Supplementary appendix

Supplement to:

Physical activity and constipation: A systematic review of cohort studies

1. Full search strategy

#1 Exercises OR Physical Activity OR Activities, Physical OR Activity, Physical OR Physical Activities OR Exercise, Physical OR Exercises, Physical OR Physical Exercise OR Physical Exercises OR Acute Exercise OR Acute Exercises OR Exercise, Acute OR Exercises, Acute OR Exercise, Isometric OR Exercises, Isometric OR Isometric Exercises OR Isometric Exercise OR Exercise, Aerobic OR Aerobic Exercise OR Aerobic Exercises OR Exercises, Aerobic OR Exercise Training OR Exercise Trainings OR Training, Exercise OR Trainings, Exercise

#2 Constipation OR Dyschezia OR Colonic Inertia

Table S1. Characteristics of the 13 studies on physical activity and constipation risk

Table 1 Characteristics of the 13 studies on physical activity and constipation risk

Authors,year	Gender	Region	Subjects	Cases	Relative Risk (95%CI) for high VS low PA	Relative Risk (95%CI) for high VS moderate PA	Relative Risk (95%CI) for moderate VS low PA	Low PA defined by	Moderate PA defined by	High PA defined by	Adjustment factors (excluding)
Keiko Asakura et al 2017	female and male	Asia	5309	5309	0.60(0.40,0.90)	0.81(0.78,0.83)	0.74(0.49,1.15)	Low	Middle	High	residential area, physical activity level, preparation time for breakfast, and educational background of the mother
Gamze Yurtdas et al 2020	female and male	Asia	4561	4561	0.74(0.59,0.90)	0.96(0.95,0.99)	0.77(0.62,0.91)	Inactive	Moderately active	Active	age, gender, BMI, physical activity level(IPAQ), fiber intake(quartiles), water intake(quartiles)
Shigeyuki Naka ji et al 2002	male	Asia	1699	696	0.46(0.23,1.05)	None	None	≤4h/day	Nnoe	>4h/day	Nnoe
Migule A Sanjoaquin et al 2004	male	European	20630	4654	1.04(0.69,1.57)	0.97(0.86,1.08)	1.07(0.80,1.45)	None	1-3h/week	7or more h/week	age, diet group, BMI, fibre intake, fluid intake, vigorous exercise, employment status, smoking, alcohol intake and, for women only, menopausal status and current HRT use
	female	European	20630	15976	1.70(1.42,2.03)	1.48(1.37,1.60)	1.15(1.04,1.27)	None	1-3h/week	7or more h/week	age, diet group, BMI fibre intake, fluid intake, vigorous e-

Author	Sex	Region	Total	Cases	Q1 OR(95%CI)	Q2 OR(95%CI)	Q3 OR(95%CI)	Q1 level	Q2 level	Q3 level	Adjustment
											xercise, employment status, smoking, alcohol intake and, for women only, menopausal status and current H-RT use
Lisa M Driessen et al 2013	female and male	European	347	347	0.37(0.15,0.92)	0.84(0.79,0.88)	0.44(0.19,1.04)	Total activity% <12	Total activity%12-17	Total activity% ≥17	attendance of childcare and birth weight z score. Additional adjustment for other covariates did to change the effect estimates with ≥ 10%
Ling Huang et al 2017	female	Asia	1568	77	0.61(0.37,0.98)	None	None	≤2 days/ week		≥3 days /week	Nnoe
Parinaz Moezi et al 2018	female and male	Asia	9264	752	0.56(0.46,0.68)	0.76(0.74,0.76)	0.74(0.62,0.89)	Low	Medium	High	Nnoe
Wendy J. Brown et al 2000	female	Oceania	13609	13609	0.72(0.63,0.83)	0.81(0.79,0.83)	0.89(0.80,1.00)	PA score <5	PA score 5- <15	PA score≥ 25	adjusting for smoking status, alcohol consumption, number of diets in last year, body mass index, lowiron, menopausal status, type of contraception or hormonereplacement therapy, stress level, education, and area of residence.
Rong Huang et al 2014	female and male	Asia	32371	5052	0.79(0.74,0.86)	None	None	<1hour/ day		≥1hour/ day	adjusting for sex, age, perceived family affluence, fruit and vegetable intake, and depression and anxiety symptoms

