

睡前认知觉醒的相关因素及干预研究进展

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【摘要】 睡前认知觉醒是失眠维持的关键因素,反刍、担忧等侵入性思维是睡前认知觉醒的主要形式,在元认知、睡眠信念、压力与应激等因素的影响下,睡前认知觉醒产生并对睡眠产生影响。经典的失眠认知行为疗法和放松训练对睡前认知觉醒的作用有限,在此基础上结合正念疗法对降低睡前认知觉醒有更大优势。文章从失眠与睡前认知觉醒的关系为出发点,对睡前认知觉醒的影响因素、干预方式的研究进行综述。

【关键词】 睡眠; 失眠; 睡前认知觉醒; 失眠的认知行为疗法; 正念; 综述

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【Abstract】 Pre-sleep cognitive arousal is a key factor in maintaining insomnia. Intrusive thoughts such as rumination and worry are the main forms of pre-sleep cognitive arousal, which are generated and maintained by the interaction of metacognition, sleep beliefs, stress and strain and further influence insomnia. Classical cognitive-behavioral therapy for insomnia and relaxation training have limited effect on pre-sleep cognitive arousal, based on which augmentation programs incorporating mindfulness have more advantages in reducing pre-sleep cognitive arousal. This study reviews the factors influencing pre-sleep cognitive arousal and intervention programs based on the relationship between insomnia and pre-sleep cognitive arousal.

【Key words】 Sleep; Insomnia; Pre-sleep cognitive arousal; Cognitive behaviour treatment for insomnia; Mindfulness; Review

睡眠是人类的基本需求之一,在维持生理和心理健康中发挥着重要作用,是焦虑、抑郁等心理疾病的重要预测因素之一^[1-2]。在国际睡眠障碍分类第3版中,失眠的定义为“个体在充足的睡眠机会和良好的睡眠环境下仍持续出现入睡困难、睡眠时间减少、睡眠中断或睡眠质量下降等症状,并引起相关的日间功能损害”^[3]。Borkovec等^[4]认为失眠是指无法在睡前消除侵入性的、充满情感的想法和图像的结果,即失眠是由入睡之前的过度兴奋和警觉所导致的,睡眠的开始必然需要觉醒度的下调,所以觉醒被认为是失眠维持的关键机制^[5-6]。相关报道显示,西方国家睡眠质量问题在一般人群中的发生率为23%~56%^[7],国内一项纳入了17项流行病学研究的Meta分析显示,睡眠障碍在人群中的检出率约为15.0%^[8],原因可能为随着工作、生活的压力越来越大,个体需要处理更多的认知和躯体任务,导致夜间过度觉醒。现对失眠与睡前觉醒之间关系

的研究进展进行综述,以提高失眠门诊医生对失眠成因的认识,为失眠患者的干预与治疗提供参考。

一、失眠与睡前认知觉醒的关系

失眠是一种过度觉醒障碍,从不同角度可将觉醒划分为多个类别,如从特质-状态的角度可分为特质觉醒倾向和特定觉醒状态^[9],从形式上可分为认知觉醒和躯体觉醒,从持续时长又可进一步区分为一般觉醒和睡前觉醒^[10]。目前,睡眠医学领域的研究多围绕睡前认知觉醒状态开展。广义的认知觉醒指由思维、知觉、注意、信念、归因和预期等过程引起的认知持续性激活,而睡前认知觉醒特指夜间入睡之前的认知激活,可表现为有关睡眠的担忧、过度警觉、反刍等^[11],与之对应的睡前躯体觉醒则指夜间入睡之前的躯体激活,如心跳加快、肌肉紧张、呼吸急促等。睡前认知觉醒是一般认知觉醒的一种特殊形式,在该状态下,个体的思维、注意、信

念等过程往往与睡眠密切相关。一项研究表明,原发性失眠症患者表现出更多的睡前认知觉醒和一般认知觉醒^[12]。进一步分析显示,与睡眠相关的认知觉醒水平的提高与睡眠质量存在相关性,然而当考虑到睡眠相关认知觉醒时,一般认知觉醒与睡眠的相关性并不显著。

