Evidence Portfolio – Sedentary Subcommittee, Question 5

Q5. Does the effect of moderate-to-vigorous physical activity on all-cause mortality vary by amount of sedentary behavior?

Sources of Evidence: Existing Meta-Analysis and Original Research

Conclusion Statement and Grade

Moderate evidence indicates that the beneficial effect of moderate-to-vigorous physical activity on all-cause mortality varies by amount of sedentary behavior. Importantly, the relative reductions in risk are larger for those who are the most sedentary. **PAGAC Grade: Moderate.**

Description of the Evidence

As determined by the Sedentary Subcommittee the evidence used to address research question 5 were obtained from the results from the initial search for systematic reviews, meta-analyses, pooled analyses, and reports and the supplementary search for original research compiled for research question 1.

Existing Meta-Analysis

Overview

One existing meta-analysis published in 2016 was included.[1] The meta-analysis included 16 studies and covered an extensive timeframe from inception to one year before publication.

Exposures

The meta-analysis examined daily sitting time and TV viewing time and physical activity.

Outcomes

The meta-analysis addressed all-cause mortality as an outcome.

Original Research

Overview

One original research study was included.[2] The prospective cohort study by Lee[2] was conducted in the United States and had a sample size of 7,006.

Exposures

The study measured sedentary behavior and physical activity using an accelerometer.

Outcomes

The included study addressed all-cause mortality as an outcome.

Populations Analyzed

The table below lists the populations analyzed in each article.

Table 1. Populations Analyzed by All Sources of Evidence

	Sex	Race/ Ethnicity	Age	Socio-economic Status	Weight Status	Other
Ekelund, 2016			Adults			
Lee, 2016			Adults ≥18			

Supporting Evidence

Existing Systematic Reviews and Meta-Analyses

Table 2. Existing Systematic Reviews and Meta-Analyses Individual Evidence Summary Tables

<table>
<tr><td colspan="2">Meta-Analysis
Citation: Ekelund U, Steene-Johannessen J, Brown WJ, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. Lancet. 2016;388(10051):1302-1310. doi:10.1016/S0140-6736(16)30370-1.</td></tr>
<tr><td>Purpose: To examine the joint and stratified associations of sedentary behavior and physical activity with all-cause mortality.</td><td rowspan="5">Abstract: BACKGROUND: High amounts of sedentary behaviour have been associated with increased risks of several chronic conditions and mortality. However, it is unclear whether physical activity attenuates or even eliminates the detrimental effects of prolonged sitting. We examined the associations of sedentary behaviour and physical activity with all-cause mortality. METHODS: We did a systematic review, searching six databases (PubMed, PsycINFO, Embase, Web of Science, Sport Discus, and Scopus) from database inception until October, 2015, for prospective cohort studies that had individual level exposure and outcome data, provided data on both daily sitting or TV-viewing time and physical activity, and reported effect estimates for all-cause mortality, cardiovascular disease mortality, or breast, colon, and colorectal cancer mortality. We included data from 16 studies, of which 14 were identified through a systematic review and two were additional unpublished studies where pertinent data were available. All study data were analysed according to a harmonised protocol, which categorised reported daily sitting time and TV-viewing time into four standardised groups each, and physical activity into quartiles (in metabolic equivalent of task [MET]-hours per week). We then combined data across all studies to analyse the association of daily sitting time and physical activity with all-cause mortality, and estimated summary hazard ratios using Cox regression. We repeated these analyses using TV-viewing time instead of daily sitting time. FINDINGS: Of the 16 studies included in the meta-analysis, 13 studies provided data on sitting time and all-cause mortality. These studies included 1 005 791 individuals who were followed up for 2-18·1 years, during which 84 609 (8·4%) died. Compared with the referent group (ie, those sitting <4 h/day and in the most active quartile [>35·5 MET-h per week]), mortality rates during follow-up were 12-59% higher in the two lowest quartiles of physical activity (from HR=1·12, 95% CI 1·08-1·16, for the second lowest quartile of physical activity [<16 MET-h per week] and sitting <4 h/day; to HR=1·59, 1·52-1·66, for the lowest quartile of physical activity [<2·5 MET-h per week] and sitting >8 h/day). Daily sitting time was not associated with increased all-cause mortality in those in the most active quartile of physical activity. Compared with the referent (<4 h of sitting per day and highest quartile of physical activity [>35·5 MET-h per week]), there was no increased risk of mortality during follow-up in those who sat for more than 8 h/day but who also reported >35·5 MET-h per week of activity (HR=1·04; 95% CI 0·99-1·10). By contrast, those who sat the least (<4 h/day)</td></tr>
<tr><td>Timeframe: Inception–October 2015</td></tr>
<tr><td>Total # of Studies: 16</td></tr>
<tr><td>Exposure: Daily sitting or TV-viewing time and physical activity.</td></tr>
<tr><td>Outcomes Addressed: All-cause mortality, cardiovascular disease mortality, and cancer mortality.</td></tr>
</table>

	and were in the lowest activity quartile (<2·5 MET-h per week) had a significantly increased risk of dying during follow-up (HR=1·27, 95% CI 1·22-1·31). Six studies had data on TV-viewing time (N=465 450; 43 740 deaths). Watching TV for 3 h or more per day was associated with increased mortality regardless of physical activity, except in the most active quartile, where mortality was significantly increased only in people who watched TV for 5 h/day or more (HR=1·16, 1·05-1·28). INTERPRETATION: High levels of moderate intensity physical activity (ie, about 60-75 min per day) seem to eliminate the increased risk of death associated with high sitting time. However, this high activity level attenuates, but does not eliminate the increased risk associated with high TV-viewing time. These results provide further evidence on the benefits of physical activity, particularly in societies where increasing numbers of people have to sit for long hours for work and may also inform future public health recommendations.
Populations Analyzed: Adults	**Author-Stated Funding Source:** No funding source used

Table 3. Existing Systematic Reviews and Meta-Analyses Quality Assessment Chart

AMSTARExBP: SR/MA	
	Ekelund, 2016
Review questions and inclusion/exclusion criteria delineated prior to executing search strategy.	Yes
Population variables defined and considered in methods.	Yes
Comprehensive literature search performed.	Yes
Duplicate study selection and data extraction performed.	Yes
Search strategy clearly described.	Yes
Relevant grey literature included in review.	Yes
List of studies (included and excluded) provided.	No
Characteristics of included studies provided.	Yes
FITT defined and examined in relation to outcome effect sizes.	Yes
Scientific quality (risk of bias) of included studies assessed and documented.	Yes
Results depended on study quality, either overall, or in interaction with moderators.	Yes
Scientific quality used appropriately in formulating conclusions.	Yes
Data appropriately synthesized and if applicable, heterogeneity assessed.	Yes
Effect size index chosen justified, statistically.	Yes
Individual-level meta-analysis used.	Yes
Practical recommendations clearly addressed.	Yes
Likelihood of publication bias assessed.	Yes
Conflict of interest disclosed.	Yes

