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Faculteit Revalidatiewetenschappen

master in de revalidatiewetenschappen en de kinesitherapie

Masterthesis

Physiotherapists' awareness, knowledge, and attitude regarding sleep and sleep disorders: a systematic review

Laurien Houben
Zoë Huygen

Scriptie ingediend tot het behalen van de graad van master in de revalidatiewetenschappen en de kinesitherapie, afstudeerrichting revalidatiewetenschappen en kinesitherapie bij kinderen

PROMOTOR :
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Acknowledgment

With this master's thesis, we were able to put the finishing touches on our professional development. It provided us with the opportunity to further expand our knowledge, and delve into a previously obscure topic in physiotherapy.

The realisation of this master's thesis would not have been possible without the guidance and support of several individuals. We would like to sincerely thank Prof. Dr. Dent. Miche De Meyer (Vrije Universiteit Brussel – Universitair Tandheelkundig Centrum), Prof. Dr. Wolfgang Jacquet (Vrije Universiteit Brussel – Universitair Tandheelkundig Centrum), and Prof. Dr. Raf Meesen (Hasselt University), for their substantive guidance and necessary adjustments. Additionally, special thanks go to Adrian Zacher, our family, and friends for their support during this process. Several individuals played a decisive role in the creation of our master's thesis.

Contents

List of abbreviations

AASM	American Academy of Sleep Medicine
AHI	Apnoea-Hypopnoea Index
AKA	Awareness, Knowledge, and Attitude
AZ	Adrian Zacher
CSP	Chronic Spinal Pain
ESS	Epworth Sleepiness Scale
ICSD	International Classification of Sleep Disorders
ICSD-3-TR	International Classification of Sleep Disorders – Third Edition, Text Revision
ISI	Insomnia Severity Index
LBP	Lower Back Pain
LH	Laurien Houben
MeSH	Medical Subject Headings
MS	Multiple Sclerosis
OHRE	Oral Health Research
OSA	Obstructive Sleep Apnoea
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
PSQI	Pittsburgh Sleep Quality Index
RLS	Restless Leg Syndrome
SPSS	Statistical Package for the Social Sciences (SPSS)
VAS	Visual Analogue Scale
VUB	Vrije Universiteit Brussel
WHO	World Health Organisation
ZH	Zoë Huygen

0. Research context

For this master's thesis, a collaboration between the Vrije Universiteit Brussel (VUB) and Hasselt University (UHasselt) was carried out.

This research was conducted as part of the Oral Health Research (OHRE) group of the VUB. Sleep, Health, and Society are the main research topics in this research group. Prof. Dr. Dent. Miche De Meyer leads and coordinates this team, with the focus on the post academic education for healthcare professionals (first liners and specialists) embedded in all the aspects of 'sleep'. In that perspective, we conducted an exploratory investigation into the awareness, knowledge, and attitude (AKA) of physiotherapists regarding sleep and sleep disorders, in the form of a systematic review. This master's thesis is part of a project to publish the state of the art on the AKA of healthcare professionals (first line and specialists) involved in clinical research and education communities on 'sleep and sleep medicine'. It is part of the PhD of Drs. Adrian Zacher (VUB).

Inadequate sleep and untreated sleep disorders are harmful to health, wellbeing, and public safety. Sleep is a biological necessity (Grandner, 2017). All age groups require enough sleep each night to maintain healthy endocrine, metabolic, neurological, and cognitive systems. Due to the severity of sleep disorders and deprivation, which can have negative effects, sleep-related problems are a common and developing public health concern. A wide range of chronic conditions, such as cardiovascular diseases, and some cancers, as well as daytime sleepiness-related car accidents, falls among the elderly population, mental health issues (depression, moodiness, and irritability), and impaired judgment or decision-making are among the known health consequences associated with the spectrum of sleep disorders.

Physiotherapists are a community of healthcare professionals who maintain close contact with their patients, and cooperate mostly in an interdisciplinary setting. Therefore, it is important, yet often underestimated, for this community to be informed about the importance of good sleep for their patients in order to optimize therapy outcomes and for the effective continuation of therapy.

Therefore, this systematic review, with the title 'Physiotherapists' awareness, knowledge, and attitude regarding sleep and sleep disorders', can help researchers and clinicians to keep up with literature by summarising a large body of evidence, and can help to explain differences among studies on the same question.

This project can position the physiotherapist within the broader context of the medical community, enabling them to contribute to the comprehensive care of their patients' sleep and overall health.

The research question and search string used in this study, were drawn up by both of us, in consultation with the promotors. A third person (Adrian Zacher) from the United Kingdom was also involved in this study. He was not involved in the development of the search string, but he was involved in the screening process (as a third collaborator), and he improved our English grammar. The introduction, methods, results, discussion, and conclusion were written by both of us. We divided the work by section.

1. Abstract

Background: Insomnia and obstructive sleep apnoea are two leading sleep disorders worldwide. Yet the awareness, knowledge, and attitude (AKA) of physiotherapists about these disorders are not extensively explored in scientific research.

Methods: The purpose of this systematic review is to explore the AKA of physiotherapists about sleep and sleep disorders. Twenty articles from PubMed/Medline, Scopus, and Web of Science were screened in full text, resulting in the inclusion of seven articles. (Modified) quality appraisals were conducted using the ROBIS, NHBLI, and LEGEND tools.

Results: Physiotherapists generally showed awareness of sleep health importance, with over 90% agreeing on its significance. Despite awareness, they lacked adequate knowledge, and more than 70% lacked education. However, around 70% of physiotherapists indicated that they considered it a moderate to high priority to address the sleep quantity or quality of their patients.

Discussion and conclusion: Despite increasing awareness, little attention has been given to sleep health in physiotherapy practice. This study also highlights a significant knowledge gap among physiotherapists regarding sleep and sleep disorders. While recognising their potential role in addressing sleep-related issues, physiotherapists face barriers, such as inadequate education. Recommendations include integrating sleep education into the physiotherapy curriculum, offering continuing education, and enhancing collaboration with specialists. Moreover, physiotherapists perceive themselves as important in promoting sleep health and possess opportunities to integrate it into their practice. Further research is needed to explore regional differences and patient perspectives, ultimately improving sleep health integration in physiotherapy.

Keywords: Awareness; Knowledge; Attitude; Physiotherapists; Sleep; Insomnia; Obstructive sleep apnoea

2. Introduction

Sleep is a normal state of rest that occurs periodically. However, it is not just a period of physiological inactivity. Sleep is critical for the proper functioning of numerous body systems (Colrain, 2011; Medic et al., 2017; Siengsukon et al., 2017). Sleep positively impacts tissue healing, pain regulation, cardiovascular health, and modulates depression and anxiety. It also positively impacts cognitive abilities, learning, and memory (Dahat et al., 2023; Dejenie et al., 2022; Siengsukon et al., 2015; Taylor et al., 2007). The duration of sleep as well as sleep quality are also essential. Consequently, a lack of sleep (e.g. due to insomnia) and various sleep disorders (e.g. Obstructive Sleep Apnoea (OSA)) can have a negative impact on body functions. Ultimately, the quality of life may also be lower (Matsui et al., 2021; Siengsukon et al., 2017).

In June 2023, the American Academy of Sleep Medicine (AASM) released the 'International Classification of Sleep Disorders – Third Edition, Text Revision' (ICSD-3-TR), which is the latest update of the International Classification of Sleep Disorders (ICSD). Insomnia and OSA are two leading sleep disorders in this international classification (American Academy of Sleep Medicine, 2023).

