
23			2,401 (29.3%) responded positively;		The median number of attended sessions
24			1,186 (14.5%) declined;	12 months:	was 2 (out of a max of 6).
25			921 (11.2%) of those who accepted	I: n= 249 (79.3%)	
26			invitation met the waist circumference	C: n= 253 (82.1%)	
27			inclusion criterion;		
28			772 (9.4%) attended screening at clinic and	24 months:	
29			consented;	I: n= 236 (75.2%)	
30 21			622 (7.6%) fully eligible and randomised.	C: n= 244 (79.2%)	
37					
33				Reasons for loss to follow-	
34				up:	
35				15.1% (I: n=42/308, C:	
36				n=52/314) Unable to attend	
37				3.7% (I: n=9/308, C:	
38				n=14/314) Withdrew	
39				consent	
40				1.1% (I: n=5/308, C:	
41				n=2/314) Became pregnant	
42 13				1.3% (IG n=5/308, C:	

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			n=3/314) Unable to contact 0.2% (I: n=1/308, C: n=0/314) Died 1.4% (I: n=2/308, C: n=7/314) Diagnosed type 2 DM	
Lane (2010)	Not reported	<ul> <li>11,205 women registered for the Women's Mini Marathon completed a survey about their PA habits.</li> <li>Consented respondents were followed up 2 months and 6 months afterwards respectively:</li> <li>2,020 of them provided records of PA changes at both follow-ups;</li> <li>414 of them were identified as having relapsed to insufficient levels of PA and invited to participate in the trial;</li> <li>176 consented to participate.</li> </ul>	Follow-up response rate (end of trial at 6 Weeks): I: n= 55 (65%) C: n= 57 (63%)	<ul> <li>76% of Intervention group participants responded at 3 Weeks:</li> <li>97% received the booklet(s)</li> <li>90% found the booklet(s) useful</li> <li>50% reported increase in PA levels</li> <li>28.5% felt greater levels of motivation which led to PA increase</li> <li>16% felt they had more knowledge on being active which led to PA increase</li> <li>5% attributed the PA increase to training for the Mini Marathon for the following year</li> <li>At end of trial (6 Weeks), receipt and use of materials provided:</li> <li>95% of intervention group participants</li> <li>80% of control group participants</li> </ul>
Matson (2018)	Not reported	Not reported	*I: n= 29 (100%) *C: n= 25 (80.6%)	Only qualitative data reported
Matthews (2016)	Only qualitative data reported	Sample was deemed representative of adults with intellectual disabilities: 91% (n = 93) had mild or moderate intellectual disability.	*End of intervention (12 weeks): I: n= 45 (83.3%) C: n= 43 (89.6%) *24 weeks: I: n= 42 (77.8%) C: n= 40 (83.3%) Reasons for loss to follow- up: 32.4% (I: n=20/54, C: n=13/48) Did not want to	<ul> <li>*54 participants were assigned to intervention, and received the intervention.</li> <li>*71% took part in all 3 planned face-to- face physical activity consultations.</li> <li>*26% took part in 2 consultations</li> <li>*3% took part in 1 consultation</li> </ul>

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			continue 1% (I: n=1/54) Ill-health	
Poston	Goals were set at all group	According to information from the Health	End of intervention:	82/94 (88%) attended at least one group
(2013)	sessions, of which 88% were	and Social Care Information Centre (2013),	I: n= 79 (84.0%)	session, and 60 (64%) attended 4 or more.
	considered SMART by HTs	approximately 1:5 pregnant women would	C: n= 75 (84.3%)	
	according to their diaries.	be eligible for inclusion.		42 women (45%) received material from
				all eight sessions, 6 by full attendance
		473/656 (72%) eligible people declined to		(6%) and 36 when partly/wholly covered
		participate (43.0% of those who declined		by subsequent phone contact.
		were in the lowest quintile for index of		M
		deprivation indicating the most severe		Mean of 6.1 (SD 2.6) sessions were
		2904 participated		intervention group
School of	Fidelity checks were	9 participating Integrated Family Service	Trial Coro sossion (baseline).	Dhysical activity group: (296 randomicod)
Dublic	conducted for every session of	Contras to recruit around 600 eligible	111al Core session (baseline): 1. n= 357 (92 5%)	257 (92 5%) attended core (1st) session
Health	the programmes which	narents	1.11 = 337 (92.376) C: n= 316 (92.4%)	357 (92.5%) attended booster session at 3
HKII	ensured the quality of the		C. II = 510(72.470)	months
(2017)	intervention and the	728 (121.3% of target) randomised	3 months:	313 (81.1%) attended tea gathering at 6
(_01)	implementation of the key		I: n = 335 (86.8%)	months
	elements in the intervention.		C: n = 306 (89.5%)	281 (72.8%) attended Family Holistic
				Health session at 1 year.
			6 months:	
			I: n= 328 (85.0%)	Healthy diet group: (342 randomised)
			C: n= 298 (87.1%)	316 (92.4%) attended core (1st) session
				306 (89.5%) attended booster session at 3
			End of intervention -12	months
			months:	292 (85.4%) attended tea gathering at 6
			I: n= 309 (80.1%)	months
			C: n= 284 (83.0%)	268 (78.4%) attended Family Holistic
				Health session at 1 year.
			Reasons for absence from	
			sessions included occupied	Participant's feedback at end of Physical
			with other activities, took	activity programme (on a scale of 0-10, 10
			care of family, liness, could	Is best) (Mean (SD)):
			not be contacted, and	9.0 (1.2) Quality of intervention content 0.0 (1.2) Lovel of utility of the intervention
			abroau; the exact number of	9.0 (1.2) Level of utility of the intervention
			participants dropped out for	100% participants would recommend this
			each of these reasons calliot	100% participants would recommend this

