Systematic review of the association of physical activity and sedentary behaviour with frailty: literature search documentation

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The following literature search report has been conducted using the STARLITE method. ¹

SAMPLING STRATEGY

- The systematic review hypothesis of concern is categorized as an interventional/etiology question; as such, all relevant study designs including observational were included
- The primary investigator (JS) provided prior to the search investigation an established list of citations known to the investigator that met the inclusion criteria in the study proposal (see List of References to Determine Search Validity)
- Database selection was based on question type, and study designs of interest, consequently sampling expanded beyond clinical literature to include Sport Discus (Ebscohost), and the World Health Organization Trials Registry
- Conference proceedings were not desired by the primary investigator (JS) thus no gray literature and hand searching was conducted
- No date limit was applied
- Possible strategies were investigated using several Cochrane systematic reviews that included exercise, sedentary behaviours
- Analysis of the results utilizing the validity set determined that the strategy include various combinations of the following concepts: frailty, physical exercise, sedentary behaviour, risk, etiology, prevention – see also Terms Used

List of References to Determine Search Validity


Szwajcer, Kehler – SR Association of Exercise and Sedentary Behaviour with Frailty

TYPES OF STUDIES

- No study design filter/limit was applied
- Primary research was only considered: see also Inclusion and Exclusions
- Investigative methods appropriate for laboratory methodology:
  - Case-control
  - Retrospective Cohort
  - Cross-sectional

APPROACHES: Not applicable

RANGE OF YEARS

- Initial strategy did not include date limit; date ranges in databases include Medline (OVID – 1946 – present, in-process and other non-indexed citations), Embase (OVID – 1974 – present), Social Science and Science Citation Index (1900 - ). Search completed January 6, 2017.
• Update:
  o August 1, 2017 – all but WHO Registry included (date limit of 2017 only applied to search results)

LIMITS
• English and Human

INCLUSION AND EXCLUSIONS

Inclusion:
• Studies that describe persons who are not diagnostically frail at study onset (applicable to longitudinal studies only)
• Studies published in adults 18 or older
• Studies describing physical activity interventions or measures
• Studies describing sedentary behaviours of any measure

Exclusion:
• Studies published in persons less than or equal to 18 years old
• Involve animals
• Studies that describe persons who are diagnostically frail at study onset (applicable to longitudinal studies only)
• Studies assessing frailty as a risk factor and not an outcome

ELECTRONIC SOURCES: Medline (OVID); Embase (OVID); CINAHL (EBSCO); Science Citation Index (Web of Science, ISI); Social Science Citation Index (Web of Science, ISI); Sport Discus (EBSCO); World Health Organization Trials Registry (http://www.who.int/ictrp/en/)

TERMS USED/STRATEGIES:

Medline

1 exercise/ or exercise therapy/
2 exp sports/
3 physical fitness/
4 life style/
5 Resistance Training/
6 exerci$.ti,ab,kw.
7 physic$ activi$.ti,ab,kw.
8 physic$ fit$.ti,ab,kw.
9 aerob$ fit$.ti,ab,kw.
10 aerob$ activi$.ti,ab,kw.
11 sport$.ti,ab,kw.
12 activi$ performance.ti,ab,kw.
4

