A scoping review of sleep management as an occupational therapy intervention: expanding a niche area of practice in mental health

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Abstract

Purpose – This study aims to examine the existing literature on sleep-related interventions and confirm the intervention methods and their effectiveness led by occupational therapists.

Design/methodology/approach – All the relevant literature published from 2010 to June 31, 2022, in five prominent databases were searched using the five-stage review framework proposed by Arksey and O'Malley.

Findings – In this review, four types of sleep-related interventions were led by occupational therapists (tool use, exercise program, sleep education and occupational-based program). When the intervention was analyzed based on its content, occupational therapists demonstrated excellent ability in interventions based on sensory intervention and lifestyle redesign.

Originality/value – Various factors cause sleep problems; hence, the development of individualized and extensive occupational therapy intervention methods is required.

Keywords Lifestyle redesign, Occupational therapy, Sensory-based intervention, Sleep, Scoping review

Paper type Literature review

1. Introduction

Sleep is one of the key occupations defined in the Occupational Therapy (OT) Practice Framework-4th ed. (OTPF-4). Because of the important role sleep plays in daily life, sleep has been classified as a major form of occupation along with rest (American Occupational Therapy Association, 2020). A consistent sleep routine with adequate sleep boosts cognitive function and overall health of the body. We sleep for one-third of our lifetime (Yildirim *et al.*, 2020). Sleep disturbance can be defined as disorders of the sleep–wake cycle and dysfunctions associated with sleep, sleep stages or total sleep time. Although the amount of sleep required varies from person to person, getting adequate sleep is associated with mental and physical health benefits (Stone *et al.*, 2014). The role of sleep in maintaining motor and perceptual skills and memory consolidation has already been supported by strong research (Aoun *et al.*, 2019; Leland *et al.*, 2014). Insomnia can disrupt daily life by lowering the overall quality of life and affecting social, emotional and psychological coping skills. In addition, daytime sleepiness due to lack of sleep can cause serious problems in performing key tasks and affect risk-taking behavior, posing a safety risk in daily life and occupations (Faulkner and Mairs, 2015). Insufficient sleep can lead to adverse outcomes such as decreased occupational performance, increased medical care utilization and potential physical and mental problems (Sheth, 2016).

Recently, OT has emerged as a practice area for people with functional problems owing to insufficient sleep. Rest and sleep are occupational areas that support active engagement in other occupations (Tester and Foss, 2018). The American Occupational Therapy Association (AOTA) has emphasized the role of occupational therapists in resolving sleep hygiene problems. Poor sleep quality and insufficient sleep affect occupational participation and motivation, negatively affecting rehabilitation treatment by causing drowsiness and fatigue (Chen *et al.*, 2016). These consequences can affect the activities of daily living and productivity; hence, OT focuses on these activities. However, there is a practice gap in OT because it is not generally assessed and is not addressed in interventions (Eakman *et al.*, 2017). Occupational therapists

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should strive to improve sleep quality because sleep conditions can affect many occupational areas in life. Humans participate in various occupations daily; hence, sleep management ultimately affects successful occupational performance. Sleep is an essential component of the human occupational field, and OT specializes in promoting human health and well-being (Tester and Foss, 2018). AOTA states that sleep management among OT fields is an essential effort for the field's growth, and occupational therapists should pay much attention to ways of implementing an intervention process for evaluation and problem-solving for this purpose (Enam *et al.*, 2020).

Despite the existing guidelines for OT and evidence of its effectiveness, the global level of occupational therapists' activity is currently low. Although they can therapeutically treat sleep problems, it is very difficult to find occupational therapists working in formal sleep clinics (Fung *et al.*, 2013). Additionally, the number of related studies and attempts to discuss these interventions and their effects are insufficient (Brown *et al.*, 2013; Faulkner and Mairs, 2015; Leland *et al.*, 2014). Besides, there are even fewer cases where occupational therapists lead the research. To develop and strengthen the role of OT in solving sleep problems, it is necessary to consider a specific examination process that would aid in advancing this field in the future (Akbarfahimi *et al.*, 2020). Therefore, this study aims to examine the existing literature on sleep-related interventions and confirm the intervention methods and their effectiveness led by occupational therapists.

2. Methods

According to the method proposed by Arksey and O'Malley (Arksey and O'Malley, 2005), each database was searched for studies published from 2010 to June 31, 2022. The following search terms were combined: (sleep OR sleep deprivation OR sleep disturbance OR drowsiness OR insomnia) AND (occupational therapy OR occupational therapist OR therapist). Studies involving humans and those written in English were used as limits. The following five electronic databases were used: PubMed, CINAHL, PsycINFO, MEDLINE Complete and EBSCOhost. The pertinent articles were exported and managed using RefWorks referencing software. In the first stage, relevant research was reviewed, and three initial exploratory research questions were drafted as follows:

RQ1. How have sleep-related OT interventions been studied so far?

RQ2. What OT interventions are used to treat sleep disturbances and how effective are these?

RQ3. What areas should we focus on to improve sleep disorder treatment in the future?

At stage two, we established the following eligibility criteria:

- journal article type;
- articles published from 2010 to the present;
- articles written in English; and
- studies aimed at confirming the therapeutic effectiveness of OT for persons with sleep problems.