JAMES E Everhart et al 1989	male	North America	14407	4411	0.32(0.14,0.77)	0.56(0.26,1.19)	None	Least	Intermediate	Most	age
	female	North America	14407	6793	0.29(0.20,0.42)	0.56(0.40,0.77)	None	Least	Intermediate	Most	age
Patrick B. Wilson 2020	female and male	North America	9963	771	0.87(0.68,1.12)	0.98(0.74,1.30)	None	Low	Moderate	High	age, gender, education,race/ethnicity, relationship status, perceived health status, BMI, dietary fiber, dietary moisture
Bodil Ohlsson et al 2016	female and male	European	16840	516	0.298(0.153,0.580)	0.552(0.441,0.689)	0.540(0.347,0.842)	Mostly sitting	Activity 30-60min/day	Strenuous activity 60 min/ day	basal characteristics
Mari A. Kuutti et al 2023	female	European	1098	189	1.00(0.95,1.04)	0.97(0.68,1.38)	1.03(0.69,1.54)	No exercise	Regular PA	Current PA (MET-h/d)	None

CI - confidence interval   % - percent

Table S2. Quality of studies according to Newcastle-Ottawa Scale

Table 2 Quality of studies according to Newcastle-Ottawa Scale

First author, Year, country	Selection (Max, score 4)	Comparability (Max, score 2)	Exposure (case-control) or outcome (cohort) (max, score 3)
Keiko Asakura et al 2017	3	1	2
Gamze Yurtdas et al 2020	3	2	2
Shigeyuki Nakaji et al 2002	2	1	2
Migule A Sanjoaquin et al 2004	3	2	2
Lisa M Driessen et al 2013	2	1	2
Ling Huang et al 2017	4	1	1
Parinaz Moezi et al 2018	3	1	1
Wendy J. Brown et al 2000	2	2	2
Rong Huang et al 2014	4	1	2
JAMES E Everhart et al 1989	2	1	2
Patrick B. Wilson 2020	3	2	2
Bodil Ohlsson 2016	4	2	3
Mari A. Kuutti et al 2023	4	1	2

4. Figures
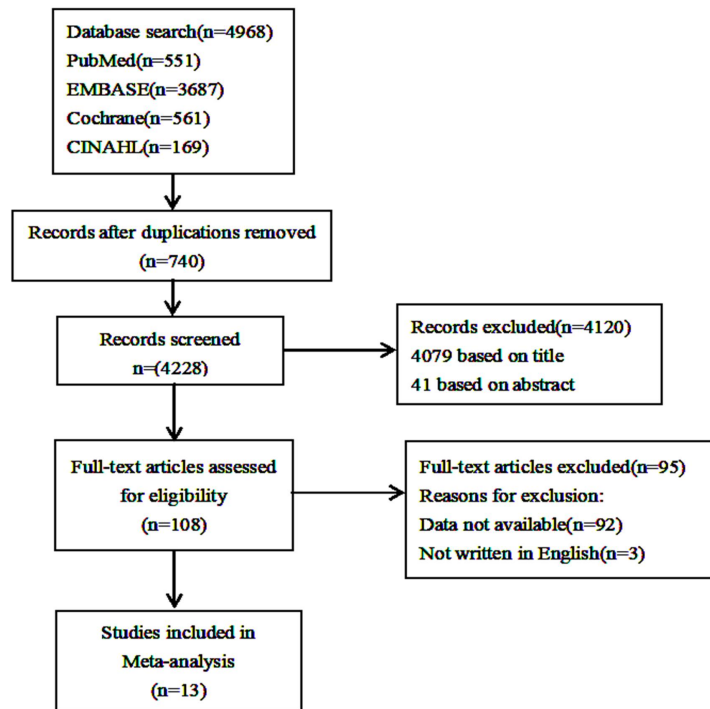
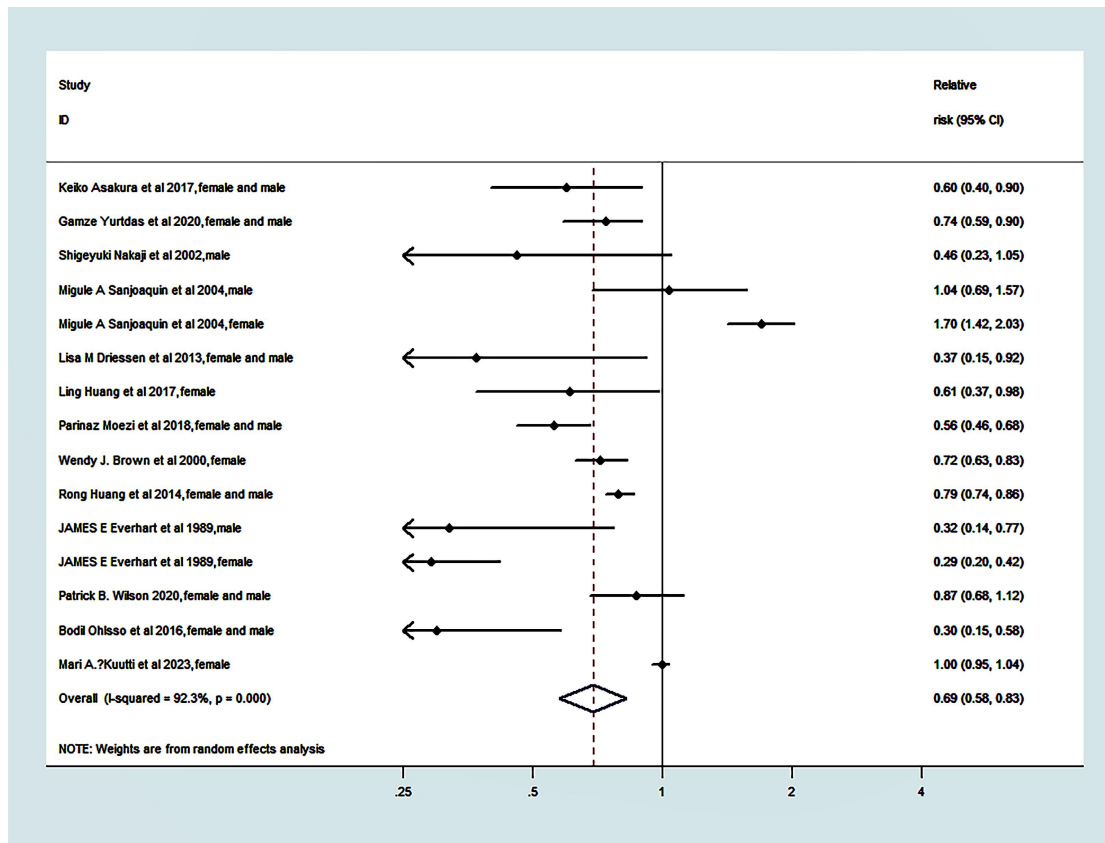**Figure S1.** PRISMA fow diagram of identifcation and selection of eligible studies