motor activit$.ti,ab,kw.
(moderate-vigorous activit$ or MVPA or moderate-to-vigorous activit$).ti,ab,kw.
(lifestyle or life-style or life style).ti,ab,kw.
(walk$ or run$ or jog$).ti,ab,kw.
swim$.ti,ab,kw.
(bicyc$ or cycling or bi-cyc$).ti,ab,kw.
weight lift$.ti,ab,kw.
gymnastic? or danc$.ti,ab,kw.
hiking or hike? or mountaineering).ti,ab,kw.
cano?ing or kayaking).ti,ab,kw.
(baseball or basketball or football or soccer or volleyball or golf$).ti,ab,kw.
wrestling or boxing or martial art?).ti,ab,kw.
racket$ or tennis or squash).ti,ab,kw.
hockey or skat$.ti,ab,kw.
(strength or resistance or circuit or enduranc$ or aerob$ or physic$ or fit$) adj6 (train$ or program$)).ti,ab,kw.
or/1-27 [Kehler-EXERCISE]
Sedentary Lifestyle/
sedentar$.ti,ab,kw.
non-functional ambulation.ti,ab,kw.
inactiv$.ti,ab,kw.
low-activ$.ti,ab,kw.
sitting.ti,ab,kw.
(sedentary behavior? or sedentary behaviour?).ti,ab,kw.
or/29-35 [Kehler-SEDENTARY]
Frail Elderly/
frail$.ti,ab,kw.
(non-frail$ or nonfrail$ or pre-frail$ or prefrail$).ti,ab,kw.
((grip adj1 strength) or (grip adj1 measur$) or (grip adj1 test$)).ti,ab,kw.
resili$.ti,ab,kw.
or/37-41 [Kehler-FRAILTY]
exp Risk Factors/
Longitudinal Studies/
Time Factors/
Prognosis/
(prevent$ or predict$ or prognos$).ti,ab,kw.
longitudinal.ti,ab,kw.
(risk or risk factor$).ti,ab,kw.

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etiology.fs.
(time factor$ or follow-up or followup or "follow up").ti,ab,kw.
(etiolog$ or causa$).ti,ab,kw.
or/43-52 [PREDICTION]
or/28,36 [EXERCISE, SEDENTARY]
54 and 42 and 53 [COMBO]
limit 55 to english language
exp Animals/ not (exp Animals/ and Humans/)
56 not 57
(comment or editorial or interview or news).pt.
(letter not (letter and randomized controlled trial)).pt.
or/59-60 [COMMENT removal]
58 not 61

Embase
1 frail elderly/
2 frail$.ti,ab,kw.
3 (non-frail$ or nonfrail$ or pre-frail$ or prefrail$).ti,ab,kw.
4 ((grip adj1 strength) or (grip adj1 measur$) or (grip adj1 test$)).ti,ab,kw.
5 resilien$.ti,ab,kw.
or/1-5 [Kehler - FRAILTY]
6 risk factor/
7 longitudinal study/
8 time factor/
9 "prediction and forecasting"/
10 prediction/
11 prognosis/
12 (prevent$ or predict$ or prognos$).ti,ab,kw.
13 longitudinal.ti,ab,kw.
14 (risk or risk factor$).ti,ab,kw.
15 etiology.fs.
17 (time factor$ or follow-up or followup or "follow up").ti,ab,kw.
18 (etiolog$ or causa$).ti,ab,kw.
or/7-18 [Kehler - PREDICTION - Embase]
20 sedentary lifestyle/
21 Sitting/

