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Enhancing healthcare professionals' biopsychosocial perspective to chronic pain: assessing the impact of implementing an interdisciplinary training program

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Abstract

Advancements in clinical science have shown the necessity for a paradigm shift away from a biomedical toward a biopsychosocial approach. Yet, the translation from clinical science into clinical practice is challenging. The aim of this study was to assess the short-term and mid-term changes in pain knowledge and attitudes and guideline-adherent recommendations of healthcare professionals (HCP) by means of an interdisciplinary training program (ITP) about chronic pain. Belgian HCPs, with a priority for medical doctors, physiotherapists, occupational therapists, nurses, psychologists, and pharmacists in primary care, participated in the ITP, which contained 2 e-learning modules and two 7-hour workshops provided in small interdisciplinary groups in 5 cities. The objective of ITP was to improve HCP's competencies for integrating biopsychosocial chronic pain management with a cognitive behavioral approach into clinical practice. Primary outcomes were changes in knowledge and attitudes about pain and guideline-adherent recommendations for continuation of physical activity, sports, and work; avoiding bed rest; and not supporting opioid usage measured through 2 clinical vignettes. They were measured before, immediately after, and 6 months after the ITP. Changes were analyzed using (generalized) linear mixed models. A total of 405 HCPs participated. The knowledge and attitudes about pain scores improved at post-training ($\Delta = 9.04$, 95% confidence interval 7.72-10.36) and at 6-month follow-up ($\Delta = 7.16$, 95% confidence interval 5.73-8.59). After the training program, HCPs provided significantly more recommendations in accordance with clinical guidelines. Thus, an ITP can improve the biopsychosocial perspective of chronic pain management among HCPs in the short-term and mid-term.

Keywords: Persistent pain, Education, Implementation, Health personnel, Cognitive behavioral therapy, Pain education, Attitudes, Pain management, Multidisciplinary

1. Introduction

Musculoskeletal chronic pain management is challenging for both healthcare professionals (HCPs)[13] and patients,[10] who often perceive it as inadequate.[10,64] Clinical guidelines recommend biopsychosocial management for chronic pain, including pain science education. However, HCPs adhere poorly to clinical guidelines.[34,58] Currently, chronic pain management is dominantly biomedically oriented, which is associated with poorer patient outcomes, for example, decreased levels of activity and participation, increased pain intensity, and work absenteeism.[16,56]

This discrepancy with clinical guidelines is poorly understood but partly stems from HCPs' lack of skills, difficulties in changing behavior, disagreement with clinical guidelines, and prioritization of their own clinical experience, peer consensus, and original education.[5,58,62] Many HCPs still hold the belief that pain is caused by physical impairments and consider painful activities as harmful,

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often advising against them.[24] Education plays a crucial role in shaping HCPs' understanding of chronic pain to prioritize high-value care and improve patient experiences. Yet, structural and substantive changes are needed since many HCPs received insufficient training during their education, often with a biomedical orientation,[61] monodisciplinary focus[38,57] and lacking content about pain management.[11,52]

To improve biopsychosocial perspectives and skills to facilitate better chronic pain management in graduated HCPs, postgraduate training programs with a cognitive behavioral approach are needed.[29,55] In response, we developed and implemented an interdisciplinary training program (ITP). The aim of the ITP was to improve HCP's competencies for integrating biopsychosocial chronic pain management with a cognitive behavioral approach into clinical practice.[41] Competencies encompass knowledge, skills, and attitudes essential to the practice of medicine.[2] This ITP covered the basic theory of chronic pain management through e-learning modules and 2 workshops that focused on interdisciplinary discussions, skill training, and practical implementation of biopsychosocial chronic pain management. Little is known about the impact of the ITP on HCPs' knowledge and attitudes toward biopsychosocial chronic pain management with a cognitive behavioral approach. Yet, these elements—knowledge and attitudes—are foundational for developing the competencies needed to effectively implement biopsychosocial chronic pain management in clinical practice.