Original Research

Table 4. Original Research Individual Evidence Summary Tables

<table>
<tr><td colspan="2">Original Research
Citation: Lee PH. Examining non-linear associations between accelerometer-measured physical activity, sedentary behavior, and all-cause mortality using segmented Cox regression. Front Physiol. 2016;7:272. doi:10.3389/fphys.2016.00272.</td></tr>
<tr><td colspan="2">Purpose: To examine the interaction effect between accelerometer-measured physical activity and sedentary behaviors, on all-cause mortality among adults.</td></tr>
<tr><td>Study Design: Prospective cohort study</td><td rowspan="5">Abstract: Healthy adults are advised to perform at least 150 min of moderate-intensity physical activity weekly, but this advice is based on studies using self-reports of questionable validity. This study examined the dose-response relationship of accelerometer-measured physical activity and sedentary behaviors on all-cause mortality using segmented Cox regression to empirically determine the break-points of the dose-response relationship. Data from 7006 adult participants aged 18 or above in the National Health and Nutrition Examination Survey waves 2003-2004 and 2005-2006 were included in the analysis and linked with death certificate data using a probabilistic matching approach in the National Death Index through December 31, 2011. Physical activity and sedentary behavior were measured using ActiGraph model 7164 accelerometer over the right hip for 7 consecutive days. Each minute with accelerometer count <100; 1952-5724; and >/=5725 were classified as sedentary, moderate-intensity physical activity, and vigorous-intensity physical activity, respectively. Segmented Cox regression was used to estimate the hazard ratio (HR) of time spent in sedentary behaviors, moderate-intensity physical activity, and vigorous-intensity physical activity and all-cause mortality, adjusted for demographic characteristics, health behaviors, and health conditions. Data were analyzed in 2016. During 47,119 person-year of follow-up, 608 deaths occurred. Each additional hour per day of sedentary behaviors was associated with a HR of 1.15 (95% CI 1.01, 1.31) among participants who spend at least 10.9 h per day on sedentary behaviors, and each additional minute per day spent on moderate-intensity physical activity was associated with a HR of 0.94 (95% CI 0.91, 0.96) among participants with daily moderate-intensity physical activity </=14.1 min. Associations of moderate physical activity and sedentary behaviors on all-cause mortality were independent of each other. To conclude, evidence from this study supported at least 15 min per day of moderate-intensity physical activity and no more than 10.9 h per day of sedentary behaviors as recommendations to reduce all-cause mortality.</td></tr>
<tr><td>Location: United States</td></tr>
<tr><td>Sample: 7,006
Attrition Rate: 24.17%
Sample Power: Not Reported</td></tr>
<tr><td>Exposure Measurement
Device-Measured: Waist Accelerometty, sedentary time classified by accelerometer count <100.
Measures Steps: No
Measures Bouts: No</td></tr>
<tr><td>Refers to Other Materials: Yes
Examine Cardiorespiratory Fitness as Outcome: No</td></tr>
<tr><td rowspan="2"></td><td>Outcomes Examined: Mortality: linked using a probabilistic matching approach with death certificate data in the National Death Index, classified according to the 10th International Classification of Diseases.</td></tr>
<tr><td>Populations Analyzed: Adults ≥18</td><td>Author-Stated Funding Source: Not reported</td></tr>
</table>

Table 5. Original Research Bias Assessment Chart

Nutrition Evidence Library (NEL) Bias Assessment Tool (BAT): Original Research	
	Lee, 2016
(???) = Can't Determine	
Inclusion/exclusion criteria similar across study groups.	N/A
Strategy for recruiting or allocating participants similar across study groups.	N/A
Distribution of critical confounding factors similar across study groups at baseline, or analysis controlled for differences between groups.	N/A
Accounted for variations in execution of study from proposed protocol or research plan.	N/A
Adherence to study protocols similar across study groups.	N/A
Investigators accounted for unintended concurrent exposures that were differentially experienced by study groups and might bias results.	N/A
Valid and reliable measures used consistently across study groups to assess inclusion/exclusion criteria, exposures, outcomes, and confounders.	N/A
Length of follow-up similar across study groups.	N/A
In cases of high or differential loss to follow-up, impact assessed through sensitivity analysis or other adjustment.	No
Other sources of bias taken into account in design and/or analysis of study through matching or other statistical adjustment.	Yes
Adequate statistical methods used to assess primary outcomes.	Yes

Appendices

Appendix A: Analytical Framework

Analytical Framework

Topic Area
Sedentary Behavior

Systematic Review Question
Does the effect of moderate-to-vigorous physical activity on all-cause mortality vary by amount of sedentary behavior?

Population
Adults, 18 years and older

Exposure
Sedentary behavior

- Total sitting time
- Screen time
- Leisure-time sitting
- Occupational sitting time
- Objective measures of sedentary time

Comparison
Adults who participate in varying amounts and types of sedentary behavior

Endpoint Health Outcomes
Incidence of:

- All-cause mortality

Key Definition:

Sedentary Behavior: In general, it is any waking behavior characterized by an energy expenditure ≤1.5 METs while in a sitting or reclining posture (Sedentary Behaviour Research Network. Standardized use of the terms "sedentary" and "sedentary behaviours." Appl Physiol Nutr Metab 2012;37:540-542).

Appendix B: Final Search Strategy[1]

Search Strategy: PubMed (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: PubMed; Date of Search: 12/5/2016; 164 results

Set	Search Terms
Limit: Language	(English[lang])
Limit: Exclude animal only	NOT ("Animals"[Mesh] NOT ("Animals"[Mesh] AND "Humans"[Mesh]))
Limit: Exclude child only	NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) AND "adult"[Mesh]))
Limit: Publication Date Systematic Reviews/Meta-Analyses	AND ("2000/01/01"[PDAT] : "3000/12/31"[PDAT])
Limit: Publication Type Include Systematic Reviews/Meta-Analyses	AND (systematic[sb] OR meta-analysis[pt] OR "systematic review"[tiab] OR "systematic literature review"[tiab] OR metaanalysis[tiab] OR "meta analysis"[tiab] OR metanalyses[tiab] OR "meta analyses"[tiab] OR "pooled analysis"[tiab] OR "pooled analyses"[tiab] OR "pooled data"[tiab])
Limit: Publication Type Exclude Systematic Reviews/Meta-Analyses	NOT ("comment"[Publication Type] OR "editorial"[Publication Type])
Sedentary	AND (("Sedentary lifestyle"[mh] OR "Computer time"[tiab] OR "Computer use"[tiab] OR "Screen time"[tiab] OR "Sitting"[tiab] OR "Television"[tiab] OR "TV viewing"[tiab] OR "TV watching"[tiab] OR "Video game"[tiab] OR "Video gaming"[tiab]) OR (("Sedentary"[tiab] OR "Inactivity"[tiab] OR "Physically inactive"[tiab] OR "Sedentarism"[tiab]) NOT medline[sb]))
Mortality OR Cardiovascular Disease OR Cancer	AND (("Death"[mh] OR "Death"[tiab] OR "Dying"[tiab] OR Fatal*[tiab] OR Mortalit*[tiab] OR "Postmortem"[tiab] OR "Mortality"[mh] OR "Arteriosclerosis"[mh] OR "Death, sudden, cardiac"[mh] OR "Heart failure"[mh] OR "Myocardial ischemia"[mh] OR "myocardial infarction"[mh] OR "Stroke"[mh] OR "Subarachnoid hemorrhage"[mh] OR "Aortic Aneurysm, Thoracic"[mh] OR "Intracranial hemorrhages"[mh] OR myocardial ischemia[mh]OR "neoplasms"[mh]) OR ((Arteriosclero*[tiab] OR Atherosclero*[tiab] OR "Cerebral infarction"[tiab] OR "Cerebrovascular diseases"[tiab] OR "Cerebrovascular disease"[tiab] OR "Coronary heart disease"[tiab] OR "Intracerebral Hemorrhage"[tiab] OR "Intracerebral

[1] The search results from Q1 were used to answer Q5.

Set	Search Terms
	Hemorrhages"[tiab] OR "Intracranial hemorrhage"[tiab] OR "Intracranial hemorrhages"[tiab] OR "ischemic"[tiab] OR "myocardial infarction"[tiab] OR "Stroke"[tiab] OR "Subarachnoid hemorrhages"[tiab] OR "Subarachnoid hemorrhage"[tiab] OR "Cancer"[tiab] OR "Neoplasm"[tiab] OR "Tumor"[tiab] OR "Carcinogenesis"[tiab] OR "Leukemia"[tiab] OR "Lymphoma"[tiab] OR "Malignan*"[tiab] OR "Blastoma"[tiab] OR "Tumour"[tiab] OR "Melanoma"[tiab] OR "Myeloma"[tiab] OR "Carcinoma"[tiab] OR "Neoplasia"[tiab] OR "Sarcoma"[tiab] OR "Tumors"[tiab] OR "Tumours"[tiab] OR "Neoplasms"[tiab] OR "Adenosarcoma"[tiab] OR "Angiosarcoma"[tiab] OR "Astrocytoma"[tiab] OR "Cholangiocarcinoma"[tiab] OR "Chondrosarcoma"[tiab] OR "Craniopharyngioma"[tiab] OR "Ependymoma"[tiab] OR "Fibrosarcoma"[tiab] OR "Glioma"[tiab] OR "Langerhans Cell Histiocytosis"[tiab] OR "Hodgkin's Disease"[tiab] OR "Leiomyosarcoma"[tiab] OR "Medulloblastoma"[tiab] OR "Mesothelioma"[tiab] OR "Neuroblastoma"[tiab] OR "Rhabdomyosarcoma"[tiab] OR "Osteosarcoma"[tiab]) NOT medline[sb]))