At stage three, the primary selection of studies to be included in the review was made by reviewing the title and abstract. The full text was then read and screened according to the inclusion criteria. Because the emphasis was on the specificity of the OT field, a particular study was not selected if not authored by occupational therapists or if they were not included in the research process. Studies published as posters, books and magazines were also excluded. Fifteen papers were finalized; data were extracted based on six categories that were used to analyze the full review: subject characteristics, first author's expertise, occupational therapist's role, study design, key findings of outcome measurement and analysis. Data extraction was performed independently by the reviewers. The flow chart describes the study selection process, and the results are presented in a descriptive tabular form (Tables 1, 2 and 3). In the final stage, the papers were categorized and organized using a charting form in Microsoft Excel (Table 3). The primary goals were to identify the effectiveness and emphasize the importance of OT programs for patients with sleep problems.

3. Results

3.1 Study selection and characteristics

A summary of the stages described in the methods section is shown in Figure 1. After a full-text review, 97 articles were excluded, and 15 were included in the present review. Out of 15, seven were randomized controlled trials, seven were conducted as a single group and one was a single-subject design study. In all studies, occupational therapists performed the interventional role. Out of 15 studies, an occupational therapist applied the intervention in 12 studies, an occupational and a physical therapist applied the intervention together in two studies, and an occupational therapist, a physical therapist, a mental health and vocational specialist and a physician applied the intervention together in one study. The sample size varied from 2 to 262 participants, and 6 out of 15 studies conducted intervention studies by recruiting a relatively large number of participants (more than 50 participants).

3.2 Participants and research conditions

Most studies were conducted on adults, and only five studies included children aged $\leq$8 years. Although most participants had sleep problems, only five studies used an objective sleep evaluation tool. These studies were conducted with participants who were at risk of experiencing sleep disturbances or who had a mild level of sleep problems rather than serious conditions. In addition, the participants who participated in 9 out of 15 studies were diagnosed with other diseases, and 5 included participants who only complained of simple sleep disorders. One study was conducted on college students with no special criteria other than a BMI $\leq$ 25. The intervention environment was performed at home in six studies, and interventions were applied to participants within the institution in seven studies. The intervention was applied in an experimental environment and school in two studies, and it was applied simultaneously at home and the institution in one study. Most of the studies are based on qualitative measurement rather than quantitative measurement of sleep,

Table 1 Summary of study characteristics from 15 studies

Article citation	Service providers	Specialty of first author	Study design, Participants	Status of participants	Setting
Akbarfahimi *et al.* (2020)	OT	Occupational therapy	RCT, $N = 20$, 38.6 years	MS patients EDSS < 6 MMSE > 23 PSQI: 5 or above	Institution
Asih *et al.* (2014)	Physician, OT, PT, Mental health and vocational professionals	Psychology	One group study, $N = 262$, 44.9 years Ethnicity: Caucasian (58.4%), African American (25.1%), Hispanic or Latino (15.3%)	4 groups: NCSI (0–7), STI (8–14), MCI (15–21), SCI (22–28)	Institute
Bolic Baric *et al.* (2021)	OT	Health, medicine and caring sciences	One group study, $N = 85$ (aged 7–17 [$n = 48$], 18–30 [$n = 23$] and 31–59 years [$n = 14$])	Prescribed a weighted blanket due to sleep problems Diagnosed as having ADHD and/or ASD	Home
Cheng *et al.* (2017)	OT	Occupational therapy	One group study, N = 7, 12.9 years	Apneaehypopnea Index (AHI) greater than 1.0	Home
Frazzitta *et al.* (2015)	OT, PT	Neurology	RCT, $N = 138$, 69.1 years	Hoehn-Yahr stage 2 or 3 MMSE > 26 Subjective complaints of sleep disturbances	Institution
Gee *et al.* (2016)	OT	Occupational therapy	Single subject design, $N = 2$, 4 years and 5 years	With ASD (Evidence of sleep disturbance according to the Child Sleep Habits Questionnaire)	Home
Gutman *et al.* (2017)	OT	Neurology	RCT, $N = 30$, 43.3 years, Ethnicity: White (82.8%), African American (6.9%), Asian (6.9%), Hispanic (3.4%)	Self-report poor sleep for at least 2 months	Home
Joseph (2018)	OT	Occupational therapy	RCT, $N = 30$, 32.1 years	With insomnia(onset: 3 months to 1 year) HAM-A: 18 or above	Institution
Kurasawa *et al.* (2020)	OT	Rehabilitation Sciences	One group study, $N = 67$, 9.6 years	Students of elementary school	School
Lawson and Little (2017)	OT	Occupational therapy	One group study, $N = 10$, 7.5 years Ethnicity: White (100%), and one family identified as Hispanic	With ASD	Institution

(*continued*)