			be ascertained.	intervention programme to their friends
Spittaels	Not reported	8,000 employees targeted via 6 worksites	End of intervention:	Recalled having received the tailored
(2007)		newsletters.	116 (66 7%)	97% Tailored advice+emails group
		570 (7 1%) responded positively	Tailored advice: $n = 122$	94% Tailored advice group
		562 (7.0%) returned the baseline	(69 7%)	53% Control group
		questionnaire with the informed consent.	C: n = 141 (79.7%)	oo // dontroi group
		and then randomised.		Tailored advice+emails group satisfaction
		$\sim 65\%$ of participants met the minimal		92% Received at least 3 of the 5
		recommendations for physical activity at		reinforcement empils
		haseline despite explicit recruitment of		77% Read them completely
		inactive participants		87% Satisfied by number of emails
		indetive participants		86% Satisfied by frequency of emails
		31% participants were female, males		45% Felt emails were useful
		comprising the majority of employees in		33% Reported behavioural changes
		the two biggest worksites for recruitment		
		Male participants already had high baseline		
		physical activity scores compared to the	CI.	
		general male population (72% vs. 57%		
		meeting the recommendations), whereas		
		female participants were more		
		representative of the population (47% vs.		
		48% meeting the recommendations).		
Stathi	Not reported	2,000 mailed invitations were delivered in	End of intervention:	All participants who completed the
(2019)		the target areas resulting in 230 responses	Activator: n= 15 (100.0%)	intervention engaged with their activator
		from potential participants and activators		at least 7 times as planned.
		(response rate 11.5%).	Participants:	
			1: n = 19 (86.4%)	Of the 3 participants who dropped out: 2
		ALE participants: 154 (7.7%) requests for	C: n = 13(76.5%)	met their activator less than 5 times but
		Information packs. 65 (3.3%) people		were contacted regularly by phone.
		returned reply forms. 40 (2.0%) recruited.	Reasons for dropping out	
		Activistors, 76 (2 00/) requests for	7 704 (2/20) Ill boolth	
		Activators: 70 (3.8%) requests for	1.7% (3/37) III-Ilealth	
		after completing the training	5.1% (2/39) Carer	
		after completing the training.	communents	

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### Supplementary file 6. Implementation data\_27.05.21

			2.6% (1/39) Lack of time 2.6% (1/39) Moving to a different city	
Williams (2019)	Not reported	<ul> <li>215 eligible service users contacted by</li> <li>letter and phone;</li> <li>71 not interested;</li> <li>104 not contactable;</li> <li>40 (18.6%) recruited.</li> </ul>	I: n= 16 (80.0%) C: n= 17 (85.0%)	<ul><li>13 (65%) received intervention:</li><li>5 did not engage with intervention;</li><li>2 did not engage with intervention after education session.</li></ul>

Keys: \* = Data from associated publications; ACE = Active, Connected, Engaged intervention; BCG = Behaviour change group; BMI = Body Mass Index; C = Control isor; MVPA = Mouc. .cific, Measurable, Achievaus. group; CVD = Cardiovascular disease; DM = Diabetes Mellitus; FU = Follow-up; GP = General practitioner; HC = Health centre; HCP = Health care provider; HT = Health trainer; I = Intervention group; LSA = Lifestyle advisor; MVPA = Moderate-to-vigorous physical activity; n = number of persons; PA = Physical activity; PT = Physiotherapist; SD = Standard deviation; SMART = Specific, Measurable, Achievable, Relevant, and Time Specific; TEG = Traditional exercise group; vs = versus

 Supplementary file 7\_SB results from RCTs associated with included PEs\_27.05.21

<b>Study (Year)</b> Number of participants randomised	Unit of outcome	Outcome measure(s) for SB	Intervention group Baseline	Control group Baseline	Intervention group End of intervention <sup>a</sup>	Control group End of intervention <sup>a</sup>		
Adams (2012)	1. Mean % of SB time per day (SD) 2. Mean sitting	1. Accelerometer	(n= 40) SB: 47.42% (10.77)	(n= 24) SB: 50.7% (13.78)	(n= 40) SB: 49.16% (10.23)	(n= 24) SB: 50.39% (14.92)		
I: 47 C: 28	hours per week (SD)	2. IPAQ	Sitting time: 57.99 (29.70)	Sitting time: 45.18 (34.88)	Sitting time: 46.00 (28.91)	Sitting time: 40.33 (40.68)		
<b>Albright (2015)</b> I: 138 C:140	Mean sitting hours per day (SD)	sitting hours y (SD) Active Australia Survey Active Au		Traveling to/from work: 1.41 (0.82)* While at work: 2.52 (2.5) Watching TV: 1.91 (1.36) Using a computer at home: 1.41 (1.18) Other leisure time (movies, dining out): 1.31 (1.05) While holding/feeding baby: 3.20 (2.08)	Fraveling to/from work: 1.41 (0.82)* While at work: 2.52 (2.5) Watching TV: 1.91 (1.36) Using a computer at home: 1.41 (1.18) Other leisure time (movies, dining out): 1.31 (1.05) While holding/feeding			
<b>Benedetti (2020)</b> BCG: 36 TEG: 52 C: 26	Baseline: Mean SB minutes per week (SD) End of trial: Mean SB minutes per day (SE)	Accelerometer	BCG: 498.5 (113.6) TEG: 529.8 (107.3)	522.8 (86.7)	Change between baseline and end of intervention (3 months): BCG: -14.3 (56.3) ° TEG: -4.1 (62.2) ° Change between baseline and end of trial (12 months): BCG: -10.9 (59.9) ° TEG: 4.2 (78.6) °	Change between baseline and end of intervention (3 months): -25.6 (77.9) <sup>c</sup> Change between baseline and end of trial (12 months): -26.7 (68.3) <sup>c</sup>		
Berendsen (2015) I: 247 C: 164	Not published	Accelerometer	Not published	Not published	Not published	Not published		

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# Supplementary file 7\_SB results from RCTs associated with included PEs\_27.05.21

