

ONLINE SUPPLEMENTARY MATERIAL (OSM)

TITLE

Does sedentary behaviour cause spinal pain in children and adolescents? A systematic review with meta-analysis

AUTHORS

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OSM Table 1 Detailed search strategies and search results for Medline(Ovid) search strategy 23.03.2023

Term Set	#	Subject Headings	Key words	Results
Sedentary exposure	1	Sedentary Behavior/		8125
	2		((sedentary or stationary or sitting) adj2 (behavio?* or lifestyle* or time or duration or bout* or activit* or position)).tw.	12654
	3	Exercise/		101434
	4		(physical* adj4 (inactiv* or activ*)).tw.	101615
	5	Screen Time/		116
	6		screen time.tw.	1785
	7		screentime.tw.	12
	8		(screen base* adj3 (activity or behavio?r)).tw.	55
	9	Television/		13181
	10		television.tw.	13057
	11		TV.tw.	12575
	12	Computers/		50348
	13		computer*.tw.	286477
	14		laptop*.tw.	1718
	15		((digital OR electronic) adj2 (game* OR product* OR device)).tw.	3835
	16	Internet/		69579
	17		internet.tw.	46961
	18	Smartphone/		3198
	19	Cell Phone/		7924
	20		(phone* adj1 (smart or cell or mobile)).tw.	10199
	21	Text Messaging/		2355
	22		"text messaging"	1800
	23		texting.tw.	754
	24		SMS.tw.	5373
	25	Video Games/		4886
	26		(gam* adj1 (computer or video)).tw.	4331
	27	Posture/		63145
	28		postur*.tw	57789
	29		((sit* or lay* or reclin*) adj3 postur*).tw.	1675
		30	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 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29	
Spinal pain	31	Back Pain/		17157
	32		backache*.tw.	2510
	33	Low Back Pain/		20644
	34		lumbago.tw.	1318
	35	Neck Pain /		6585
	36		cervicalgia.tw.	114
	37		cervicodynia.tw.	9
	38		text neck.tw.	7
	39		((back or spin* or thoracic or midback or lumbar or neck or cervical) adj3 (pain* or ache* or complaint* or symptom*)).tw.	72424
		40	31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39	88002
Child, Adolescent	41	Child/		1629719
	42		child*.tw.	1316990
	43		boy*.tw.	147537
	44		girl*.tw.	142095
	45	Adolescent/		1951786
	46		adolescen*.tw.	259460
	47		juvenile*.tw.	77737
	48	Minors/		2514
	49		minor*.tw.	281431
	50	Schools/		35580
	51		school*.tw.	266353
	52	Students/		54097
	53		student*.tw.	261270
	54	Pediatrics/		51634
	55		p?ediatric*.tw.	326320
	56		teen*.tw.	28985
	57		preteen*.tw.	306

Montgomery, et al. 2024

Does sedentary behaviour cause spinal pain in children and adolescents? A systematic review with meta-analysis

Page 1 of 13

	58	youth*.tw.	68392
	59	(young adj1 (person* or people or female* or male* or men or man or women or woman)).tw.	95349
	60	41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59	3961807
Sub-total	61	30 AND 40 AND 60	1817
Update		limit 61 to yr="2019 -Current"	490

OSM Table 2 Detailed search strategies and search results for Embase(Ovid) search strategy update 23.03.2023