Table 1

Article citation	Service providers	Specialty of first author	Study design, Participants	Status of participants	Setting
Leland *et al.* (2016)	OT	Occupational therapy	RCT, $N = 217$, 74.2 years Race: White (40%) Black or African-American (31%) Hispanic or Latino(21%) Asian (4%) Other (4%)	–	Home or Institution
McGhee *et al.* (2021)	OT	Occupational therapy	One group study, $N = 12$, 6.3 years	"Much more than others" on the SSP version 2 in either sensation-avoiding or sensitivity categories Identified sleep difficulties on the CSWS	Home
Oh *et al.* (2016)	PT, OT	Occupational therapy	One group study, $N = 20$, 61.0 years	COPD patients	Institution
Sheth (2016)	OT	Occupational therapy	RCT, $N = 76$, 69.6 years	Underwent joint replacement	Institution
Wan Yunus *et al.* (2020)	OT	Occupational therapy	RCT, $N = 36$, 22.9 years Race: Malay (33.3%) Chinese (66.7%)	Body mass index less than 25	Laboratory

Notes: ASD = Autism spectrum disorder; BDI = Beck depression inventory; COPD = Chronic obstructive pulmonary disease; CSWS = Children's sleep wake scale; EDSS = Expanded disability status score; HAM-A = Hamilton anxiety rating scale; HARS = Hamilton anxiety rating scales; ISI = Insomnia severity index; MCI = Moderate clinical insomnia; MMSE = Mini-mental status examination; MS = Multiple sclerosis; NCSI = No clinically significant insomnia; OT = Occupational therapist; PSQI = Pittsburgh sleep quality index); PT = Physical therapy; RCT = Randomized controlled trial; SCI = Severe clinical insomnia; SSP-2 = Short sensory profile-version 2; STI = Subthreshold insomnia
Source: Authors' own work

Table 2 Description of OT programs from 15 studies

OT programs	Description
Tool-based intervention	(1) Dreampad pillow and iRest meditation: Dreampad Pillow® ran for 2 hours at bedtime, and iRest® meditation used for 20 min before bed (Gutman *et al.*, 2017) (2) Weighted blankets: Used weighted blankets (SensaCalm®, 10% of body weight) for fourteen consecutive nights (Bolic Baric *et al.*, 2021; Gee *et al.*, 2016) (3) Touchpoints Basic Sleep Kit: Wearing for 30 min before bedtime each night (McGhee *et al.*, 2021)
Exercise or training program	(1) Medication management and assessment of remaining surgical options, 44 exercise programs (muscular strength, flexibility, endurance and cardiovascular fitness), stress-management and biofeedback training, education, coping skills and vocational reintegration assistance (Asih *et al.*, 2014) (2) Cardiovascular warmup activities, relaxation, and muscle-stretching exercises, Exercises to improve balance and gait, to improve autonomy in day living activities (Frazzitta *et al.*, 2015) (3) Breathing training, expectoration, aerobic exercise, muscle strengthening of upper and lower extremities, strengthening of the respiration muscles, daily life training and energy preservation (Oh *et al.*, 2016), strength training the tongue and oral-facial muscles by teaching individuals (Cheng *et al.*, 2017) (4) Kinect Sports 1: Six activities: bowling, boxing, track and field, table tennis, beach volleyball and football/soccer games (Wan Yunus *et al.*, 2020) (5) Sensory enhanced aquatics to support children's skill acquisition: (1) visual supports, (2) sensory supports, (3) communication strategies, (4) physical supports and (5) modeling (Lawson and Little, 2017)
Education	(1) Miniku: Interested in sleep, is aware of one's own sleep, is able to pay attention to the habit of staying up too late, deeper knowledge on sleep which can be implemented, learn appropriate use of television, games and smartphones (Kurasawa *et al.*, 2020) (2) On the night of surgery, the author provided a "sleep kit" that contained an eye mask and ear plugs as well as a handout containing information about the recommended daytime routine and nighttime modifications (Sheth, 2016).
Occupational based intervention	(1) Lifestyle redesign: Small-group sessions (didactic presentation, peer exchange, participation in activities and personal reflection), individual sessions (to enhance the adoption and maintenance of desired lifestyle changes) (Leland *et al.*, 2016) (2) Education, set daily schedule based on the occupational profile, encourage health management behavior, discuss the occupational balance and keeping busy during the day, review cognitive behavioral exercises, physical exercise, and consultation (Akbarfahimi *et al.*, 2020) (3) Group and individual sessions (didactic education, meditation, stimulus control, sleep restriction therapy, sleep hygiene, CBT, individual session and roleplaying) (Joseph, 2018)

Source: Authors' own work

and additionally, the effectiveness of the physical activity index and the psychological aspect of sleep status was evaluated at the same time.

3.3 Occupational therapy intervention for people with sleep disturbance

Four of the 15 studies included in this review were conducted using equipment and tools. In a study by Gutman and colleagues, the application of iRest meditation was effective in improving sleep (Gutman *et al.*, 2017). The effect of applying a weighted blanket was confirmed in two studies; it provided a blanket with a certain weight based on the participant's weight (Bolic Baric *et al.*, 2021; Gee *et al.*, 2016). The duration of the intervention using each tool did not exceed two weeks. Touchpoints is a wearable device type that can be worn on the wrist or ankle and is a type of intervention that provides vibration stimulation with various strengths; this intervention was applied for 10 days (McGhee *et al.*, 2021). The application time of each tool was 2 h from the time of sleep for the Dreampad pillow, and the Touchpoints Basic Sleep Kit was applied 30 min before the time of sleep. A weighted blanket was applied continuously during sleep.