此外,有研究认为特质觉醒和睡眠前高觉醒状态的叠加效应共同促使了失眠的发生和维持^[13],觉醒的特质倾向可能通过睡眠相关元认知活动影响睡眠前觉醒状态^[14]。与睡眠良好的人相比,失眠患者表现出更多的睡前认知觉醒和睡前躯体觉醒^[15],较多的人睡后自发醒来且夜间睡眠连续性较差。虽然有研究认为夜间的躯体过度兴奋与睡眠效率和质量降低有关^[16],但相关研究结果显示失眠与睡眠前认知觉醒存在相关性,而与睡眠前躯体觉醒的相关性并不显著^[17],如在慢性疼痛共病失眠的患者中控制疼痛强度、抑郁症、不宁腿综合征后,在睡前认知觉醒的影响下睡前躯体觉醒对失眠的影响不再显著^[18],可以推测对于失眠患者而言睡前认知觉醒更为重要。高水平的睡前认知觉醒会影响睡眠的各方面,如导致睡眠潜伏期延长、睡眠效率降低和总睡眠时间缩短^[19]。研究显示,与睡前认知觉醒程度低的受试者相比,认知觉醒程度高的受试者入睡时间长 37 min,进入持续睡眠的时间长 45 min^[17]。用于控制睡前认知觉醒的策略可能会加剧失眠症状,治疗后残留的认知觉醒与失眠症状之间的高度相关提示睡前认知觉醒与失眠治疗反应不佳相关^[20],这可能是严重或难治性失眠的关键治疗靶点^[15]。

睡前认知觉醒有不同的分类,有研究者认为有必要区分焦虑和非焦虑性的认知觉醒^[21]。非焦虑性睡前认知觉醒不伴随负面情绪,而焦虑性睡前认知觉醒则以反刍和担忧为主,并伴随一系列负面情绪。虽然两种睡前认知觉醒都与睡眠潜伏期增加有关,但焦虑性睡前认知觉醒者报告了更长的睡眠潜伏期和更低的主观睡眠质量^[22-23],但也有研究报道两种类型的睡前认知觉醒之间并不存在睡眠潜伏期的差异,可能的原因是不同试验激起的觉醒水平不一致^[22]。反刍和担忧是焦虑性睡前认知觉醒的代表形式,处于此状态下的个体将注意力集中于负面信息,使大脑处于高水平的觉醒中,负面侵入性想法增多,睡眠潜伏期随之增加。目前有关焦虑性睡前认知觉醒和非焦虑性睡前认知觉醒的研究较少,但研究结论较为一致,即焦虑性睡前认知觉醒会导致更严重的失眠。

二、睡前认知觉醒的影响因素

1. 睡眠相关元认知与睡眠信念: 认知通常分为认知过程以及元认知过程,在睡眠医学领域将其分为睡眠认知过程和睡眠相关元认知过程。睡眠相关元认知是一个多层面的概念,包括对睡眠过程的解释、控制以及对睡眠相关认知过程的监控和评价。既往研究表明失眠相关元认知过程与睡前认知觉醒相关,如长期失眠患者的睡前认知觉醒由失眠相关元认知和特质高觉醒共同决定^[14],即睡眠相关的元认知过程可能与特质性觉醒相互作用,进而调节睡前认知觉醒状态,这一关系已在大学生样本中得到验证^[13]。

此外,与健康者相比,失眠患者有更多关于睡眠的功能失调信念。相关研究表明,失眠及功能失调信念是睡前认知觉醒和慢性失眠的预测因子^[24]。失眠的认知模型显示,当个体检测到睡眠威胁或睡眠缺失,会激发有关睡眠的消极认知和错误信念,如产生担忧等负面睡眠认知活动,进而导致睡前认知觉醒^[25]。功能失调的睡眠信念和睡前认知觉醒之间还存在复杂的相互作用,具体而言,关于睡眠的不良信念使睡前认知觉醒持续存在,反过来又进一步强化以功能失调的信念为代表的负面认知内容对情绪的影响,从而加剧失眠^[15]。同时,难以入睡还与对消极认知内容的选择性注意有关^[26],这意味着睡前认知觉醒水平的升高,进一步加剧适应不良的睡眠信念。不良睡眠信念普遍存在于高特质觉醒者中,这种不良信念也可能在睡前认知觉醒水平升高时加剧^[21]。

简言之,睡前认知觉醒作为认知觉醒的特殊形式,其不仅是一般认知觉醒的延续,还与认知过程和元认知过程密不可分。在 Ong 等^[27]的元认知模型中,被分别称为“初级觉醒”和“二级觉醒”。

