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COMMENTARY

From bit player to key mechanism: the role of sleep in exercise

Commentary on Baron KG, Reid KJ, Zee PC. Exercise to improve sleep in insomnia: exploration of the bidirectional effects. *J Clin Sleep Med.* 2013;9(8):819–824. doi:10.5664/jcsm.2930

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The physical activity (PA)/sleep relationship has been extensively studied, but questions remain regarding directionality. Although greater sustained exercise is linked with better sleep in healthy adults[1] and older adults with insomnia,[2] findings regarding acute daily sleep/PA associations are mixed.[3,4] Researchers traditionally focused on PA's effect on sleep, but some, including Baron, Reid, and Zee,[5] also examined sleep's effect on next day PA.[4]

Baron et al's secondary analysis examined the effects of a 16-week sleep hygiene intervention with/without exercise on daily and average bidirectional associations between exercise and self-reported sleep in older women with insomnia (mean age = 61.4, standard deviation = 4.4 years). Given high night-to-night insomnia variability,[6] this investigation of daily associations and, importantly, their directionality (sleep→next day exercise/exercise→prior night's sleep) was novel and among the first to show that sleep impacts next day exercise, not vice versa.

While sleep's relationship with exercise and other variables has long been characterized as reciprocal, sleep was generally considered a "bit player" worthy of study as a dependent variable or secondary symptom but not a "key" mechanistic player. Decades of research suggesting sleep has greater influence on other behaviors/conditions than the reverse changed the conceptualization of sleep, resulting in calls for research examining it as an important pathophysiological mechanism.

A strength of Baron et al's study is its consideration of individual characteristics. Exercise interventions were titrated to equate PA levels across participants. Examination of women is important as more older women (relative to men) have insomnia,[7] and receive less sleep benefit from acute exercise.[1] As circulating estrogen and progesterone affect sleep and exercise,[8] future work should examine menopausal and/or hormonal impact. Further, the sample's short sleep duration and primary insomnia raise concerns about generalizability to other insomnia phenotypes. Additionally, given evidence showing racial/ethnic disparities in the PA/sleep relationship,[9] acute association patterns among different racial/ethnic groups should be examined. Although the authors note that the small sample size limited power, examination of 120 daily exercise/sleep observations for each of the 11 participants mitigates these concerns. Interpretation of study findings is limited by the absence of detailed multilevel model results, leaving readers to wonder if nonsignificant findings were "stunningly null" or revealed important trends. Effect size and clinical significance are lingering questions. For instance, for every 30-minute increase in sleep latency above a participant's own average, next day exercise duration increased by one-minute, but qualification/quantification of this finding's clinical significance was lacking.

This article's influence is evidenced by 120 citations (to date). Later work[10] shows greater morning exercise is associated with better sleep, suggesting sleep mechanisms underlie greater propensity for morning exercise. Similar sleep/PA daily associations are found in adults with chronic pain[11] and in younger adults.[12] As Baron et al[5] discuss, their findings promote sleep as a mechanism underlying behaviors beyond exercise. This is consistent with recent work showing that improved sleep through behavioral therapy (cognitive behavioral therapy for insomnia) positively affects behavioral[13] (pain) and neural[14] (central sensitization) chronic pain mechanisms.

Baron et al is a significant seminal work that shed early light on the importance of studying daily bidirectional associations for revealing sleep as a "key" mechanistic player in exercise and other behaviors.

CITATION

McCrae CS, Curtis AF. From bit player to key mechanism: the role of sleep in exercise. *J Clin Sleep Med*. 2020;16(suppl_1):19S–20S.

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DISCLOSURE STATEMENT

The authors have seen and approved this manuscript. Work for this commentary was performed at the University of Missouri. The authors report no conflicts of interest.