"Insomnia is defined as a persistent difficulty with sleep initiation, duration, consolidation, or quality that occurs despite adequate opportunity and circumstances for sleep, and results in some form of daytime impairment" (American Academy of Sleep Medicine, 2023, p. 19). The importance given to a pathology is mostly based upon its prevalence. Of all sleep disorders described in the ICSD-3-TR, insomnia seems to have high prevalence rates globally. Prevalence rates of insomnia vary from 5% to 50%, depending on the definition and considered symptoms. Taking into account diagnostic criteria as documented in the ICSD-3-TR, prevalence in adults is estimated between 6% and 10% globally (Morin & Jarrin, 2022). According to a recent large Norwegian study, with a Norwegian population, prevalence can be as high as 20% (Sivertsen et al., 2021). However, this might be an overestimation, as influenceable factors were not considered. Additionally, this study indicates that women suffer more from insomnia (25%) than men (15%), and prevalence increases with age for women only (Sivertsen et al., 2021). Other factors that may elevate the risk of insomnia include growing older, the coexistence of various disorders (medical, psychiatric, sleep, and substance use), engaging in shift work, and

potentially facing unemployment or having a lower socioeconomic status (Schutte-Rodin et al., 2008).

“OSA is characterized by repetitive episodes of complete (apnea) or partial (hypopnea) upper airway obstruction occurring during sleep. These events often result in reductions in blood oxygen saturation and are usually terminated by brief arousals from sleep” (American Academy of Sleep Medicine, 2023, p. 54). OSA is mostly caused by anatomical issues in the upper airway, especially by impaired functionality of the oropharyngeal muscles (Lin et al., 2020). Approximately seven out of ten patients may also experience non-anatomical issues, such as dysfunction of the upper airway dilator muscle during sleep, unstable respiratory control (loop gain), and a low respiratory arousal threshold that may contribute to respiratory problems (Eckert, 2018). The severity of OSA is mostly assessed by using the Apnoea-Hypopnoea Index (AHI) during polysomnography, with mild, moderate, and severe scores determined by the number of events per hour. A mild severity reflects ≥ 5-14 events/hour, ≥ 15-29 events/hour corresponds with a moderate severity, and more than 30 events/hour indicates severe OSA (Lai et al., 2019). The overall prevalence of OSA ranges from 3% to 17%, depending on age. It is slightly more prevalent in men (Peppard et al., 2013). According to Benjafield et al. (2019), this corresponds with an estimated number of 936 million people between 30 and 69 years, when using an AHI criterion of five or more events per hour. For an AHI of fifteen or more events per hour, it was estimated that 425 million individuals were impacted (Benjafield et al., 2019). OSA, with an AHI criterion of five or more events per hour, seems present in more than half the population of some countries. Based on the AHI of more than five events per hour, the prevalence in Belgium is estimated at 30.4%. While considering more than fifteen events per hour, the prevalence is estimated at 15.7%. Real prevalence rates of OSA and insomnia in Belgium remain unknown (Benjafield et al., 2019). Age, obesity, and anatomical abnormalities in the upper airway are identified as risk factors for OSA. There is a higher prevalence of OSA in postmenopausal females, and also in the elderly population among Asians when contrasted with Caucasians (Bloom et al., 2009).

Sleep issues, based on prevalence estimates, should be recognised as a significant public health issue (Siengsukon et al., 2015). Globally, studies reveal a meaningful underdiagnosis of sleep disorders among others, primarily stemming from a lack of awareness, knowledge, and attitude (AKA) of healthcare professionals, compounded by limited routine screenings. Given

the impact of sleep disorders on various health conditions, such as metabolic (e.g. diabetes mellitus) and cardiovascular diseases, the low diagnosis rate will most likely be associated with an increased clinical and economic burden (Borsoi et al., 2022). Healthcare professionals in general, given their close patient contact, can play a crucial role in limiting the economic burden associated with sleep disorders. In the context and purpose of this review, we focussed on physiotherapists. Indeed, physiotherapists can actively assess and educate patients about sleep within their practice. When sleep problems are promptly detected, timely referrals to sleep specialists may potentially avert or reduce medical consequences for the patient (Siengsukon et al., 2015). Physiotherapists see patients with all kinds of conditions or problems, including musculoskeletal, neurological, and psychological problems. Sleep problems might interfere with chronic spinal pain (CSP), which is a frequently seen condition in physiotherapy practice. Studies found that sleep disturbances, like low sleep quality or low sleep duration, may negatively impact CSP's occurrence and pain intensity (Van Looveren et al., 2021). A recent meta-analysis has shown that preoperative sleep disorders are linked to the onset and intensity of chronic postoperative pain (Varallo et al., 2022). Besides an influence on pain mechanisms, more pathologies seem to be linked to sleep disorders in the current scientific research. Primary sleep disorders are more frequent in Multiple Sclerosis (MS) patients and are strongly associated with MS fatigue (Brass et al., 2014). Sleep disordered breathing (e.g. OSA) is also a potential risk factor for adverse outcomes in stroke patients (Birkbak et al., 2014).

The United Nations has established seventeen global goals, with the third goal focusing on promoting good health and well-being (Lee et al., 2020). There are three key components for a healthy lifestyle, which include diet, sleep, and exercise (Yadav, 2022). The World Health Organisation (WHO) suggests that sleep is important for the third goal of the United Nations (World Health Organisation, 2004). Sleep is therefore a detrimental to brain health. The American Heart Association also added sleep duration as an essential factor for good cardiovascular health (Makarem et al., 2022). Although sleep is an apparent risk factor for different health concerns, there is little data available worldwide. This shows a global under-recognition of the importance of sleep (Lim et al., 2023).

Despite the importance of sleep, little attention has been paid in scientific research to the knowledge of sleep and sleep disorders of healthcare professionals. To our knowledge, only one other systematic review has been conducted that investigates this topic in physiotherapists, dating from 2020. At that time, only one study with a focus on physiotherapists was retrieved. The global gap of AKA of physiotherapists about sleep remains, based on limited evidence at that time (Caudwell et al., 2020). Not only was the evidence limited, but also, restrictions on the design of included studies were made, and their AKA concerning some populations was excluded (e.g. paediatric population). Therefore, our study aimed to systematically review the current data regarding the AKA of physiotherapists, in particular, without any restrictions on study design or the target group involved. We aimed for a comprehensive overview of the currently existing evidence worldwide, over the last ten years. In addition, we aimed for an updated search on more recent literature, since there has been an increasing interest in this topic in recent years. The main focus was on their AKA concerning sleep in general and the two most prevalent sleep disorders as previously stated, namely insomnia and OSA.

This systematic review defined AKA according to the National Library of Medicine, which defined these terms as Medical Subject Headings (MeSH)-terms. Awareness is defined as "the act of 'taking account' of an object or state of affairs. It does not imply assessment of, nor attention to the qualities or nature of the object". Knowledge is "the body of truths or facts accumulated in the course of time, the cumulated sum of information, its volume and nature, in any civilization, period, or country" (National Library of Medicine). Attitude is defined as:

> An enduring, learned predisposition to behave in a consistent way toward a given class of objects, or a persistent mental and/or neural state of readiness to react to a certain class of objects, not as they are but as they are conceived to be. (National Library of Medicine)

In what follows, we systematically reviewed the literature to study the AKA of physiotherapists, and reported these aspects to find gaps and possible pathways to address the growing sleep health crisis.

3. Methods

This systematic review was written in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA 2020) guidelines (Page et al., 2021).

3.1 Research question

The research question guiding this review was: "What is the AKA of physiotherapists regarding sleep and sleep disorders (insomnia & OSA)?". Four different classes of keywords have emerged from this question, namely, 'awareness, knowledge, and attitude', physiotherapists, sleep or sleep disorders, and questionnaire or survey.

3.2 Search strategy

There were four search strings for 'awareness, knowledge and attitude', physiotherapists, sleep and sleep disorders, and questionnaire or survey. They were combined into one search string, and the search was limited to studies published since January 1, 2013. This filter was applied as more attention has been paid to sleep and sleep problems over the past ten years. MeSH-terms were used in addition to the mentioned keywords, and were combined with 'Boolean' operators "AND" and "OR".