2. 压力、应激与疼痛: 相关研究表明,失眠患者在应对压力挑战时的睡前认知觉醒水平有所升高^[9],并且以反刍为代表的睡前认知觉醒已被证明在对压力与睡眠质量不佳间的关系有影响^[28]。应激在睡前认知觉醒的发展中也扮演着重要角色,依据睡眠干扰过程理论,压力性应激事件导致患者情绪过度唤醒,使得睡前认知觉醒水平升高,使正常的睡眠过程受到干扰^[29]。有研究表明,睡前认知觉醒介导了青少年应激与睡眠质量之间的关系^[30],其潜在机制可能是应激导致的睡前认知觉醒延长了睡眠潜伏期,从而使整体睡眠质量有所降低。

疼痛同样会导致躯体反应和情绪压力的增加,尽管疼痛与失眠并没有独立的联系,但可能会间接地

激发睡前认知觉醒,因为感知和评估疼痛感觉的认知过程与失眠症患者评估睡眠的认知过程相似^[18]。生理亢奋假说认为较差的睡眠质量与自主神经指标升高密切相关^[31],自主神经系统激活导致情绪唤起得到增强,对情绪刺激更敏感。对慢性疼痛患者的研究结果显示,睡前认知觉醒在疼痛与失眠的关系中有重要作用^[32],可能的解释是受疼痛影响,自主神经系统激活导致个体的认知活动更强烈^[22]。此外,患者对疼痛的灾难性想法可能更突出,因此有更高的睡前认知觉醒,更有可能扰乱睡眠。因此,旨在减轻压力和管理情绪需求的干预措施较单纯减少认知需求的方式而言,更有可能减少睡前认知觉醒。

可以推测睡前认知觉醒是认知、情绪、躯体等多方面因素相互作用的结果,在失眠的维持与发展中起重要作用。所以,减少睡前认知觉醒可能是改善睡眠质量的重要机制,基于此,以睡前认知觉醒为治疗目标的干预措施有所发展。

三、睡前认知觉醒的干预

1. 失眠认知行为疗法(cognitive-behavioral therapy for insomnia, CBTI): CBTI是非药物治疗失眠的首选方案^[33],包括认知疗法、行为干预和睡眠卫生教育的内容。CBTI已被证明短期疗效可与药物干预相媲美^[34]。相关研究表明,CBTI对失眠的疗效可以维持到治疗结束后10年^[35]。

虽然CBTI已被证实可以改善关于睡眠的功能失调信念从而治疗失眠,但CBTI对睡前认知觉醒的影响仍不明确^[36]。标准CBTI并不将睡前认知觉醒作为关键治疗目标^[17],这与一系列CBTI治疗失眠的干预研究一致^[37-38]。研究表明,睡前认知觉醒是CBTI治疗反应的障碍,CBTI治疗后缓解率较低的患者报告了更高的睡前认知觉醒^[20],干预之前的低睡前认知觉醒还可以预测6个月随访时的失眠缓解^[36],即睡前认知觉醒水平更低的患者对CBTI的反应更灵敏。但仍有研究报道睡前觉醒可以介导CBTI的疗效,一项以产后女性为对象的研究报道睡前认知觉醒可能是认知行为干预的切入点,通过减少睡前认知唤醒可以缩短患者的客观睡眠潜伏期^[17]。

研究结论不一致的潜在原因可能是睡前认知觉醒产生机制的复杂性。具体而言,睡前认知觉醒的产生受多种因素的影响,如睡眠相关元认知、不良睡眠信念、压力以及应激等,而CBTI对部分因素具有治疗效果,如不良睡眠信念、不良睡眠习惯,随着这些因素的改善,过度的睡前认知觉醒问题也随之得到解决。但是,仍有部分因素是CBTI不曾涉及的,如觉醒倾向^[9],即在各种任务和环境压力源存在的

情况下,普遍存在预期觉醒倾向的个体差异。觉醒倾向作为一种个人特质因素在失眠的三因素模型中被划分为易感因素^[39],而认知行为模型并不针对易感因素进行干预^[40],所以由觉醒倾向而非其他因素导致的睡前认知觉醒并不能通过标准CBTI得到缓解。

2. 正念疗法:正念旨在培养一种对当下的思想、情绪或经验不评判以及接纳的状态,正念作为一种治疗方案已广泛运用于失眠治疗中^[41-42]。尽管,美国睡眠医学会在2021发布的指南中并未将正念作为推荐疗法^[43],但临床对照研究表明,正念可有效缓解失眠问题^[41,44]。