Study		Relative
ID		risk (95% CI)
Keiko Asakura et al 2017,female and male		0.60 (0.40, 0.90)
Gamze Yurtdas et al 2020,female and male		0.74 (0.59, 0.90)
Shigeyuki Nakaji et al 2002,male		0.46 (0.23, 1.05)
Migule A Sanjoaquin et al 2004,male		1.04 (0.69, 1.57)
Migule A Sanjoaquin et al 2004,female		1.70 (1.42, 2.03)
Lisa M Driessen et al 2013,female and male		0.37 (0.15, 0.92)
Ling Huang et al 2017,female		0.61 (0.37, 0.98)
Parinaz Moezi et al 2018,female and male		0.56 (0.46, 0.68)
Wendy J. Brown et al 2000,female		0.72 (0.63, 0.83)
Rong Huang et al 2014,female and male		0.79 (0.74, 0.86)
JAMES E Everhart et al 1989,male		0.32 (0.14, 0.77)
JAMES E Everhart et al 1989,female		0.29 (0.20, 0.42)
Patrick B. Wilson 2020,female and male		0.87 (0.68, 1.12)
Bodil Ohlsso et al 2016,female and male		0.30 (0.15, 0.58)
Mari A.?Kuutti et al 2023,female		1.00 (0.95, 1.04)
Overall (I-squared = 92.3%, p = 0.000)		0.69 (0.58, 0.83)