Six studies included training and exercise programs in specific areas. That included oral–pharyngeal motor training, sensory-enhanced aquatics and respiration training (Asih *et al.*, 2014; Cheng *et al.*, 2017; Frazzitta *et al.*, 2015; Lawson and Little, 2017; Oh *et al.*, 2016; Wan Yunus *et al.*, 2020). Each training session was performed in 10 and eight sessions, and the duration of each session was between 30 and 50 min. For example, Lawson's study (2017) applied a sensory-enhanced aquatics program that supported children's skill acquisition for participants with autism spectrum disorder (ASD) (Lawson and Little, 2017). The exercise program was conducted by occupational and physical therapists and other health professionals. The exercise programs included gaining muscle strength, flexibility, endurance and fall prevention. One study, operated by an occupational therapist, was a game-based exercise program that used an Xbox 360 Kinect-based sports game (Wan Yunus *et al.*, 2020).

Sleep-education-based interventions were applied. One study applied only education; Kurasawa and colleagues conducted sleep education by operating two courses for

Table 3 Summary of OT programs characteristics and key results from 15 studies

Article citation	Programs	Intervention protocol	Evaluations	Main findings	Types
Akbarfahimi *et al.* (2020)	Occupational therapy-based sleep interventions	8 sessions (one session: 30–45 min)	PSQI, FIS, FSS, SF-36	CAU plus intervention group Sleep quality ($p < 0.001$) PSQI ($p < 0.001$, d = 0.60) FIS ($p < 0.001$, d = 0.82) FSS ($p < 0.001$, d = 0.76) SF-36 ($p < 0.001$)	FTF
Asih *et al.* (2014)	Medically supervised + Quantitatively directed exercise program + Multimodal disability management program	Complete 160 hours, for 4–8 hours per day Duration: 4–8 weeks	ISI, PVAS, BDI, PDQ, ODI, Opioid, antidepressant, and sedative use, outcomes with socioeconomic relevance	Decrease in insomnia prevalence ($z = -9.3$, $p < 0.001$/53.4% had moved to a lesser insomnia category) All psychosocial patient-reported scores improved significantly between admission and discharge in all insomnia groups ($p < 0.001$) Decrease in drug use: Opioids ($\chi_2 = 26.09$, $p = 0.01$), sedatives ($\chi_2 = 20.43$, $p < 0.001$) and antidepressants ($\chi_2 = 14.01$, $p = 0.002$) Differences in work retention ($\chi_2 = 19.27$, $p < 0.001$/SCI group was 10.4 times less likely to retain work than the NCSI group)	FTF
Bolic Baric *et al.* (2021)	Weighted blankets	78% used the weighted blanket every night, and 24% used the weighted blanket during the day for activities.	Daily activities (evening routines and morning routines)	Improved their daily routines, especially during the evening and in the morning (45%) Improved preparing/going to sleep (68.8%) Improvements in sleeping through the night (81%) Improved waking up in the morning (26.5%) Improved performance of activities at work or in school/education (16.5%)	NFTF
Cheng *et al.* (2017)	Oral-pharyngeal motor training	8 weeks (10 sessions, one session: 45 min)	NOT-S, IOPI	Tongue strength ($p = 0.018$), tongue endurance ($p = 0.203$), NOT-S ($p = 0.026$)	Non-FTF
Frazzitta *et al.* (2015)	Physical therapy + Occupational therapy	4 weeks (3 sessions (PT, two sessions/OT, one session) in day per week, one session: 60 min)	UPDRS, PDSS	UPDRS III ($p < 0.0001$)/UPDRS II ($p < 0.0001$) PDSS: Group ($p = 0.88$); Time ($p < 0.0001$); Time x Group ($p < 0.0001$)	FTF
Gee *et al.* (2016)	Weighted blankets	2 weeks (used weighted blankets for fourteen consecutive nights)	SPM, CSHQ	Time to fall asleep: minimal effect Number of waking: habituate to the weighted blanket Hours of sleep: increase and stability Morning mood: worsening	Non-FTF
Gutman *et al.* (2017)	Dreampad pillow + iRest meditation	2 hours at bedtime (pillow) + 20 min before bed (meditation) Duration: 2 weeks	GSDS, PSQI, AntiGraph accelerometer, Sleep journal	Length of time asleep: Exp. group ($p < 0.006$, d = 1.87)/Con. group ($p < 0.03$, d = 1.80) (ActiGraph data: $p < 0.02$, d = 1.29/$p < 0.03$, d = 2.37) Number of nighttime awakening: Exp. group ($p < 0.04$, d = −1.53)/Con. group ($p < 0.004$, d = −1.43) (ActiGraph data: $p < 0.02$, d = −1.12/$p < 0.04$, d = −1.47)	Non-FTF
Joseph (2018)	Occupational therapy (group OT + 1:1 OT)	8 weeks (7 group sessions + 1 individual session)	PIRS, HAM-A	PIRS(within group: $p < 0.05$, between group: $p < 0.05$)	FTF

(*continued*)