Term Set	#	Subject Headings	Key words	Results
Sedentary exposure	1	sedentary lifestyle/		12646
	2	sitting/		22396
	3		((sedentary or stationary or sitting) adj2 (behavio?* or lifestyle* or time or duration or bout* or activit* or position)).tw.	25102
	4	physical inactivity/		146466
	5	physical activity/		5008
	6		(physical* adj4 (inactiv* or activ*)).tw.	161872
	7		screen time.tw.	2223
	8		screentime.tw.	34
	9		("screen base*" adj3 (activit* or behav*)).tw.	212
	10	television/		15032
	11		television.tw.	15229
	12		TV.tw.	21179
	13	computers/		75358
	14		computer*.tw.	358067
	15	laptop/		301
	16		laptop*.tw.	2727
	17		((digital OR electronic) adj2 (game* OR product* OR device)).tw.	4924
	18	internet/		104567
	19		internet.tw.	63827
	20	smartphone/		9294
	21	mobile phone/		15646
	22	"cell phone use"/		459
	23	mobile application/		8749
	24		(phone* adj1 (smart or cell or mobile)).tw.	13609
	25		texting.tw.	1037
	26		"text messaging"	2196
	27		SMS.tw.	7738
	28	video game/		2897
	29	recreational game/		300
	30		(gam* adj1 (computer or video)).tw.	5652
	31	body position/		19412
	32		posture*.tw.	43737
	33		((sit* or lay* or reclin*) adj3 postur*).tw.	2294
	34		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 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33	859419
Spinal pain	35	backache/		51462
	36		backache*.tw.	3224
	37	low back pain/		56530
	38		lumbago.tw.	1951
	39	neck pain/		22323
	40		cervicalgia.tw.	198
	41		cervicodynia.tw.	19
	42		text neck.tw.	12
	43	spinal pain/		3200
	44	thorax pain/		84732
	45		((back or spin* or thoracic or midback or lumbar or neck or cervical) adj3 (pain* or ache* or complaint* or symptom*)).tw.	106937
	46		35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45	241761
Child, Adolescent	47	child/		1731067
	48		child*.tw.	1759767
	49	boy/		45321
	50		boy*.tw.	214170
	51	girl/		60648
	52		girl*.tw.	206607
	53	adolescent/		1456902
	54		adolescenc*.tw.	344130
	55	juvenile/		45916
	56		juvenile*.tw.	98675
	57	"minor (person)"/		569
	58		minor*.tw.	376500
	59	school/		72064
	60		school*.tw.	340417
	61	student/		114810
	62		student*.tw.	345083
	63	pediatrics/		75734
	64		p?ediatric*.tw.	514083
	65		teen*.tw.	39736
	66		preteen*.tw.	367

	67	youth*.tw.	85151
	68	(young adj1 (person* or people or female* or male* or men or man or women or woman)).tw.	133584
	69	47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68	4241425
Sub-total	70	34 AND 46 AND 69	2547
Update		limit 70 to yr="2019 -Current"	1135

OSM Table 3 Detailed search strategies and search results for CINAHL(EBSCO) search strategy update 23.03.2023

Term Set	#	Subject Headings	Key words	Results
Sedentary exposure	1	(MH "Life Style, Sedentary+")		7138
	2	(MH "Sitting")		2467
	3		((sedentary OR stationary OR sitting) N2 (behavio#r OR behavio#rs OR lifestyle* OR time OR duration OR bout* OR activit* OR position))	7987
	4	(MH "Physical Activity")		35176
	5		(physical* N4 (inactiv* or activ*))	71940
	6	(MH "Screen Time")		184
	7		"screen time"	1203
	8		screentime	10
	9		("screen base*" N2 (activit* OR behavio#r))	91
	10	(MH "Television")		8818
	11		television	11529
	12		TV	7842
	13	(MH "Computers, Hand-Held+")		5984
	14	(MH "Computers, Portable+")		7095
	15		computer*	145488
	16		laptop*	699
	17		((digital OR electronic) N2 (game* OR product* OR device))	2598
	18	(MH "Internet+")		132798
	19		internet	58297
	20	(MH "Celluar Phone+")		5746
	21	(MH "Telephone+")		20914
	22	(MH "Smartphone")		2132
	23	(MH "Text Messaging+")		2320
	24		(phone* N1 (smart OR cell OR mobile))	4388
	25		"text messaging"	2870
	26		texting	1799
	27		SMS	1234
	28	(MH "Video Games+")		4126
	29		(gam* N1 (computer OR video))	4930
	30	(MH "Posture+")		26832
	31	(MH "Body Positions+")		31179
	32		posture*	17155
	33		((sit* OR lay* OR reclin*) N3 postur*)	766
	34		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 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33	415039
Spinal pain	35	(MH "Back Pain+")		27327
	36		backache*	6556
	37	(MH "Low Back Pain")		17777
	38		lumbago	14366
	39	(MH "Neck Pain")		5966
	40		cervicalgia	4186
	41		cervicodynia	4157
	42		"text neck"	40
	43		((back OR spin* OR thoracic OR midback OR "mid back" OR lumbar OR neck OR cervical) N3 (pain* OR ache* OR complaint* OR symptom*))	79052
	44		35 OR 36 OR 37 OR 38 OR 39 OR 40 OR 41 OR 42 OR 43	79346
	Child, Adolescent	45	(MH "Child+")	
46			child*	689916
47			boy*	33902
48			girl*	35430
49		(MH "Adolescence+")		464071
50			adolescen*	490884
51			juvenile*	12784