Search Strategy: CINAHL (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: CINAHL; Date of Search: 12/1/2016; 4 unique results
Terms searched in title or abstract

Set	Search Terms
Sedentary	Title OR Abstract: ("Sedentary" OR "Sedentary lifestyle" OR "Inactivity" OR "Physically inactive" OR "Sedentarism" OR "Computer time" OR "Computer use" OR "Screen time" OR "Sitting" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming")
Mortality OR Cardiovascular Disease OR Cancer	AND Title OR Abstract: ("Death" OR "Dying" OR Fatal* OR Mortalit* OR "Postmortem" OR Arteriosclero* OR Atherosclero* OR "Cerebral infarction" OR "Cerebrovascular diseases" OR "Cerebrovascular disease" OR "Coronary heart disease" OR "Heart failure" OR "Intracerebral Hemorrhage" OR "Intracerebral Hemorrhages" OR "Intracranial hemorrhage" OR "Intracranial hemorrhages" OR "ischemic" OR "myocardial infarction" OR "Stroke" OR "Subarachnoid hemorrhages" OR "Subarachnoid hemorrhage" OR "Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignan*" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" OR "Neoplasms" OR "Adenosarcoma" OR "Angiosarcoma" OR "Astrocytoma" OR "Cholangiocarcinoma" OR "Chondrosarcoma" OR "Craniopharyngioma" OR "Ependymoma" OR "Fibrosarcoma" OR "Glioma" OR "Langerhans Cell Histiocytosis" OR "Hodgkin's Disease" OR "Leiomyosarcoma" OR "Medulloblastoma" OR "Mesothelioma" OR "Neuroblastoma" OR "Rhabdomyosarcoma" OR "Osteosarcoma")
Systematic Reviews and Meta-Analyses	AND (“systematic review” OR “systematic literature review” OR metaanalysis OR "meta analysis" OR metanalyses OR "meta analyses"" OR "pooled analysis"[tiab] OR “pooled analyses”[tiab] OR "pooled data"[tiab])
Limits	2000-present English language Peer reviewed Exclude Medline records Human

Search Strategy: Cochrane (Systematic Reviews, Meta-Analyses, Pooled Analyses, and High-Quality Reports)

Database: Cochrane; Date of Search: 12/5/16; 37 Results
Terms searched in title, abstract, or keywords

Set	Search Terms
Sedentary	Title, Abstract, Keywords: ("Sedentary" OR "Sedentary lifestyle" OR "Inactivity" OR "Physically inactive" OR "Sedentarism" OR "Computer time" OR "Computer use" OR "Screen time" OR "Sitting" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming")
Mortality OR Cardiovascular Disease OR Cancer	AND ("Death" OR "Dying" OR Fatal* OR Mortalit* OR "Postmortem" OR Arteriosclero* OR Atherosclero* OR "Cerebral infarction" OR "Cerebrovascular diseases" OR "Cerebrovascular disease" OR "Coronary heart disease" OR "Heart failure" OR "Intracerebral Hemorrhage" OR "Intracerebral Hemorrhages" OR "Intracranial hemorrhage" OR "Intracranial hemorrhages" OR "ischemic" OR "myocardial infarction" OR "Stroke" OR "Subarachnoid hemorrhages" OR "Subarachnoid hemorrhage" OR "Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignan*" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" OR "Neoplasms" OR "Adenosarcoma" OR "Angiosarcoma" OR "Astrocytoma" OR "Cholangiocarcinoma" OR "Chondrosarcoma" OR "Craniopharyngioma" OR "Ependymoma" OR "Fibrosarcoma" OR "Glioma" OR "Langerhans Cell Histiocytosis" OR "Hodgkin's Disease" OR "Leiomyosarcoma" OR "Medulloblastoma" OR "Mesothelioma" OR "Neuroblastoma" OR "Rhabdomyosarcoma" OR "Osteosarcoma")
Limits	2000-present Cochrane Reviews and Other Reviews Word variations not searched

Search Strategy: PubMed (Original Research)

Database: PubMed; Date of Search: 1/30/17; 953 results

Set	Search Terms
Limit: Language	(English[lang])
Limit: Exclude animal only	NOT ("Animals"[Mesh] NOT ("Animals"[Mesh] AND "Humans"[Mesh]))
Limit: Exclude child only	NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) NOT (("infant"[Mesh] OR "child"[mesh] OR "adolescent"[mh]) AND "adult"[Mesh]))
Limit: Exclude subheadings	NOT (ad[sh] OR aa[sh] OR ai[sh] OR ci[sh] OR cn[sh] OR dh[sh] OR de[sh] OR dt[sh] OR em[sh] OR en[sh] OR es[sh] OR eh[sh] OR ge[sh] OR hi[sh] OR is[sh] OR ip[sh] OR lj[sh] OR ma[sh] OR mi[sh] OR og[sh] OR ps[sh] OR py[sh] OR pk[sh] OR pd[sh] OR po[sh] OR re[sh] OR rt[sh] OR rh[sh] OR st[sh] OR sd[sh] OR tu[sh] OR th[sh] OR tm[sh] OR tr[sh] OR ut[sh] OR ve[sh] OR vi[sh])
Limit: Publication Date (Original)	AND ("2014/01/01"[PDAT] : "3000/12/31"[PDAT])
Limit: Publication Type Exclude (Original)	NOT (“comment”[Publication Type] OR “editorial”[Publication Type] OR “review”[Publication Type] OR systematic[sb] OR "meta-analysis"[publication type] OR “systematic review”[tiab] OR “systematic literature review”[tiab] OR metaanalysis[tiab] OR "meta analysis"[tiab] OR metanalyses[tiab] OR "meta analyses"[tiab] OR "pooled analysis"[tiab] OR “pooled analyses”[tiab] OR "pooled data"[tiab])
Sedentary	AND (("Sedentary lifestyle"[mh] OR "Computer time"[tiab] OR "Computer use"[tiab] OR "Screen time"[tiab] OR "Sitting"[tiab] OR "Television"[tiab] OR "TV viewing"[tiab] OR "TV watching"[tiab] OR "Video game"[tiab] OR "Video gaming"[tiab]) OR (("Sedentary"[tiab] OR "Inactivity"[tiab] OR "Physically inactive"[tiab] OR "Sedentarism"[tiab]) NOT medline[sb]))
Mortality OR Cardiovascular Disease OR Cancer	AND (("Death"[mh] OR "Death"[tiab] OR "Dying"[tiab] OR Fatal*[tiab] OR Mortalit*[tiab] OR "Postmortem"[tiab] OR "Mortality"[mh] OR "Arteriosclerosis"[mh] OR "Death, sudden, cardiac"[mh] OR "Heart failure"[mh] OR "Myocardial ischemia"[mh] OR "myocardial infarction"[mh] OR "Stroke"[mh] OR "Subarachnoid hemorrhage"[mh] OR "Aortic Aneurysm, Thoracic"[mh] OR "Intracranial hemorrhages"[mh] OR "neoplasms"[mh]) OR ((Arteriosclero*[tiab] OR Atherosclero*[tiab] OR "Cerebral infarction"[tiab] OR "Cerebrovascular diseases"[tiab] OR "Cerebrovascular disease"[tiab] OR "Coronary heart disease"[tiab] OR "Heart failure"[tiab] OR "Intracerebral Hemorrhage"[tiab] OR "Intracerebral Hemorrhages"[tiab] OR "Intracranial hemorrhage"[tiab] OR "Intracranial hemorrhages"[tiab] OR "ischemic"[tiab] OR "myocardial infarction"[tiab] OR "Stroke"[tiab] OR "Subarachnoid hemorrhages"[tiab] OR "Subarachnoid hemorrhage"[tiab] OR "Cancer"[tiab] OR "Neoplasm"[tiab] OR "Tumor"[tiab] OR "Carcinogenesis"[tiab] OR "Leukemia"[tiab] OR "Lymphoma"[tiab] OR