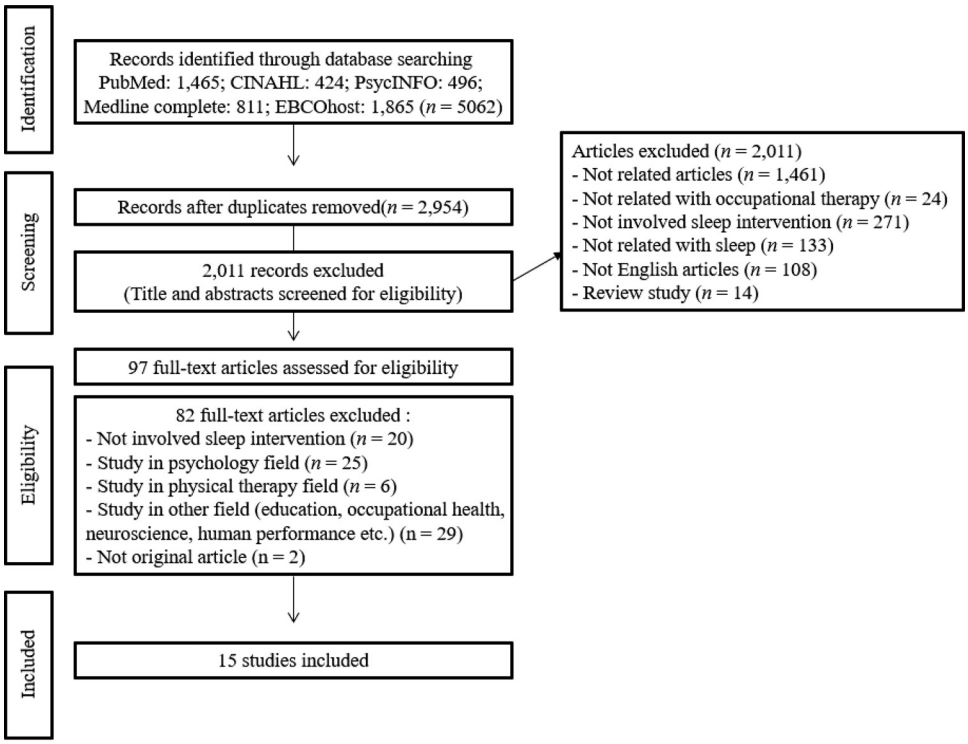
Table 3

Article citation	Programs	Intervention protocol	Evaluations	Main findings	Types
Kurasawa *et al.* (2020)	Miniku(sleep education)	Two lectures (one lecture: 45 min)	JSQ-ES	The JSQ-ES scores (lower grade ($p = 0.780$), higher grade ($p = 0.458$)) Daytime excessive sleepiness in higher grade decreased ($p = 0.039$), and poor sleep habits were improved ($p = 0.063$)	FTF
Lawson and Little (2017)	Sensory enhanced aquatics	8 weeks (30 min per a week)	SRS-2, SPCQ, CSHQ, PSQ	4/10 children showed improvements in sleep behavior (mean = −0.375, SD = 1.25, range =−2.0 to −5.0) 5/10 children showed increased sleep disturbance postintervention (mean increase = 3.33; SD = 2.16; range = 2.0 to 5.0)	FTF
Leland *et al.* (2016)	Occupational based intervention	Ten sessions (one session: 120 min)	Nighttime sleep duration, napping and nap duration, total time spent sleeping	No longer napped group ($p < 0.05$) Intervention group: Increase of 9 min of total sleep (control group: decrease of total sleep)	FTF
McGhee *et al.* (2021)	Touchpoints Basic Sleep Kit	10 days (30 min before bedtime each night)	SSP, CSWS, ActiGraph, Sleep diary	AntiGraph (sleep duration (W = 0.203/number of nighttime awakenings (W = 0.028)/total sleep efficiency (W = 0.047)/sleep latency (W = 0.578)) CSWS(intervention, $p = 0.037$) and withdrawal, $p = 0.803$)/Going to Bed (W = 0.72), Maintaining Sleep (W = 0.87), and Total Score (W = 0.58)/ Falling Asleep (W = 0.45) and Returning to Wakefulness (W = 0.47), Returning to Sleep (W = 0.10)	NFTF
Oh *et al.* (2016)	Respiration rehabilitation program	12 weeks (3sessions per week, one session: 50 min)	FAI, PSQI	IADL ($p < 0.05$) PSQI ($p < 0.001$)	FTF
Sheth (2016)	Occupational therapy intervention (OT+education)	Presurgery to discharged from the hospital	RCSQ, SRDS, FIM	RCSQ was significantly higher than in the controls ($p = 0.0006$) experimental group improved quality ($p = 0.0024$) of sleep, decreased significantly ($p = 0.04$) in the control group. Postsurgery, experimental group reported better quantity of sleep ($p = 0.0006$)	FTF
Wan Yunus *et al.* (2020)	Xbox 360 Kinect with the choice of Kinect Sports 1	6 weeks (3 sessions per week, one session: 30 min)	DASS-21, FOSQ	FOSQ (within group: $p = 0.011$/within-between group: $p = 0.013$/d = 0.871)	FTF