越来越多的证据表明,正念与CBTI结合可作为一种治疗增强策略,其疗效优于单独CBTI治疗^[45]。有研究显示,以正念为基础的治疗在降低反刍和担忧等形式的认知觉醒方面非常成功^[46],这可能是正念的潜在作用机制,即通过减少错误的认知处理,进而减少反刍和担忧等形式的睡前认知觉醒来缓解失眠,在青少年和成人的研究中都发现了类似的作用机制^[44,47]。此外,以正念为基础的治疗可能通过改变非适应性的情绪调节过程,进而减轻过度的睡前认知觉醒达到改善睡眠的效果^[27],有正念经验的人更擅长对有关睡眠的负面想法采取中立、非反应性的态度,对这些想法的反应更冷静、更少焦虑,焦虑性睡前认知觉醒水平也随之降低^[48]。也有研究者认为正念技术旨在通过加强元认知来降低睡前认知觉醒,如减少睡眠前的焦虑、反刍以及消极评价^[27]。监控和接受理论将正念的作用机制解释为:提升对当前状态的关注,以及改变自身与经验的关系^[49]。具体到睡眠,即通过提高自身失眠经历的正确认识可改善睡眠相关的不良认知过程,尽管过多的监控会增加情绪反应性,但通过接受失眠的现状又使得情绪反应性降低,即降低睡前觉醒,从而达到缓解负面情绪、压力以及改善睡眠的目的。正念对睡前认知觉醒的治疗效果或许有助于解释为什么对于某些个体而言正念结合CBTI的治疗方案优于单独CBTI治疗。

3. 放松疗法:放松疗法也被广泛运用于失眠干预,如旨在降低生理觉醒的渐进式肌肉放松,这些放松训练大都作用于躯体觉醒,而非认知觉醒。降低睡前躯体觉醒水平也可达到缓解失眠的作用,各种帮助减少睡前觉醒的放松技巧已经被证明是治疗失眠的有效方法^[50],如在儿童失眠治疗中父母帮助孩子降低警觉和觉醒的放松活动,与良好的睡眠有一定的相关性^[51]。然而,放松训练在减轻睡前认知觉醒方面的效果并不理想,不如CBTI和正念疗法有效^[52]。

四、总结和展望

本文通过综述既往睡前认知觉醒相关因素研究和睡前认知觉醒在失眠治疗中的作用研究,发现睡前认知觉醒受元认知、认知、情绪以及应激等多方面因素影响,不同因素之间既可单独作用导致睡前认知觉醒水平的升高,也可相互作用以维持睡前认知觉醒。此外,睡前认知觉醒可能是失眠治疗的有效靶点之一,传统的CBTI似乎并不直接作用于睡前认知觉醒,已有相当可观的研究表明将CBTI与正念相结合可弥补这一不足。但正念增强方案的作用机制仍有待进一步研究,未来的研究应侧重于理清正念在缓解睡前认知觉醒中的有效成分,进一步开发快速有效降低睡前认知觉醒的治疗方案,这对失眠障碍的预防及治疗有重要意义。