NOTE: Weights are from random effects analysis

Figure S2. Forest plot of a random efects meta-analysis including 15 risk estimates of constipation for a high versus low level of PA
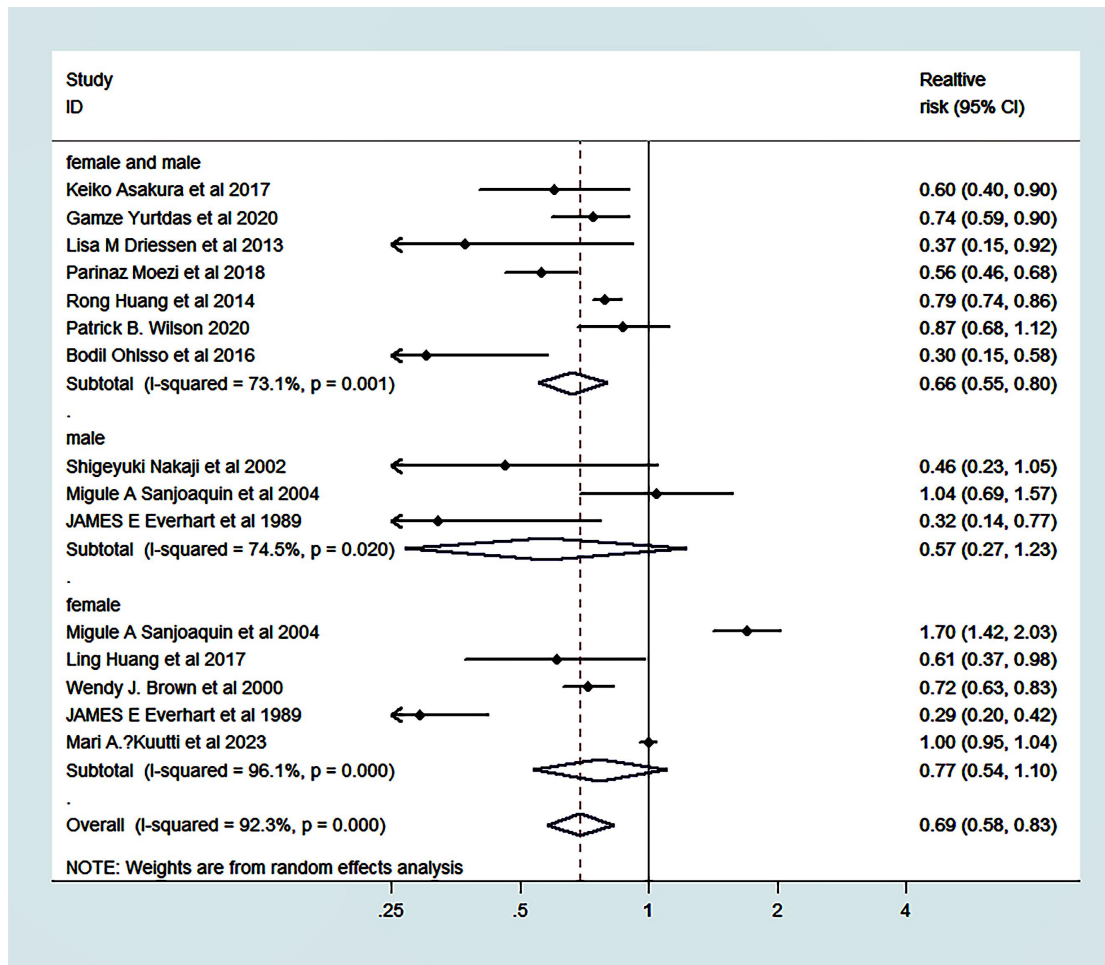
Figure S3. Forest plot of a random efects meta-analysis including 15 risk estimates of constipation for a high versus low level of PA, grouped by gender
