

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

**Andrea Szwajcer**, MLIS, AHIP

[andrea.szwajcer@umanitoba.ca](mailto:andrea.szwajcer@umanitoba.ca)

Carolyn Sifton-Helene Fuld Library, St. Boniface Hospital, 351 Tache Ave. Winnipeg, MB R2H 2A6

**D. Scott Kehler**, MSc, PhD candidate

The following literature search report has been conducted using the STARLITE method.<sup>1</sup>

### SAMPLING STRATEGY

- The systematic review hypothesis of concern is categorized as a 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

1. Alexandre Tda S, Corona LP, Nunes DP, Santos JL, Duarte YA, Lebrão ML. (2014). Similarities among factors associated with components of frailty in elderly: SABE Study. *J Aging Health*. Apr;26(3):441-57. doi: 10.1177/0898264313519818.
2. Bastone Ade C, Ferriolli E, Teixeira CP, Dias JM, Dias RC. (2015). Aerobic Fitness and Habitual Physical Activity in Frail and Nonfrail Community-Dwelling Elderly. *J Phys Act Health*. Sep;12(9):1304-11. doi: 10.1123/jpah.2014-0290.
3. Blodgett J, Theou O, Kirkland S, Andreou P, Rockwood K. The association between sedentary behaviour, moderate-vigorous physical activity and frailty in NHANES cohorts. (2015). *Maturitas*. Feb;80(2):187-91. doi: 10.1016/j.maturitas.2014.11.010.

---

<sup>1</sup> Booth, A. 2006. "Brimful of STARLITE": towards standards for reporting literature searches. *J Med Lib Assoc*, October; 94(4): 421-429. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1629442/pdf/i1536-5050-094-04-0421.pdf>

4. Chan CS1, Slaughter SE, Jones CA, Wagg AS.(2016). Measuring Activity Performance of Continuing Care Residents Using the ActivPAL: An Exploratory Study, *J Frailty Aging*. 2016;5(3):158-61. doi: 10.14283/jfa.2016.97
5. DA Silva Coqueiro R, DE Queiroz BM, Oliveira DS, DAS Mercedes MC, Carneiro JA, Pereira R, Fernandes MH. (2016). Cross-sectional relationships between sedentary behavior and frailty in older adults. *J Sports Med Phys Fitness*. Mar 9. [Epub ahead of print].
6. Eyigor S, Kutsal YG, Duran E, Huner B, Paker N, Durmus B, Sahin N, Civelek GM, Gokkaya K, Dogan A, Günaydin R, Toraman F, Cakir T, Evcik D, Aydeniz A, Yildirim AG, Borman P, Okumus M, Ceceli E; Turkish Society of Physical Medicine and Rehabilitation, Geriatric Rehabilitation Working Group. (2015). Frailty prevalence and related factors in the older adult-FrailTURK Project. *Age (Dordr)*. 2015 Jun;37(3):9791. doi: 10.1007/s11357-015-9791-z. Epub 2015 May 7.
7. Jansen FM, Prins RG, Etman A, van der Ploeg HP, de Vries SI, van Lenthe FJ, Pierik FH. (2015). Physical activity in non-frail and frail older adults. *PLoS One*. 2015 Apr 24;10(4):e0123168. doi: 10.1371/journal.pone.0123168. eCollection 2015.
8. Peterson MJ, Giuliani C, Morey MC, Pieper CF, Evenson KR, Mercer V, Cohen HJ, Visser M, Brach JS, Kritchevsky SB, Goodpaster BH, Rubin S, Satterfield S, Newman AB, Simonsick EM; Health, Aging and Body Composition Study Research Group. (2009) Physical activity as a preventative factor for frailty: the health, aging, and body composition study. *J Gerontol A Biol Sci Med Sci*. 2009 Jan;64(1):61-8. doi: 10.1093/gerona/gln001.
9. Poli S, Cella A, Puntoni M, Musacchio C, Pomata M, Torriglia D, Vello N, Molinari B, Pandolfini V, Torrigiani C, Pilotto A.(2016). Frailty is associated with socioeconomic and lifestyle factors in community-dwelling older subjects. *Aging Clin Exp Res*. 2016 Aug 27. [Epub ahead of print]
10. Ribeiro SM, Morley JE, Malmstrom TK, Miller DK. (2016). Fruit and Vegetable Intake and Physical Activity as Predictors of Disability Risk Factors in African-American Middle-Aged Individuals. *J Nutr Health Aging*. 2016;20(9):891-896.
11. Soler-Vila H, Garcia-Esquinas E, Leon-Munoz LM, Lopez-Garcia E, Banegas JR, Rodriguez-Artalejo F. Contribution of health behaviours and clinical factors to socioeconomic differences in frailty among older adults. *J Epidemiol Community Heal* [Internet]. 2015;jech – 2015–206406 – . Available from: <http://jech.bmj.com/content/early/2015/11/13/jech-2015-206406.long>
12. Song J, Lindquist LA, Chang RW, Semanik PA, Ehrlich-Jones LS, Lee J, Sohn MW, Dunlop DD. (2015). Sedentary Behavior as a Risk Factor for Physical Frailty Independent of Moderate Activity: Results From the Osteoarthritis Initiative. *Am J Pub Health*, Jul; 105(7): 1439-45. doi: 10.2105/AJPH.2014.302540

## 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:
  - 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 exercis\$.ti,ab,kw.
- 7 physic\$ activit\$.ti,ab,kw.
- 8 physic\$ fit\$.ti,ab,kw.
- 9 aerob\$ fit\$.ti,ab,kw.
- 10 aerob\$ activit\$.ti,ab,kw.
- 11 sport\$.ti,ab,kw.
- 12 activit\$ performance.ti,ab,kw.