52	(MH "Minors (Legal)")		634
53		minor*	58626
54	(MH "Schools+")		64300
55		school*	152539
56	(MH "Students+")		119287
57		student*	201943
58	(MH "Pediatrics+")		18345
59		p#ediatric*	160184
60		teen*	15880
61		preteen*	183
62		youth*	42218
63		(young N1 (person* OR people OR female* OR male* OR men OR man OR women OR woman))	38173
64	45 OR 46 OR 47 OR 48 OR 49 OR 50 OR 51 OR 52 OR 53 OR 54 OR 55 OR 56 OR 57 OR 58 OR 59 OR 60 OR 61 OR 62 OR 63		1305190
Sub-total	65	34 AND 44 AND 64	1688
Update		Limiters - Published Date: 20190101-20230431	430

OSM Table 4 Detailed search strategies and search results for Web of Science search strategy 23.03.2023

Databases= WOS, BIOSIS, CABL, CSCD, CCC, KJD, MEDLINE, RSCI, SCIELO, ZOOPEC.

Timespan=All years.

Search language=Auto.

TOPIC: (Searches title, abstract, author keywords, and more.)

Term Set	#	Key words	Results
Sedentary exposure	1	((sedentary OR stationary OR sitting) NEAR/2 (behavio\$* OR lifestyle* OR time OR duration OR bout* OR activit* OR position))	5390872
	2	(physical* NEAR/4 (inactiv* OR activ*))	265417
	3	"screen time"	2933
	4	screen time	31
	5	("screen base*" NEAR/3 (activit* OR behav*))	268
	6	television	155749
	7	TV	75616
	8	computer*	4446172
	9	laptop*	10714
	10	((digital OR electronic) NEAR/2 (game* OR product* OR device))	81194
	11	internet	481745
	12	(phone* NEAR/1 (smart OR cell OR mobile))	72836
	13	texting	1680
	14	"text messaging"	4702
	15	SMS	20911
	16	(gam* NEAR/1 (computer OR video))	35035
	17	posture*	127225
	18	((sit* OR lay* OR reclin*) NEAR/3 postur*)	3836
		19	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 OR 18
Spinal pain	20	backache*	5029
	21	lumbago	2494
	22	cervicalgia	282
	23	cervicodynia	21
	24	"text neck"	20
	25	((back OR spin* OR thoracic OR midback OR lumbar OR neck OR cervical) NEAR/3 (pain* OR ache* OR complaint* OR symptom*))	143613
		26	20 OR 21 OR 22 OR 23 OR 24 OR 25
Child, Adolescent	27	child*	3701921
	28	boy*	273613
	29	girl*	252623
	30	adolescen*	2485143
	31	juvenile*	106681
	32	minor*	545
	33	school*	200465
	34	student*	288391
	35	p#ediatric*	252706
	36	teen*	728697
	37	preteen*	929571
	38	youth*	1080899
	39	(young NEAR/1 (person* OR people OR female* OR male* OR men OR man OR women OR woman))	1965970
		40	27 OR 28 OR 29 OR 30 OR 31 OR 32 OR 33 OR 34 OR 35 OR 36 OR 37 OR 38 OR 39 OR 40 OR 41 OR 42
Sub-total	41	19 AND 26 AND 43	4073
Update		Timespan=2019-present	288

OSM Table 5 Full list of data items extracted

Category	Felds
Study Details	Year Author Title Journal
Study Characteristics	Language Design Aim/s Country Setting
Sample Characteristics	Dataset (if applicatble) Source Age: Mean Age: SD Age: Range
Sample Size	Initial/Eligible: n= Final in analysis: n = Male: n = Female: n = Female: % Incl/excl criteria Final response rate %
Follow-up (Longitudinal studies only)	Period Attrition rate: % Attrition reason Attempted follow-up
Exposure: Sedentary Behaviour	Definition Measure Measure valid & reliable Recall period Category/Type Duration Reference Category n=
Outcome: Spinal Pain	Definition Measure Measure valid & reliable Recall period Region Sub-category Reference Category n=
Statistical analysis	Method Unadjusted/adjusted Measure (OR, RR, etc) Missing data % Estimate Lower CI Upper CI p-value
Confounders	Individual Family &/or Environment
Notes	