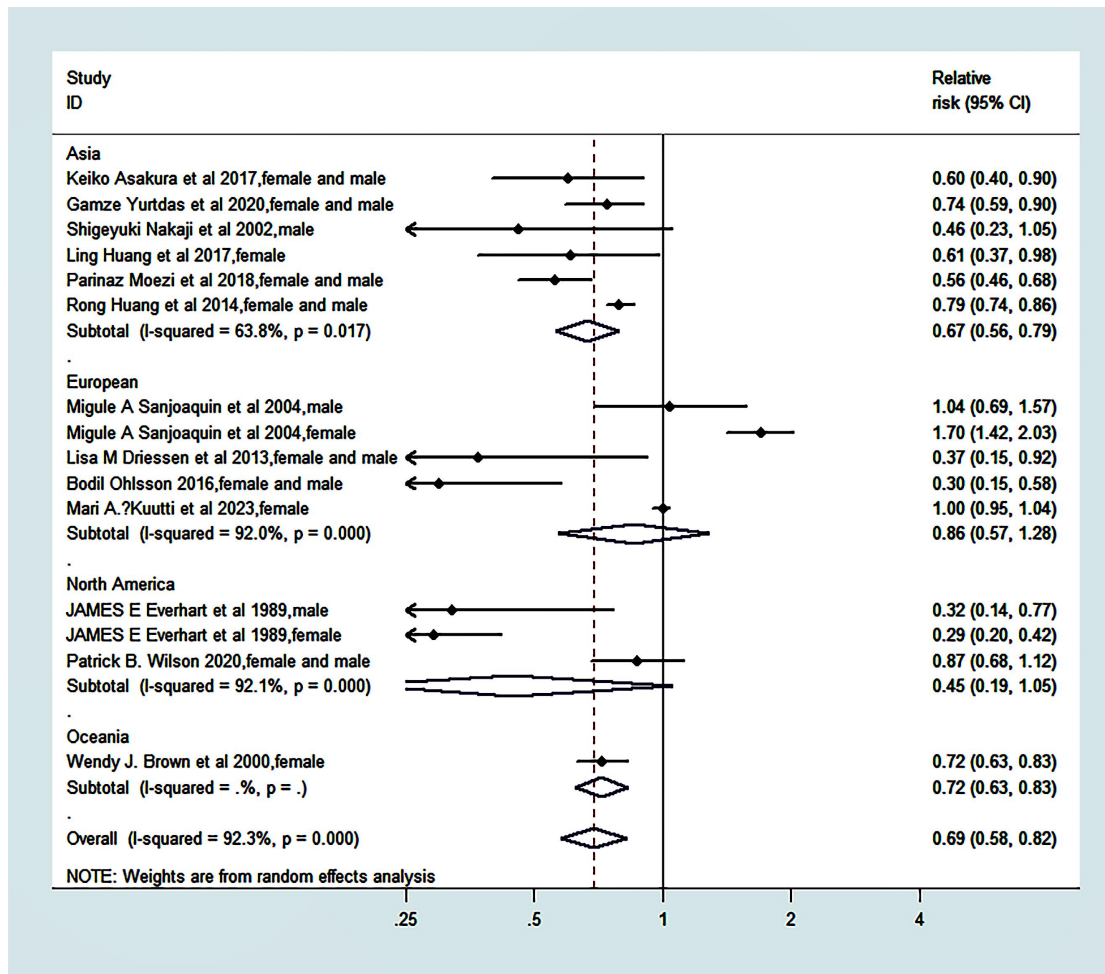
Figure S4. Forest plot of a random efects meta-analysis including 15 risk estimates of constipation for a high versus low level of PA, grouped by region
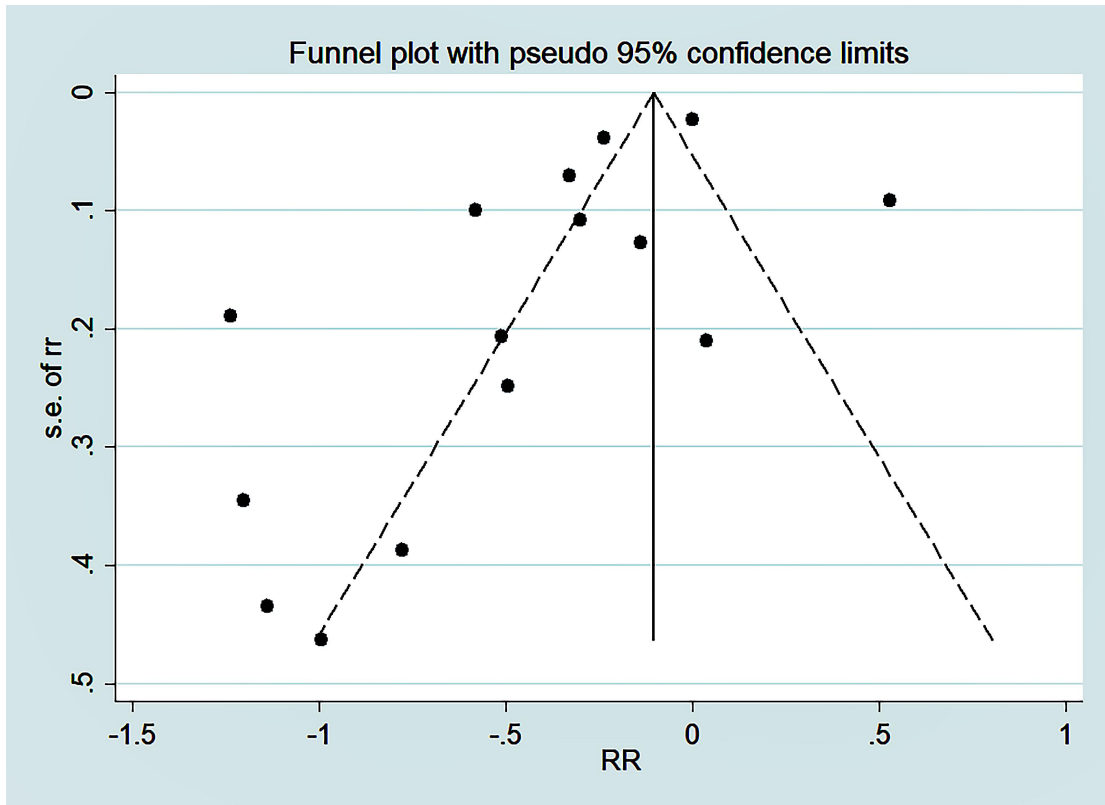
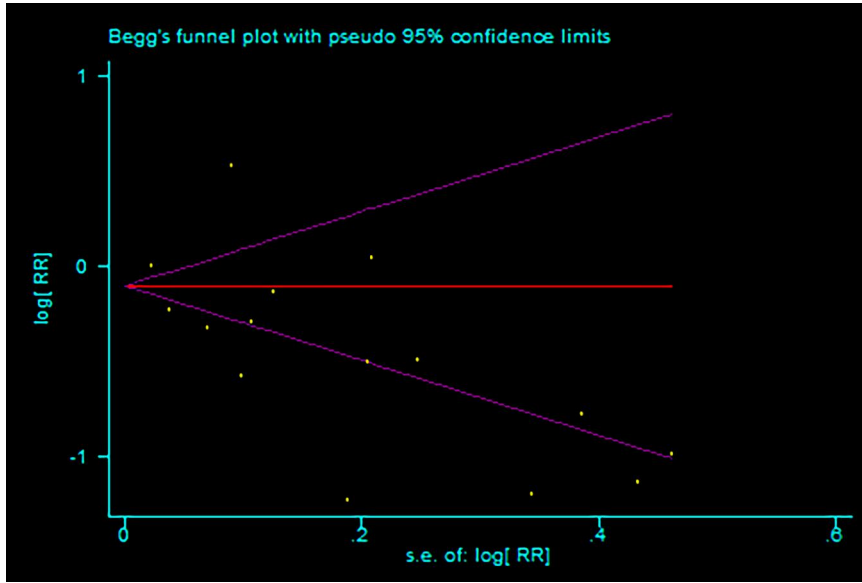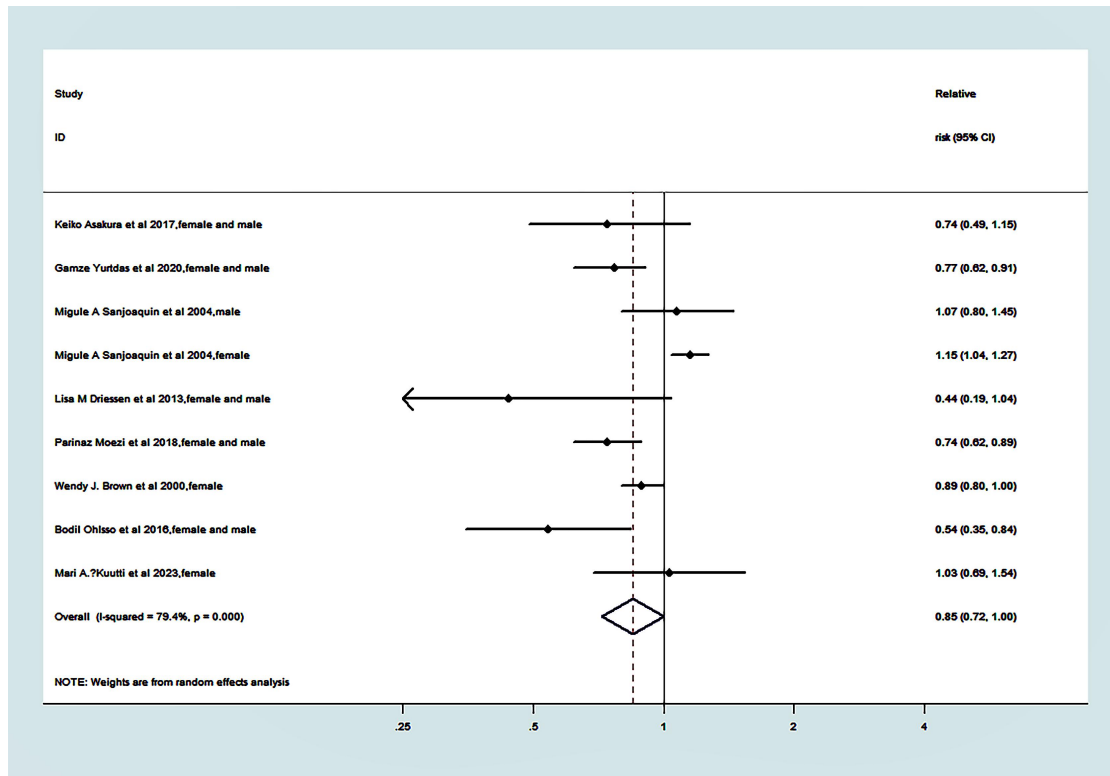**Figure S5.** Standardized Funnel plot corresponding to the main random-efects meta-analysis

