**1. The rationale for conducting the meta-analysis**

Exercise is a nonpharmacological therapy for insomnia, is readily available, and costs less than other nonpharmacological treatments for insomnia; notably, its effects depend upon exercise type and evaluation methodology (Youngstedt, O'Connor & Dishman, 1997; Driver & Taylor, 2000; Youngstedt, 2005). Recent randomized controlled trials (RCTs) have confirmed that exercise can improve sleep quality, sleep onset latency, total sleep time, sleep efficiency, and insomnia severity (Passos et al., 2010; Reid et al., 2010; Hartescu, Morgan & Stevinson, 2015). The beneficial effect of exercise on sleep may be explained by the interaction between the circadian rhythm and metabolic, immune, thermoregulatory, vascular, mood, and endocrine effects (Chennaoui et al., 2015).

The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and the third edition of the International Classification of Sleep Disorders (ICSD-3) made major revisions to their definitions of insomnia. The DSM-5 and ICSD-3 abolished the distinction between primary and secondary insomnia. The revision was based on the findings that insomnia: 1) often accompanies another disease; 2) is preceded by a comorbid condition; 3) persists even after effective treatment for the comorbid condition; and 4) exacerbates the symptoms of the comorbid condition (Riemann et al., 2015). Previous systematic reviews and/or meta-analyses investigated the effects of exercise on sleep on people with sleep complaints or chronic insomnia, undefined populations, and patients with sleep problems (Kubitz et al., 1996; Youngstedt, O'Connor & Dishman, 1997; Montgomery & Dennis, 2002; Montgomery & Dennis, 2004; Passos et al., 2012; Yang et al., 2012; Kredlow et al., 2015). A previous review also examined the effects of exercise on sleep for specific subpopulations (e.g., cancer survivors) (Mercier, Savard & Bernard, 2017). However, no previous systematic reviews have examined the effect of exercise on patients with primary and secondary insomnia as defined by having both sleep disruption and daytime impairment. Investigating the effect of exercise on patients with primary and secondary insomnia would be beneficial in clinical practice since the DSM-5 and ICSD-3 abolished the distinction between primary and secondary insomnia.

This review aimed to examine the efficacy of exercise among patients with insomnia.

**2. The contribution that the meta-analysis makes to knowledge in light of previously published related reports, including other meta-analyses and systematic reviews.**

We first performed a systematic review and meta-analysis of the effects of exercise on sleep in patients with insomnia (diagnosed by criteria or screened by questionnaires). Our findings suggest that the effects of exercise on sleep were larger in patients with insomnia than in other populations and should be an effective nonpharmacological intervention. Exercise interventions may alleviate symptoms in patients with insomnia without use of hypnotics. The American Academy of Sleep Medicine report does not include exercise as a viable recommendation for treating insomnia (Morgenthaler et al., 2006). Our findings suggest that future clinical practice guidelines should include exercise as recommendation for treating patients with insomnia.

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