OSM Table 6 Modified QUIPS tool (1, 2)

Bias domains and items	Potential risk of bias
1. Study Participation <i>Does the study sample represent the population of interest on key characteristics, sufficient to limit potential selection bias due to likelihood of differences between exposure and outcome for study participants and eligible non-participants?</i> <ol style="list-style-type: none"> Adequate description of source of target population by key characteristics Adequate description of sampling frame and recruitment strategy Adequate description of recruitment period and place (setting and location) Adequate description of inclusion and exclusion criteria Adequate participation in study by eligible individuals Adequate description of baseline study sample for key characteristics 	High = >2 items unmet Moderate = 1–2 items unmet Low = 0 items unmet
2. Study Attrition <i>Is the loss to follow-up (from study sample to study population) associated with key characteristics sufficient to cause attrition bias, i.e. significant difference between completing and non-completing participants?</i> <ol style="list-style-type: none"> Adequate response rate (Yes = ≥85%, No = <84%) Description of attempts to collect information on participants who dropped out of the study Reasons for loss to follow-up are provided 	<i>Longitudinal studies only</i> High = >2 items unmet

Bias domains and items	Potential risk of bias
d. Adequate description of key characteristics of participants lost to follow-up e. No important differences exist between participants who completed and did not complete the study	Moderate = 1–2 items unmet Low = 0 items unmet
3. Exposure Measurement <i>Is sedentary behaviour adequately measured in study participants to sufficiently limit potential misclassification, recall or reporting bias?</i> a. A clear definition of sedentary behaviour is provided b. Continuous variables are reported or appropriate cut-points (i.e. not data-dependant) are used c. Valid and reliable measure of sedentary behaviour: Currently there are no valid and reliable measures for sedentary behaviour in children and adolescents.(3) There are advantages and disadvantages with both objective or subjective measures. We will consider the risk of bias associated with each. Objective measures (i.e. accelerometry, posture monitor, direct observation) may limit biases related to human error and allow for accurate measurement of sedentary duration, including often forgotten tasks such as eating or passive travel. Although sedentary behaviour type and posture are not always concurrently reported which can be problematic when trying to differentiate between standing and sitting tasks for example.(4, 5) Subjective measures (i.e. self and proxy report questionnaires, activity diaries) may suffer recall and reporting bias.(6) However they measure multiple aspects of sedentary behaviour such as duration, type and context.(5) Simultaneous engagement in multiple sedentary behaviours (i.e. using smart phone whilst watching TV) is also problematic for accurate measurement. Questionnaires which specifically ask about engagement in different types of sedentary behaviour may over-report on total sedentary time. Whilst those which ask about total sedentary time may under-report on unassuming sedentary tasks (i.e. eating, passive travel).(7) d. Adequate proportion of the study sample has complete sedentary behaviour data (Yes = ≥85%, No = <84%) e. Method and setting of sedentary behaviour measurement are the same for all study participants f. Appropriate methods are used if imputation is used for missing exposure measurement data	High = Proxy reported or self-report >7days recall or 'usual'/typical'. Or reporting inadequate to rate. Moderate = Proxy or self-report <7 days recall, or objective measure without sedentary behaviour type reported. Low = Direct observation, accelerometry/posture monitor with sedentary behaviour type reported, or activity diary (behaviours coded in pre-set time increments, <7 days recall).