Figure S6. Standardized Begg's rank correlation test corresponding to the main random-efects meta-analysis
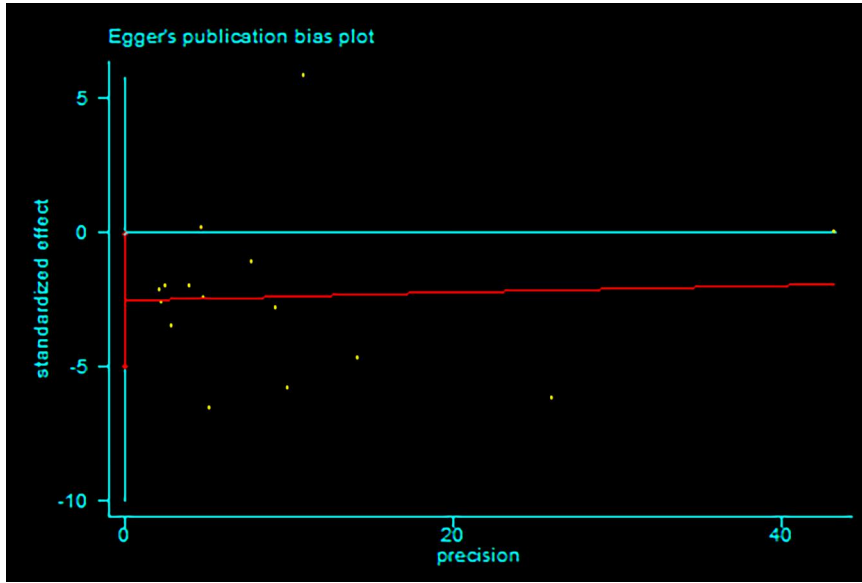
Figure S7. Standardised Egger's regression test corresponding to the main random-efects meta-analysis