Set	Search Terms
	"Malignan*"[tiab] OR "Blastoma"[tiab] OR "Tumour"[tiab] OR "Melanoma"[tiab] OR "Myeloma"[tiab] OR "Carcinoma"[tiab] OR "Neoplasia"[tiab] OR "Sarcoma"[tiab] OR "Tumors"[tiab] OR "Tumours"[tiab] OR "Neoplasms"[tiab] OR "Adenosarcoma"[tiab] OR "Angiosarcoma"[tiab] OR "Astrocytoma"[tiab] OR "Cholangiocarcinoma"[tiab] OR "Chondrosarcoma"[tiab] OR "Craniopharyngioma"[tiab] OR "Ependymoma"[tiab] OR "Fibrosarcoma"[tiab] OR "Glioma"[tiab] OR "Langerhans Cell Histiocytosis"[tiab] OR "Hodgkin's Disease"[tiab] OR "Leiomyosarcoma"[tiab] OR "Medulloblastoma"[tiab] OR "Mesothelioma"[tiab] OR "Neuroblastoma"[tiab] OR "Rhabdomyosarcoma"[tiab] OR "Osteosarcoma"[tiab]) NOT medline[sb]))

Search Strategy: CINAHL (Original Research)

Database: CINAHL; Date of Search: 1/27/17; 49 results
Terms searched in title or abstract

Set	Search Terms
Sedentary	Title and Abstract: ("Sedentary" OR "Sedentary lifestyle" OR "Inactivity" OR "Physically inactive" OR "Sedentarism" OR "Computer time" OR "Computer use" OR "Screen time" OR "Sitting" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming")
Mortality OR Cardiovascular Disease OR Cancer	AND ("Death" OR "Dying" OR Fatal* OR Mortalit* OR "Postmortem" OR Arteriosclero* OR Atherosclero* OR "Cerebral infarction" OR "Cerebrovascular diseases" OR "Cerebrovascular disease" OR "Coronary heart disease" OR "Heart failure" OR "Intracerebral Hemorrhage" OR "Intracerebral Hemorrhages" OR "Intracranial hemorrhage" OR "Intracranial hemorrhages" OR "ischemic" OR "myocardial infarction" OR "Stroke" OR "Subarachnoid hemorrhages" OR "Subarachnoid hemorrhage" OR "Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignan*" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" OR "Neoplasms" OR "Adenosarcoma" OR "Angiosarcoma" OR "Astrocytoma" OR "Cholangiocarcinoma" OR "Chondrosarcoma" OR "Craniopharyngioma" OR "Ependymoma" OR "Fibrosarcoma" OR "Glioma" OR "Langerhans Cell Histiocytosis" OR "Hodgkin's Disease" OR "Leiomyosarcoma" OR "Medulloblastoma" OR "Mesothelioma" OR "Neuroblastoma" OR "Rhabdomyosarcoma" OR "Osteosarcoma")
Original Research	NOT (“systematic review” OR “systematic literature review” OR metaanalysis OR "meta analysis" OR metanalyses OR "meta analyses" OR "pooled analysis" OR “pooled analyses” OR "pooled data")
Limits	Title or abstract 2014-present English language Peer reviewed Exclude Medline records Human

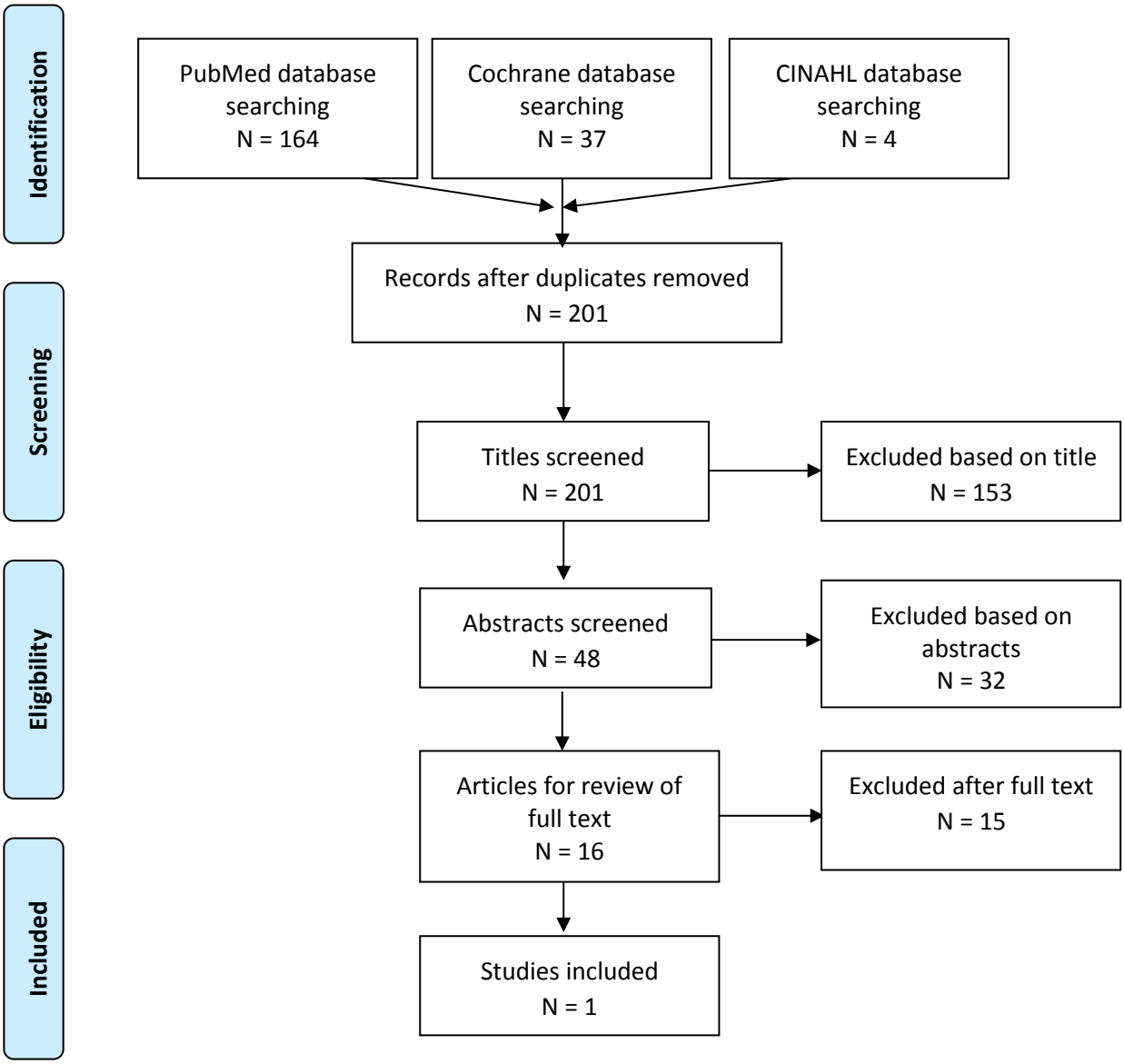
Search Strategy: Cochrane (Original Research)

Database: Cochrane; Date of Search: 1/27/17; 325 Results
Terms searched in title, abstract, or keywords