4. Outcome Measurement <i>Is spinal pain is adequately measured in study participants to sufficiently limit potential misclassification, recall or reporting bias?</i> a. A clear definition of spinal pain is provided b. Valid and reliable measure of spinal pain: As pain is multi-dimensional it is complex to accurately measure all aspect and a majority of measures focus on pain intensity.(8) Self-report measures allow for the child to articulate their subjective pain experience themselves and should be used when the child is old enough to understand, this is commonly agreed at 7 years of age.(9, 10) Proxy reporting measures often under-report a child's pain and should only be used for children unable to comprehend a self-report measure or are younger than 7 years.(11) The use of a body pain diagram or mannequin is both valid and reliable to report the anatomical location of musculoskeletal pain in children over 7 years old. (12, 13) c. Method and setting of spinal pain measurement are the same for all study participants	High = Proxy reported, or self-reported <7 years of age. Or reporting inadequate to rate. Moderate = Self-report aged >7 years without body diagram. Low = Self-report aged >7 years with body pain diagram.
5. Study Confounding <i>Is potential confounding bias limited via appropriately accounting for important potential confounders, i.e. the effect of sedentary behaviour on spinal pain is unlikely to be distorted by important confounding variable/s?</i> a. All-important confounders are measured; Many confounding variables exist when assessing the relationship between sedentary behaviour and spinal pain in children and adolescents. Not all can be measured, and a level of unknown confounding will always exist. However there are two main categories of confounding we feel are important to consider in this relationship; 1. Individual factors (for example; age, sex, height, weight, BMI, level of physical activity, physical fitness, muscle strength and endurance, mental health, sleep, substance use, previous pain episode, overall health), and 2. Environmental factors (for example; family history of pain, family dynamic, SES, parental health literacy, parent/family physical activity and sedentary behaviours, ease of access to physical activities and sedentary behaviour/s, satisfaction with school furniture etc). (14-19) b. A clear definition of confounders measured are provided c. Valid and reliable measures of confounding variables are used d. Method and setting of confounding measurement are the same for all study participants e. Appropriate methods of imputation are used for missing confounder data f. Important potential confounders are accounted for in the study design (e.g., matching for key variables, stratification, or initial assembly of comparable groups) g. Important potential confounders are accounted for in the analysis (i.e., appropriate adjustment)	High = Does not adjust for any confounders. Or reporting inadequate to rate Moderate = Adjusts for confounders in 1 category only Low = Adjusts for confounders in both categories
6. Statistical Analysis and Reporting <i>Is the statistical analysis appropriate for the design of the study, limiting potential for presentation of invalid or false results, i.e. the reported results are unlikely to be false or biased related to analysis or reporting?</i> a. Sufficient presentation of data to assess the adequacy of the analysis b. Appropriate strategy for model building is used and is based on a conceptual framework or model c. The selected statistical model is adequate for the design of the study d. There is no selective reporting of results	High = >2 items unmet Moderate = 1–2 items unmet Low = 0 items unmet
Overall risk of bias	
Low	Low risk of bias in four or more of the six domains, including 5. Study Confounding.
Not Low	Studies that do not meet above 'Low' criteria.