Notes: BDI = Beck depression inventory; CAU = Care-as-usual; CSHQ = Children's sleep habit questionnaire; CSWS = Children's sleep wake scale; DASS-21 = Depression anxiety, and stress scale; Exp. = Experimental; FAI = Frenchay activity index; FIM = Functional independence measure; FIS = Fatigue impact scale; FSS = Fatigue severity scale; FTF = Face to face; FOSQ = Functional outcome sleep questionnaire; GSDS = General sleep disturbance scale; HAM-A = Hamilton anxiety scale; IADL = Instrumental activities of daily living; IOPI = Iowa oral pressure instrument; ISI = Insomnia severity index; JSQ-ES = Japanese sleep questionnaire for elementary schoolers; NFTF = Non-face to face; NOT-S = Nordic orofacial test-screening assessment; ODI = Oswestry disability index; PDQ = Pain disability questionnaire; PDSS = PD sleep scale; PIRS = Pittsburgh insomnia rating scale; PSQ = Parent satisfaction questionnaire; PSQI = Pittsburgh sleep quality index; PVAS = Pain visual analogue scale; RCSQ = Richards campbell sleep questionnaire; SF-36 = Short form health survey; SPCQ = Sensory profile caregiver questionnaire; SPM = Sensory processing measure; SRDS = Self-reported duration of sleep; SRS-2 = Social responsiveness scale; SSP-2 = Short sensory profile-version 2; UPDRS = Unified Parkinson's disease rating scale

Source: Authors' own work

Figure 1 Flowchart of illustrating inclusion process



Source: Authors' own work

elementary school students; one course was 45 min long. Regarding the contents of education, awareness about one's sleep and factors that positively and negatively affect sleep were taught (Kurasawa *et al.*, 2020). In a study by Sheth, OT for recovery and sleep education was applied to surgery patients. The sleep education applied in this study was a form of general sleep education (Sheth, 2016).

The three studies were occupation-based sleep interventions to improve sleep problems. The program was conducted individually and in groups and consisted of 8–10 sessions. The operating time for each session was relatively large, ranging from 30 to 120 min. Leland *et al.* applied a lifestyle redesign program that educated participants on the importance of meaningful occupational participation and yielded positive effects on the quality and quantity of sleep by appropriately adjusting their daily routines. In addition to mediation through individual meetings, the program was conducted in a group to share the participants' opinions and motivate the adjusted occupational participation schedule (Leland *et al.*, 2016). A study by Akbarfahimi and colleagues was also somewhat similar to that of Leland *et al.* (2016). Based on the participants' occupational profile, the daily routine was adjusted, behavioral habits for health management during the day were recommended, and support was provided to maintain an appropriate level of occupational participation (Akbarfahimi *et al.*, 2020). Finally, in a study by Jeseph, a program based on the concept of cognitive behavioral therapy such as meditation, sensory control, sleep restriction therapy and role-play was applied along with sleep hygiene and educational education (Joseph, 2018) (Table 1 and 2).

3.4 Effectiveness of occupational therapy to improve quality and quantity of sleep

In this review, OT intervention methods were divided into four major categories: tool use, exercise program, sleep education and occupation-based programs. The effectiveness of the tool-based intervention was demonstrated in four studies (Bolic Baric *et al.*, 2021; Gee *et al.*, 2016; Gutman *et al.*, 2017; McGhee *et al.*, 2021). Gutman *et al.* used a Dreampad pillow in their study; this intervention coupled with iRest meditation was applied to adults with sleeping difficulty, and its effectiveness was confirmed. In the experimental group, both interventions were applied simultaneously; in the control group, only meditation intervention was applied. Both groups were effective, but the experimental group was more effective in terms of sleep time and nighttime awakening (Gutman *et al.*, 2017). A weighted blanket was used in two studies. These studies asserted the positive effects of sleep preparation and sleep duration when applying a weighted blanket to children and adults with ASD or attention deficit hyperactivity disorder. However, statistical significance could not be confirmed because no statistical analysis was performed in this intervention method (Bolic Baric *et al.*, 2021; Gee *et al.*, 2016). In McGhee's (2021) study, the application of the Touchpoint Basic Sleep Kit to children experiencing sensory overresponsivity had a positive effect on sleep time and sleep latency; it was particularly effective in maintaining and lasting a long sleep duration, and it showed a moderate level of effectiveness in terms of sleep time and nighttime awakening (McGhee *et al.*, 2021).

The effectiveness of sleep intervention studies that centered on exercise or training programs was demonstrated in six studies. In two studies, occupational and physical therapists applied exercise programs for gaining muscle strength, flexibility, endurance and cardiopulmonary function, focusing on participants with musculoskeletal pain and Parkinson's disease. In a study by Asih and colleagues, in addition to exercise programs, medical observation and multimodal disability management programs were provided by other experts (Asih *et al.*, 2014). This reduced the prevalence of insomnia in participants with musculoskeletal disorders and provided psychological stability. It also helped reduce unnecessary drug use and improved occupational performance. In a study by Frazzitta and colleagues, physical and occupational therapists provided exercise programs and daily life movement training; this contributed to the improvement of sleep quality, restless legs syndrome and nocturnal psychosis in patients with Parkinson's disease (Frazzitta *et al.*, 2015). Two studies have confirmed the effectiveness of oropharyngeal and respiratory rehabilitation (Cheng *et al.*, 2017; Oh *et al.*, 2016). In a study by Cheng and colleagues oral-pharyngeal motor training was applied to participants experiencing sleep apnea. It effectively increased tongue strength and improved oral function. In particular, it is explained that the improvement of intraoral motor function can help sleep function by improving abnormal oral breathing problems and improving dyspnea during sleep (Cheng *et al.*, 2017). Oh *et al.* applied a respiratory rehabilitation program to COPD patients, which helped to improve the quality of sleep and instrumental activities of daily living (Oh *et al.*, 2016). Wan Yunus and colleagues confirmed the effectiveness of maintaining sleep and the psychological state of college students by applying a game-based exercise program; this confirmed the difference in outcomes of activities in terms of general productivity and social relationships within the intervention group but not between the groups (Wan Yunus *et al.*, 2020). Lawson and Little's study confirmed the effectiveness of sleep states by applying a water sensorimotor program and showed unclear results about the effect of improving sleep-related behavior and reducing sleep disturbances (Lawson and Little, 2017).