<b>Biddle (2017)</b> 1: 94 C:93	Mean SB hours per day (95% CI)	1. Actigraph (worn on waistband) 2. ActivPAL (worn on thigh)	Actigraph (n= 76): 10.83 (10.50, 11.17) ° ActivPal (n= 60): 8.91 (8.59, 9.24) °	Actigraph (n= 80): 11.01 (10.76, 11.26) ActivPal (n= 57): 9.02 (8.73, 9.30)	Outcomes not measured at end of intervention (6 Weeks). Change between baseline and end of trial (12 months) Actigraph (n= 38): -0.29 (-0.75, 0.17) c ActivPal (time change, n=32): 0.64 (0.13, 1.16) c	Outcomes not measured at end of intervention (6 Weeks). Change between baseline and end of trial (12 months) Actigraph n= 49): -0.23 (-0.60, 0.14) ° ActivPal (n=29): 0.58 (0.06, 1.09) °
<b>Blunt (2018)</b> I: 59 C:59	Mean sitting minutes per day (SD)IPAQ360 (315)360 (240)				Mean difference between at end of active interven -0.08 (-0.16, -0.006)* °	n groups (only measured tion phase – 6 months):
<b>Elramli (2017)</b> I: 39 C: 37	ramli (2017)Mean SB hours per day (SE)1. ActivPalActivPal C IPAQ weekday sitting: 5.3 (0.31) IPAQ weekend sitting: 5.3 (0.36)ActivPa IPAQ we 4.7 (0.4 IPAQ weekend sitting: 4.6 (0.3			ActivPal SB: 18.5 (0.2) <sup>c</sup> IPAQ weekday sitting: 4.7 (0.41) IPAQ weekend sitting: 4.6 (0.38)	ActivPal SB: 17.2 (0.3) <sup>c</sup> IPAQ weekday sitting: 4.2 (0.33)** IPAQ weekend sitting: 3.9 (0.33)	ActivPal SB: 18.7 (0.41) <sup>c</sup> IPAQ weekday sitting: 5.7 (0.53)** IPAQ weekend sitting: 5.1 (0.63)
Harris (2018) Postal: 339 Nurse: 346 C: 338	Mean SB minutes per day (SD, or 95% CI)	Accelerometer	Postal: 614 (71) Nurse: 619 (78)	613 (86)	Mean difference between intervention (3 months) Postal versus control: -2 Nurse versus control: -7 Nurse versus Postal: -4 ( Mean difference between (12 months) Postal versus control: 1 (- Nurse versus control: -0.2 Nurse versus Postal: -1 (-	n groups at end of (-12, 7) <sup>c</sup> (-16, 3) <sup>c</sup> -13, 5) <sup>c</sup> n groups at e <i>nd of trial</i> -8, 10) <sup>c</sup> ? (-9, 9) <sup>c</sup> 10, 8) <sup>c</sup>
Lakerveld (2012) I: 314 C: 308	Mean SB minutes per day (SD)	A subscale of AQuAA	253.7 (146.9)°	255.4 (124.5)°	Outcomes not measured at end of intervention End of trial (Month 24): 231.5 (122.2) c	Outcomes not measured at end of intervention End of trial (Month 24): 233.0 (140.7) c

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Supplementary file 7\_SB results from RCTs associated with included PEs\_27.05.21

<b>Lane (2010)</b> I: 85 C: 91	Mean sitting time minutes per week (SD)	Frequently used validated questions selected for the trial from other population-level PA interventions.	335.9 (194.9)	310.1 (224.7)	371.4 (170.1)	369.5 (152.6)
<b>Matson (2018)</b> I: 29 C: 31	Mean sitting time minutes over last 7 days (SD) <sup>b</sup>	ActivPAL	Not published	Not published	Change between baseline and end of intervention (n= 29): -70.1 (104) <sup>b</sup>	Change between baseline and end of intervention (n= 25): 6.5 (69) <sup>b</sup>
<b>Matthews</b> (2016) I: 54 C: 48	Mean% of time per day spent in SB (SD)	Accelerometer	64.2% (10.5)	66.9% (11.3)	(n= 42) 66.4% (10.0) °	(n= 40) 65.9% (12.0) °
<b>Poston (2013)</b> I: 94 C: 89	Mean SB time minutes per day (SD)	1. Accelerometer 2. RPAQ	Accelerometer (n= 68): 1165 (91) <sup>c</sup> RPAQ (n= 79): 1009 (187) <sup>c</sup>	Accelerometer (n= 72): 1172 (95) <sup>c</sup> RPAQ (n= 80): 1007 (207) <sup>c</sup>	Accelerometer (n= 36): 1197 (77) ° RPAQ (n= 56): 1020 (226) °	Accelerometer (n= 39): 1175 (86) <sup>c</sup> RPAQ (n= 54): 1068 (177) <sup>c</sup>
School of Public Health HKU (2017) I: 357 C:316	Mean sitting hours in a working day (SD)	IPAQ-C	4.47 (2.47)*	4.11 (2.38)*	4.3	4.2
Spittaels (2007) I: Group 1 (tailored advice + email): 116 Group 2 (tailored advice): 122 C: 141	ittaels (2007) pup 1 (tailored vice + email): 6 pup 2 (tailored vice): 122 141		Group 1: Weekday: 482 (183) Weekend day: 308 (160) Group 2: Weekday: 492 (202) Weekend day: 296 (160)	Weekday: 470 (217) Weekend day: 309 (182)	Group 1: Weekday: 443 (168) Weekend day: 276 (131) Group 2: Weekday: 438 (172) Weekend day: 268 (141)	Weekday: 419 (181) Weekend day: 271 (139)
<b>Stathi (2019)</b> I: 22 C: 17	Mean SB minutes per day (SD, +/ 95% CI)	Accelerometer	681.5 (74.9)	616.2 (112.3)	Change between baseline and end of intervention:	Change between baseline and end of intervention:

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### Supplementary file 7 SB results from RCTs associated with included PEs 27.05.21

					13.1 (77.2) (-26.6, 52.8)	-8.7 (70.7) (-57.6, 75.1)
Williams (2019) I: 20 C: 20	Mean SB minutes per day (SE)	Accelerometer	577.2 (9.8)	549.2 (19.1)	End of intervention (17 weeks, n= 16): 520.9 (36.2)*	End of intervention (17 weeks, n= 17): 637.9 (30.4)*
					End of trial (6 months, n= 8): 508.2 (19.4)*	End of trial (6 months, n= 13): 661.2 (33.5)*

#### Supplementary file 3: Sedentary behaviour measured (at baseline and end of the trial) in the randomised controlled trials associated with the included process evaluation studies

**Keys:** <sup>a</sup> = Results available from the assessment immediately after the intervention, unless otherwise specified; <sup>b</sup> = unclear if adjusted for covariates; <sup>c</sup> = data were adjusted for covariates; \* = p value <0.05 for comparison between intervention and control groups (where reported); \*\* = p value <0.025 for comparison between intervention and control groups reported as accepted statistical significance ; *Italic font* = End of trial results, if available from publications; AOuAA = Activity Questionnaire for Adolescents & Adults; BCG = Behaviour Change Group; C = Control group; FU = Follow-up; I = Intervention group; IPAQ = International Physical Activity Questionnaire; IPAQ-C = International Physical Activities Questionnaire-Chinese version; n = number of persons included in the analysis; RPAQ = Recent Physical Activity Questionnaire; SB = Sedentary behaviour; SD = Standard deviation; SE = Standard error; TEG = Traditional Exercise Group 