The complete search string used, is as follows:

("Knowledge"[MeSH Terms] OR "Knowledge"[Title/Abstract] OR "Epistemology"[Title/Abstract] OR "Sleep Literacy"[Title/Abstract] OR "Attitude"[MeSH Terms] OR "Attitude of Health Personnel"[MeSH Terms] OR "attitude*"[Title/Abstract] OR "opinion*"[Title/Abstract] OR "Awareness"[MeSH Terms] OR "awareness*"[Title/Abstract])

AND

("Physical Therapists"[MeSH Terms] OR "physiotherapist*"[Title/Abstract] OR "physical therapist*"[Title/Abstract])

AND

("Sleep"[MeSH Terms] OR "Sleep Medicine Specialty"[MeSH Terms] OR "Sleep"[Title/Abstract] OR "sleep apnea, obstructive"[MeSH Terms] OR "Sleep Apnea Syndromes"[MeSH Terms] OR "Apnea"[MeSH Terms] OR "OSAHS"[Title/Abstract] OR "Upper Airway Resistance"[Title/Abstract] OR "sleep hypopnea*"[Title/Abstract] OR "sleep disordered breathing"[Title/Abstract] OR "sleep disordered breathing"[Title/Abstract] OR "OSA"[Title/Abstract] OR "SAS"[Title/Abstract] OR "OSAS"[Title/Abstract] OR "sleep related breathing disorder*"[Title/Abstract] OR "apnea*"[Title/Abstract] OR "apnoea*"[Title/Abstract] OR "Sleep Initiation and Maintenance Disorders"[MeSH Terms] OR "Disorders of Initiating and Maintaining Sleep"[Title/Abstract] OR "DIMS"[Title/Abstract] OR "sleep initiation dysfunction*"[Title/Abstract] OR "Sleeplessness"[Title/Abstract] OR "sleep initiation and maintenance disorder*"[Title/Abstract] OR "insomnia*"[Title/Abstract])

AND

("Surveys and Questionnaires"[MeSH Terms] OR "Health Care Surveys"[MeSH Terms] OR "questionnaire*"[All Fields] OR "survey*"[All Fields]).

The search string was applied in PubMed/Medline, Scopus, and Web of Science. There were respectively 27, 71, and 23 hits. It gave a total of 121 hits on August 5, 2023. The software Rayyan was used for duplicate removal. One person (LH) checked the outcome of Rayyan and removed the remaining duplicates. After duplicate removal, 80 articles were identified for further screening. Three researchers (LH, ZH, and AZ) independently screened the 80 articles in a Google sheet, based on title and abstract. There were separate sheets for each researcher, and one sheet where a summary was automatically placed. The researchers worked with three categories: ‘inclusion’, ‘exclusion’, and ‘unsure’. The scores were respectively ‘1’, ‘0’, and ‘9’.

Differences between reviewers were then discussed, and a consensus decision was made. All three researchers continued individually with full text data screening of the remaining 20 articles. Some more reports were excluded based on wrong or uncertain target population, outcomes not being AKA about sleep, or when an article contained too little information about the indicated outcomes. Finally, seven articles were included in this systematic review (see Figure 1). Reasons for exclusion for each of these articles can be found in table 1.

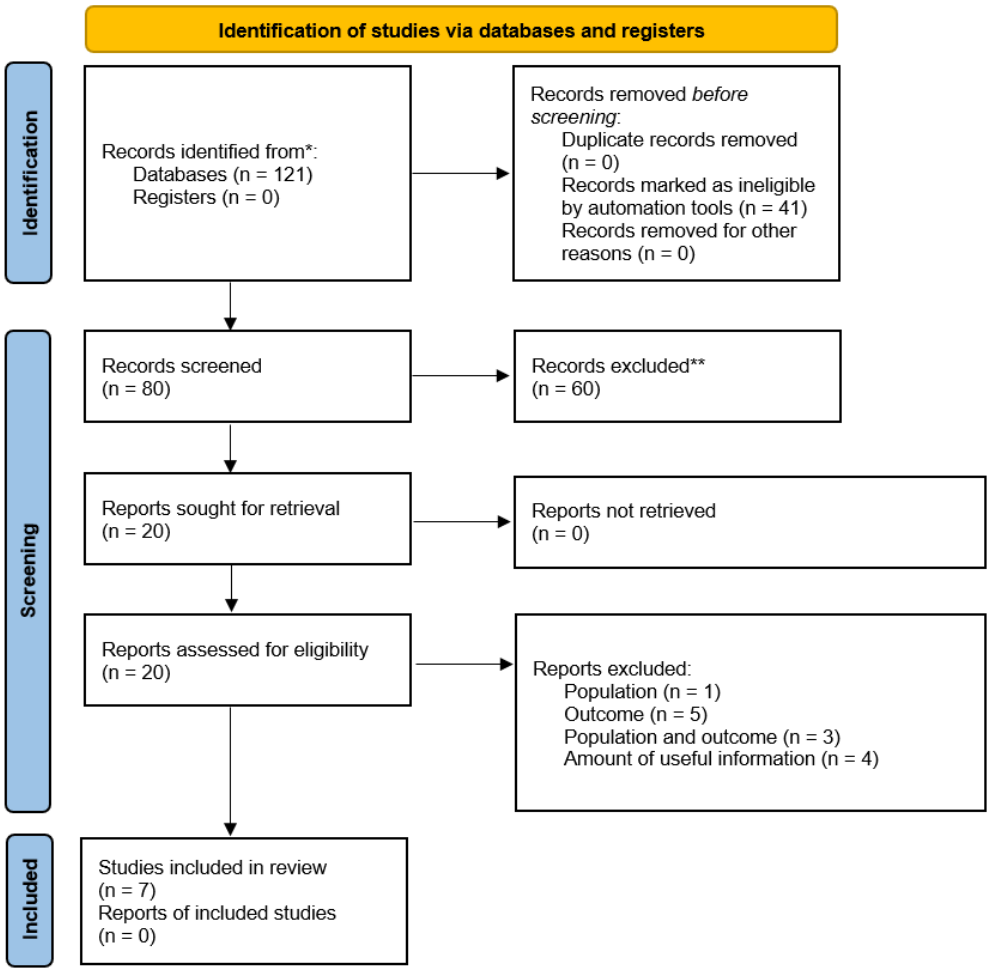

Figure 1

Flowchart according to PRISMA (Moher et al., 2009)

3.3 Selection criteria

For this systematic review, studies were eligible if they described the AKA of physiotherapists. The AKA of sleep (disorders) of physiotherapists concerning the paediatric population was also considered. Physiotherapy students were excluded from this systematic review. As little evidence existed regarding physiotherapists, it was decided not to exclude articles based upon their level of evidence or quality, ranging from expert opinions to guidelines.

3.4 Quality assessment

Quality appraisal was conducted by two reviewers (LH, ZH). For the included systematic review, the ROBIS tool was used to rate the quality of the article and risk of bias (Whiting et al., 2016). A quality assessment tool, developed by NHLBI, was used for cross-sectional studies (National Heart Lung and Blood Institute, 2013). However, we used a modified version of this checklist, because certain questions were only applicable for interventional cross-sectional studies. None of the included studies had an interventional study design. Finally, LEGEND developed an evidence evaluation tool for expert opinions and general reviews, of which a modified version was used for quality appraisal (Clark et al., 2009).

3.5 Data extraction

All three researchers individually performed theme analysis for the final selection of articles. A qualitative data analysis was performed, whereby important themes and patterns were identified (see Table 2). The next step was to pool the data in one resume together with the results of the quality assessment. An overview of this analysis is provided in table 3.

3.6 Statistical analyses

To evaluate the reliability of our screening process, we conducted inter-rater reliability analysis using the Kappa coefficient between each pair of the three reviewers. The Kappa coefficient accounts for agreement occurring by chance, offering a more precise measure of true agreement compared to simple percent agreement. JMP Pro 17 was utilized for these calculations. While the Kappa inter-rater reliability coefficient was moderate between ZH and LH ($\kappa = 0.514$), it was slight to poor/fair for the combinations with the rater AZ. Criteria for interpretation of the Kappa coefficients for inter-rater agreement can be found in table 4 (Wongpakaran et al., 2013). The coefficients between each pair of the three reviewers are $\kappa = 0.198$ for ZH and AH, and $\kappa = 0.278$ for LH and AZ. The observed Kappa scores are not completely satisfactory.