The effectiveness of sleep intervention studies that centered on sleep education was demonstrated in two studies. First, Kurasawa and colleagues conducted a sleep-related education program for elementary school students. Although it was not possible to confirm statistical significance in terms of sleeping habits and interfering factors, daytime sleepiness was confirmed to decrease significantly in the case of the upper grades (Kurasawa *et al.*, 2020). Second, in a study by Sheth, basic tools and education applied to sleep interventions were coupled with daily living interventions by an occupational therapist for patients with hip surgery. Nonpharmacological sleep interventions before discharge improved the participants' sleep quality, while the group without education showed lower sleep quality (Sheth, 2016).

Lastly, the sleep intervention study centered on the task-based intervention program was effective in three studies. Leland *et al.* reduced the weekly nap time using an intervention process where the occupational schedule and time were adjusted through lifestyle redesign, an occupation-based intervention, and the effect of increased sleep time was confirmed in the elderly participants (Leland *et al.*, 2016). Leland's intervention method was also reflected in a study by Akbarfahimi and colleagues, where an advanced occupational-based intervention program, including physical and cognitive activities, was developed to provide occupational-based sleep intervention to participants with multiple sclerosis. This intervention program significantly reduces fatigue and improves sleep quality (Akbarfahimi *et al.*, 2020). In a study by Joseph, a relatively similar psychological-based program was applied in conjunction with the intervention to adjust the occupational performance schedule, and it was shown to be effective in reducing insomnia symptoms in participants (Joseph, 2018) (Table 3).

4. Discussion

The impact of sleep on functioning and participation is integrated across OT disciplines and addressed across the lifespan (American Occupational Therapy Association, 2020). This scoping review was conducted to address the three main research questions. First, the OT intervention methods applied to participants experiencing sleep problems were mainly sensory-based tools as well as group and individual programs to help with occupational balance. Sensory-based interventions helped participants achieve sleep through sensory stimulation, which reduces unnecessary external stimuli to the fullest extent (Bolic Baric *et al.*, 2021; Gutman *et al.*, 2017; Lawson and Little, 2017; McGhee *et al.*, 2021). Gee *et al.*, in their study, applied deep pressure that reduced endorphins and serotonins to maintain stability and helped regulate external sensory stimuli, which aided participants in falling or staying asleep (Gee *et al.*, 2016). Foitzik and Brown emphasized the link between sensory processing difficulties and sleep problems (Foitzik and Brown, 2018). McGhee and colleagues demonstrated that alternating vibratory stimulation applied to the body could help improve the body's stress response system and control arousal levels (McGhee *et al.*, 2021). The sensory-integration-based intervention was applied to improve the difficulties faced by participants with neurodevelopmental disorders. Several studies have demonstrated the possibility of improving sleep quality using these interventions (Bodison and Parham, 2018; Schaaf *et al.*, 2018). The hyperarousal model supports the effectiveness of this intervention. Typically, participants with sleep problems experience difficulties in achieving and maintaining sleep because of abnormal physiological, cognitive and emotional arousal; particularly, in the case of participants with extreme sensory integration tendencies, deep sleep is unachievable owing to increased sensitivity (Kay and Buysse, 2017). According to sensory integration theory, deep compression and proprioceptive sense are proposed to solve the sensory integration problem in extreme areas. Although not included in this study, a Korean study confirmed improved sleep quality through sensory integration intervention in adults (Hong *et al.*, 2019).

Second, the application of group and individual programs to help occupational balance helped participants adjust their occupational schedule and participate in purposeful and meaningful activities through lifestyle redesign (Cassidy *et al.*, 2017). Additionally, an intervention method that promoted

occupational engagement by sharing content with colleagues demonstrated positive life changes (Leland *et al.*, 2016). Some programs positively changed the occupational style of participants by adding psychological intervention techniques such as meditation, sensory control and role-play, along with basic lifestyle redesign. In particular, behavioral strategies used to achieve sleep were also related to sleep hygiene improvement, increased participation in daily activities and improved sleep habits (Akbarfahimi *et al.*, 2020; Joseph, 2018). Facilitating participation in meaningful activities not only positively affects the health and quality of life but also reduces daytime sleep and increases the level of daily occupational participation, which in turn improves sleep quality (Leland *et al.*, 2016). Therefore, it is necessary to focus on lifestyle redesign because this intervention method promotes physical and mental health and improves occupational performance (Clark *et al.*, 2012,2013). Education and support through group activities accompanied by encouraging meaningful occupational participation and setting strategies to resolve obstacles could increase the effectiveness of intervention methods. Previously, the effectiveness of the intervention method was confirmed with diverse participant groups, including elderly patients, patients with spinal cord injury, obesity patients and university students (Uyeshiro Simon and Collins, 2017). The above report supports the finding that continuously maintaining occupational performance through a balanced occupational performance tailored to the individual and peer support for occupational experience can positively affect the quality of life. The chaos caused by a rapidly changing environment can hinder meaningful and balanced occupational performance; therefore, inducing active occupation participation during the daytime through a selection of meaningful tasks can have an overall effect on health and quality of life and may positively affect sleep quality (Ng *et al.*, 2013; Zhu *et al.*, 2016).