## Supplementary file 8 characteristics of 24 excluded studies 27.05.21

Study	Reason for exclusion
Ashe 2013	Results of process evaluation not available.
Burton 1995	Ineligible study design: The study did not involve process evaluation.
Cohen 2017	Ineligible study design: The participants were not all assessed at all timepoints
	throughout the trial. The data from each time point were not obtained from the
	same sample group throughout the study.
Coll-Planas 2019	Results of process evaluation not available.
Douglas 2019	Ineligible study design: The study is not RCT.
Gray 2018	Sedentary behaviour was not measured in the RCT.
Gummelt 2017	Sedentary behaviour was not measured in the RCT.
Hammerback 2012	Sedentary behaviour was not measured in the RCT.
Harvey 2016	Ineligible study design: The study did not involve process evaluation of
	exploration of the intervention.
Holt 2019	Sedentary behaviour was not measured in the RCT.
Hsu 2013	Sedentary behaviour was not measured in the RCT.
Jayaprakash 2016	Sedentary behaviour was not measured in the RCT: Sedentary behaviour was
	measured at baseline, but not throughout the trial as an outcome.
Lai 2019	Ineligible study design: The study was not a RCT.
Maddison 2020	Sedentary behaviour was not measured in the RCT.
McAuley 2013	Ineligible study design: The study did not involve process evaluation.
Orme 2017	Ineligible study design: The evaluation of feasibility did not involve process
	evaluation or qualitative evaluation.
Rovniak 2014	Sedentary behaviour was not measured in the RCT.
Sazlina 2015	Results of process evaluation not available.
Seguin 2019	Sedentary behaviour was not measured in the RCT.
Sheppard 2016	Sedentary behaviour was not measured in the RCT.
Stevens 2015	Sedentary behaviour was not measured in the RCT.
Thomsen 2016	Ineligible study design: The study did not involve process evaluation or qualitative
	evaluation.
Thompson 2008	Results of process evaluation not available.
Thornton 2018	Ineligible comparator: The eligible intervention was assigned to the control group,
	not the experimental intervention group in this study.
Tiedemann 2015	Sedentary behaviour was not measured in the RCT.
van de Glind 2017	Results of process evaluation not available.
van der Wardt 2019	Sedentary behaviour was not measured in the RCT.
Varela-Mato 2016	Ineligible setting: The intervention was delivered at workplace.
Voorn 2016	Sedentary behaviour was not measured in the RCT.
Yeung 2020	Ongoing: Study not completed.
Zabaleta-Del-Olmo 2018	Results of process evaluation not available.

Keys: RCT = Ramdomised Controlled Trial

Page	8§upplementar	<u>y file 9</u>	_Quality	y asses	sment	MMA	T_27.0	5.21				BMJ (	Dpen															
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		QUES	STIONS						CC	ONTR	OLLEI	) TRIA	LS	l	RAN	DOM	IIZE	D	DES	CRIF	PTIVE	E STUI	DIES		S	TUDI	ES	
1												<b>I</b> -			SI	UDI	ES					1						
2	Authors	<b>S1</b>	S2	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5
4	(Year)																											
5	Adams (2012)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
7 8	Albright (2015)	No	Can't tell						Can't tell	Yes	Can't tell	No	No						Yes	Yes	Yes	Yes	Yes					
9 10	Benedetti 2015	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Can't tell	Can't tell	No						Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes	Yes	Yes
11 12	Berendsen (2015)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Can't tell	Yes	Can't tell						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	Biddle (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14	Blunt (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No															
15 16 17	Elramli (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No															
17 18	Harris (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
19 20	Lakerveld (2012)	Yes	No						Yes	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	Yes					
21 22	Lane (2010)	Yes	Yes						Can't tell	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	Yes					
23 24	Matson (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Can't tell															
25 26	Matthews (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Can't tell	Yes	Yes	No	Yes						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
27 28 29	Poston (2013)	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Can't tell	Yes						Yes	Yes	Yes	Yes	Yes	Yes	No	No	Can't tell	No
30 31	SPH HKU (2017)	Yes	Yes	Yes	Yes	No	No	No	Can't tell	No	Yes	Can't tell	No															
32 33	Spittaels (2007)	Yes	Yes						Can't tell	Yes	Yes	Can't tell	Yes						Yes	Yes	Yes	Yes	Yes					
34 35	Stathi (2019)	Yes	Yes	Yes	Yes	No	No	No	Can't tell	No	Yes	Can't tell	Yes						Yes	Yes	Yes	Yes	Yes	Yes	No	No	Can't tell	No
36 37	Williams (2019)	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No	Yes	No						Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No

S1. Are there clear research questions? S2. Do the collected data allow to address the research questions? 1.1. Is the qualitative approach appropriate to answer the research question? 1.2. Are the qualitative data collection methods adequate to address the research question? 1.3. Are the findings adequately derived from the data? 1.4. Is the interpretation of results sufficiently substantiated by data? 1.5. Is there coherence between qualitative data sources, collection, analysis and For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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interpretation? 2.1. Is randomization appropriately performed? 2.2. Are the groups comparable at baseline? 2.3. Are there complete outcome data? 2.3. Are there complete outcome data? 2.4. Are outcome assessors blinded to the intervention provided? 2.5 Did the participants adhere to the assigned intervention? 3.1 Are the participants representative of the target population? 3.2 Are measurements appropriate regarding both the outcome and intervention? 3.3 Are there complete outcome data? 3.4 Are the confounders accounted for in the design and analysis? 3.5 During the study period, is the intervention administered (or exposure . ana, ...ess the res, ...oias low? 4.5. Is th. ...ress the research questio. ...e integration of qualitative and ...ve results adequately addressed? 5.5. Dc occurred) as intended? 4.1. Is the sampling strategy relevant to address the research question? 4.2. Is the sample representative of the target population? 4.3. Are the measurements appropriate? 4.4. Is the risk of nonresponse bias low? 4.5. Is the statistical analysis appropriate to answer the research question? 5.1. Is there an adequate rationale for using a mixed methods design to address the research question? 5.2. Are the different components of the study effectively integrated to answer the research question? 5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted? 5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed? 5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