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22 hibernation/
23 laziness/
24 torpor/
25 winter dormancy/
26 rest/
27 physical inactivity/
28 sedentar$.ti,ab,kw.
29 non-functional ambulation.ti,ab,kw.
30 inactiv$.ti,ab,kw.
31 low-activ$.ti,ab,kw.
32 (sedentary behavior? or sedentary behaviour?).ti,ab,kw.
33 or/20-32 [Kehler-SEDENTARY-EMBASE]
34 Exercise/
35 Physical Activity/
36 kinesiotherapy/
37 lifestyle/
38 exp sport/
39 fitness/
40 "physical activity, capacity and performance"/
41 physical capacity/
42 endurance/
43 Training/
44 exercis$.ti,ab,kw.
45 physic$ activit$.ti,ab,kw.
46 physic$ fit$.ti,ab,kw.
47 aerob$ fit$.ti,ab,kw.
48 aerob$ activit$.ti,ab,kw.
49 sport$.ti,ab,kw.
50 activit$ performance.ti,ab,kw.
51 motor activit$.ti,ab,kw.
52 (moderate-vigorous activit$ or MVPA or moderate-to-vigorous activit$).ti,ab,kw.
53 (lifestyle or life-style or life style).ti,ab,kw.
54 (walk$ or run$ or jog$).ti,ab,kw.
55 swim$.ti,ab,kw.
56 (bicyc$ or cycling or bi-cyc$).ti,ab,kw.
57 weight lift$.ti,ab,kw.
58 (gymnastic? or danc$).ti,ab,kw.
(hiking or hike? or mountaineering).ti,ab,kw.
(cano?ing or kayaking).ti,ab,kw.
(baseball or basketball or football or soccer or volleyball or golf$).ti,ab,kw.
(wrestling or boxing or martial art?).ti,ab,kw.
(racket$ or tennis or squash).ti,ab,kw.
(hockey or skat$).ti,ab,kw.
((strength or resistance or circuit or enduran$ or aerob$ or physic$ or fit$) adj6 (train$ or program$)).ti,ab,kw.
or/34-65 [Kehler-EXERCISE-EMBASE]
or/33,66 [Kehler-EXERCISE, SEDENTARY]
67 and 6 and 19
limit 68 to english language
exp animal experimentation/ or exp models animal/ or exp animal experiment/ or nonhuman/ or exp vertebrate/
exp human/ or exp human experimentation/ or exp human experiment/
70 not 71
69 not 72
editorial.pt.
letter.pt. not (letter.pt. and randomized controlled trial/)
74 or 75
73 not 76
CINAHL
1 MH Exercise or MH Aerobic Exercises+ or MH Leisure Activities or MH Physical Activity or MH Resistance Training or MH Physical Fitness or MH Sports+ or MH Walking or MH Life Style or MH Resistance Training or MH "Sport Specific Training"
2 TI exercis* or AB exercis* or SU exercis*
3 TI ((physic* w1 activit*) or ( physic* w1 fit*) or ( aerob* w1 fit*) or ( aerob* w1 activit*)) or AB ((physic* w1 activit*) or (physic* w1 fit*) or ( aerob* w1 fit*) or ( aerob* w1 activit*))
4 TI sport* or AB sport*
5 TI ((activit* w1 performance) or (lifestyle or life-style or "life style")) or AB (((activit* w1 performance) or (lifestyle or life-style or "life style"))
6 TI (motor w1 activit*) or AB (motor w1 activit*) or SU (motor w1 activit*)
7 TI (moderate-vigorous w1 activit*) or TI (MVPA) or TI (moderate-to-vigorous w1 activit*) or AB (moderate-vigorous w1 activit*) or AB (MVPA) or AB (moderate-to-vigorous w1 activit*)
8 TI (walk* or run* or jog* or swim* or bicyc* or cycling or bi-cyc* or weight lift* or gymnastic? or danc* or hiking or hike? or mountaineering or cano?ing or kayaking or baseball or basketball or football or soccer or volleyball or golf* or wrestling or boxing or martial art? or racket* or tennis or squash or hockey or skat*) or AB (walk* or run* or jog* or swim* or bicyc*
or cycling or bi-cyc* or weight lift* or gymnastic? or danc* or hiking or hike? or mountaineering or cano*ing or kayaking or baseball or basketball or football or soccer or volleyball or golf* or wrestling or boxing or martial art? or racket* or tennis or squash or hockey or skat*)

9   ((TI (strength or resistance or circuit or enduran* or aerob* or physic* or fit*) w6 TI (train* or program*)) or (AB (strength or resistance or circuit or enduran* or aerob* or physic* or fit*) w6 AB (train* or program*))

10  MH “Life Style, Sedentary”

11  TI sedentar* or AB sedentar* or SU sedentar*

12  TI (non-functional n1 ambulation) or AB (non-functional n1 ambulation)

13  TI (inactiv* or low-activ* or sitting) or AB (inactiv* or low-activ* or sitting) or SU (inactiv* or low-activ* or sitting)

14  TI (sedentary behavior? or sedentary behaviour?) or AB (sedentary behavior? or sedentary behaviour?)

15  or/1-14

37  MH Frail Elderly or MH Frailty Syndrome

38  TI frail* or AB frail* or SU frail*

39  TI (non-frail* or nonfrail* or pre-frail* or prefrail*) or AB (non-frail* or nonfrail* or pre-frail* or prefrail*) or SU (non-frail* or nonfrail* or pre-frail* or prefrail*)