Therefore, the primary objective of this study was to assess the short-term and mid-term changes in HCPs' knowledge, attitudes, and guideline-adherent recommendations regarding activity, sports, work, bed rest, and opioid use toward musculoskeletal chronic pain. Secondary objectives were (1) to analyze HCPs' pain knowledge and attitudes 6 months after the ITP, (2) analyze whether HCPs' demographics predict HCP's pain knowledge and attitudes and the change over time, and (3) to assess participants' satisfaction with the ITP.

2. Methods

2.1. Study design

This quasi-experimental implementation study was presented in accordance with the Standards for Reporting Implementation Studies Statement[49] and the Strengthening the Reporting of Observational Studies in Epidemiology Statement.[9] This study was part of a type-1 hybrid effectiveness-implementation study.

2.2. Ethics approval

This study was approved by an independent Medical Ethical Committee (EC-2021-327) linked to the University Hospital of Brussels, Brussels, Belgium. All HCPs provided informed consent when participating in the study.

2.3. Interdisciplinary training program

Detailed information about the training program and development process is reported elsewhere.[41] More information about the cognitive behavioral approach covered in the ITP can be found in Supplemental Materials (available at http://links.lww.com/PAIN/C132). In brief, the ITP was implemented between October 2021 and July 2023 with 24 training groups, that is, 5 training groups (of approximately 20-25 HCPs) in Antwerp, Brussels, Namur, and Liège and 4 groups in Ghent. The ITP contains 2 face-to-face workshops of 7 hours each and 2 online e-learning modules of 1 hour each. The targeted competencies for integrating biopsychosocial chronic pain management with a cognitive behavioral approach into clinical practice can be found in the Supplemental Materials (available at http://links.lww.com/PAIN/C132).

2.4. Recruitment

Healthcare professionals for the ITP were recruited between June 2021 and July 2023. All HCPs working in Belgium were eligible to enroll in the ITP, but the recruitment was prioritized for specific groups in primary care (medical doctors, nurses, psychologists, physiotherapists, occupational therapists, dentists, and pharmacists). All HCPs enrolled in the ITP were invited to participate in the study.

We collaborated with Belgian organizations associated with HCPs in primary care, the Belgian Federal Public Service of Health, and organizations connected to the project to recruit HCPs. All organizations shared information through newsletters, magazines, flyers, information on their website, and social media within their network. At the start, we prioritized recruitment in Antwerp, Ghent, Brussels, Liège, and Namur—where we implemented the training. The recruitment area was expanded when a training group was not full a month before the training date. The training was free of cost, and participants received accreditation.

2.5. Outcomes

The primary outcome was HCPs' change in knowledge and attitudes about pain (KNAP), including their recommendations to clinical vignettes from baseline, directly after the ITP (post-training) and 6 months after the ITP (follow-up). To contextualize the changes in primary outcomes, participants were invited to fill out a satisfaction questionnaire about the ITP directly after each workshop and at 6-month follow-up.

Except for the satisfaction questionnaire which was filled out at the end of each workshop, all other questionnaires were completed digitally through the platform of Qualtrics.

2.6. Participants' demographics

The following information was collected: sex, nationality, healthcare discipline, years of clinical experience, working area, type of clinical team (solo practice, monodisciplinary, or in a multidisciplinary team), and type of institution they work in.

2.7. Knowledge and attitudes about pain

The KNAP questionnaire containing 30 statements about modern pain science was scored on a 6-point Likert scale, ranging from "totally agree" to "totally disagree".[7,40] Scores were transformed based on the Rasch transformation[7] in scores between 0 and 5, and total scores range between 0 and 150. Higher scores indicate that knowledge and attitudes of pain are more congruent with modern pain science, reflecting a stronger biopsychosocial perspective. Both Dutch[7] and French[40] versions were used. They are reported to be acceptable, valid, and reliable. The standard error of measurement was 2.12 (95% confidence interval [CI] 1.58-2.73).[40]

2.8. Guideline-adherent recommendations

Participants were asked for their clinical recommendations regarding activity, sports, work, bed rest, and how likely they

Table 1

Answers considered guideline adherent within the clinical vignettes.