Figure S8. Forest plot of a random efects meta-analysis including 9 risk estimates of constipation
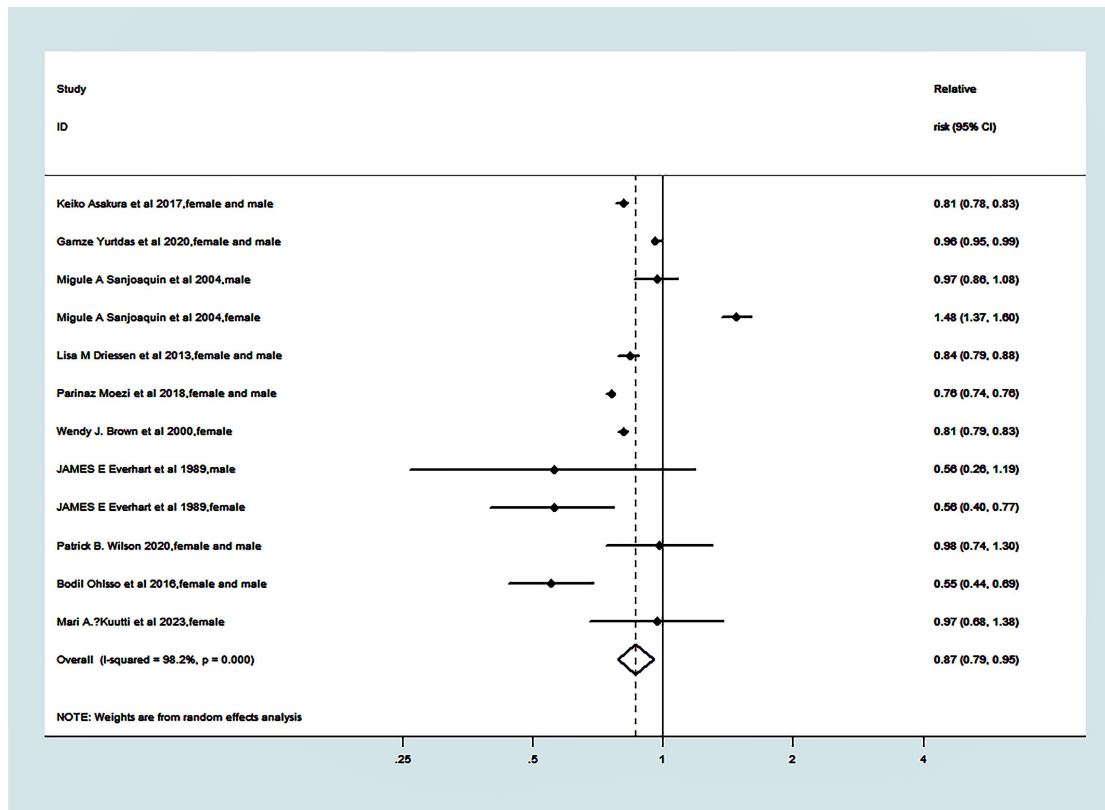
for a moderate versus low level of PA