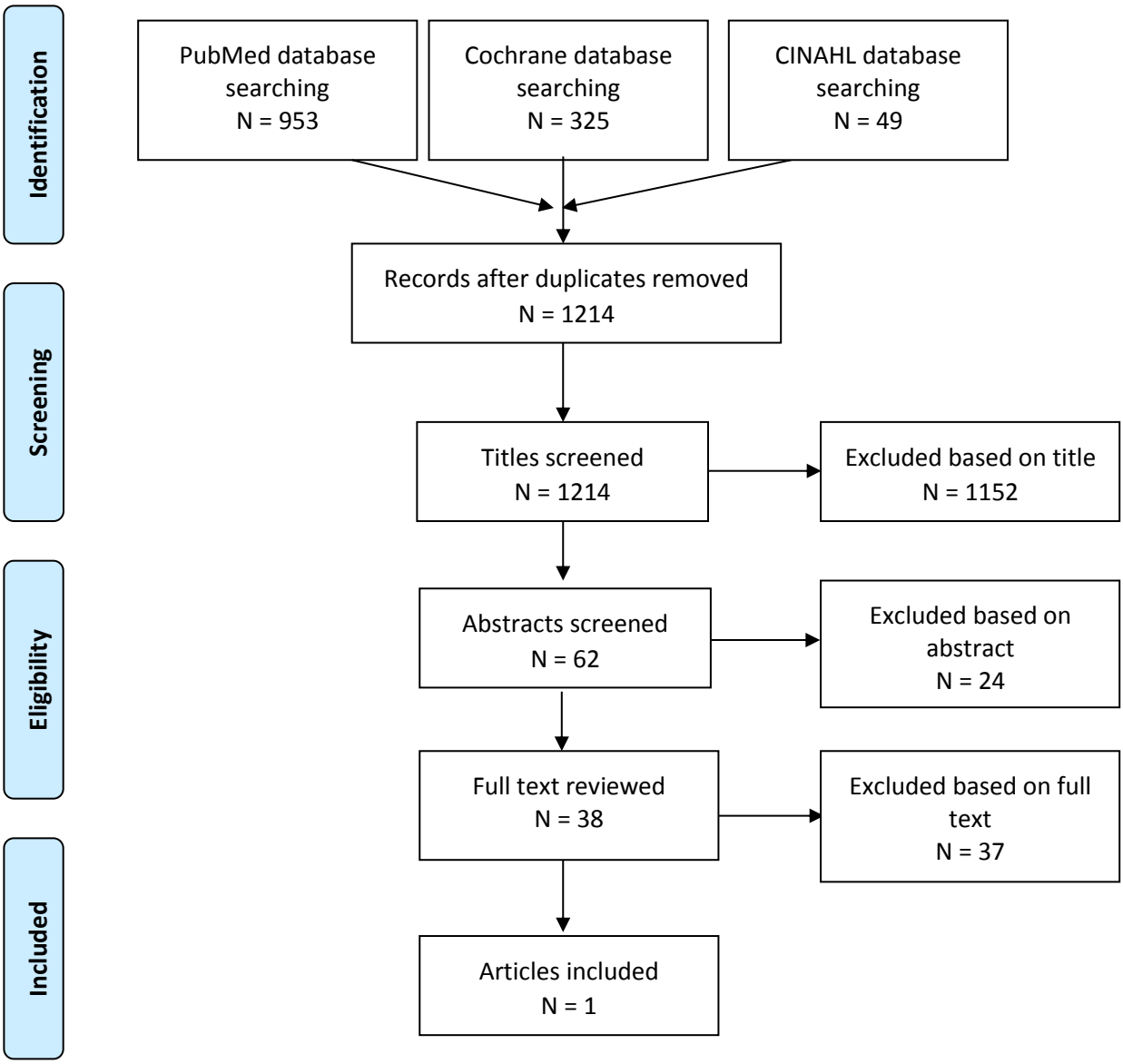
Set	Search Terms
Sedentary	Title, Abstract, Keywords: ("Sedentary" OR "Sedentary lifestyle" OR "Inactivity" OR "Physically inactive" OR "Sedentarism" OR "Computer time" OR "Computer use" OR "Screen time" OR "Sitting" OR "Television" OR "TV viewing" OR "TV watching" OR "Video game" OR "Video gaming")
Mortality OR Cardiovascular Disease OR Cancer	AND ("Death" OR "Dying" OR Fatal* OR Mortalit* OR "Postmortem" OR Arteriosclero* OR Atherosclero* OR "Cerebral infarction" OR "Cerebrovascular diseases" OR "Cerebrovascular disease" OR "Coronary heart disease" OR "Heart failure" OR "Intracerebral Hemorrhage" OR "Intracerebral Hemorrhages" OR "Intracranial hemorrhage" OR "Intracranial hemorrhages" OR "ischemic" OR "myocardial infarction" OR "Stroke" OR "Subarachnoid hemorrhages" OR "Subarachnoid hemorrhage" OR "Cancer" OR "Neoplasm" OR "Tumor" OR "Carcinogenesis" OR "Leukemia" OR "Lymphoma" OR "Malignan*" OR "Blastoma" OR "Tumour" OR "Melanoma" OR "Myeloma" OR "Carcinoma" OR "Neoplasia" OR "Sarcoma" OR "Tumors" OR "Tumours" OR "Neoplasms" OR "Adenosarcoma" OR "Angiosarcoma" OR "Astrocytoma" OR "Cholangiocarcinoma" OR "Chondrosarcoma" OR "Craniopharyngioma" OR "Ependymoma" OR "Fibrosarcoma" OR "Glioma" OR "Langerhans Cell Histiocytosis" OR "Hodgkin's Disease" OR "Leiomyosarcoma" OR "Medulloblastoma" OR "Mesothelioma" OR "Neuroblastoma" OR "Rhabdomyosarcoma" OR "Osteosarcoma")
Limits	2014-present Word variations not searched Trials

Appendix C: Literature Tree

Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports Literature Tree



Original Research Literature Tree



Appendix D: Inclusion/Exclusion Criteria

Sedentary Subcommittee
Q5. Does the effect of moderate-to-vigorous physical activity on all-cause mortality vary by amount of sedentary behavior?

Category	Inclusion/Exclusion Criteria	Notes/Rationale
Publication Language	**Include:** • Studies published with full text in English	
Publication Status	**Include:** • Studies published in peer-reviewed journals • Reports determined to have appropriate suitability and quality by PAGAC **Exclude:** • Grey literature, including unpublished data, manuscripts, abstracts, conference proceedings	
Research Type	**Include:** • Original research • Meta-analyses • Systematic reviews • Reports determined to have appropriate suitability and quality by PAGAC	
Study Subjects	**Include:** • Human subjects	
Age of Study Subjects	**Include:** • Adults ages 18 and older	Sedentary behavior in youth will be address by youth subcommittee
Health Status of Study Subjects	**Exclude:** • Nonambulatory adults • Hospitalized patients	
Date of Publication	**Include:** • Original research, systematic reviews, and meta-analyses published from 2000 to 2016	
Study Design	**Include:** • Prospective cohort studies • Systematic reviews • Meta-analyses • Reports determined to have appropriate suitability and quality by PAGAC **Exclude:** • Randomized controlled trials • Non-randomized controlled trials • Retrospective cohort studies • Case-control studies	

	• Narrative reviews • Commentaries • Editorials • Cross-sectional studies • Before-and-after studies	
Exposure	**Include studies in which the exposure is:** • All types of sedentary behavior • Moderate-to-vigorous physical activity **Exclude:** • Studies that use sedentary behavior solely as a confounding variable	
Outcome	**Include studies in which the outcome is:** • All-cause mortality	

Appendix E: Rationale for Exclusion at Abstract or Full-Text Triage for Existing Systematic Reviews, Meta-Analyses, Pooled Analyses, and Reports