Domains	Guideline-adherent	Non guideline-adherent
Work	1. Return to normal work 2. Return to part-time or light duties	3. Be off work for a further … weeks (stating number of weeks) 4. Be off work until pain has improved 5. Be off work until pain has completely disappeared
Sports	1. Return to normal sports 2. Return to light sports	3. Refrain from sports for another … weeks (stating number of weeks) 4. Refrain from sports until pain has improved 5. Refrain from sports until pain has completely disappeared
Activities*	1. Perform usual activities 2. Perform activities within the patient's tolerance	3. Perform only pain free activities 4. Limit all physical activities until pain disappears
Bed rest	1. Avoid resting in bed entirely 2. Avoid resting in bed as much as possible	3. Rest in bed only when pain is severe 4. Rest in bed until pain improves substantially 5. Rest in bed until pain disappears
Support usage of opioid painkillers	1. Very unlikely 2. Somewhat unlikely	3. Not likely, nor unlikely 4. Somewhat likely 5. Very likely

* Activities was rated on a 4-point Likert scale.

are to support the use of opioids based on 2 clinical vignettes.[8] The first clinical vignette—developed by Rainville et al.[51]—is about a 40-year-old male construction worker with chronic low back pain. The authors developed the second clinical vignette based on a clinical case of Nijs et al.[44] and concerns a 45-year-old female office worker with chronic neck pain. The descriptions of all domains and classification of guideline-adherent recommendations[8,27] are presented in **Table 1**.