A consensus phase was foreseen to counteract possible discrepancies in screening decisions. Whenever differences in appreciations based on title and abstract occurred, all three reviewers thoroughly discussed the differences in their screening decisions, to reach a consensus judgment. The origin of the discrepancy was mostly due to a more stringent judgement of some raters: ZH (exclusion 67/80), LH (exclusion 65/80), and AZ (exclusion 40/80).

All studies where there was a discrepancy between raters, based on title and abstract, were revisited, when doubt by at least one of the raters. When in doubt the paper was referred to full text screening, 20 papers remained for full text screening (see Figure 1). The collaborative consensus approach ensured that all studies included in the final selection underwent rigorous evaluation. Through this iterative process, we ensured that the final selection of studies was comprehensive and representative of collective agreement among the reviewers.

4. Results

4.1 Study selection

In total, seven studies met the eligibility criteria (Figure 1). Of these, there is one systematic review, four cross-sectional studies, and two expert opinions, where one is tending towards a narrative review.

4.2 Assessment of methodological quality

Based on the results from the ROBIS tool, the included systematic review showed overall low concern about its quality and risk of bias. However, a full search string could not be found. Moreover, no reason was given for the exclusion of articles that examined the role of sleep in children, paediatric, or neonatal populations. A language restriction was also applied, which is rarely appropriate. Finally, their flowchart indicates that sixteen studies were included, but in the result section only fifteen articles are mentioned (Caudwell et al., 2020). This could be by mistake, but might also indicate a publication bias. Quality assessment of the cross-sectional studies showed fair quality for all four studies. They each received a score of five out of eight on the modified tool by NHLBI, when looked at the applicable questions. In all studies the research question was clearly stated, and its study population was clearly specified and defined (Al-Sharman et al., 2022; Alodaibi et al., 2022; Siengsukon et al., 2015; Siengsukon et al., 2023). However, only in the study of Siengsukon (2015), they identified the key potential confounding variables measured and adjusted statistically for their impact. Only in two out of four studies, it could be noted that loss of follow-up after baseline was 20% or less (Al-Sharman et al., 2022; Siengsukon et al., 2023). A sample size justification was only provided by Alodaibi et al. (2022), and participation rate of eligible persons could only be determined in the study of Siengsukon et al. (2015). In this study, the participation rate was less than 50% (Siengsukon et al., 2015). In the expert opinion by Morelhão et al. (2019) no clear objective is described. The literature study was not clearly described in both expert opinions. All other answers were answered 'Yes'. Therefore, their quality was indicated as ‘good’ when scoring with the modified appraisal tool (Morelhão et al., 2019; Siengsukon et al., 2017).

Individual scores of the critical appraisals of the included articles can be found in table 5a, 5b, 6, and 7.

4.3 Results data extraction

We included one systematic review that focused primarily on the attitudes and perceptions of registered healthcare professionals, including physiotherapists, concerning sleep health. Secondly, the focus in this study was on the need for healthcare professionals to receive education on sleep health. In total only fifteen studies were included, of which only two had investigated these topics in physiotherapists. Publication dates of the reviewed studies, in this systematic review by Caudwell et al. (2020), range from 1990 to 2020. Healthcare professionals were employed in primary, secondary, or tertiary healthcare. They did not include studies that investigated AKA of healthcare professionals in the paediatric or neonatal population (Caudwell et al., 2020).

Four cross-sectional studies (see Table 3) were included and classified at level four in the hierarchy, according to the PRISMA classification (Al-Sharman et al., 2022; Alodaibi et al., 2022; Siengsukon et al., 2015; Siengsukon et al., 2023). These studies are cross-sectional descriptive studies, in the form of survey studies, focusing on physiotherapists. In total, 441 physiotherapists completed the surveys in these studies. In three out of four cross-sectional studies, the physiotherapists were predominantly female (83%, 72%, and 57%) (Al-Sharman et al., 2022; Siengsukon et al., 2015; Siengsukon et al., 2023). Between studies, there was heterogeneity in terms of the degree of the physiotherapists. Some physiotherapists held a bachelor's degree, while others had a master's degree, or had obtained a doctorate (see Table 8). Some physiotherapists worked in outpatient clinics, others in acute care settings, with a variety of patients. Physiotherapists' knowledge of sleep was evaluated in the cross-sectional studies, focusing solely on education. As the foundation for the electronic surveys, the four cross-sectional studies utilised different (validated) questionnaires, such as the Dartmouth Sleep Questionnaire. Some developed their own questionnaire, whether or not derived from an existing questionnaire. In all studies, the first section consisted of some demographic questions, such as gender and age. However, the other sections did not correspond with each other. They included topics, such as physiotherapists' attitudes regarding sleep, sleep education, their assessment of patients' sleep, and barriers or facilitators to implementing sleep health (Al-Sharman et al., 2022; Alodaibi et al., 2022; Siengsukon et al., 2015; Siengsukon et al., 2023).

The awareness of physiotherapists

Almost all physiotherapists indicate that sleep is an important topic. Two survey studies asked this specific question to their participants. In the study of Al-Sharman et al. (2022), 100% of physiotherapists agreed on its importance. A study by Siengsukon et al. (2015) revealed that 96% agreed on this. Also, the majority of physiotherapists acknowledged that they should ask about their patients' sleep and their potential role in assessing this (Al-Sharman et al., 2022). In two out of four studies, more than 80% agreed that they should ask their patients about their sleep habits and sleep quality. More than half of them (89.6% and 51%) also indicated that performing an objective assessment would be a potential role for a physiotherapist (Al-Sharman et al., 2022; Siengsukon et al., 2015).

Almost all physiotherapists were aware that sleep is associated with patients' health, and that managing sleep disorders can impact therapy outcomes. This was surveyed both in the study of Al-Sharman et al. (2022), as well as in the study of Siengsukon et al. (2015). Respectively 81.6% and 93% were aware that poor sleep impacts function. Eighty-eight and a half percent and ninety-five percent of physiotherapists agreed that addressing sleep issues may have a positive effect on therapy outcomes (Al-Sharman et al., 2022; Alodaibi et al., 2022; Siengsukon et al., 2015). Most physiotherapists were also aware that various aspects of sleep are important, such as physiology, causes, medications, prevention, and promotion. They suggest that sleep should be taught during entry-level physiotherapy education (Siengsukon et al., 2015).

The knowledge of physiotherapists

Education during physiotherapists' studies on sleep or risk factors is important for building knowledge to question or inform patients. Nevertheless, more than 70 % of the surveyed physiotherapists, seem to lack this education. Most of them received no more than one lecture about sleep during their undergraduate education. They also encountered scarce explanations in their education regarding sleep disorders (Al-Sharman et al., 2022; Alodaibi et al., 2022; Siengsukon et al., 2015).

An important theme throughout all the articles was that healthcare professionals lack knowledge about sleep health. According to the results of the included systematic review, this was partly contributed by a lack of sleep health education in the professional curriculum.

Overall, their findings indicate that professionals tended to show better knowledge about sleep, when they had received some education regarding this topic (Caudwell et al., 2020). In this systematic review, there were two studies that included physiotherapists into their study, and they identified a clear knowledge gap (Brown et al., 2014; Siengsukon et al., 2015). Physiotherapists are well-positioned to give education about sleep to their patients. To maximise patients' function, they need to have sufficient levels of knowledge. The result of the included systematic review suggests that sleep health should be integrated into entry-level programmes of physiotherapists, as well as an integration into existing continuing education (Caudwell et al., 2020).