# Supplementary file 10\_search strategies 27<sup>th</sup> October 2021

2		
3 4 5	Our ir behav	nformation specialist updated a few of the MeSH terms that weren't available in the previous searches e.g. sedentary viour/ screen time/ and sitting position/.
6 7	<u>Datak</u>	pase: CINAHL (EBSCOost), search modes - Boolean/Phrase:
8 9	S1	(MH "Life Style, Sedentary")
10 11	S2	TI (sedentary or sitting or sedentariness or sedentarism)
12 13	S3	TX ( (sedentary or sitting or seated) N5 (behavio* or lifestyle* or life-style* or pattern* or leisure or time or bout*)) )
14 15 16 17	S4	TX((inactiv* or "no exercise" or nonexercise or "non exercise") N3 (adult* or men or women or male or males or female or females or individual* or people or person or population* or senior or seniors or elderly))
17 18 19 20	S5	TX((sedentary) N3 (adult* or men or women or male or males or female or females or individual* or people or person or population* or senior or seniors or elderly))
21 22	S6	TX ( (light or low) N1 "physical activ*" )
23 24	S7	TX "physical* inactiv*"
25 26	S8	TX ( "leisure time" N5 ("physical* activ*" or passive or inactiv*))
27 28	S9	TX "physical activity level*"
29 30	S10	(MH "Sitting")
31 32	S11	TX ( (sitting or lying) N2 posture* )
33 34 35	S12	TX ((uninterrupted or long* or prolong* or extend* or continu* or protracted or sustain* or period* or duration* or time*) N5 (reclin* or sit or sitting or seated or lying))
36 37	S13	TX ("sit less" or "sitting less")
38 39 40 41	S14	TX ( (decrease or reduc* or discourag* or lessen*) N3 (sit or sitting or stand or standing or "physical* inactiv*" or sedentar*) )
42 43	S15	(MH "Screen Time")
44 45	S16	TX ( time N5 (computer* or television or tv or "video game*" or videogame* or gaming or screen or media) )
46 47	S17	TX ( (watch* or view*) N5 (television or tv) )
48 49	S18	TX( play* N5 ("video game*" or videogame* or "computer game*") )
50 51 52	S19	TI ((computer* or television or tv or video game* or videogame* or gaming) and (sedentary or "physical* activity" or sitting or seated or underactiv* or "under activ*")))
53 54	S20	MH randomized controlled trials
55 56	S21	MH single-blind studies
57 58	S22	MH double-blind studies
59 60	S23	MH random assignment
	S24	MH pretest-posttest design

1	S25	MH cluster sample
2 3	S26	TI (randomised OR randomized)
4 5	S27	AB (random*)
6 7	S28	TI (trial)
8 9	S29	MH (sample size)
10 11	S30	AB (assigned OR allocated OR control)
12 13	S31	MH (placebos)
14 15	S32	PT (randomized controlled trial)
16 17	S33	AB (control W5 group)
18 19	S34	MH (crossover design)
20 21	S35	MH (comparative studies)
22 23	S36	AB (cluster W3 RCT)
24 25	S37	MH animals+
26 27 28	S38	MH (animal studies)
28 29 20	S39	TI (animal model*)
30 31 32	S40	S37 OR S38 OR S39
33 34	S41	MH (human)
35 36	S42	S40 not S41
37 38 39	S43	S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36
40 41	S44	S43 NOT S42
42 43	S45	(MH "Program Evaluation")
44 45	S46	(MH "Process Assessment (Health Care)")
46 47	S47	TX "program* evaluat*"
48 49	S48	TX ( (process evaluat*) )
50 51	S49	S45 OR S46 OR S47 OR S48
52 53 54	S50	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19
55 56 57 58 59	S51	S43 AND S49 AND S50
60	Datał	pase: SPORTDiscus (EBSCOHost), search modes - Boolean/Phrase

- S1 SU Sedentary Lifestyle
- 2 S2 TI (sedentary or sitting or sedentariness or sedentarism)
- 4 S3 TX ( (sedentary or sitting or seated) N5 (behavio\* or lifestyle\* or life-style\* or pattern\* or leisure or time or bout\*)) 5
- 6<br/>7<br/>8S4TX((inactiv\* or "no exercise" or nonexercise or "non exercise") N3 (adult\* or men or women or male or males or<br/>female or females or individual\* or people or person or population\* or senior or seniors or elderly))
- S5 TX((sedentary) N3 (adult\* or men or women or male or males or female or females or individual\* or people or person
   or population\* or senior or seniors or elderly))
- 12 13 S6 TX ( (light or low) N1 "physical activ\*")
- 14 15 S7 TX "physical\* inactiv\*"
- 17 S8 TX ( "leisure time" N5 ("physical\* activ\*" or passive or inactiv\*))
- 19 S9 TX "physical activity level\*"
- 20 21 S10 SU sitting

18

22

24

40

43

47

- 23 S11 TX ( (sitting or lying) N2 posture\* )
- S12 TX ((uninterrupted or long\* or prolong\* or extend\* or continu\* or protracted or sustain\* or period\* or duration\* or time\*) N5 (reclin\* or sit or sitting or seated or lying))
- 28 S13 TX ("sit less" or "sitting less")
- S14 S14 TX ( (decrease or reduc\* or discourag\* or lessen\*) N3 (sit or sitting or stand or standing or "physical\* inactiv\*" or sedentar\*) )
- 33 34 S15 TX (time N5 (computer\* or television or tv or "video game\*" or videogame\* or gaming or screen or media))
- 35 36 S16 TX ( (watch\* or view\*) N5 (television or tv) )
- 37
   38
   S17 TX( play\* N5 ("video game\*" or videogame\* or "computer game\*") ) OR AB ( play\* N5 ("video game\*" or videogame\*
   39 or "computer game\*")
- S18 TI ((computer\* or television or tv or "video game\*" or videogame\* or gaming) and (sedentary or "physical\* activity"
   or sitting or seated or underactiv\* or "under activ\*"))
- 44 S19 ((DE "RANDOMIZED controlled trials")))45
- 46 S20 TX "allocat\* random\*"
- 48 S21 TX "random\* assign\*"49
- 50 S22 TI (randomised OR randomized) 51
- 52 S23 TI (trial) 53
- 54 S24 AB (assigned OR allocated OR control) 55
- 56 S25 AB (control W5 group) 57
- 58 S26 TX placebo\*
- 60 S27 TX clinic\* n1 trial\*

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S28 S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27