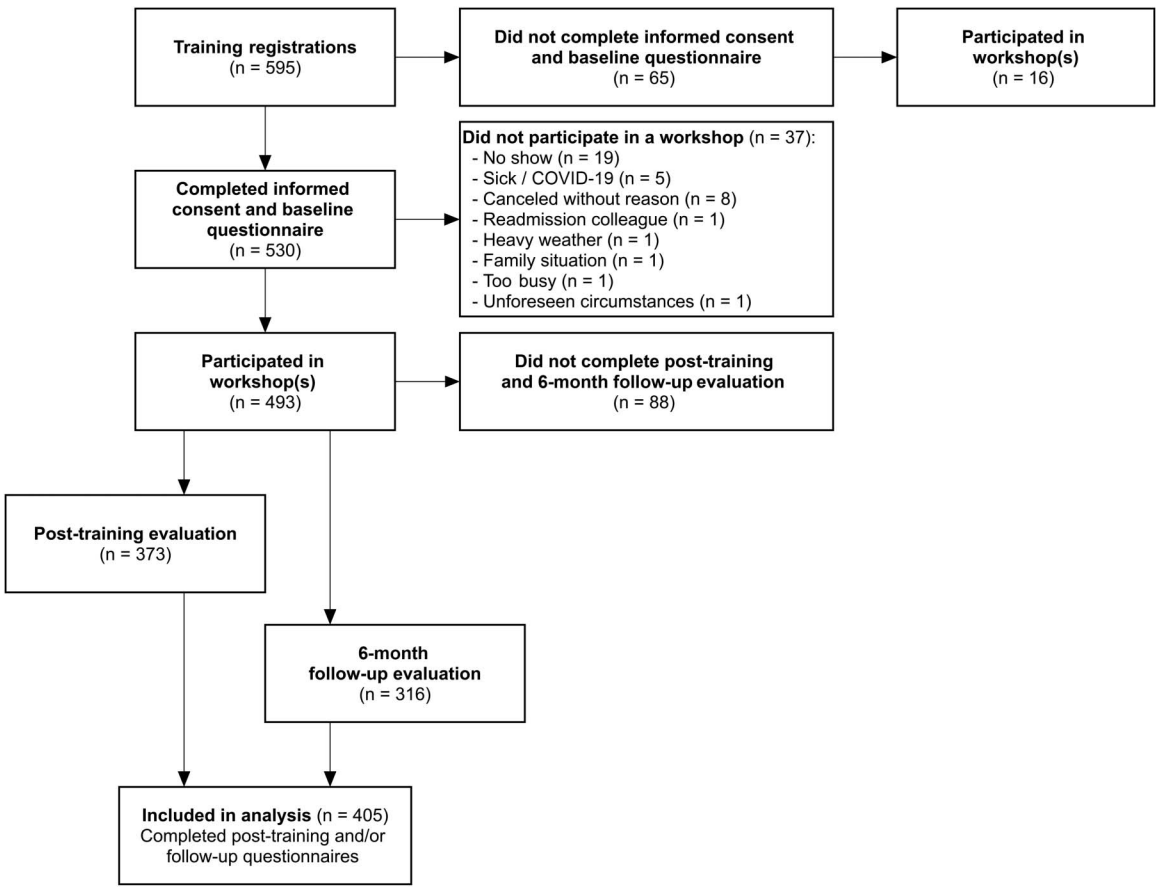

Figure 1. Flowchart. ITP, interdisciplinary training program; n, number of healthcare professionals.

Table 2

Overall demographics of the participants in this study and per healthcare discipline.

	Total	Medical doctors	Physiotherapists	Psychologists	Nurses	Occupational therapists	Pharmacists	Others
N (%)	405 (100)	141 (34.8)	162 (40.0)	30 (7.4)	26 (6.4)	19 (4.7)	9 (2.2)	18 (4.4)
Age (y), median (IQR)	36 (30-47)	35 (30-44.50)	35.5 (28-49)	39 (31-49.25)	44 (40.75-49.25)	32 (25-41)	39 (30-49.50)	38 (26.75-47.50)
Sex, female, n (%)	316 (78.0)	116 (82.3)	116 (71.6)	22 (66.7)	22 (84.6)	16 (84.2)	8 (88.9)	18 (100)
Years of clinical experience, median (IQR)	10 (4-21)	9 (4-19)	10.5 (4.38-25.25)	7 (4-18.5)	16 (11.5-25.5)	8 (3-15)	8 (5.5-21.5)	4 (0-16.63)
Area of implementation, n (%)								
Antwerp	80 (19.8)	17 (12.1)	28 (17.3)	14 (46.7)	5 (19.2)	7 (36.8)	1 (11.1)	8 (44.4)
Brussels	105 (25.9)	46 (32.6)	40 (24.7)	4 (13.3)	6 (23.1)	5 (26.3)	1 (11.1)	3 (16.7)
Namur	82 (20.2)	31 (22.0)	32 (19.8)	4 (13.3)	7 (26.9)	2 (10.5)	2 (22.2)	4 (22.2)
Ghent	55 (13.6)	16 (11.3)	24 (14.8)	5 (16.7)	5 (19.2)	1 (5.3)	2 (22.2)	2 (11.1)
Liège	83 (20.5)	31 (22.0)	38 (23.5)	3 (10.0)	3 (11.5)	4 (21.1)	3 (33.3)	1 (5.6)
Working region, n (%)								
Flanders	136 (33.6)	35 (24.8)	52 (32.1)	19 (63.3)	10 (38.5)	7 (36.8)	3 (33.3)	10 (55.6)
Brussels	91 (22.5)	37 (26.2)	38 (23.5)	4 (13.3)	3 (11.5)	6 (31.6)	1 (11.1)	2 (11.1)
Wallonia	178 (44.0)	69 (48.9)	72 (44.4)	7 (23.3)	13 (50.0)	6 (31.6)	5 (55.6)	6 (33.3)
Institution, n (%)*								
Primary care	227 (66.6)	103 (90.4)	94 (65.3)	14 (53.8)	3 (13.6)	1 (6.7)	5 (71.4)	7 (53.8)
Hospital	48 (14.1)	6 (5.3)	22 (15.3)	4 (15.4)	10 (45.5)	3 (20.0)	2 (28.6)	1 (7.7)
Rehabilitation center	5 (1.5)	—	3 (2.1)	—	1 (4.5)	1 (6.7)	—	—
Nursing home	12 (3.5)	—	6 (4.2)	—	4 (18.2)	2 (13.3)	—	—
Different	19 (5.6)	3 (2.6)	3 (2.1)	3 (11.5)	2 (9.1)	4 (26.7)	—	4 (30.8)
Multiple institutions	30 (8.8)	2 (1.8)	16 (11.1)	5 (19.2)	2 (9.1)	4 (26.7)	—	1 (17.7)
Missing	64 (15.8)	27 (19.1)	18 (11.1)	2 (13.3)	4 (15.5)	4 (21.1)	2 (22.2)	5 (33.3)
Type of clinical team, n (%)*								
Solo practice	71 (17.7)	18 (12.8)	37 (22.8)	5 (16.7)	1 (3.8)	6 (31.6)	1 (11.1)	3 (20.0)
Monodisciplinary	60 (14.9)	27 (19.1)	19 (19.1)	7 (23.3)	1 (3.8)	1 (5.3)	1 (33.3)	2 (13.3)
Multidisciplinary	271 (67.4)	96 (68.1)	106 (65.4)	18 (60.0)	24 (92.3)	12 (63.2)	5 (55.6)	10 (66.7)
Missing	3 (0.7)	—	—	—	—	—	—	3 (20.0)