40  TI ((grip w1 strength) or (grip w1 measur*) or (grip w1 test*)) or AB ((grip w1 strength) or (grip w1 measur*) or (grip w1 test*))

41  TI resilien* or AB resilien* or SU resilien*

42  or/37-41 [Kehler-FRAILTY]

43  MH Risk Factors+

45  MH Time or MH Time Factors

46  MH Prognosis or MH Risk Assessment

47  TI (prevent* or predict* or prognos*) or AB (prevent* or predict* or prognos*)

48  TI longitudinal or AB longitudinal

49  TI (risk or risk factor*) or AB (risk or risk factor*)

50  MW “ET” [etiology as floating sub heading]

51  TI (time w1 factor* or follow-up or followup or "follow up") or AB (time w1 factor* or follow-up or followup or "follow up") or SU (time w1 factor* or follow-up or followup or "follow up")

52  TI (etiolog* or causa*) or AB (etiolog* or causa*)

53  or/43, 45-52 [PREDICTION]

54  or/28,36 [EXERCISE, SEDENTARY]

55  54 and 42 and 53 [COMBO]

56  limit 55 to english language

57  limit 56 to source type=academic journals

Social Sciences Citation Index & Science Citation Index (Web of Science)
1 TS=(exercis* OR sport* OR lifestyle OR life-style OR MVPA OR walk* OR run* OR jog* OR swim* OR bicyc* OR cycling OR bi-cyc* OR gymnastic? OR danc* OR hiking OR hike? OR mountaineering OR cano$ing OR kayaking OR baseball OR football OR soccer OR volleyball OR golf* OR wrestling OR boxing OR racket* OR tennis OR squash OR hockey OR skat*)

2 TS=((phys* NEAR/1 fit*) OR (life NEAR/1 style) OR (phys* NEAR/1 activit*) OR (activit* NEAR/1 performance) OR (motor NEAR/1 activit*) OR (aerob* NEAR/1 activit*) OR (aerob* NEAR/1 fit*))

3 TS=((moderate-vigorous NEAR/1 activit*) OR (moderate-to-vigorous NEAR/1 activit*))

4 TS=((weight NEAR/1 lift*) OR (strength NEAR/6 train*) OR (strength NEAR/6 program*) OR (resistance NEAR/6 train*) OR (resistance NEAR/6 program*) OR (circuit NEAR/6 train*) OR (circuit NEAR/6 program*) OR (enduran* NEAR/6 train*) OR (enduran* NEAR/6 program*) OR (physic* NEAR/6 train*) OR (physic* NEAR/6 program*) OR (fit* NEAR/6 train*) OR (fit* NEAR/6 program*))

5 1 OR 2 OR 3 OR 4 [EXERCISE SET]

6 TS=(sedentar* OR inactive* OR low-activ* OR sitting)

7 TS=((non-functional NEAR/1 ambulation) OR (sedentary NEAR/1 behavior?) OR (sedentary NEAR/1 behaviour?))

8 6 OR 7 [SEDENTARY SET]

9 TS=(frail* OR non-frail* OR nonfrail* OR prefrail* OR pre-frail* OR resilien*)

10 TS=((grip NEAR/1 strength) OR (grip NEAR/1 measur*) OR (grip NEAR/1 test*))

11 9 OR 10 [FRAILTY SET]

12 TS=((risk NEAR/1 factor*) OR (time NEAR/1 factor*))

13 TS=(risk OR longitudinal OR prevent* OR predict* OR prognos* OR follow-up OR followup OR “follow-up” OR etiolog* OR causa*)

14 12 OR 13 [PREDICTION]

15 5 OR 8 [EXERCISE, SEDENTARY]
16 15 AND 11 AND 14 [COMBINATION]