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参 考 文 献

- [1] Bragantini D, Sivertsen B, Gehrman P, et al. Differences in anxiety levels among symptoms of insomnia. The HUNT study[J]. *Sleep Health*, 2019, 5(4): 370-375. DOI: 10.1016/j.sleth.2019.01.002.
- [2] Kalmbach DA, Abelson JL, Arnedt JT, et al. Insomnia symptoms and short sleep predict anxiety and worry in response to stress exposure a prospective cohort study of medical interns[J]. *Sleep Med*, 2019, 55: 40-47. DOI: 10.1016/j.sleep.2018.12.001.
- [3] Sateia MJ. International classification of sleep disorders-third edition: highlights and modifications[J]. *Chest*, 2014, 146(5): 1387-1394. DOI: 10.1378/chest.14-0970.
- [4] Borkovec TD, Robinson E, Pruzinsky T, et al. Preliminary exploration of worry: some characteristics and processes[J]. *Behav Res Ther*, 1983, 21(1):9-16. DOI:10.1016/0005-7967(83)90121-3.
- [5] Hoyniak CP, McQuillan MM, Bates JE, et al. Presleep arousal and sleep in early childhood[J]. *J Genet Psychol*, 2021, 182(4): 236-251. DOI: 10.1080/00221325.2021.1905596.
- [6] Kalmbach DA, Cheng P, Ong JC, et al. Depression and suicidal ideation in pregnancy exploring relationships with insomnia, short sleep, and nocturnal rumination[J]. *Sleep Med*, 2020, 65: 62-73. DOI: 10.1016/j.sleep.2019.07.010.
- [7] Smith MT, McCrae CS, Cheung J, et al. Use of Actigraphy for the Evaluation of Sleep Disorders and Circadian Rhythm Sleep-Wake Disorders: An American Academy of Sleep Medicine Clinical Practice Guideline[J]. *J Clin Sleep Med*, 2018, 14(7): 1231-1237. DOI: 10.5664/jcsm.7230.
- [8] Cao XL, Wang SB, Zhong BL, et al. The prevalence of insomnia in the general population in China: a meta-analysis[J]. *PLoS One*, 2017, 12(2): e0170772. DOI: 10.1371/journal.pone.0170772.
- [9] Wassing R, Benjamins JS, Dekker K, et al. Slow dissolving of emotional distress contributes to hyperarousal[J]. *Proc Natl Acad Sci U S A*, 2016, 113(9): 2538-2543. DOI: 10.1073/pnas.1522520113.
- [10] Nicassio PM, Mendlowitz DR, Fussell JJ, et al. The phenomenology of the pre-sleep state: the development of the pre-sleep arousal scale[J]. *Behav Res Ther*, 1985, 23(3): 263-271. DOI: 10.1016/0005-7967(85)90004-x.
- [11] Wicklow A, Espie CA. Intrusive thoughts and their relationship to actigraphic measurement of sleep: towards a cognitive model of insomnia[J]. *Behav Res Ther*, 2000, 38(7): 679-693. DOI: 10.1016/S0005-7967(99)00136-9.
- [12] Spiegelhalter K, Regen W, Feige B, et al. Sleep-related arousal versus general cognitive arousal in primary insomnia[J]. *J Clin Sleep Med*, 2012, 8(4): 431-437. DOI: 10.5664/jcsm.2040.
- [13] Doos Ali Vand H, Gharraee B, Farid AA, et al. Prediction of insomnia severity based on cognitive, metacognitive, and emotional variables in college students[J]. *Explore (NY)*, 2014, 10(4): 233-240. DOI: 10.1016/j.explore.2014.04.005.
- [14] Palagini L, Ong JC, Riemann D. The mediating role of sleep-related metacognitive processes in trait and pre-sleep state hyperarousal in insomnia disorder[J]. *J Psychosom Res*, 2017, 99: 59-65. DOI: 10.1016/j.jpsychores.2017.03.001.
- [15] Kalmbach DA, Buysse DJ, Cheng P, et al. Nocturnal cognitive arousal is associated with objective sleep disturbance and indicators of physiologic hyperarousal in good sleepers and individuals with insomnia disorder[J]. *Sleep Med*, 2020, 71: 151-160. DOI: 10.1016/j.sleep.2019.11.1184.
- [16] Morin CM, Rodrigue S, Ivers H. Role of stress, arousal, and coping skills in primary insomnia[J]. *Psychosom Med*, 2003, 65(2): 259-267. DOI: 10.1097/01.PSY.0000030391.09558.A3.
- [17] Kalmbach DA, Cheng P, Roth T, et al. Objective sleep disturbance is associated with poor response to cognitive and behavioral treatments for insomnia in postmenopausal women[J]. *Sleep Med*, 2020, 73: 82-92. DOI: 10.1016/j.sleep.2020.04.024.
- [18] Byers HD, Lichstein KL, Thorn BE. Cognitive processes in comorbid poor sleep and chronic pain[J]. *J Behav Med*, 2016, 39(2): 233-240. DOI: 10.1007/s10865-015-9687-5.
- [19] Galbiati A, Giora E, Sarasso S, et al. Repetitive thought is associated with both subjectively and objectively recorded polysomnographic indices of disrupted sleep in insomnia disorder[J]. *Sleep Med*, 2018, 45: 55-61. DOI: 10.1016/j.sleep.2017.10.002.
- [20] Kalmbach DA, Cheng P, Roth T, et al. Examining patient feedback and the role of cognitive arousal in treatment non-response to digital cognitive-behavioral therapy for insomnia during pregnancy[J]. *Behav Sleep Med*, 2022, 20(2): 143-163. DOI: 10.1080/15402002.2021.1895793.
- [21] Hantsoo L, Khou CS, White CN, et al. Gender and cognitive-emotional factors as predictors of pre-sleep arousal and trait hyperarousal in insomnia[J]. *J Psychosom Res*, 2013, 74(4): 283-289. DOI: 10.1016/j.jpsychores.2013.01.014.
- [22] Tang NK, Harvey AG. Effects of cognitive arousal and physiological arousal on sleep perception[J]. *Sleep*, 2004, 27(1): 69-78. DOI: 10.1093/sleep/27.1.69.
- [23] Čapková K, Vaculík M, Ellis J, et al. The impact of pre-sleep arousal state and strategy to control unwanted thoughts on sleep quality[J]. *Anxiety Stress Coping*, 2018, 31(3): 338-347. DOI: 10.1080/10615806.2017.1421843.