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
Biddle SJ, Bennie JA, Bauman AE, et al. Too much sitting and all-cause mortality: is there a causal link? *BMC Public Health*. 2016;16:635. doi:10.1186/s12889-016-3307-3.	X			
Biswas A, Oh PI, Faulkner GE, et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: A systematic review and meta-analysis. *Ann Intern Med*. 2015;162(2):123-32.			X	
Boyle T, Fritschi L,Kobayashi LC, et al. Sedentary work and the risk of breast cancer in premenopausal and postmenopausal women: a pooled analysis of two case-control studies. *Occup Environ Med*. 2016;73(11):735-741. doi:10.1136/oemed-2015-103537.	X			
Brenner DR. Cancer incidence due to excess body weight and leisure-time physical inactivity in Canada: implications for prevention. *Prev Med*. 2014;66:131-139. doi:10.1016/j.ypmed.2014.06.018.	X			
Buckley JP, Hedge A, Yates T, et al. The sedentary office: an expert statement on the growing case for change towards better health and productivity. *Br J Sports Med.* 2015;49:1357-1362. doi:10.1136/bjsports-2015-094618.	X			
Cannioto RA, LaMonte MJ, Kelemen LE, et al. Recreational physical inactivity and mortality in women with invasive epithelial ovarian cancer: evidence from the Ovarian Cancer Association Consortium. *Br J Cancer.* 2016;115(1):95-101. doi:10.1038/bjc.2016.153.			X	
Charansonney OL, Despres JP. Disease prevention--should we target obesity or sedentary lifestyle? *Nat Rev Cardiol*. 2010;7(8):468-472. doi:10.1038/nrcardio.2010.68.		X		
Chau JY, Grunseit AC, Chey T, et al. Daily sitting time and all-cause mortality: A meta-analysis. *PLoS One.* 2013;8(11):e80000. doi:10.1371/journal.pone.0080000.			X	
Cong YJ, Gan Y, Sun HL, et al. Association of sedentary behaviour with colon and rectal cancer: a meta-analysis of observational studies. *Br J Cancer*. 2014;110:817-826. doi:10.1038/bjc.2013.709.	X			
de Rezende LF, Rey-Lopez JP, Matsudo VK, do Carmo Luiz O. Sedentary behavior and health outcomes among older adults: A systematic review. *BMC Public Health*. 2014;14:333. doi:10.1186/1471-2458-14-333.			X	
de Rezende LF, Rodrigues Lopes M, Rey-Lopez JP, Matsudo VK, Luiz Odo C. Sedentary behavior and health outcomes: an overview of systematic reviews. *PLoS One*. 2014;9:e105620. doi:10.1371/journal.pone.0105620.		X		
Dempsey PC, Owen N, Biddle SJ, Dunstan DW. Managing sedentary behavior to reduce the risk of diabetes and cardiovascular disease. *Curr Diab Rep*. 2014;14(9):522. doi:10.1007/s11892-014-0522-0.	X	X		

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
English C, Manns PJ, Tucak C, Bernhardt J. Physical activity and sedentary behaviors in people with stroke living in the community: a systematic review. *Phys Ther.* 2014;94(2):185-196. doi:10.2522/ptj.20130175.	X			
Grontved A, Hu FB. Television viewing and risk of type 2 diabetes, cardiovascular disease, and all-cause mortality: A meta-analysis. *JAMA*. 2011;305(23):2448-55. doi: 10.1001/jama.2011.812.			X	
Haney EM, Huffman LH, Bougatsos C, et al. *U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews.* Screening for lipid disorders in children and adolescents. 2007;Jul(Report No. 07-0598).	X			
Henson J, Dunstan DW, Davies MJ, Yates T. Sedentary behaviour as a new behavioural target in the prevention and treatment of type 2 diabetes. *Diabetes Metab Res Rev*. 2016;32(suppl 1):213-220. doi:10.1002/dmrr.2759.		X		
Hughes J, Kee F, O'Flaherty M, et al. Modelling coronary heart disease mortality in Northern Ireland between 1987 and 2007: broader lessons for prevention. *Eur J Prev Cardiol*. 2013;20(2):310-321. doi:10.1177/2047487312441725.		X		
Jaworski CA. Latest clinical research published by ACSM. *Curr Sports Med Rep.* 2015;14(1):351-352. doi:10.1249/JSR.0b013e3182750106.		X		
Katzmarzyk PT, Lee IM. Sedentary behaviour and life expectancy in the USA: a cause-deleted life table analysis. *BMJ Open.* 2012;2e000828. doi:10.1136/bmjopen-2012-000828.	X			
Keum N, Cao Y, Oh H, et al. Sedentary behaviors and light-intensity activities in relation to colorectal cancer risk. *Int J Cancer*. 2016;138(9):2109-2117. doi:10.1002/ijc.29953.	X			
Lin JS, Eder M, Weinmann S, et al. *U.S. Preventive Services Task Force Evidence Syntheses, formerly Systematic Evidence Reviews.* Behavioral counseling to prevent skin cancer: systematic evidence review to update the 2003 U.S. Preventive Services Task Force Recommendation. 2011;82(Report No.11-05152-EF-1).	X			
Lynch BM. Sedentary behavior and cancer: a systematic review of the literature and proposed biological mechanisms. *Cancer Epidemiol Biomarkers Prev*. 2010;19(11):2691-2709. doi:10.1158/1055-9965.EPI-10-0815.	X			
Milton K, Macniven R, Bauman A. Review of the epidemiological evidence for physical activity and health from low- and middle-income countries. *Glob Public Health.* 2014;9(4):369-381. doi:10.1080/17441692.2014.894548.			X	
Molmenti CL, Hibler EA, Ashbeck EL, et al. Sedentary behavior is associated with colorectal adenoma recurrence in men. *Cancer Causes Control*. 2014;25(10):1387-1395. doi:10.1007/s10552-014-0444-9.	X			
Moore SC, Gierach GL, Schatzkin A, Matthews CE. Physical activity, sedentary behaviours, and the prevention of	X			

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
endometrial cancer. *Br J Cancer*. 2010;103(7):933-938. doi:10.1038/sj.bjc.6605902.				
Nelson SH, Marinac CR, Patterson RE, et al. Impact of very low physical activity, BMI, and comorbidities on mortality among breast cancer survivors. *Breast Cancer Res Treat*. 2016;155(3):551-557. doi:10.1007/s10549-016-3694-2.		X		
Oczkowski W. Complexity of the relation between physical activity and stroke: a meta-analysis. *Clin J Sport Med*. 2005;15(5):399.	X			
Pandey A, Salahuddin U, Garg S, et al. Continuous dose-response association between sedentary time and risk for cardiovascular disease: a meta-analysis. *JAMA Cardiol*. 2016;1(5):575-583. doi:10.1001/jamacardio.2016.1567.				X
Park S, Kim Y, Shin HR, et al. Population-attributable causes of cancer in Korea: obesity and physical inactivity. *PLoS One*. 2014;9(7):e90871. doi:10.1371/journal.pone.0090871.	X			
Pizot C, Boniol M, Mullie P, et al. Physical activity, hormone replacement therapy and breast cancer risk: a meta-analysis of prospective studies. *Eur J Cancer*. 2016;52:138-154. doi:10.1016/j.ejca.2015.10.063.	X			
Proper KI, Singh AS, van Mechelen W, Chinapaw MJ. Sedentary behaviors and health outcomes among adults: A systematic review of prospective studies. *Am J Prev Med.* 2011;40(2):174-182. doi:10.1016/j.amepre.2010.10.015.			X	
Rezende LF, Sa TH, Mielke GI, Viscondi JY, Rey-Lopez JP, Garcia LM. All-cause mortality attributable to sitting time: analysis of 54 countries worldwide. *Am J Prev Med*. 2016;51(2):253-263. doi:10.1016/j.amepre.2016.01.022.				X
Schmid D, Leitzmann MF. Television viewing and time spent sedentary in relation to cancer risk: a meta-analysis. *J Natl Cancer Inst*. 2014;106(7). pii: dju098. doi:10.1093/jnci/dju098.	X			
Shen D, Mao W, Liu T, et al. Sedentary behavior and incident cancer: a meta-analysis of prospective studies. *PLoS One.* 2014;9(8):e105709. doi:10.1371/journal.pone.0105709.	X			
Sluik D, Buijsse B, Muckelbauer R, et al. Physical activity and mortality in individuals with diabetes mellitus: a prospective study and meta-analysis. *Arch Intern Med*. 2012;172(17):1285-1295. doi:10.1001/archinternmed.2012.3130.			X	
Solomon TP, Thyfault JP. Type 2 diabetes sits in a chair. *Diabetes Obes Metab.* 2013;15(11): 987-992. doi:10.1111/dom.12105.		X		
Stamatakis E, Chau JY, Pedisic Z, et al. Are sitting occupations associated with increased all-cause, cancer, and cardiovascular disease mortality risk? A pooled analysis of seven British population cohorts. *PLoS One*. 2013;8(9):e73753. doi:10.1371/journal.pone.0073753.		X		
Sun JW, Zhao LG, Yang Y, Ma X, Wang YY, Xiang YB. Association between television viewing time and all-cause			X	