STATA code

```
// THE RELATIONSHIP BETWEEN SEDENTARY BEHAVIOUR AND SPINAL PAIN IN CHILDREN AND ADOLESCENTS: A SYSTEMATIC REVIEW AND META-ANALYSIS
// Code for quantitative analysis of included data.
// Date 06.03.2024
// By L Montgomery
// Use metan, metafunnel and metabias commands. Help commands below.
help metan
Montgomery, et al. 2024
Does sedentary behaviour cause spinal pain in children and adolescents? A systematic review with meta-analysis
```

```

help metafunnel
help metabias
// Cut/copy data into Stata from excel data extraction form.
// Look over data to ensure correct variable names, labels, data types etc.
edit
describe

// Convert estimates and confidence intervals into log scale, calculate SE.
// odds ratios
gen logor = ln(or)
gen loglci = ln(lci)
gen loguci = ln(uci)
// calculate OR standard error for 95% CI for funnel plots
gen selogor = (loguci - loglci) / (2*invnormal(0.975))
// prevalence ratios
gen logpr = ln(pr)
gen loglci = ln(lci)
gen loguci = ln(uci)
// calculate PR standard error for 95% CI for funnel plots.
gen selogpr = (loguci - loglci) / (2*invnormal(0.975))
// risk ratios
gen logrr = ln(rr)
gen loglci = ln(lci)
gen loguci = ln(uci)
// calculate RR standard error for 95% CI for funnel plots.
gen selogrr = (loguci - loglci) / (2*invnormal(0.975))

// Check data for errors in entry of LCI or UCI higher/lower than estimate. Input error will stop metan command from running.
// odds ratios
browse if !(loglci <= logor & logor <= loguci)
// prevalence ratios
browse if !(loglci <= logpr & logpr <= loguci)
// risk ratios
browse if !(loglci <= logrr & logrr <= loguci)

// Run meta-analysis by review objective and effect estimate type
// metan // command to run meta-analysis
// logor loglci loguci, // effect size as odds ratio on logarithmic scale with lower and upper confidence intervals - change for prevalence and risk ratios
// randomi // DerSimonian and Laird random effects model, assumes the true effect size can vary between studies
// eform // exponentiate effect sizes back from logarithmic scale for forest plot and interpretation
// effect(OR) // effect size reported as odds ratio - change for prevalence and risk ratios
// boxsca(25) // size of boxes represented study weight in meta analysis (25 units)
// texts(300) // text labels maximum length (300 units)
// xsize(15) ysize(20) // size of overall forest plot (15 units wide and 20 units high)
// xlab(0.1,1,9) // specify x-axis labels and mark ticks at 0.1, 1, and 9
// force lcols(report samplesize rob)
// force columns to be included for (report samplesize rob) change as needed
// favours(Lower odds of spinal pain # Higher odds of spinal pain)
// label the x-axis - change for prevalence and risk ratios
// by() // within brackets type the variable to subgroup by i.e. rob, age, sex etc to run subgroup and sensitivity analyses
// nooverall // no overall pooled estimate when using by(), only group estimates, remove for overall pooled estimate
// add "nosubgroup" if you dont want subgroup pooled estimates

//1) Association analysis in cross-sectional studies;
// odds ratios
metan logor loglci loguci, randomi eform effect(OR) boxsca(25) texts(300) xsize(15) ysize(20) xlab(0.1,1,9) force lcols(report samplesize rob) favours(Lower odds of spinal pain # Higher odds of spinal pain) by(group) nooverall
// prevalence ratios
metan logpr loglci loguci, randomi eform effect(PRE) boxsca(25) texts(200) xsize(15) ysize(5) xlab(0.1,1,9) force lcols(report samplesize rob) favours(Lower prevalence of spinal pain # Higher prevalence of spinal pain) by(group) nooverall
//2) Risk assessment in longitudinal studies;
// odds ratios
metan logor loglci loguci, randomi eform effect(OR) boxsca(100) texts(200) xsize(10) ysize(3) xlab(0.1,1,9) force lcols(report samplesize rob) favours(Lower odds of spinal pain # Higher odds of spinal pain)
// risk ratios
metan logrr loglci loguci, randomi eform effect(RR) boxsca(100) texts(200) xsize(15) ysize(4) xlab(0.1,1,9) force lcols(report samplesize rob) favours(Lower risk of spinal pain # Higher risk of spinal pain) by(group) nooverall
// 3) Prognosis assessment in longitudinal studies
// NA

// Run tests for small study effects where there are >10 studies included in meta-analysis by review objective and effect estimate type
// odds ratios - Funnel plot
metafunnel logor selogor, eform xscale(log) xlab(0.1 0.25 0.5 1 2 4 8) xttitle("Log OR") yttitle("Standard error of Log OR")
// odds ratios - Egger's test
metabias logor selogor, egger graph subtitle (Egger's test for small study effects)