1

2 3	S29	SU program evaluation
4 5	S30	TX "program* evaluat*"
6 7	S31	TX "process evaluat*"
8 9	S32	S29 OR S30 OR S31
10 11 12	S33	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18
13 14 15 16	S34	S28 AND S32 AND S33
17		
18 19	<u>Datab</u>	ase: Cochrane Database of Systematic Reviews (Wiley):
20	#1	MeSH descriptor: [Sedentary Behavior] this term only
21	#2	((sedentary or sitting or sedentariness or sedentarism)):ti (Word variations have been searched)
22	#3	((sedentary or sitting or seated) near/5 (behavio* or lifestyle* or "life style*" or pattern* or leisure or time or
23	bout*	)):ti.ab.kw (Word variations have been searched)
24	#4 ((	inactiv* or "no exercise" or nonexercise or "non exercise") near/3 (adult* or men or women or male or males or female or
25	female	es or individual* or people or person or population* or senior or seniors or elderly)) ti ab kw (Word variations have been
20	search	led)
27	#5	(sedentary near/3 (adult* or men or women or male or males or female or females or individual* or people or person or
20	popula	ation* or senior or seniors or elderly)):ti.ab.kw (Word variations have been searched)
29	#6	(((light or low) near/1 "physical activ*")):ti.ab.kw (Word variations have been searched)
20 21	#7	("physical activity level*"):ti.ab.kw
27	#8	("physical* inactiv*"):ti.ab.kw
22 22	#9	("leisure time" near/5 ("physical* activ*" or passive or inactiv*)):ti.ab.kw (Word variations have been searched)
27	#10	MeSH descriptor: [Sitting Position] explode all trees
35	#11	((sitting or lying) near/2 posture*);ti.ab.kw
36	#12	((uninterrupted or long* or prolong* or extend* or continu* or protracted or sustain* or period* or duration* or time*)
30	near/	5 (reclin* or sit or sitting or seated or lying)) ti ab kw
38	#13	(("sit* less" or "sitting less")):ti.ab.kw
30	#14	((light or low) near/1 "physical activ*") ti ab kw
40	#15	((decrease or reduct or discourage or lessent) near/3 (sit or sitting or stand or standing or "physical" inactive" or
40	seden	tar*)):ti.ab.kw
42	#16	MeSH descriptor: [Screen Time] this term only
43	#17	(time near/5 (computer* or television or ty or "video game*" or videogame* or gaming or screen or media)):ti.ab.kw
44	#18	((watch* or view*) near/5 (television or tv)):ti,ab,kw
45	#19	(play* near/5 ("video game*" or videogame* or computer game*)):ti,ab,kw
46	#20	((computer* or television or tv or "video game*" or videogame* or gaming) and (sedentary or "physical* activity*" or
47	sitting	or seated or underactiv* or "under activ*")):ti,ab,kw
48	#21	{or #1-#20}
49	#22	(("program* evaluation*")):ti,ab,kw
50	#23	MeSH descriptor: [Outcome and Process Assessment, Health Care] this term only
51	#24	MeSH descriptor: [Process Assessment, Health Care] this term only
52	#25	("process evaluation*"):ti,ab,kw
53	#26	{or #22-#25}
54	#27	#21 and #26
55 56	#28	#21 and #26 in Cochrane Reviews
57 58	<u>Datab</u>	ase: Cochrane Central Register of Controlled Trials (Wiley):
59	#1	MeSH descriptor: [Sedentary Behavior] this term only
60	#2	((sedentary or sitting or sedentariness or sedentarism)):ti (Word variations have been searched)
	—	

#3 ((sedentary or sitting or seated) near/5 (behavio\* or lifestyle\* or "life style\*" or pattern\* or leisure or time or bout\*)):ti,ab,kw (Word variations have been searched)

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1	#4 or fem	((inactiv* or "no exercise" or nonexercise or "non exercise") near/3 (adult* or men or women or male or males or female nales or individual* or people or person or population* or senior or seniors or elderly)):ti,ab,kw (Word variations have
2	been s	searched)
3	#5	(sedentary near/3 (adult* or men or women or male or males or female or females or individual* or people or person or
4	popula	ation* or senior or seniors or elderly)):ti,ab,kw (Word variations have been searched)
5	#6	(((light or low) near/1 "physical activ*")):ti,ab,kw (Word variations have been searched)
6	#7	("physical activity level*"):ti,ab,kw
/	#8	("physical* inactiv*"):ti,ab,kw
8	#9	("leisure time" near/5 ("physical* activ*" or passive or inactiv*)):ti,ab,kw (Word variations have been searched)
9	#10	MeSH descriptor: [Sitting Position] explode all trees
10	#11	((sitting or lying) near/2 posture*):ti.ab.kw
11	#12	((uninterrupted or long* or prolong* or extend* or continu* or protracted or sustain* or period* or duration* or time*)
12	near/5	5 (reclin* or sit or sitting or seated or lying)):ti.ab.kw
13	#13	(("sit* less" or "sitting less")):ti.ab.kw
14	#14	((light or low) near/1 "physical activ*") ti ab kw
15	#15	(decrease or reduct or discourage or lessent) near/3 (sit or sitting or stand or standing or "nhysical" inactiv" or
16	sedent	tar*))-ti ah kw
17	#16	MeSH descriptor: [Screen Time] this term only
18	#17	(time near/E (computer* or television or ty or "video game*" or videogame* or gaming or screen or modia));ti ah kw
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20	#10 #10	(watch of view ) field/5 (television of tv)).ti,ab,kw
21	#19	(play' field/5 ( video game* of video game* of computer game*). (i.i.do, kw
22	#20	((computer of television of toor video game of video game of gaming) and (sedentary of physical activity of
23	Sitting	for seated or underactive or under active )):ti,ab,kw
24	#21	{0r #1-#20}
25	#22	(("program* evaluation*")):ti,ab,kw
26	#23	MeSH descriptor: [Outcome and Process Assessment, Health Care] this term only
27	#24	MeSH descriptor: [Process Assessment, Health Care] this term only
28	#25	("process evaluation*"):ti,ab,kw
29	#26	{or #22-#25}
30	#27	#21 and #26
31	#28	#21 and #26 in Trials
32		
33	AMFD	(Allied and Complementary Medicine) (OVID) <1985 to October 2021>
34	<u>/ (IVIED</u>	
35	1 5	
36	2 6	sedentary or sitting or sedentariness or sedentarism) ti
37	2 (	sedentary of sitting of sedentariness of sedentarismilla.
38	o no nul	secentary augs (adult: of men of women of male of males of remale of remales of multidual: of people of person of
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40	4 ( fomale	(inactive of no exercise of nonexercise of nonexercise) aujs (addite of men of women of male of males of remaie of
41		es of individuals of people of person of populations of senior of seniors of endergy). two
42	) C	sedentary adja (addite of men of women of males of remales of individuale of people of populatione of senior of seniors
43	or elde	eriy)).tw. (light on low) odi physical activity two
44	ь ( 7	(light or low) adj physical activ").tw.
45	/ p	Mysical Mideliv". (W. (248)
46	8 (	leisure time adj5 (physical* activ* or passive or inactiv*)).tw.
47	9 " 10	physical activity level <sup>***</sup> .tw.
48	10 s	itting/
49	11 (	(sitting or lying) adj2 posture*).tw.
50	12 (	(uninterrupted or long* or prolong* or extend* or continu* or protracted or sustain* or period* or duration* or time*)
51	adj5 (r	reclin* or sit or sitting or seated or lying)).tw.
52	13 (	sit less or sitting less).tw.
53	14 (	(decrease or reduc* or discourag* or lessen*) adj3 (sit or sitting or stand or standing or physical* inactiv* or
54	seden	tar*)).tw.
55	15 (	time adj5 (computer* or television or tv or video game? or videogame? or gaming or screen or media)).tw.
56	16 (	(watch* or view*) adj5 (television or tv)).tw.
57	17 (	play* adj5 (video game? or videogame? or computer game?)).tw.
58	18 (	(computer* or television or tv or video game? or videogame? or gaming) and (sedentary or physical* activity* or sitting or
59	•	
	seated	l or underactiv* or under activ*)).ti.
60	seated 19 c	d or underactiv* or under activ*)).ti. or/1-18 [sedentary behaviour]
60	seated 19 c 20 p	d or underactiv* or under activ*)).ti. or/1-18 [sedentary behaviour] orocess evaluat*.mp.
60	seated 19 c 20 p 21 "	d or underactiv* or under activ*)).ti. or/1-18 [sedentary behaviour] orocess evaluat*.mp. Outcome and Process Assessment"/