Citation	Outcome	Study Design	Exposure	Not ideal fit for replacement of de novo search
mortality: A meta-analysis of cohort studies. *Am J Epidemiol.* 2015;182(11):908-16. doi:10.1093/aje/kwv164.				
Tarraga Lopez PJ, Albero JS, Rodriguez-Montes JA. Primary and secondary prevention of colorectal cancer. *Clin Med Insights Gastroenterol*. 2014;7:33-46. doi:10.4137/CGast.S14039.			X	
Thorp AA, Owen N, Neuhaus M, Dunstan DW. Sedentary behaviors and subsequent health outcomes in adults a systematic review of longitudinal studies, 1996-2011. *Am J Prev Med.* 2011;41(2):207-215. doi:10.1016/j.amepre.2011.05.004.			X	
van Uffelen JG, Wong J, Chau JY, et al. Occupational sitting and health risks: a systematic review. *Am J Prev Med.* 2010;39(4):379-388. doi:10.1016/j.amepre.2010.05.024.			X	
Vancampfort D, Firth J, Schuch F, et al. Physical activity and sedentary behavior in people with bipolar disorder: a systematic review and meta-analysis. *J Affect Disord*. 2016;201:145-152. doi:10.1016/j.jad.2016.05.020.	X			
Wahid A, Manek N, Nichols M, et al. Quantifying the association between physical activity and cardiovascular disease and diabetes: a systematic review and meta-analysis. *J Am Heart Assoc*. 2016;5(9). pii: e002495. doi:10.1161/JAHA.115.002495.			X	
Wilmot EG, Edwardson CL, Achana FA, Davies MJ, Gorely T, Gray LJ, et al. Sedentary time in adults and the association with diabetes, cardiovascular disease and death: Systematic review and meta-analysis. *Diabetologia*. 2012;55(11):2895-2905. doi: 10.1007/s00125-012-2677-z.			X	
Wilson LF, Page AN, Dunn NA, Pandeya N, Protani MM, Taylor RJ. Population attributable risk of modifiable risk factors associated with invasive breast cancer in women aged 45-69 years in Queensland, Australia. *Maturitas*. 2013;76(4):370-376. doi:10.1016/j.maturitas.2013.09.002.	X			
World Health Organization. *Global recommendations on physical activity for health.* Geneva; World Health Organization;2010.	X			
Zhou Y, Zhao H, Peng C. Association of sedentary behavior with the risk of breast cancer in women: update meta-analysis of observational studies. *Ann Epidemiol.* 2015;25(9):687-697. doi:10.1016/j.annepidem.2015.05.007.	X			

Rationale for Exclusion at Abstract and/or Full-Text Triage for Original Research

The table below lists the excluded articles with at least one reason for exclusion, but may not reflect all possible reasons.

Citation	Outcome	Study Design	Exposure
Beddhu S, Wei G, Marcus RL, Chonchol M, Greene T. Light-intensity physical activities and mortality in the United States general population and CKD subpopulation. *Clin J Am Soc Nephrol*. 2015;10(7):1145-1153. doi:10.2215/CJN.08410814.		X	
Behrend SW. Television viewing and time spent sedentary in relation to cancer risk. *Oncol Nurs Forum*. 2014;41(6):695-696. doi:10.1188/14.ONF.695-696.	X		
Bjork Petersen C, Bauman A, Gronbaek M, Wulff Helge J, Thygesen LC, Tolstrup JS. Total sitting time and risk of myocardial infarction, coronary heart disease and all-cause mortality in a prospective cohort of Danish adults. *Int J Behav Nutr Phys Act*. 2014;11:13. doi:10.1186/1479-5868-11-13.	X		
Bol O, Cebicci H, Koyuncu S, Şarlı B, Günay N. A hidden household danger: television. *Ulus Travma Acil Cerrahi Derg.* 2016;22(3):265-268. doi:10.5505/tjtes.2015.42078.			X
Borodulin K, Karki A, Laatikainen T, Peltonen M, Luoto R. Daily sedentary time and risk of cardiovascular disease: the National FINRISK 2002 Study. *J Phys Act Health*. 2015;12(7):904-908. doi:10.1123/jpah.2013-0364.	X		
Borrell LN. The effects of smoking and physical inactivity on advancing mortality in U.S. adults. *Ann Epidemiol*. 2014;24(6):484-487. doi:10.1016/j.annepidem.2014.02.016.			X
Brown JC, Harhay MO, Harhay MN. Physical activity, diet quality, and mortality among community-dwelling prefrail and frail older adults. *J Nutr Gerontol Geriatr.* 2016;35(4):253-266.	X		
Brown JC, Harhay MO, Harhay MN. Physical activity, diet quality, and mortality among sarcopenic older adults. *Aging Clin Exp Res*. 2017;29(2):257-263. doi:10.1007/s40520-016-0559-9.	X		
Chau JY, Grunseit A, Midthjell K, et al. Sedentary behaviour and risk of mortality from all-causes and cardiometabolic diseases in adults: evidence from the HUNT3 population cohort. *Br J Sports Med*. 2015;49(11):737-742.	X		
Converse LJ. Sitting with death. *Am J Nurs*. 2016;116(12):72.		X	
Coombs N, Stamataki E, Lee IM. Physical inactivity among older adults: implications for life expectancy among non-overweight and overweight or obese individuals. *Obes Res Clin Pract*. 2015;9(2):175-179. doi:10.1016/j.orcp.2014.11.004.			X
de Rezende LF, Rabacow FM, Viscondi JY, Luiz Odo C, Matsudo VK, Lee IM. Effect of physical inactivity on major noncommunicable diseases and life expectancy in Brazil. *J Phys Act Health*. 2015;12(3):299-306. doi:10.1123/jpah.2013-0241.			X
Ding D, Rogers K, van der Ploeg H, Stamatakis E, Bauman AE. Traditional and emerging lifestyle risk behaviors and all-cause mortality in middle-aged and older adults: Evidence			X

Citation	Outcome	Study Design	Exposure
from a large population-based Australian cohort. *PLoS Med.* 2015;12(12):e1001917. doi:10.1371/journal.pmed.1001917.			
Edwards MK, Loprinzi PD. All-cause mortality risk as a function of sedentary behavior, moderate-to-vigorous physical activity and cardiorespiratory fitness. *Phys Sportsmed.* 2016;44(3):223-30. doi:10.1080/00913847.2016.1221751.			X
Eijsvogels TM, George KP, Thompson PD. Cardiovascular benefits and risks across the physical activity continuum. *Curr Opin Cardiol.* 2016;31(5):566-571. doi:10.1097/HCO.0000000000000321.		X	
Ensrud KE, Blackwell TL, Cauley JA, et al. Objective measures of activity level and mortality in older men. *J Am Geriatr Soc.* 2014;62(11):2079-87. doi:10.1111/jgs.13101.			X
Evenson KR, Herring AH, Wen F. Accelerometry-assessed latent class patterns of physical activity and sedentary behavior with mortality. *Am J Prev Med.* 2017;52(2):135-43. doi:10.1016/j.amepre.2016.10.033.			X
Evenson KR, Wen F, Herring AH. Associations of accelerometry-assessed and self-reported physical activity and sedentary behavior with all-cause and cardiovascular mortality among US adults. *Am J Epidemiol*. 2016;184(9):621-32.			X
Everson-Hock ES, Green MA, Goyder EC, et al. Reducing the impact of physical inactivity: evidence to support the case for targeting people with chronic mental and physical conditions. *J Public Health (Oxf).* 2016;38(2):343-351. doi:10.1093/pubmed/fdv036.	X		X
Fassier P, Zelek L, Partula V, et al. Variations of physical activity and sedentary behavior between before and after cancer diagnosis: results from the prospective population-based NutriNet-Sante cohort. *Medicine (Baltimore).* 2016;95(40):e4629.	X		
Fazel-Tabar Malekshah A, Zaroudi M, Etemadi A, et al. The combined effects of healthy lifestyle behaviors on all-cause mortality: the Golestan Cohort Study. *Arch Iran Med.* 2016;19(11):752-761.			X
Fishman EI, Steeves JA, Zipunnikov V, et al. Association between objectively measured physical activity and mortality in NHANES. *Med Sci Sports Exerc*. 2016;48(7):1303-11. doi:10.1249/MSS.0000000000000885.			X
Fox KR, Ku PW, Hillsdon M, et al. Objectively assessed physical activity and lower limb function and prospective associations with mortality and newly diagnosed disease in UK older adults: an OPAL four-year follow-up study. *Aging*. 2015;44(2):261-268. doi:10.1093/ageing/afu168.			X
Grace MS, Lynch BM, Dillon F, Barr EM, Owen N, Dunstan DW. Joint associations of smoking and television viewing time on cancer and cardiovascular disease mortality. *Int J Cancer*. 2017;140(7):1538-1544. doi:10.1002/ijc.30580.	X		
Grunseit AC, Chau JY, Rangul V, Holmen TL, Bauman A. Patterns of sitting and mortality in the Nord-Trondelag health study (HUNT). *Int J Behav Nutr Phys Act.* 2017;14(1):8. doi:10.1186/s12966-016-0457-8.			X
Hagger-Johnson G, Gow AJ, Burley V, Greenwood D, Cade JE. Sitting time, fidgeting, and all-cause mortality in the UK			X

Sedentary Subcommittee: Q5. Does the effect of moderate-to-vigorous physical activity on all-cause mortality vary by amount of sedentary behavior?