The attitude of physiotherapists

In the majority of articles included in the systematic review of Caudwell et al. (2020), it was observed that healthcare professionals have a positive attitude towards sleep health (67%), and believe that sleep disorders are important medical considerations. However, they also indicated that some caregivers had a negative attitude towards sleep health being part of their role. More specifically, assessing sleep in patients is not often performed by physiotherapists, because they do not know how. It showed that almost all healthcare professionals, including physiotherapists are aware of the impact of sleep disorders upon their patients' health. However, some of them are not aware of a possible relationship between sleep and other factors. A variety of sleep health awareness for each profession was found (Caudwell et al., 2020).

Despite the general awareness, and in the presence of a limited degree of knowledge, only a small proportion of the physiotherapists surveyed, indicated they assessed their patients' sleep. However, the results were somewhat contradictory. Respectively 12%, 57%, and 35% of physiotherapists are assessing sleep already (Al-Sharman et al., 2022; Alodaibi et al., 2022; Siengsukon et al., 2015). These physiotherapists utilise questionnaires to obtain information. Those who did not assess their patients' sleep, lacked knowledge of how to do so (Siengsukon et al., 2015). In the study of Alodaibi et al. (2022), around 70% of physiotherapists indicated a moderate to high priority for addressing the sleep quantity or quality of their patient. Indirectly, this might indicate that they see a potential role for the physiotherapist to also provide education to patients about sleep. Additionally, less than one fifth refers patients to specialists in sleep medicine (Siengsukon et al., 2015).

Statistical analysis reported in studies

Three cross-sectional studies used Statistical Package for the Social Sciences (SPSS) for statistical analysis (Al-Sharman et al., 2022; Alodaibi et al., 2022; Siengsukon et al., 2015). In one cross-sectional study, two binary stepwise logistic regressions were used to investigate whether the assessment of the patient's sleep was influenced by the age and experience of the physiotherapist, or the age of the patient. However, this was not significant (Siengsukon et al., 2015). Two studies only reported means and standard deviations with respect to continuous variables, and frequency distributions with respect to categorical variables (Al-Sharman et al., 2022; Siengsukon et al., 2023). In the study of Alodaibi et al. (2022), they used absolute and relative frequencies for the likelihood that the therapist report assessed lifestyles. There were no statistically significant relationships between age, gender, experience, and sleep (Alodaibi et al., 2022).

The narrative review and expert opinion

Two expert opinions, whereby one tended more towards a narrative review, were incorporated into the findings due to the limited availability of articles (see Table 3) (Morelhão et al., 2019; Siengsukon et al., 2017). While they did not specifically evaluate the AKA of physiotherapists, they provided sufficient mention of AKA to include in the results of this systematic review. Also in one expert opinion, it was indicated that physiotherapists are aware that poor sleep can affect patient outcomes, and may increase the risk of mortality (Siengsukon et al., 2017). Sleep disorders and reduced sleep quality are common comorbidities among many patients seeking physical therapy, and they may worsen the physiotherapist's outcome measures. Poor sleep is a frequent complaint among patients with lower back pain (LBP). Physiotherapists should be aware of the range of clinical tools that are available to assess the quality of sleep (Morelhão et al., 2019). The authors of the expert opinions mention several screening tools that can be used to uncover sleep problems. Those that appeared in both were: the Insomnia Severity Index (ISI)99, Pittsburgh Sleep Quality Index (PSQI), and Epworth Sleepiness Scale (ESS). The STOP-Bang questionnaire and the Morningness-Eveningness Questionnaire were also mentioned in one of the expert opinions (Morelhão et al., 2019; Siengsukon et al., 2017). These expert opinions also indicated that education of AKA about sleep is not a part of the current curriculum for physiotherapists worldwide. However, physiotherapists require an educational programme on sleep and sleep-related disorders to effectively screen and assist patients.

When a patient requires specialised assistance, the physiotherapist can also facilitate appropriate referrals (Morelhão et al., 2019; Siengsukon et al., 2017). Physiotherapists should also have adequate knowledge about the three most common sleep disorders (insomnia, OSA, and restless leg syndrome (RLS)). Moreover, they should have knowledge about sleep hygiene, physical activity, bed mobility, changes in internal patient factors, and sleep problems related to LBP (Morelhão et al., 2019; Siengsukon et al., 2017). Education about sleep hygiene aids the patient in achieving a better quality of sleep. Engaging in physical activity in the morning or early afternoon improves depressive symptoms, sleep quality, and reduces the use of medication (Siengsukon et al., 2017). Only one expert opinion assessed physiotherapists' attitude about sleep. Most physiotherapists believe that sleep is important for overall health (Siengsukon et al., 2017). Therefore, physiotherapists should consistently screen for sleep problems. After screening, they should educate patients thoroughly about sleep, sleep hygiene, and sleeping positions. This will help alleviate pain during sleep, and reduce, or eliminate waking up during the night (Morelhão et al., 2019; Siengsukon et al., 2017). Physiotherapists should take an active role in an interdisciplinary team to reduce sleep problems and reduce the onset of chronic conditions (Siengsukon et al., 2017).

5. Discussion

5.1 Reflection on quality

The quality of all seven included studies was indicated as fair to good. When looking at the level of evidence according to PRISMA, the systematic review has a relatively high level of evidence: namely level three. The other six studies have a level of four or five (see Table 3).

5.2 Reflection on findings

This systematic review aimed to provide the most comprehensive answer possible about the research of physical therapists' AKA of sleep and sleep disorders, which encompasses both existing insights and areas that remain to be explored. The results of our study show a clear 'knowledge gap' among physiotherapists worldwide (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023). There is a lack of education at the entry-level of the curriculum (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Morelhão et al., 2019; Siengsukon et al., 2015; Siengsukon et al., 2023). According to these authors, sleep education should definitely include knowledge about the three most common sleep disorders: insomnia, OSA, and RLS (Morelhão et al., 2019; Siengsukon et al., 2017). Physiotherapists could play a key role in questioning and monitoring the sleep of their patients. Physiotherapists also want to receive more education to be able to fulfil this role (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023). Furthermore, physiotherapists believe they could have an active role in screening and evaluating sleep in a multidisciplinary setting. It is, however, not clear whether or not they are currently taking up this role (Al-Sharman et al., 2022; Morelhão et al., 2019; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023). Some screening tools are suggested by experts, being the ISI99, PSQI, ESS, and STOP-Bang questionnaire (Morelhão et al., 2019; Siengsukon et al., 2017). All therapists acknowledge the importance of sleep (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023). The majority are also aware that addressing sleep issues may have a positive effect on therapy outcomes (Al-Sharman et al., 2022; Caudwell et al., 2020; Siengsukon et al., 2015; Siengsukon et al., 2017).

When comparing these findings to previous research that addresses the importance of sleep, some interesting remarks can be made. A clinical guideline, drawn up by the Brazilian Sleep Association, provides some practice recommendations for the role of physiotherapists in the management of sleep disorders (Frange et al., 2022). This guideline gives an insight into what the authors consider as important knowledge or information about sleep for physiotherapists. This enabled us to compare the authors' priorities with the evidence available and the findings in our results. In this guideline, they suggest that the role of the physiotherapist is increasingly crucial in addressing sleep-related issues, yet there remains a shortage of education for physiotherapists about sleep and sleep disorders (Frange et al., 2022). This is a similar finding to our own. The guideline authors acknowledge physiotherapist's possible role, but face some barriers, like the existing 'knowledge gap' (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Morelhão et al., 2019; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023). The clinical guideline mentioned several aspects of sleep AKA. Firstly, they emphasise the importance of knowing the patient's age due to variations in sleep stages, and the prevalence of sleep disorders across different age groups. Additionally, understanding factors, such as eating habits (including food intake, alcohol, and caffeine consumption), smoking, work activities, and physical activity are essential as they directly impact sleep. Knowledge about medication that can have an effect on sleep is important for screening purposes (Frange et al., 2022). It is not clear in the existing studies if physiotherapists currently receive some knowledge in their education concerning these topics (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Morelhão et al., 2019; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023). This guideline also indicates that physiotherapists need to understand how assessment tools for screening purposes of sleep disorders, such as questionnaires and scales, can be incorporated into their screening process (Frange et al., 2022). For physiotherapists' selection of a screening tool, the Brazilian guidelines of Frange et al. (2022) listed some tools in a table detailing various sleep problems, tools for children, and tools for sleep quality. Some of these tools however still need validation in Belgium. Although it showed that physiotherapists believe in their potential role in evaluating and screening sleep, it is however not clear whether or not they are currently performing such an assessment in their patients (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Siengsukon et al., 2015; Siengsukon et al., 2017).