- 23 or/20-22 [process evaluation] 19 and 23 [sedentary behaviour and process evaluation] Database: Embase Classic+Embase (OVID) <1947 to 2021 October 22>: Sedentary Lifestyle/ sedentary time/ (sedentary or sitting or sedentariness or sedentarism).ti. ((sedentary or sitting or seated) adj5 (behavio\* or lifestyle\* or life-style\* or pattern\* or leisure or time or bout\*)).tw,kw. ((inactiv\* or no exercise or nonexercise or non exercise) adj3 (adult? or men or women or male or males or female or females or individual? or people or person or population? or senior or seniors or elderly)).tw,kw. (sedentary adj3 (adult? or men or women or male or males or female or females or individuals or people or person or population? or senior or seniors or elderly)).tw,kw. physical\* inactiv\*.tw,kw. (leisure time adj5 (physical\* activ\* or passive or inactiv\*)).tw,kw. physical activity level\*.tw,kw. ((sitting or lying) adj2 posture\*).tw,kw. sitting/ ((uninterrupted or long\* or prolong\* or extend\* or continu\* or protracted or sustain\* or period\* or duration\* or time\*) adj2 (reclin\* or sit or sitting or seated or lying)).tw,kw. (sit less or sitting less).tw,kw. ((light or low) adj physical activ\*).tw,kw. ((decrease or reduc\* or discourag\* or lessen\*) adj3 (sit or sitting or stand or standing or physical\* inactiv\* or sedentar\*)).tw,kw. screen time/ (time adj5 (computer\* or television or tv or video game? or videogame? or gaming or screen or media)).tw,kw. ((watch\* or view\*) adj5 (television or tv)).tw. (play\* adj5 (video game? or videogame? or computer game?)).tw,kw. ((computer\* or television or tv or video game? or videogame? or gaming) and (sedentary or physical\* activity\* or sitting or seated or underactiv\* or under activ\*)).ti. or/1-20 [sedentary behaviour] Randomized controlled trial/ Controlled clinical study/ 22 or 23 Random\*.tw. randomization/ intermethod comparison/ placebo.tw. (compare or compared or comparison).ti. ((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab. (open adj label).tw. ((double or single or doubly or singly) adj (blind or blinded or blindly)).tw. double blind procedure/ parallel group\*1.tw. (crossover or cross over).tw. ((assign\* or match or matched or allocation) adj5 (alternate or group\*1 or intervention\*1 or patient\*1 or subject\*1 or participant\*1)).tw. (assigned or allocated).tw. (controlled adj7 (study or design or trial)).tw. (volunteer or volunteers).tw. human experiment/ 41 trial.ti. 42 or/25-41 43 42 or 24 44 (random\* adj sampl\* adj7 ("cross section\*" or questionnaire\*1 or survey\* or database\*1)).tw. not (comparative study/ or controlled study/ or randomi?ed controlled.tw. or randomly assigned.tw.) Cross-sectional study/ not (randomized controlled trial/ or controlled clinical study/ or controlled study/ or randomi?ed controlled.tw. or control group\*1.tw.) 46 (((case adj control\*) and random\*) not randomi?ed controlled).tw. (Systematic review not (trial or study)).ti.
  - 47 (Systematic review not (trial or study)).48 (nonrandom\* not random\*).tw.
  - 49 "Random field\*".tw.

(random cluster adj3 sampl\*).tw.

(review.ab. and review.pt.) not trial.ti.

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"we searched".ab. and (review.ti. or review.pt.) 53 "update review".ab. 54 (databases adj4 searched).ab. 55 (rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset\*1).ti. and animal experiment/ Animal experiment/ not (human experiment/ or human/) or/44-56 58 43 not 57 [Cochrane Highly Sensitive Search Strategy for identifying controlled trials in Embase: (2018 revision); Ovid format (Glanville et al 2019b) Validated Search Filter] program evaluat\*.mp. 60 health care quality/ process evaluat\*.mp. 62 or/59-61 [process evaluation] 63 21 and 58 and 62 Database: APA PsycInfo (OVID) <1806 to October Week 3 2021>: Sedentary behavior/ (sedentary or sitting or sedentariness or sedentarism).ti. ((sedentary or sitting or seated) adj5 (behavio\* or lifestyle\* or life-style\* or pattern\* or leisure or time or bout\*)).tw. ((inactiv\* or no exercise or nonexercise or non exercise) adj3 (adult? or men or women or male or males or female or females or individual? or people or person or population? or senior or seniors or elderly)).tw. (sedentary adj3 (adult? or men or women or male or males or female or females or individual? or people or person or population? or senior or seniors or elderly)).tw. ((light or low) adj physical activ\*).tw. physical\* inactiv\*.tw. (leisure time adj5 (physical\* activ\* or passive or inactiv\*)).tw. "physical activity level\*".tw. 10 ((sitting or lying) adj2 posture\*).tw. ((uninterrupted or long\* or prolong\* or extend\* or continu\* or protracted or sustain\* or period\* or duration\* or time\*) adj5 (reclin\* or sit or sitting or seated or lying)).tw. (sit less or sitting less).tw. ((decrease or reduc\* or discourag\* or lessen\*) adj3 (sit or sitting or stand or standing or physical\* inactiv\* or sedentar\*)).tw. 14 screen time/ 15 (time adj5 (computer\* or television or tv or video game? or videogame? or gaming or screen or media)).tw. ((watch\* or view\*) adj5 (television or tv)).tw. (play\* adj5 (video game? or videogame? or computer game?)).tw. ((computer\* or television or tv or video game? or videogame? or gaming) and (sedentary or physical\* activity\* or sitting or seated or underactiv\* or under activ\*)).ti. or/1-18 [sednetary behaviour] clinical trials/ or treatment effectiveness evaluation/ or placebo/ (random\* or RCT or RCTs).tw. (clinical\* adj5 trial\*).tw. ((control or treatment or experiment\* or intervention) adj5 (group\* or subject\* or patient\*)).tw. ((control or experiment\* or conservative) adj5 (treatment or therapy or procedure or manage\*)).tw. ((singl\* or doubl\* or tripl\* or trebl\*) adj5 (blind\* or mask\*)).tw. (cross over or crossover).tw. (placebo\* or sham).tw. rial.ti. (assign\* or allocat\*).tw. controls.tw. or/20-30 [RCTs] program evaluat\*.mp. process evaluat\*.mp. evaluation/ or/32-34 [process evaluation terms] 19 and 31 and 35 [sedentary behaviour and RCTs and process evaluations]