- [24] Yang CM, Lin SC, Cheng CP. Transient insomnia versus chronic insomnia: a comparison study of sleep-related psychological/behavioral characteristics[J]. *J Clin Psychol*, 2013, 69(10): 1094-1107. DOI: 10.1002/jclp.22000.
- [25] Harvey AG. A cognitive model of insomnia[J]. *Behav Res Ther*, 2002, 40(8): 869-893. DOI: 10.1016/s0005-7967(01)00061-4.
- [26] Akram U, Milkins B, Ypsilanti A, et al. The therapeutic potential of attentional bias modification training for insomnia: study protocol for a randomised controlled trial[J]. *Trials*, 2018, 19(1): 567. DOI: 10.1186/s13063-018-2937-4.
- [27] Ong JC, Ulmer CS, Manber R. Improving sleep with mindfulness and acceptance: a metacognitive model of insomnia[J]. *Behav Res Ther*, 2012, 50(11): 651-660. DOI: 10.1016/j.brat.2012.08.001.
- [28] Benham G. Bedtime repetitive negative thinking moderates the relationship between psychological stress and insomnia[J]. *Stress Health*, 2021, 37(5): 949-961. DOI: 10.1002/smi.3055.
- [29] Lundh LG, Broman JE. Insomnia as an interaction between sleep-interfering and sleep-interpreting processes[J]. *J Psychosom Res*, 2000, 49(5): 299-310. DOI: 10.1016/S0022-3999(00)00150-1.
- [30] Maskevich S, Cassanet A, Allen NB, et al. Sleep and stress in adolescents the roles of pre-sleep arousal and coping during school and vacation[J]. *Sleep Med*, 2020, 66: 130-138. DOI: 10.1016/j.sleep.2019.10.006.
- [31] Adam K, Tomeny M, Oswald I. Physiological and psychological differences between good and poor sleepers[J]. *J Psychiatr Res*, 1986, 20(4): 301-316. DOI: 10.1016/0022-3956(86)90033-6.
- [32] Arnison T, Schrooten MGS, Bauducco S, et al. Sleep phase and pre-sleep arousal predicted co-developmental trajectories of pain and insomnia within adolescence[J]. *Sci Rep*, 2022, 12(1): 4480. DOI: 10.1038/s41598-022-08207-y.
- [33] Riemann D, Baglioni C, Bassetti C, et al. European guideline for the diagnosis and treatment of insomnia[J]. *J Sleep Res*, 2017, 26(6): 675-700. DOI: 10.1111/jsr.12594.
- [34] Smith MT, Perlis ML, Park A, et al. Comparative meta-analysis of pharmacotherapy and behavior therapy for persistent insomnia[J]. *Am J Psychiatry*, 2002, 159(1): 5-11. DOI: 10.1176/appi.ajp.159.1.5.
- [35] Castronovo V, Galbiati A, Sforza M, et al. Long-term clinical effect of group cognitive behavioral therapy for insomnia: a case series study[J]. *Sleep Med*, 2018, 47: 54-59. DOI: 10.1016/j.sleep.2018.03.017.
- [36] Kalmbach DA, Cheng P, Arnedt JT, et al. Treating insomnia improves depression, maladaptive thinking, and hyperarousal in postmenopausal women: comparing cognitive-behavioral therapy for insomnia (CBTI), sleep restriction therapy, and sleep hygiene education[J]. *Sleep Med*, 2019, 55: 124-134. DOI: 10.1016/j.sleep.2018.11.019.
- [37] Cheng P, Kalmbach DA, Castelan AC, et al. Depression prevention in digital cognitive behavioral therapy for insomnia: Is rumination a mediator?[J]. *J Affect Disord*, 2020, 273: 434-441. DOI: 10.1016/j.jad.2020.03.184.
- [38] Kalmbach DA, Cheng P, Sangha R, et al. Insomnia, short sleep, and snoring in mid-to-late pregnancy: disparities related to poverty, race, and obesity[J]. *Nat Sci Sleep*, 2019, 11: 301-315. DOI: 10.2147/NSS.S226291.