```

OSM Table 7 Modified GRADE framework (20, 21)

Criteria	Downgrade				Upgrade (22)		
	Study limitation (23)	Inconsistency (24)	Imprecision (25)	Indirectness (26)	Reporting bias (27)	Effect size	Dose-response
Description	▼ Evidence base contains <30% of all participants from studies	▼ Pooled estimate has substantial or considerable heterogeneity (I^2)	▼ 95%CI are excessively wide about the pooled effect estimate,	▼ Differences in population, exposure, or outcome thought	▼ Evidence of reporting deficiencies and publication bias	▲ Moderate to large pooled effect estimate (OR >2.5)	▲ Evidence of a well-defined pattern (linear or otherwise)

Montgomery, et al. 2024

Does sedentary behaviour cause spinal pain in children and adolescents? A systematic review with meta-analysis

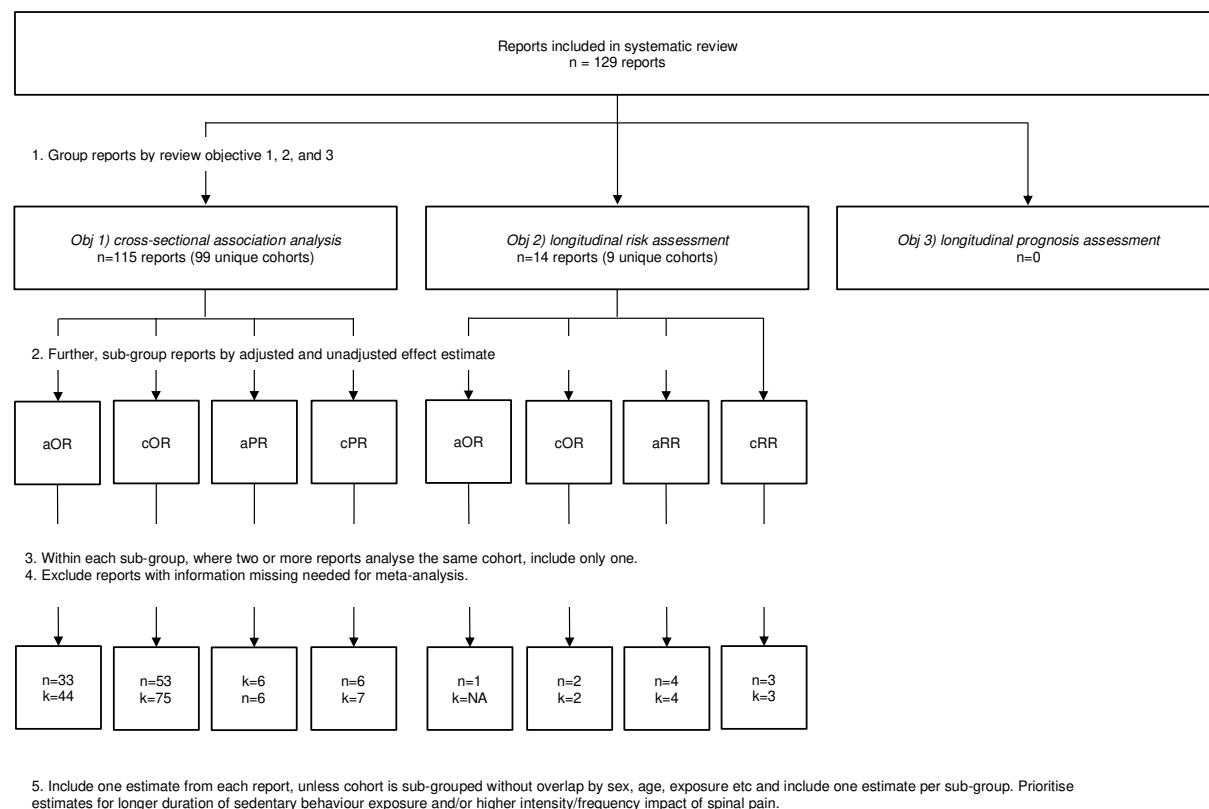
Page 7 of 13

	rated overall low risk of bias.	>50%), OR there is large variability in point estimates across studies, with estimates varying in direction and little confidence intervals.	OR evidence base contains few studies with small populations and most provide imprecise estimates.	to substantially alter pooled estimate, limiting applicability and generalisability.	from funnel plot and Egger's test if ≥ 10 studies, OR the relationship has not been repeatedly investigated (< 10 studies).	suggesting an exposure-response gradient is present
Exception	<p><i>Unless sensitivity analysis restricted to studies rated overall low RoB explains methodological heterogeneity. Then, report pooled estimate from overall low RoB studies.</i></p> <p><i>Unless subgroup analyses explain clinical heterogeneity in pooled estimate. Then, report estimates from each subgroup.</i></p>					

Levels of confidence in the certainty of the evidence

High *	We have high confidence in the estimate: the true measure of association likely lies close to that of the estimate.
Moderate	We have moderate confidence in the estimate: the true measure of association is likely close to the estimate, but possibly substantially different.
Low	We have low confidence in the estimate: the true measure of association may differ substantially from the estimate.
Very Low	We have very low confidence in the estimate: the true measure of association will likely differ substantially from the estimate.

Legend: ▼, downgrade once; ▲, upgrade once; RoB, risk of bias; *, start with High level of confidence.
 Note: The above criteria are to be used as a guide. As overlap exists between criteria, judgment on down or upgrading level of confidence was made on an overall assessment of the criteria together to reduce excessively downgrading.



Legend: n, number of reports; k, number of unique cohorts

Figure 1 Criteria for inclusion of studies effect estimate/s in meta-analyses.