Third, sleep interventions in OT have been studied in relatively limited areas. According to OTPF-3, sleep is included in the domain of occupation and is an important domain mediated by occupational therapists. In addition, supporting healthy sleep contributes greatly to active participation in occupations and is essential for performing a fitting role in society (American Occupational Therapy Association, 2014). Furthermore, sleep disorders may appear as insomnia (sleep cannot be initiated or maintained), hypersomnia (extreme drowsiness during daytime), sleep apnea and an abnormal circadian rhythm. It can also be caused by psychological factors such as depression, drugs, neurological disorders and periodic leg movements (Falck *et al.*, 2020). Conversely, sleep-related OT interventions are limited to sensory stimulation and task-based interventions. Although some psychological interventions are integrated and applied together, there is still a lack of evidence for the effectiveness of these interventions, which limits interpretation (Faulkner and Mairs, 2015; Fung *et al.*, 2013). CBT, the most widely known intervention for sleep disorders, was not addressed in this study because although occupational therapists can apply CBT interventions, there have been no cases in the literature where interventions were led by occupational therapists. Therefore, only the interventions or research led by occupational therapists were assessed in this review. This study attempted to confirm the current status of OT for sleep interventions and to suggest future directions. Based on the last 13 years of research, occupational therapists have effectively applied sensory-integrated and lifestyle redesign interventions in resolving sleep problems. According to a study by Engel-Yeger and Shochat (2012), sensory sensitivity and avoidance symptoms were related to sleep quality, which was later confirmed to be related to problems in occupational function. Although there is a difference in the response levels of children and adults to sensory integration interventions, a positive effect on adults' behavior change was also noted (Engel-Yeger and Shochat, 2012). Sensory integration intervention for sleep improvement is device-dependent, but suitable sensory integration intervention through education and training by occupational therapists is considered an ideal approach for improving sleep function in all age groups.

Occupation is an important element that shapes life and improves human well-being. Unbalanced occupational performance can negatively affect a healthy and balanced life and, consequently, adversely affect health. The occupational therapist is a specialist who helps people with difficulties concerning occupational performance, discovers their potential and finds meaningful daily activities by implementing suitable interventions. The lifestyle redesign program, which has recently received attention, is being described as a future healthcare model and can play a role in helping individuals maintain a healthy life (Clark *et al.*, 2012; Leland *et al.*, 2016). This program was based on the Well Elderly Study of the University of Southern California. Before implementing the lifestyle redesign program, the selected modules were set through an initial evaluation, and presentation, discussion, exploration and experience were provided for each session. The program was tailored to the individual participant's adjusted occupational schedule and characteristics and was operated on a module basis. The program was applied in conjunction with education intervention to find meaningful occupations and solve specific problems, emphasizing the meaning of occupational participation by adjusting and changing the daily occupational schedule to help the participants participate in a meaningful life. The lifestyle redesign program has already been reported as an effective program for various patient groups and age groups that increase the overall quality of life by inducing substantial changes in overall lifestyle and physical and psychological health. Hence, the lifestyle redesign program has more advantages because it not only consists of various programs according to the patient's disease and characteristics but also receives support from colleagues by running individual and group programs concurrently (Clark *et al.*, 2012; Clark, 2015; Uyeshiro Simon and Collins, 2017).

Lastly, further research and treatments for sleep disorders need to be considered because of serious health issues, such as fatigue and emotional problems caused by the participant's life events. Additional considerations include social situations and limited social networks that can appear in relationships with family, friends and other important people. Therefore, occupational therapists and researchers

should expand and provide individualized interventions for physical, social and environmental restrictions that may affect sleep quality. In addition, rather than assessing only the effectiveness of sleep, improvements in occupational participation and performance due to sleep improvement should also be confirmed. This review had several limitations. First, although an extended search was attempted through an extensive literature review, some documents may not have been sufficiently reflected. Second, research on sleep disorders is being attempted in various fields, and caution in interpretation may be required because it deals with interventions by few experts. Therefore, the results of this review should be understood as an attempt to examine the intervention methods in this area within the field of OT, and the need for multidisciplinary experts for the effectiveness of treatment should not be overlooked.

5. Conclusion

This review examines the characteristics and effects of programs applied by occupational therapists. The operation of occupation-based individual and group programs based on sensory-based intervention techniques and lifestyle design programs was substantially effective. However, as various factors can cause and affect sleep problems, occupational therapists should consider further individualized and broader interventions, which will contribute to the improvement of patients' sleep and their daily occupational abilities.

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