**Sport Discus**

1. DE "EXERCISE" OR DE "AEROBIC exercises" OR DE "AQUATIC exercises" OR DE "CIRCUIT training" OR DE "EXERCISE for men" OR DE "EXERCISE for middle-aged persons" OR DE "EXERCISE for older people" OR DE "EXERCISE for women" OR DE "EXERCISE therapy" OR DE "RUNNING" OR DE "STRENGTH training" OR DE "PHYSICAL activity" OR DE "PHYSICAL fitness" OR DE "SPORTS" OR DE "RESISTANCE training (Physical training & conditioning)" OR DE "WEIGHT training" OR DE "BASEBALL" OR DE "CROSS-training (Sports)" OR DE "ENDURANCE sports" OR DE "GYMNASTICS" OR DE "HOCKEY" OR DE "INDIVIDUAL sports" OR DE "SOFTBALL" OR DE "TEAM sports" OR DE LIFESTYLES

2. TI exercis* OR AB exercis* OR KW exercis*

3. TI ((physic* W1 (activit* OR fit*)) OR (aerob* W1 (fit* OR activit*)) OR (activit* W1 performance) OR lifestyle OR life-style OR "life style" OR (motor W1 activit*)) OR AB ((physic* W1 (activit* OR fit*)) OR (aerob* W1 (fit* OR activit*)) OR (activit* W1 performance) OR lifestyle OR life-style OR "life style" OR (motor W1 activit*)) OR KW ((physic* W1 (activit* OR fit*)) OR (aerob* W1 (fit* OR activit*)) OR (activit* W1 performance) OR lifestyle OR life-style OR "life style" OR (motor W1 activit*))

4. TI (((moderate-vigorous OR moderate-to-vigorous) W1 activit*) OR MVPA) OR AB (((moderate-vigorous OR moderate-to-vigorous) W1 activit*) OR MVPA) OR KW (((moderate-vigorous OR moderate-to-vigorous) W1 activit*) OR MVPA)

5. TI ((strength OR resistance OR circuit OR enduran* OR aerob* OR physic* OR fit*) W6 (train* OR program*)) OR AB ((strength OR resistance OR circuit OR enduran* OR aerob* OR physic* OR fit*) W6 (train* OR program*)) OR KW ((strength OR resistance OR circuit OR enduran* OR aerob* OR physic* OR fit*) W6 (train* OR program*))

6. DE "SEDENTARY lifestyles" OR DE "SEDENTARY behavior" OR DE "SEDENTARY people" OR DE "SEDENTARY women"

7. TI ((inactiv* OR low-activ* OR sitting OR (sedentary W1 behavior?)) OR (sedentary W1 behaviour?)) OR (non-functional N1 ambulation)) OR AB ((inactiv* OR low-activ* OR sitting OR (sedentary W1 behavior?)) OR (sedentary W1 behaviour?)) OR (non-functional N1 ambulation)) OR KW ((inactiv* OR low-activ* OR sitting OR (sedentary W1 behavior?)) OR (sedentary W1 behaviour?)) OR (non-functional N1 ambulation))
OR/1-13 [EXERCISE, SEDENTARY]

9 DE "GRIP strength"

10 TI (frail* OR non-frail* OR nonfrail* OR pre-frail* OR prefrail* OR resilienc*) OR AB (frail* OR non-frail* OR nonfrail* OR pre-frail* OR prefrail* OR resilienc*) OR KW (frail* OR non-frail* OR nonfrail* OR pre-frail* OR prefrail* OR resilienc*)

11 TI (((grip W1 (strength OR measur* OR test*)) OR AB (((grip W1 (strength OR measur* OR test*)) OR KW (((grip W1 (strength OR measur* OR test*))

12 OR/14-16 [FRAILTY]

13 DE "PREVENTIVE medicine" OR DE "PREVENTION" OR DE "DISEASES -- Causes & theories of causation" OR DE "DISEASES -- Risk factors"

14 TI (prevent* OR predict* OR prognos* OR etiolog* OR causa* OR longitudinal OR follow-up OR followup OR “follow up” OR (time W1 factor*)) OR AB (prevent* OR predict* OR prognos* OR etiolog* OR causa* OR longitudinal OR follow-up OR followup OR “follow up” OR (time W1 factor*)) OR KW (prevent* OR predict* OR prognos* OR etiolog* OR causa* OR longitudinal OR follow-up OR followup OR “follow up” OR (time W1 factor*))

15 OR/18-19

16 8 AND 12 AND 15