Furthermore, according to the Brazilian guideline, physiotherapists have to be aware of the impact of sleep disorders on patient functioning, including difficulties with concentration and participation in social activities. We found that the attitude of the physiotherapist should be that they ask the patient about the onset of the complaint until the moment the patient seeks assistance from the physiotherapist (Frange et al., 2022). Our results illustrated that there was good awareness of the possible impact from sleep problems upon patients' health and therapy outcomes (Al-Sharman et al., 2022; Caudwell et al., 2020; Morelhão et al., 2019; Siengsukon et al., 2015; Siengsukon et al., 2017). The screening conversation should be comprehensive, allowing for a thorough understanding of the patient's situation and the identification of potential sleep disorders. Additionally, the physiotherapist must gain insight into external factors in the bedroom, the patient's sleep routine during the week and on weekends, as well as pre-sleep activities, such as reading or screen time (TV, mobile phones). These factors may then be considered alongside other relevant information. Furthermore, the physiotherapist should be aware of the various sleeping positions, and how they, along with bed mobility, can impact sleep quality and pain levels. Recommendations in the Brazilian guideline suggest that physical activity may be considered as a form of treatment for sleep disorders, as it provides a safe alternative and has the potential to improve sleep. Physiotherapists would most definitely take up their role in this. Certain medical conditions may exacerbate sleep problems more than others, emphasising the need for awareness and understanding of these conditions to optimise treatment approaches. A multidisciplinary approach is more effective in treating sleep disorders compared to relying solely on physical therapy or any other single discipline. Physiotherapists can therefore play an important role in screening and treating sleep disorders (Frange et al., 2022). This is consistent with the attitude of therapists in the survey studies included (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Morelhão et al., 2019; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023). Finally, the authors of this Brazilian guideline believe it is beneficial to integrate this concept into the curriculum of physiotherapy education, thereby enhancing the ability of physiotherapists to provide better assistance to patients (Frange et al., 2022). This opinion is again shared by the people involved in the included studies (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023).

Nalajala et al. (2013) revealed the connection between chronic LBP and sleep problems (Nalajala et al., 2013). Additionally, apnoea is often associated with the supine position, highlighting the importance of providing education about sleep positions. During screening, the physiotherapist has to ask additional questions specific to sleep and sleep problems. Such questions may include inquiries about sleep positions, the sleep environment, difficulties initiating and maintaining sleep, the consequences of sleep problems the day after, and medication usage. The ESS, the Visual Analogue Scale (VAS), or the PSQI can be used during screening. Insomnia severity can be assessed using the ISI (Nalajala et al., 2013). The same screening tools were identified by the included expert opinions in our result section as being adequate tools for screening (Morelhão et al., 2019; Siengsukon et al., 2017). The authors of the reviews believe that sleep education should be incorporated into physiotherapy education. They also argue that physiotherapists should pay more attention to sleep in scientific research, education, and practice (Nalajala et al., 2013; Staub, 2018). Our results did however not mention anything about the possibility of physiotherapists gaining knowledge by paying attention to scientific research. It is not clear if they are currently doing this themselves (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Morelhão et al., 2019; Siengsukon et al., 2015; Siengsukon et al., 2017; Siengsukon et al., 2023).

Lastly, an expert opinion by Catherine Siengsukon (2022) made clear that patients with acute or chronic pain often seek treatment from physiotherapists (Siengsukon, 2022). These patients frequently experience sleep problems, and physiotherapists could play a key role in screening them. A ‘Spielman’s 3P model of insomnia’ is cited to explain the development of insomnia to patients, which could be used by physiotherapists (Siengsukon, 2022). In our results it was not investigated what education physiotherapists are already giving to their patients concerning sleep (Al-Sharman et al., 2022; Alodaibi et al., 2022; Caudwell et al., 2020; Siengsukon et al., 2015; Siengsukon et al., 2017). In this expert opinion, it is mentioned that physiotherapists should also refer their patients to appropriate healthcare professionals when needed (Siengsukon, 2022). Findings of our results were, that currently physiotherapists make few referrals for sleep problems. More attention should be drawn to this possibility (Al-Sharman et al., 2022; Caudwell et al., 2020; Siengsukon et al., 2015; Siengsukon et al., 2017).

5.3 Reflection on limitations and strengths

The limitations of the included studies are outlined in this section. There were few survey studies conducted among physiotherapists, however AKA is more commonly assessed among other healthcare professionals. Eventually only seven studies were included. The studies were also conducted in specific parts of the world, such as the United States of America, Jordan, Saudi Arabia, Brazil, and New Zealand, which means we do not have an accurate picture of the situation in Belgium or wider Europe. Several articles are authored by the same author, namely Siengsukon. Furthermore, the included studies did not clearly identify what the specific sleep knowledge of the physiotherapists was, and what exactly they asked their patients when they indicated that they were performing a sleep assessment. The limitations of our systematic review include searching only three databases, and not conducting a search in other sources, which means that essential information may have been overlooked. Due to the variability in article types, we were unable to perform statistical analyses, thus precluding a meta-analysis. Additionally, we restricted our inclusion criteria to the past 10 years, potentially missing out important data predating 2013. It is possible that there is a publication bias, as perhaps not all studies were included in our systematic review. One strength of our systematic review is that, to the best of our knowledge, we are the first to focus solely on physiotherapists. Therefore, we have also not excluded articles based on language.

5.4 Recommendations

In the future, it is vital to incorporate education about sleep and sleep disorders into the curriculum of a physiotherapy programme. Furthermore, small courses and continuing education are also essential to better assist patients. This should become the responsibility of the physiotherapist, and thus be incorporated into the field of practice. To facilitate this task, it could also be included into the nomenclature. When dealing with a complicated condition, the role of the physiotherapist should shift towards referring to specialists. Recommendations for further studies include conducting more high-quality research on this topic and exploring it in different regions or countries, such as wider Europe and Belgium. Studies could potentially focus on patients, surveying whether their physiotherapist assessed their sleep, and whether they believe that screening sleep disorders could be beneficial.

6. Conclusion

Sleep health is an area that deserves more attention within the field of physiotherapy. Currently, there is a growing awareness among physiotherapists regarding the importance of sleep for overall health, and its influence on therapy outcomes. However, according to the limited evidence available, little to no attention seems to be given to this topic in the entry-level curriculum of physiotherapists. Yet, generalising this statement worldwide is challenging due to the scarcity of existing studies. Therefore, further research is warranted for optimal development of a model-based approach. This seems most appropriate in an interdisciplinary effort.

Based on our finding that almost no attention is paid to sleep in entry-level education, we should argue that, despite the increasing awareness of physiotherapists, they lack the knowledge to incorporate sleep health into practice. Nevertheless, physiotherapists perceive themselves as playing a crucial role in promoting sleep health, demonstrating an overall positive attitude. Given their frequent and long interactions with patients, physiotherapists are well-positioned to address sleep health issues. This role is vital in preventive health care and in the management of chronic conditions, where sleep plays a significant role. Direct access to physiotherapy could have an added value to the clinical and economic burden of sleep disorders.

Their frequent involvement in multidisciplinary settings allows for seamless collaboration with other healthcare professionals. They possess extensive knowledge of physical complaints, and can identify red flag symptoms on an individual level. A comprehensive validated screening tool could be developed, and if necessary, patients should be referred to sleep specialists by their physiotherapist. Existing care pathways concerning sleep should be enhanced to include physiotherapists within the care team. Regulatory authorities should recognise sleep health as a core component of physiotherapy. This would allow for its inclusion in the nomenclature of physiotherapists and further development of sleep-related practices. Overall, there are numerous opportunities to integrate sleep health into the practice of physiotherapy.