Citation	Outcome	Study Design	Exposure
women's cohort study. *Am J Prev Med.* 2016;50(2):154-60. doi:10.1016/j.amepre.2015.06.025.			
Hayashi R, Iso H, Cui R, Tamakoshi A; JACC Study Group. Occupational physical activity in relation to risk of cardiovascular mortality: the Japan Collaborative Cohort Study for Evaluation for Cancer Risk (JACC Study). *Prev Med.* 2016;89:286-291. doi:10.1016/j.ypmed.2016.06.008.			X
Holme I, Anderssen SA. Increases in physical activity is as important as smoking cessation for reduction in total mortality in elderly men: 12 years of follow-up of the Oslo II study. *Br J Sports Med.* 2015;49(11):743-748. doi:10.1136/bjsports-2014-094522.			X
Holme I, Tonstad S. Increased predictive ability of BMI but not other risk factors with time in men: 39-year follow-up of total mortality in the Oslo Study. *Obes Facts.* 2014;7(5):311-321. doi:10.1159/000368567.			X
Holtermann A, Mork PJ, Nilsen TI. Hours lying down per day and mortality from all-causes and cardiovascular disease: the HUNT Study, Norway. *Eur J Epidemiol.* 2014;29(8):559-565. doi:10.1007/s10654-014-9939-7.			X
Ikehara S, Iso H, Wada Y; JACC Study Group. Television viewing time and mortality from stroke and coronary artery disease among Japanese men and women—the Japan Collaborative Cohort Study. *Circ J.* 2015;79(11):2389-2395. doi:10.1253/circj.CJ-14-1335.	X		
Keadle SK, Arem H, Moore SC, Sampson JN, Matthews CE. Impact of changes in television viewing time and physical activity on longevity: A prospective cohort study. *Int J Behav Nutr Phys Act.* 2015;12:156. doi:10.1186/s12966-015-0315-0.			X
Kikuchi H, Inoue S, Odagiri Y, et al. Occupational sitting time and risk of all-cause mortality among Japanese workers. *Scand J Work Environ Health.* 2015;41(6):519-28. doi:10.5271/sjweh.3526.			X
Klenk J, Dallmeier D, Denkinger MD, Rapp K, Koenig W, Rothenbacher D; ActiFE Study Group. Objectively measured walking duration and sedentary behaviour and four-year mortality in older people. *PLoS One*. 2016;11(4):e0153779. doi:10.1371/journal.pone.0153779.	X		
Koolhaas CM, Dhana K, van Rooij FJ, et al. Sedentary time assessed by actigraphy and mortality: The Rotterdam Study. *Prev Med.* 2017;95:59-65. doi:10.1016/j.ypmed.2016.11.021.			X
Krokstad S, Ding D, Grunseit AC, et al. Multiple lifestyle behaviours and mortality, findings from a large population-based Norwegian cohort study - The HUNT Study. *BMC Public Health.* 2017;17(1):58. doi:10.1186/s12889-016-3993-x.			X
Lee J, Kuk JL, Ardern CI. The relationship between changes in sitting time and mortality in post-menopausal US women. *J Public Health (Oxf).* 2016;38(2):270-8. doi:10.1093/pubmed/fdv055.			X
Llamas-Velasco S, Villarejo-Galende A, Contador I, Pablos DL, Hernández-Gallego J, Bermejo-Pareja F. Physical activity and long-term mortality risk in older adults: a prospective			X

Citation	Outcome	Study Design	Exposure
population based study (NEDICES). *Prev Med Rep*. 2016;4:546-550. doi:10.1016/j.pmedr.2016.10.002.			
Loprinzi PD, Edwards MK, Sng E, Addoh O. Sedentary behavior and residual-specific mortality. *Health Promot Perspect*. 2016;6(4):196-201. doi:10.15171/hpp.2016.32.	X		
Loprinzi PD, Loenneke JP, Ahmed HM, Blaha MJ. Joint effects of objectively-measured sedentary time and physical activity on all-cause mortality. *Prev Med.* 2016;90(Sep):47-51. doi:10.1016/j.ypmed.2016.06.026.			X
Loprinzi PD, Joyner C. Accelerometer-determined physical activity and mortality in a national prospective cohort study: Considerations by visual acuity. *Prev Med.* 2016(Jun);87:18-21. doi:10.1016/j.ypmed.2016.02.005.			X
Martinez-Gomez D, Guallar-Castillon P, Rodriguez-Artalejo F. Sitting time and mortality in older adults with disability: A national cohort study. *J Am Med Dir Assoc.* 2016;17(10):960.e15-20. doi:10.1016/j.jamda.2016.07.016.			X
Matthews CE, Keadle SK, Troiano RP, et al. Accelerometer-measured dose-response for physical activity, sedentary time, and mortality in US adults. *Am J Clin Nutr.* 2016;104(5):1424-1432.			X
Matthews CE, Moore SC, Sampson J, et al. Mortality benefits for replacing sitting time with different physical activities. *Med Sci Sports Exerc.* 2015;47(9):1833-40. doi:10.1249/MSS.0000000000000621.			X
Menotti A, Puddu PE, Lanti M, Maiani G, Catasta G, Fidanza AA. Lifestyle habits and mortality from all and specific causes of death: 40-year follow-up in the Italian Rural Areas of the Seven Countries Study. *J Nutr Health Aging.* 2014;18(3):314-321. doi:10.1007/s12603-013-0392-1.			X
Nandi A, Glymour MM, Subramanian SV. Association among socioeconomic status, health behaviors, and all-cause mortality in the United States. *Epidemiology*. 2014;25(2):170-177. doi:10.1097/EDE.0000000000000038.			X
Papandreou C, Tuomilehto H. Coronary heart disease mortality in relation to dietary, lifestyle and biochemical risk factors in the countries of the Seven Countries Study: a secondary dataset analysis. *J Hum Nutr Diet*. 2014;27(2):168-175. doi:10.1111/jhn.12187.		X	
Pavey TG, Peeters GG, Brown WJ. Sitting-time and 9-year all-cause mortality in older women. *Br J Sports Med*. 2015;49(2):95-99. doi: 10.1136/bjsports-2012-091676.	X		
Pulsford RM, Stamatakis E, Britton AR, Brunner EJ, Hillsdon M. Associations of sitting behaviours with all-cause mortality over a 16-year follow-up: The Whitehall II study. *Int J Epidemiol.* 2015;44(6):1909-16. doi:10.1093/ije/dyv191.			X
Schmid D, Ricci C, Baumeister SE, Leitzmann MF. Replacing sedentary time with physical activity in relation to mortality. *Med Sci Sports Exerc.* 2016;48(7):1312-9. doi:10.1249/MSS.0000000000000913.			X
Schmid D, Ricci C, Leitzmann MF. Associations of objectively assessed physical activity and sedentary time with all-cause mortality in US adults: The NHANES study. *PLoS One.* 2015;10(3):e0119591. doi:10.1371/journal.pone.0119591.			X
Shaw BA, Agahi N. Smoking and physical inactivity patterns during midlife as predictors of all-cause mortality and			X

Sedentary Subcommittee: Q5. Does the effect of moderate-to-vigorous physical activity on all-cause mortality vary by amount of sedentary behavior?

Citation	Outcome	Study Design	Exposure
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