OSM Table 8 Decisions to pool reports for primary meta-analyses following above criteria

Review objective	Measure	Reports included n (refs)	Reports excluded n (refs)	Reasons for report exclusion
1) Association Analysis: Cross-sectional studies	aOR	33 (28-60)	10 (61-70)	Auvinen 2007 reports on the same cohort as Auvinen 2018.(29, 61) Straker 2011 and O'Sullivan 2011 report on the same cohort as Briggs 2009.(32, 62, 63) Hakala 2010 reports on the same cohort as Hakala 2006.(39, 64) Lemes 2022 reports on the same cohort as Da Costa 2022.(34, 65) Shan 2013 reports on the same cohort as Shan 2014.(60, 66) Silva 2017 reports on the same cohort as Silva 2019.(49, 67) Deng 2014 does not report the adjusted OR.(68) Gonzalez-Galvez 2022 and Straker 2018 do not report 95%CI.(69, 70)
	aPR	6 (71-76)	2 (77, 78)	Noll 2012 reports on the same cohort as Noll 2016c.(76, 77) Noll 2017 reports on the same cohort as Noll 2016a.(75, 78)
	cOR	53 (29-31, 34, 37, 41, 42, 45, 48, 50, 55, 59, 60, 63, 67, 68, 74, 79-114)	10 (43, 49, 53, 58, 62, 66, 69, 115-117)	Gonzalez-Galvez 2022, Skoffler 2008 and Wirth 2015 do not report 95%CI.(53, 58, 69) Dianat 2018 reports on same cohort as Dianat 2017. (83, 115) Meziat Filho 2017 reports on the same cohort as Meziat Filho 2015. (96, 117) Minghelli 2016 reports on the same cohort as Minghelli 2014. (43, 97) Silva 2019 reports on the same cohort as Silva 2017. (49, 67) Shan 2013 reports on the same cohort as Shan 2014. (60, 66) O'Sullivan 2011 reports on the same cohort as Straker 2011. (62, 63) Gheysvandi 2019 reports on the same cohort as Rezapur-Shahkolai 2021. (107, 116)
	cPR	6 (71, 74, 78, 103, 104, 118)	0	-
2) Risk Assessment: Longitudinal studies	aOR	1 (119)	3 (120-122)	de Vitta 2021 include a portion of the cohort in their estimate whose exposure was standing rather than sedentary.(120) Szpalski 2002 do not report their adjusted odds ratio as the estimate was not significant.(121) Szita 2018 are unclear whether their cohort has pain at baseline or if this is adjusted for in the analysis.(122)
	aRR	4 (123-126)	1 (127)	Noll 2021 reports on the same cohort as Rosa 2022.(126, 127)
	cOR	2 (120, 128)	2 (121, 122)	Szpalski 2002 do not report their adjusted odds ratio as the estimate was not significant.(121) Szita 2018 are unclear whether their cohort has pain at baseline or if this is adjusted for in the analysis.(122)
	cRR	3 (123, 126, 129)	2 (127, 130)	Noll 2021 reports on the same cohort as Rosa 2022.(126, 127) Aartun 2015 reports on the same cohort as Aartun 2016.(123, 130)
3) Prognosis Assessment: Longitudinal studies	-	0	-	-

Legend: aOR/aPR/aRR; adjusted odds/prevalence/risk ratio, cOR/cPR/cRR; unadjusted odds/prevalence/risk ratio

Notes:

The following reports were not included in meta-analyses due to the measure of effect reported.

- Adjusted cross-sectional estimates: Belanger 2011 and Joergensen 2021 report relative risk ratios, Roman-Juan 2022 reports a β coefficient, and Wedderkopp 2003 reports p-values only.(131-134)
- Unadjusted cross-sectional estimates: Joergensen 2021 reports relative risk ratios.(132) Azabagic 2016, Burk 2002, Krisjandottir 2002 and Leininger 2017 report correlations.(135-138) There are 16 reports which report p-values and a crude odds ratio cannot be calculated. (139-154)
- Adjusted longitudinal risk estimates: Smith 2007 only provided p-values.(155)
- Unadjusted longitudinal risk estimates: Brink 2015 only provided means.(156)

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Montgomery, et al. 2024

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Page 10 of 13

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Montgomery, et al. 2024

Does sedentary behaviour cause spinal pain in children and adolescents? A systematic review with meta-analysis

Page 11 of 13

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