Toward greater specificity in research on sleep and chronic musculoskeletal pain

NILS RUNGE

PUBLIC PHD DEFENCE FOR THE DEGREE OF
DOCTOR IN REHABILITATION SCIENCES AND PHYSIOTHERAPY (VUB & KU Leuven)

FRIDAY, OCTOBER 10TH 2025 AT 16:00
AUDITORIUM P. BROUWER, CAMPUS JETTE (VUB)

SUPERVISORS
Prof. dr. Olivier Mairesse (VUB)
Prof. dr. Anneleen Malfliet (VUB)
Prof. dr. Liesbet De Baets (KUL & VUB)
Prof. dr. Sabine Verschueren (KUL)
Prof. dr. Dieter Van Assche (KUL)

EXAM COMMISSION
Prof. dr. Tom Deliens (VUB) – chair
Prof. dr. Iris Coppieters (VUB)
Prof. dr. Davy Vancampfort (KUL)
Prof. dr. An Mariman (UZ Gent & UGent)
Prof. dr. Walter Magerl (Heidelberg University)

Please confirm your presence before the 30th of September **here**.

Click here to join online

If you plan to come by car, please register your number plate **here** *to get access to the parking on campus.*

VUB PHYSICAL EDUCATION & PHYSIOTHERAPY

KU LEUVEN

ABSTRACT OF THE RESEARCH

Many studies show that people with chronic musculoskeletal pain, defined as persistent pain in muscles, bones, tendons, or joints, often struggle with sleep. They may have trouble falling or staying asleep, or wake up feeling unrefreshed. Research over the last two decades suggests a bidirectional link: poor sleep can worsen chronic pain, and chronic pain can disrupt sleep. However, sleep problems vary in the way they present, and, like pain, sleep is a complex state. To date, studies have not identified which specific sleep issues matter most for pain. Moreover, trials in which sleep problems in people with chronic musculoskeletal pain were specifically targeted showed large improvements in (subjective) sleep but only small reductions in pain intensity. This highlights major gaps in our understanding on the relationship between sleep and chronic musculoskeletal pain, and this thesis takes the first steps toward addressing some of these gaps across four papers presented in three chapters.

Chapter 1 examined whether people with sleep problems are more likely to develop chronic musculoskeletal pain, and vice versa. We conducted a systematic review with meta-analysis, meaning we carefully gathered and combined findings from all relevant published studies to create a clearer overall picture. In total, 16 studies with data from more than 115,000 people were included. Results showed that sleep problems increase the likelihood of developing chronic musculoskeletal pain. However, it remains unclear whether sleep problems actually cause this pain, or which specific types of sleep problems matter most. Evidence on whether people with chronic musculoskeletal pain are more likely to later develop sleep problems was too limited to draw firm conclusions.

Chapter 2 builds on the findings from Chapter 1. While working on several projects, including the systematic review, we noticed that sleep problems and disorders were defined in many different ways across studies, which made it difficult to compare findings and draw clear conclusions. To explore this inconsistency further, we conducted a scoping review that included 225 studies and identified 326 definitions for 39 sleep-related terminologies in the context of chronic musculoskeletal pain. As expected, we found substantial variation in definitions. For example, “insomnia,” the most frequently defined term, was described in more than 25 different ways.
We then analysed data from over 1,300 people with chronic musculoskeletal pain to examine how the use of different definitions of insomnia (based on varying sets of criteria) affects research outcomes. Depending on the definition, from the strictest to the broadest, the estimated prevalence of insomnia varied by up to 25%. Moreover, when comparing people with and without insomnia on outcomes such as pain, sleep quality, and quality of life, the magnitude of these differences often depended on the definition applied. These findings indicate that, in some contexts, research results can be strongly influenced by the use of different definitions of insomnia.

Chapter 3 involved developing a survey with input from patient experts and then collecting data from more than 1,500 people with chronic musculoskeletal pain. Participants reported the perceived status of various relevant symptoms (e.g. pain at rest and sleep quality) and other relevant variables (e.g. perceived social support) over the past month. Using these data, we estimated the strength of the relationships between symptoms and other factors, such as age and body mass index, while accounting for the influence of all other variables. The resulting network of variables showed that associations between sleep and pain communities were very weak. For example, higher levels of pain at rest over the past four weeks did not correspond to significantly greater difficulty falling asleep once other factors were taken into account. These findings give a first indication that the link between pain and sleep in people with chronic musculoskeletal pain may not be as direct or strong as often assumed. However, further studies using different methods and designs are needed to confirm these results.

Taken together, the findings of this thesis highlight that sleep problems and chronic musculoskeletal pain frequently co-occur, but their relationship is complex and not yet fully understood. The results also show that the use of sleep-related terminologies in the field is highly inconsistent, and that these varying definitions can influence research outcomes, making it difficult to draw clear conclusions based on the currently available evidence. Additionally, the findings suggest that the direct link between pain and certain sleep issues may be weaker than commonly assumed, and that more high-quality research is needed to better understand the complexities of this field.

CURRICULUM VITAE

Nils is a physiotherapist from Germany with extensive clinical experience in the musculoskeletal and pain fields across both the private sector and the NHS in Germany and the UK. He obtained his Bachelor of Science in 2016 from Hogeschool Thim van der Laan (The Netherlands), followed by an Master of Science Advancing Physiotherapy Practice in 2019 from Sheffield Hallam University (UK), and a postgraduate diploma in Clinical Research in 2021 from the University of Sheffield (UK). In November 2021, he began his joint PhD at Vrije Universiteit Brussel (VUB) and KU Leuven (KUL) working primarily on the PREMEO study.
To date, he has published 20 peer-reviewed articles, including nine as first author and two as last author, with a further four papers currently under review. He is also the first author of a book chapter and has been an invited speaker at five international congresses and webinars.