- [39] Spielman AJ, Caruso LS, Glovinsky PB. A behavioral perspective on insomnia treatment[J]. *Psychiatr Clin North Am*, 1987, 10(4): 541-553. DOI: 10.1016/S0193-953X(18)30532-X.
- [40] Lancee J, Eftting M, van der Zweerde T, et al. Cognitive processes mediate the effects of insomnia treatment evidence from a randomized wait-list controlled trial[J]. *Sleep Med*, 2019, 54: 86-93. DOI: 10.1016/j.sleep.2018.09.029.
- [41] Kim HG. Effects and mechanisms of a mindfulness-based intervention on insomnia[J]. *Yeungnam Univ J Med*, 2021, 38(4): 282-288. DOI: 10.12701/yujm.2020.00850.
- [42] Wang YY, Wang F, Zheng W, et al. Mindfulness-based interventions for insomnia: a Meta-analysis of randomized controlled trials[J]. *Behav Sleep Med*, 2020, 18(1): 1-9. DOI: 10.1080/15402002.2018.1518228.
- [43] Edinger JD, Arnedt JT, Bertisch SM, et al. Behavioral and psychological treatments for chronic insomnia disorder in adults: an American Academy of Sleep Medicine clinical practice guideline[J]. *J Clin Sleep Med*, 2021, 17(2): 255-262. DOI: 10.5664/jcsm.8986.
- [44] Kennett L, Bei B, Jackson ML. A randomized controlled trial to examine the feasibility and preliminary efficacy of a digital mindfulness-based therapy for improving insomnia symptoms[J]. *Mindfulness(NY)*, 2021, 12(10): 2460-2472. DOI: 10.1007/s12671-021-01714-5.
- [45] Vanhuffel H, Rey M, Lambert I, et al. Contribution of mindfulness meditation in cognitive behavioral therapy for insomnia[J]. *Encephale*, 2018, 44(2): 134-140. DOI: 10.1016/j.encep.2016.12.001.
- [46] Mennin DS, Fresco DM, O'Toole MS, et al. A randomized controlled trial of emotion regulation therapy for generalized anxiety disorder with and without co-occurring depression[J]. *J Consult Clin Psychol*, 2018, 86(3): 268-281. DOI: 10.1037/ccp0000289.
- [47] Blake M, Schwartz O, Waloszek JM, et al. The SENSE study: treatment mechanisms of a cognitive behavioral and mindfulness-based group sleep improvement intervention for at-risk adolescents[J]. *Sleep*, 2017, 40(6). DOI: 10.1093/sleep/zsx061.
- [48] Hassirim Z, Lim ECJ, Lo JC, et al. Pre-sleep cognitive arousal decreases following a 4-week introductory mindfulness course[J]. *Mindfulness*, 2019, 10(11): 2429-2438. DOI: 10.1007/s12671-019-01217-4.
- [49] Lindsay EK, Creswell JD. Mechanisms of mindfulness training: Monitor and Acceptance Theory (MAT) [J]. *Clin Psychol Rev*, 2017, 51: 48-59. DOI: 10.1016/j.cpr.2016.10.011.
- [50] Means MK, Lichstein KL, Epperson MT, et al. Relaxation therapy for insomnia: nighttime and day time effects[J]. *Behav Res Ther*, 2000, 38(7): 665-678. DOI: 10.1016/s0005-7967(99)00091-1.
- [51] Mindell JA, Williamson AA. Benefits of a bedtime routine in young children sleep, development, and beyond[J]. *Sleep Med Rev*, 2018, 40: 93-108. DOI: 10.1016/j.smrv.2017.10.007.
- [52] Low T, Conduit R, Varma P, et al. Treating subclinical and clinical symptoms of insomnia with a mindfulness-based smartphone application: a pilot study[J]. *Internet Interv*, 2020, 21: 100335. DOI: 10.1016/j.invent.2020.100335.

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