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8. Appendices

8.1 Reasons for exclusion

Table 1

Reasons for Exclusion

	Wrong or uncertain target population	Outcomes not being AKA about sleep	Contains too little information about the indicated outcomes
Broberg et al. (2017)	X	X	
Frange et al. (2022)[a]			X
Kerstens et al. (2021)	X	X	
Mansour et al. (2022)		X	
Meurer et al. (2017)		X	
Nalajala et al. (2013)[a]			X
Ory et al. (2014)	X	X	
Russek et al. (2016)		X	
Siengsukon et al. (2022)[a]			X
Simonelli et al. (2013)		X	
Staub, C. (2019)[a]			X
Studnicka et al. (2020)		X	
Zarem et al. (2013)	X		

[a]Study included in the discussion section.

8.2 Key concepts and themes mentioned per article

Table 2

Key Concepts and Themes Mentioned per Article

	Theme 1: Awareness		Theme 2: Knowledge				Theme 3: Attitude					
	PTs awareness about the influence of poor sleep on overall health	PTs awareness about the influence of poor sleep on therapy outcomes	PTs received education about sleep in their entry level education	Knowledge of PTs about sleep health	Sleep should be included in entry level education	Sleep should be part of continuing education	PTs think that sleep is important	PTs educating their patients	PTs attitude to sleep education as part of their role	PTs attitude to assessing sleep habits and quality as part of their role	PTs assessing sleep	PTs referring their patients to specialists
Systematic review												
Caudwell et al. (2020)	1	1	1	1	1	1	1	1	1	0	1	1
Cross-sectional studies												
Alodaibi et al. (2022)	0	0	1	1	1	1	1	1	1	9	1	9
Al-Sharman et al. (2022)	1	1	1	1	1	1	1	1	1	1	1	1
Siengsukon et al. (2015)	1	1	1	1	1	1	1	1	1	1	1	1
Siengsukon et al. (2023)	0	0	1	1	1	0	1	0	1	1	0	0
Expert opinions												
Morelhão et al. (2019)	1	0	1	0	0	1	0	0	0	1	0	0
Siengsukon et al. (2017)	1	1	0	9	1	0	1	1	1	1	1	1

Note. 1 = mentioned, 0 = not mentioned, 9 = unclear.

8.3 Aims and key outcomes of the included studies

Table 3

Aims and Key Outcomes of the Included Studies

Author; Country	Level of Evidence (PRISMA)	Aim of the study	Key outcomes	Critical appraisal score
Systematic review				
Caudwell et al (2020); New Zealand	Level 3A	To systematically review and investigate attitudes and perceptions of HPs, including physiotherapists, towards sleep health as well as the need for HPs, including physiotherapists, to have specific education on sleep health	Overall results suggested that HPs would respond positively to assessment and promotion of sleep health if they had the relevant knowledge and skills. Thus, the knowledge gap HPs have regarding sleep health needs to be addressed.	Good / Low concern
Cross-sectional studies				
Alodaibi et al. (2022); Saudi-Arabia	Level 4	To explore physiotherapists' health promotion in the musculoskeletal practice setting and investigate potential barriers and needed education.	20% of the physiotherapists were not confident to assess sleep, and 30% of the physiotherapists were very confident to assess sleep. 40% believes that sleep quality and quantity should be a high priority when addressing lifestyle behaviours. The most frequently reported perceived barriers to assessing and managing lifestyle behaviours included lack of expertise about lifestyle risk factors assessment and management, lack of proper patient education materials, lack of time, and uncertainty about what services to provide.	Fair
Al-Sharman et al. (2022); Jordan	Level 4	The purpose of this study was to assess the attitude and perception of physiotherapists on the need to assess sleep and provide education about sleep for their patients, as well as the perceived need for physiotherapists to be educated on sleep topics.	All physiotherapists agree that sleep is important to people's health and 81.6% agree that poor sleep impacts function. Also, 93.1% of respondents agreed that physiotherapists should ask their patients about their sleeping habits, and 89.6% agreed that assessing their patient's sleep quality is important. In addition, 88.5% agreed that addressing sleep issues may impact physiotherapists outcomes. Only 35.6% physiotherapists (n = 31) received education about sleep in their physiotherapist school. Less than 12% of physiotherapists reported usually assess their patient's sleep habits or quality of sleep. The most common reason provided by the physiotherapists who do not routinely assess their patient's sleep habits or quality of sleep was "I do not know how to assess sleep habits or sleep quality".	Fair
Siengsukon et al. (2015); United States of America, Kansas	Level 4	To assess the attitude and perception of physiotherapists on the perceived need to assess sleep of their patients and provide education about sleep to their patients as well as to determine the perceived need for physiotherapists to be educated on sleep topics.	Physiotherapists recognise that sleep impacts outcomes, and patients' sleep should be assessed. However, physiotherapist have not received education about sleep although the majority think physiotherapists should receive education about sleep. Therefore, entry-level physiotherapist education programs may consider incorporating education about sleep, and the development of continuing education courses is also needed.	Fair

Siengsukon et al. (2023); United States of America, Kansas	Level 4	To elucidate the perceived barriers and facilitators of incorporating sleep health into outpatient physiotherapist practice.	Of the top 10 items identified as “moderate” or “significant” barriers, 4 consisted of lack of sleep resources for physiotherapists and 2 consisted of lack of physiotherapist’s knowledge regarding sleep as a topic. Provision of sleep resources and enhancing physiotherapist’s sleep knowledge might be beneficial targets to enhance incorporation of sleep health in physiotherapist practice. This is supported by the results of the current study showing 4 of the top 10 facilitators included access to information regarding sleep topics. Developing physiotherapists’ knowledge of behaviour change theory and skills in health coaching and motivational interviewing might be a beneficial strategy to addressing perceived barriers to implementing sleep health into physiotherapist practice.	Fair
Expert opinions				
Morelhão et al. (2019); Brazil	Level 5	To examine if physical therapists should assess sleep quality in patients seeking care for low back pain.	Nearly 60% of patients with LBP report having disturbed sleep. There is evidence suggesting that 1 in 2 patients with chronic LBP seeking care in secondary care settings have insomnia complaints. Sleep quality and pattern can be assessed by clinicians using self-reported questionnaires, such as the Pittsburgh Sleep Quality Index, the Insomnia Severity Index, the Epworth Sleepiness Scale, and the Morningness-Eveningness Questionnaire. Given that knowledge about sleep health has not been incorporated in the curriculum of physical therapy education programs, they would argue that specific training and education on sleep health would help physical therapists assess the quality of sleep and refer patients to specialized care when needed.	Good
Siengsukon et al. (2017); United states of America, Kansas	Level 5	1) Discuss the relevance of sleep to physiotherapists practice. 2) Recommend tools to screen for the 3 most common sleep disorders. 3) Provide suggestions for how physiotherapists can integrate sleep health in prevention, health promotion, and wellness interventions.	Evidence shows that impaired sleep can impact outcomes and is associated with an increased mortality risk. It is recommended that therapists regularly screen clients for the 3 most common sleep disorders, provide sleep hygiene education, provide an appropriate exercise program, consider positioning to promote sleep quality, and address bed mobility issues to potentially prevent chronic conditions or delay the sequelae associated with chronic conditions as well as to promote health and wellness. In addition, professional physiotherapist education programs should consider including information about sleep, screening for sleep disorders, and methods to optimize sleep health in their curriculum.	Good

Note. Level 3a: Systematic review of (homogeneous) case-*control studies. Level 4: Case series, low-quality cohort or case-control studies. Level 5: Expert opinions based on non-systematic reviews of results or mechanistic studies.*

8.4 Benchmark scales for Kappa's value

Table 4

Benchmark scales for Kappa's value, as proposed by different investigators

Landis and Koch	Altman	Fleiss
<.0 Poor		
.00 to .20; Slight	<.20; Poor	<.40; Poor
.21 to .40; Fair	.21 to .40 Fair	.40 to .75; Intermediate to Good
.41 to .60; Moderate	.41 to .60; Moderate	
.61 to .80; Substantial	.61 to .80; Good	More than .75; Excellent
.81 to 1.00; Almost Perfect	.81 to 1.00; Very Good	

Note. From *A comparison of Cohen's Kappa and Gwet's AC1 when calculating inter-rater reliability coefficients: a study conducted with personality disorder samples*, by N. Wongpakaran et al., 2013, p. 6. In the public domain.