- 13 motor activit\$.ti,ab,kw.  
 14 (moderate-vigorous activit\$ or MVPA or moderate-to-vigorous activit\$).ti,ab,kw.  
 15 (lifestyle or life-style or life style).ti,ab,kw.  
 16 (walk\$ or run\$ or jog\$).ti,ab,kw.  
 17 swim\$.ti,ab,kw.  
 18 (bicyc\$ or cycling or bi-cyc\$).ti,ab,kw.  
 19 weight lift\$.ti,ab,kw.  
 20 (gymnastic? or danc\$).ti,ab,kw.  
 21 (hiking or hike? or mountaineering).ti,ab,kw.  
 22 (cano?ing or kayaking).ti,ab,kw.  
 23 (baseball or basketball or football or soccer or volleyball or golf\$).ti,ab,kw.  
 24 (wrestling or boxing or martial art?).ti,ab,kw.  
 25 (racket\$ or tennis or squash).ti,ab,kw.  
 26 (hockey or skat\$).ti,ab,kw.  
 27 ((strength or resistance or circuit or enduran\$ or aerob\$ or physic\$ or fit\$) adj6 (train\$ or program\$)).ti,ab,kw.  
 28 or/1-27 [Kehler-EXERCISE]  
 29 Sedentary Lifestyle/  
 30 sedentar\$.ti,ab,kw.  
 31 non-functional ambulation.ti,ab,kw.  
 32 inactiv\$.ti,ab,kw.  
 33 low-activ\$.ti,ab,kw.  
 34 sitting.ti,ab,kw.  
 35 (sedentary behavior? or sedentary behaviour?).ti,ab,kw.  
 36 or/29-35 [Kehler-SEDENTARY]  
 37 Frail Elderly/  
 38 frail\$.ti,ab,kw.  
 39 (non-frail\$ or nonfrail\$ or pre-frail\$ or prefrail\$).ti,ab,kw.  
 40 ((grip adj1 strength) or (grip adj1 measur\$) or (grip adj1 test\$)).ti,ab,kw.  
 41 resilien\$.ti,ab,kw.  
 42 or/37-41 [Kehler-FRAILITY]  
 43 exp Risk Factors/  
 44 Longitudinal Studies/  
 45 Time Factors/  
 46 Prognosis/  
 47 (prevent\$ or predict\$ or prognos\$).ti,ab,kw.  
 48 longitudinal.ti,ab,kw.  
 49 (risk or risk factor\$).ti,ab,kw.

50 etiology.fs.  
 51 (time factor\$ or follow-up or followup or "follow up").ti,ab,kw.  
 52 (etiolog\$ or causa\$).ti,ab,kw.  
 53 or/43-52 [PREDICTION]  
 54 or/28,36 [EXERCISE, SEDENTARY]  
 55 54 and 42 and 53 [COMBO]  
 56 limit 55 to english language  
 57 exp Animals/ not (exp Animals/ and Humans/)  
 58 56 not 57  
 59 (comment or editorial or interview or news).pt.  
 60 (letter not (letter and randomized controlled trial)).pt.  
 61 or/59-60 [COMMENT removal]  
 62 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.  
 6 or/1-5 [Kehler - FRAILITY]  
 7 risk factor/  
 8 longitudinal study/  
 9 time factor/  
 10 "prediction and forecasting"/  
 11 prediction/  
 12 prognosis/  
 13 (prevent\$ or predict\$ or prognos\$).ti,ab,kw.  
 14 longitudinal.ti,ab,kw.  
 15 (risk or risk factor\$).ti,ab,kw.  
 16 etiology.fs.  
 17 (time factor\$ or follow-up or followup or "follow up").ti,ab,kw.  
 18 (etiolog\$ or causa\$).ti,ab,kw.  
 19 or/7-18 [Kehler - PREDICTION - Embase]  
 20 sedentary lifestyle/  
 21 Sitting/

- 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.

- 59 (hiking or hike? or mountaineering).ti,ab,kw.  
 60 (cano?ing or kayaking).ti,ab,kw.  
 61 (baseball or basketball or football or soccer or volleyball or golf\$).ti,ab,kw.  
 62 (wrestling or boxing or martial art?).ti,ab,kw.  
 63 (racket\$ or tennis or squash).ti,ab,kw.  
 64 (hockey or skat\$).ti,ab,kw.  
 65 ((strength or resistance or circuit or enduran\$ or aerob\$ or physic\$ or fit\$) adj6 (train\$ or program\$)).ti,ab,kw.  
 66 or/34-65 [Kehler-EXERCISE-EMBASE]  
 67 or/33,66 [Kehler-EXERCISE, SEDENTARY]  
 68 67 and 6 and 19  
 69 limit 68 to english language  
 70 exp animal experimentation/ or exp models animal/ or exp animal experiment/ or nonhuman/ or exp vertebrate/  
 71 exp human/ or exp human experimentation/ or exp human experiment/  
 72 70 not 71  
 73 69 not 72  
 74 editorial.pt.  
 75 letter.pt. not (letter.pt. and randomized controlled trial/)  
 76 74 or 75  
 77 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-FRAILITY]

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 [FRAILITY 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))

8 OR/1-13 [EXERCISE, SEDENTARY]

9 DE "GRIP strength"

10 TI (frial\* OR non-frail\* OR nonfrail\* OR pre-frail\* OR prefrail\* OR resilien\*) OR AB (frial\* OR non-frail\* OR nonfrail\* OR pre-frail\* OR prefrail\* OR resilien\*) OR KW (frial\* OR non-frail\* OR nonfrail\* OR pre-frail\* OR prefrail\* OR resilien\*)

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 [FRAILITY]

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