Figure S9. Forest plot of a random efects meta-analysis including 12 risk estimates of constipation for a high versus moderate level of PA

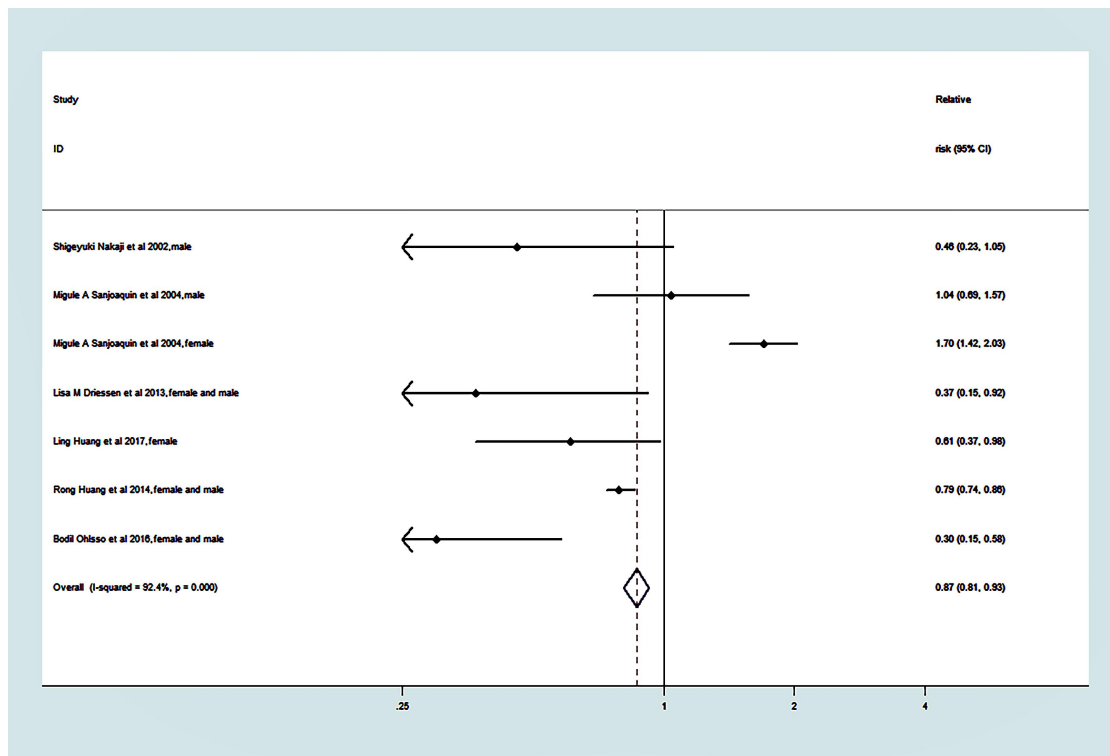**Figure S10.** Forest plot of a random efects meta-analysis including 7 risk estimates of constipation for PA guidelines