### Database: Ovid MEDLINE(R) All <1946 to October 22, 2021>:

- 1 2 1 Sedentary behavior/ 3 2 (sedentary or sitting or sedentariness or sedentarism).ti. 4 3 ((sedentary or sitting or seated) adj5 (behavio\* or lifestyle\* or life-style\* or pattern\* or leisure or time or bout\*)).tw,kf. 5 4 ((inactiv\* or no exercise or nonexercise or non exercise) adj3 (adult? or men or women or male or males or female or 6 females or individual? or people or person or population? or senior or seniors or elderly)).tw,kf. 7 5 (sedentary adj3 (adult? or men or women or male or males or female or females or individual? or people or person or 8 population? or senior or seniors or elderly)).tw,kf. 9 physical\* inactiv\*.tw,kf. 6 10 7 (leisure time adj5 (physical\* activ\* or passive or inactiv\*)).tw,kf. 11 8 physical activity level\*.tw,kf. 12 9 sitting position/ 13 10 ((sitting or lying) adj2 posture\*).tw,kf. 14 11 ((uninterrupted or long\* or prolong\* or extend\* or continu\* or protracted or sustain\* or period\* or duration\* or time\*) 15 adj5 (reclin\* or sit or sitting or seated or lying)).tw,kf. 16 12 (sit less or sitting less).tw,kf. 17 13 ((light or low) adj "physical activ\*").tw,kf. 18 14 ((decrease or reduc\* or discourag\* or lessen\*) adj3 (sit or sitting or stand or standing or physical\* inactiv\* or 19 sedentar\*)).tw,kf. 20 screen time/ 15 21 16 (time adj5 (computer\* or television or tv or video game? or videogame? or gaming or screen or media)).tw,kf. 22 17 ((watch\* or view\*) adj5 (television or tv)).tw,kf. 23 (play\* adj5 (video game? or videogame? or computer game?)).tw,kf. 18 24 ((computer\* or television or tv or video game? or videogame? or gaming) and (sedentary or physical\* activity\* or sitting or 19 25 seated or underactiv\* or under activ\*)).ti. 26 20 or/1-19 [sedentary behaviour] 27 ė Lezon program\* evaluat\*.mp. 21 28 "Outcome and Process Assessment (Health Care)"/ 22 29 23 "Process Assessment (Health Care)"/ 30 24 process evaluat\*.mp. 31 or/21-24 [process evaluation] 25 32 randomized controlled trial.pt. 26 33 27 controlled clinical trial.pt. 34 28 randomized.ab. 35 29 placebo.ab. 36 37 30 drug therapy.fs. 38 31 randomly.ab. 32 trial.ab. 39 33 groups.ab. 40 34 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 41 35 exp animals/ not humans.sh. 42 34 not 35 [Cochrane RCT filter 2008, sensitivity maximimising] 36 43 44 37 20 and 25 and 36 [sedentary behaviour and process evaluation and RCTs] 45 46 47 Database: Web of Science: Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH, ESCI (Clarivate), Timespan= 1900-2021: 48 49 TI=((sedentary or sitting or sedentariness or sedentarism)) #1 50 51 52 #2 TS=(((sedentary or inactiv\* or "no exercise" or nonexercise or "non exercise") near/3 (adult\* or men or women or 53 male or males or females or individual\* or people or person or population\* or senior or seniors or elderly) 54 )) 55 56 #3 TS=(((sedentary or sitting or seated) near/5 (behavio\* or lifestyle\* or "life style\*" or pattern\* or leisure or time or 57 bout\*))) 58 59 #4 TS=((light or low\*) near/1 "physical activ\*") 60 #5 TS=("physical\* inactiv\*")
  - For peer review only http://bmjopen.bmj.com/site/about/guidelines.xhtml

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1	#6	TS=("leisure time" near/5 ("physical* activ*" or passive or inactiv*) )
1		

- 2 # 7 TS=( "physical activity level\*")
  - # 8 TS=((sitting or lying) near/2 posture)
  - #9 TS=(((uninterrupted or long\* or prolong\* or extend\* or continu\* or protracted or sustain\* or period\* or duration\* or time\*) near/5 (reclin\* or sit or sitting or seated or lying) ))
- 10 # 10 TS=("sit less" or "sitting less")
- 11
  12 # 11 TS=(((decrease or reduc\* or discourag\* or lessen\*) near/3 (sit or sitting or stand or standing or "physical\* inactiv\*" or
  13 sedentar\*) ))
- 14
  15 # 12 TS=((time\*) near/3 (computer\* or television or tv or "video game\*" or videogame\* or gaming or screen or media) )
- 17 # 13 TS=(((watch\* or view\*) near/5 (television or tv) ))
- 18
  19 # 14 TS=((play\* near/5 ("video game\*" or videogame\* or "computer gam\*") ))
- 21 #15 TI=( ((computer\* or television or tv or "video game\*" or videogame\* or gaming) and (sedentary or "physical\* 22 activit\*" or sitting or seated or underactiv\* or "under activ\*") ) )
- 24 # 16 #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1
- 26 # 17 TS=((random\* or RCT or placebo or clinical Near/1 trial\*))
  27
- 28 # 18 TS=(("program\* evaluat\*"))
  29
- 30 # 19 TS=(("process evaluat\*"))
- 32 # 20 #19 OR #18

34 # 21 #20 AND #17 AND #16  Review only