

**Table B.1.i. Sleep outcomes: Association between physical activity and sleep outcomes among adults**

[See the Supplementary materials](#) for description of evidence of US PAGAC by outcome

Systematic review evidence	No. of studies/ Study design	Quality Assessment					Description of evidence Summary of findings	Certainty
		Risk of bias	Inconsistency	Indirectness†	Imprecision	Other		
Kovacevic 2018 (36) Moderate	10 RCTS N=NR	Serious risk of bias	Serious inconsistency	Serious indirectness	No serious imprecision	None	<p>Studies evaluated the effects of <b>resistance training</b> vs. no intervention or other exercise intervention on sleep outcomes. Seven studies compared resistance training with a non-exercise control group and 3 studies compared the effects of aerobic exercise plus resistance training vs. aerobic exercise alone. Variability in study populations included those with mental health symptoms or diagnoses, older adults, nursing home residents, and adults with co-morbid health conditions (fibromyalgia, heart failure and sleep apnoea, breast cancer), mean age was 58 years.</p> <p>1/3 studies found a significant effect of resistance training vs. no exercise on subjective measures of <b>sleep quantity</b>; 5/7 studies reported significant improvement in subjective measures of <b>sleep quality</b>. In studies comparing aerobic exercise plus resistance training vs. aerobic exercise alone, 1/1 study found no effect on <b>sleep quantity</b>. 2/2 studies found no effect on objective measures of <b>sleep quality</b> whereas 1/1 study found a significant effect on subjective measures of sleep quality.</p>	LOW <sup>a</sup>
Perez-Lopez 2017 (55) Moderate	3 RCTs N=469	No serious risk of bias	Serious inconsistency	Serious indirectness	Serious imprecision	None	<p>Studies evaluated the effects of <b>exercise interventions that were at least 6 weeks in duration</b> vs. no exercise control groups reporting symptoms of insomnia among middle-aged and older women.</p> <p>Exercise interventions were associated with reduced <b>symptoms of insomnia</b> vs. no exercise control groups among women (SMD = -0.52 [95% CI, -1.02 to -0.02], 3 RCTs).</p>	LOW <sup>b</sup>
Robbins 2019 (58) Low	5 pre-post studies N=NR	Serious risk of bias	No serious inconsistency	Serious indirectness	No serious imprecision	None	<p>Studies evaluated the effects of <b>any workplace intervention</b>, including PA or yoga, on measures of sleep. 1/5 studies found a significant improvement in self-reported <b>sleep quality</b> following a yoga intervention; no studies reported significant improvement in self-reported <b>sleep quantity</b> following the intervention.</p>	VERY LOW <sup>c</sup>

Stutz 2019 (68) Moderate	23 crossover studies  N=275	Serious risk of bias	Serious inconsistency	Serious indirectness	Serious imprecision	None	<p>Studies evaluated the effects of <b>one single session of exercise close to usual bedtime</b> (less than 4 hours before usual bedtime) on various measures of sleep. All studies enrolled healthy or good sleepers, except one study that enrolled adults with self-reported sleep difficulties. Adults included sedentary individuals as well as trained athletes. Most interventions were cycling or running, with an average duration of 87 minutes.</p> <p>Compared with no-exercise, one session of PA ending 12 minutes to 4 hours before bedtime significantly increased <b>REM latency and slow-wave sleep, and decreased stage 1 sleep. No effects were found for SOL, TST, SE, WASO, stage 2, 3, and 4 sleep, REM sleep, or subjective sleep quality.</b></p>	VERY LOW <sup>d</sup>
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Abbreviations: CI = confidence interval; NR = not reported PA = physical activity; RCT = randomized controlled trial; REM = rapid eye movement; SE = sleep efficiency; SMD = standardized mean difference; SOL = sleep onset latency; TST = total sleep time; WASO = wake after sleep onset

<sup>†</sup> Serious indirectness indicates measurement of intermediate/indirect outcomes or heterogeneity in exposures and comparisons assessed; certainty of evidence was not always downgraded for indirectness if it was not judged to impact the certainty in the findings for the outcome evaluated in the review

<sup>a</sup> Certainty of evidence downgraded given serious risk of bias, serious inconsistency of effects (direction and significance of effects highly variable), and serious indirectness in measures, interventions, and variability in populations

<sup>b</sup> Certainty of evidence downgraded given serious inconsistency ( $I^2=81\%$ ), serious indirectness in outcome measure, and imprecision in estimate of effect

<sup>c</sup> Certainty of evidence downgraded given serious risk of bias and serious indirectness in measures of sleep as well as interventions

<sup>d</sup> Certainty of evidence downgraded given serious risk of bias, serious inconsistency within and between studies in measures of sleep, serious indirectness in measures of sleep as well as interventions, and serious imprecision in estimates of effects