8.5 Appraisal tools for systematic review individual scoring

Table 5a

Appraisal Tool for Systematic Review (ROBIS) Individual Scoring – part one

Author	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	4.6
Systematic Review																					
Caudwell et al (2020)	PY	Y	Y	Y	PN	PY	Y	NI	N	Y	Y	PY	PY	Y	Y	PN	PY	Y	Y	Y	Y

Note. Appraisal tool for systematic review (ROBIS) individual scoring: 1.1 Did the review adhere to pre-defined objectives and eligibility criteria? 1.2 Were the eligibility criteria appropriate for the review question? 1.3 Were eligibility criteria unambiguous? 1.4 Were any restrictions in eligibility criteria based on study characteristics appropriate (e.g. date, sample size, study quality, outcomes measured)? 1.5 Were any restrictions in eligibility criteria based on sources of information appropriate (e.g. publication status or format, language, availability of data)? 2.1 Did the search include an appropriate range of databases/electronic sources for published and unpublished reports? 2.2 Were methods additional to database searching used to identify relevant reports? 2.3 Were the terms and structure of the search strategy likely to retrieve as many eligible studies as possible? 2.4 Were restrictions based on date, publication format, or language appropriate? 2.5 Were efforts made to minimise error in selection of studies? 3.1 Were efforts made to minimise error in data collection? 3.2 Were sufficient study characteristics available for both review authors and readers to be able to interpret the results? 3.3 Were all relevant study results collected for use in the synthesis? 3.4 Was risk of bias (or methodological quality) formally assessed using appropriate criteria? 3.5 Were efforts made to minimise error in risk of bias assessment? 4.1 Did the synthesis include all studies that it should? 4.2 Were all pre-defined analyses reported or departures explained? 4.3 Was the synthesis appropriate given the nature and similarity in the research questions, study designs and outcomes across included studies? 4.4 Was between-study variation (heterogeneity) minimal or addressed in the synthesis? 4.5 Were the findings robust, e.g. as demonstrated through funnel plot or sensitivity analyses? 4.6 Were biases in primary studies minimal or addressed in the synthesis? Y = Yes, PY = probably yes, PN = probably no, N = No, NI = No information.

Table 5b

Appraisal Tool for Systematic Review (ROBIS) Individual Scoring – part two

Author	1	2	3	4	A	B	C
Systematic review							
Caudwell et al (2020)	Low	Unclear	Low	Low	PY	Y	NI

Note. Appraisal tool for systematic review (ROBIS) individual scoring: 1. Concerns regarding specification of study eligibility criteria. 2. Concerns regarding methods used to identify and/or select studies. 3. Concerns regarding methods used to collect data and appraise studies. 4. Concerns regarding the synthesis and findings. A. Did the interpretation of findings address all of the concerns identified in Domains 1 to 4? B. Was the relevance of identified studies to the review's research question appropriately considered? C. Did the reviewers avoid emphasising results on the basis of their statistical significance? Y = Yes, PY = probably yes, PN = probably no, N = No, NI = No information.

8.6 Modified appraisal tool for cross-sectional studies individual scoring

Table 6

Modified Appraisal Tool for Cross-sectional Studies (NHLBI) Individual Scoring

Author	1	2	3	4	5	6	7	8	9
Cross-sectional studies									
Alodaibi et al. (2022)	1	1	CD	1	1	1	NA	0	5/8
Al-Sharman et al. (2022)	1	1	CD	1	0	1	1	0	5/8
Siengsukon et al. (2015)	1	1	0	1	0	1	NA	1	5/8
Siengsukon et al. (2023)	1	1	CD	1	0	1	1	0	5/8

Note. Modified appraisal tool for cross-sectional study (NHLBI) individual scoring: 1. Was the research question or objective in this paper clearly stated? 2. Was the study population clearly specified and defined? 3. Was the participation rate of eligible persons at least 50%? 4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants? 5. Was a sample size justification, power description, or variance and effect estimates provided? 6. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? 7. Was loss to follow-up after baseline 20% or less? 8. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)? 9. Quality rating. 1 = Yes, 2 = No, CD = cannot determine, NA = not applicable, NR = not reported.

8.7 Modified appraisal tool for expert opinions and general reviews individual scoring

Table 7

Modified Appraisal Tool for Expert Opinions and General Reviews (LEGEND) Individual Scoring

Author	1	2	3	4	5	6	7	8	9	10	11	12
Expert opinions												
Morelhão et al. (2019)	9	1	1	0	1	1	1	1	1	1	1	Good quality
Siengsukon et al. (2017)	1	1	1	0	1	1	1	1	1	1	1	Good quality

Note. Modified appraisal tool expert opinions (LEGEND) individual scoring: 1. Do the objectives assist in answering your clinical question? 2. Is the author a known expert in the field being studied? 3. Is the patient population, problem, or issue clearly described? 4. Is the literature search clearly described? 5. Is the date range of the cited literature appropriate and current? 6. What types of research are cited (e.g., animal model, basic science, clinical studies)? 6. Is there more than one point of view explained, reported, or referenced? 7. Were any conclusions clearly presented in the article? 8. Was there freedom from conflict of interest? 9. Can the results be applied to my population of interest? 10. Are my patient's and family's values and preferences satisfied by the knowledge gained from this article (such as outcomes considered)? 11. Would you include this article in development of a care recommendation? 12. the evidence level. 1 = Yes, 0 = No, 9 = unknown.

8.8 Demographics of the included studies

Table 8

Demographics of the included studies

Author	n (sample)	Age	Gender	Degree	Working place	Target population
Systematic review						
Caudwell et al (2020) Brown et al (2014) Siengsukon et al (2015)	256 10.8% of 1846 76	/ 41.99 +/- 10.94 years old	/ 83% female	/ 36% Bachelor's degree 34% Master's degree 30% Doctorate	Different settings Outpatient clinic (41/76) Acute care/hospitals (30/76)	Patients with dementia Variety of age ranges (from birth to older than 65 years old)
Cross-sectional studies						
Alodaibi et al. (2022)	150	52%: 30 years old or less 41%: 31-40 years old 7%: 40 years old	70% male	53% Bachelor's degree 25% Master's degree 21% Doctorate	/	MSK disorders
Al-Sharman et al. (2022)	87	28.1 +/- 4.4 years old	50/87 female 37/87 male	96,6% Bachelor's degree	Most (90,8%) worked as full-time physiotherapist clinicans: +/- 3/4th working in a private center, 1/4th in a governmental or private hospital	Patients from a variety of ages
Siengsukon et al. (2015)	76	41.99 +/- 10.94 years old	83% female	36% Bachelor's degree 34% Master's degree 30% Doctorate	Outpatient clinic (41/76) Acute care/hospitals (30/76)	Variety of age ranges (from birth to older than 65 years old)
Siengsukon et al. (2023)	128	39.6 +/- 10.3 years old	72% female	13% Bachelor's degree 24% Master's degree 64% Doctorate	The majority practiced primarily in an outpatient clinic (n = 123)	Adults 19-64 years old
Expert opinions						
Morelhão et al. (2019)	5	/	3 females 2 males	100% PhD	Universidade Federal de Sao Paulo (4) Universidade Federal de Minas Gerais (1)	/
Siengsukon et al. (2017)	3	/	3 females	1) PhD 2) Physiotherapist 3) MD	University of Kansas Medical Center	/

Note. PhD = Doctor of Philosophy, MD = Master's Degree.