Group "others" were a variety of healthcare professionals with disciplines other than the priority groups. Data were reported with n (%) or median (IQR).
N, number of observations; IQR, interquartile range; — none.
* Has missing data; percentages do not include missing data.

2.9. Training satisfaction

After each workshop, participants were asked to complete a questionnaire regarding their overall satisfaction (on a 5-point Likert scale ranging from "Very good" to "Very bad") and specific satisfaction on 13 criteria (Supplemental Materials, available at http://links.lww.com/PAIN/C132) about for example, the objectives, content, materials, trainers, learning process, and applicability (on a 5-point Likert scale ranging from "Strongly agree" to "Strongly disagree").

At 6-month follow-up, a tailored version of the Questionnaire for Professional Training Evaluation was applied, focusing on the domains of satisfaction, utility, gained knowledge, application to practice, individual management, and global management (Supplemental Materials, available at http://links.lww.com/PAIN/C132).[23] Each statement was scored on a scale from 0 to 10, 0 = completely disagree to 10 = completely agree.

2.10. Statistical analysis

Only HCPs who completed the baseline questionnaire, participated in at least 1 workshop and completed at least 1 evaluation after the ITP were included in the analysis. Changes in KNAP scores between baseline, post-training, and 6-month follow-up were examined with a hierarchical linear mixed model, and the estimated marginal mean change was reported (delta; Δ). Three levels of random factors were potentially included to account for the hierarchical structure, the level of the participant, the training group, and the area of implementation. Years of clinical experience, sex, healthcare discipline, working region, and type of clinical team were potential fixed factors to determine whether these factors were predictors of the level of pain knowledge and attitudes. The Reliable Change Index (RCI) was calculated to assess whether individual KNAP scores changed significantly over time.[28] The RCI calculation was RCI = (follow-up measurement − baseline measurement)/standard error of measurement tool.[40] An RCI above 1.96 was considered "Reliably improved," below −1.96 as "Reliably deteriorated," and between 1.96 and −1.96 as "No reliable change." The distribution of KNAP item scores was assessed at 6-month follow-up and reported in percentages. Guideline-adherent recommendations were examined with generalized linear mixed model, and the estimated marginal means was reported per measurement. The proportion of the variance explained by the random factors was reported by the intraclass correlation coefficients.[39] A Bonferroni correction was used to address the

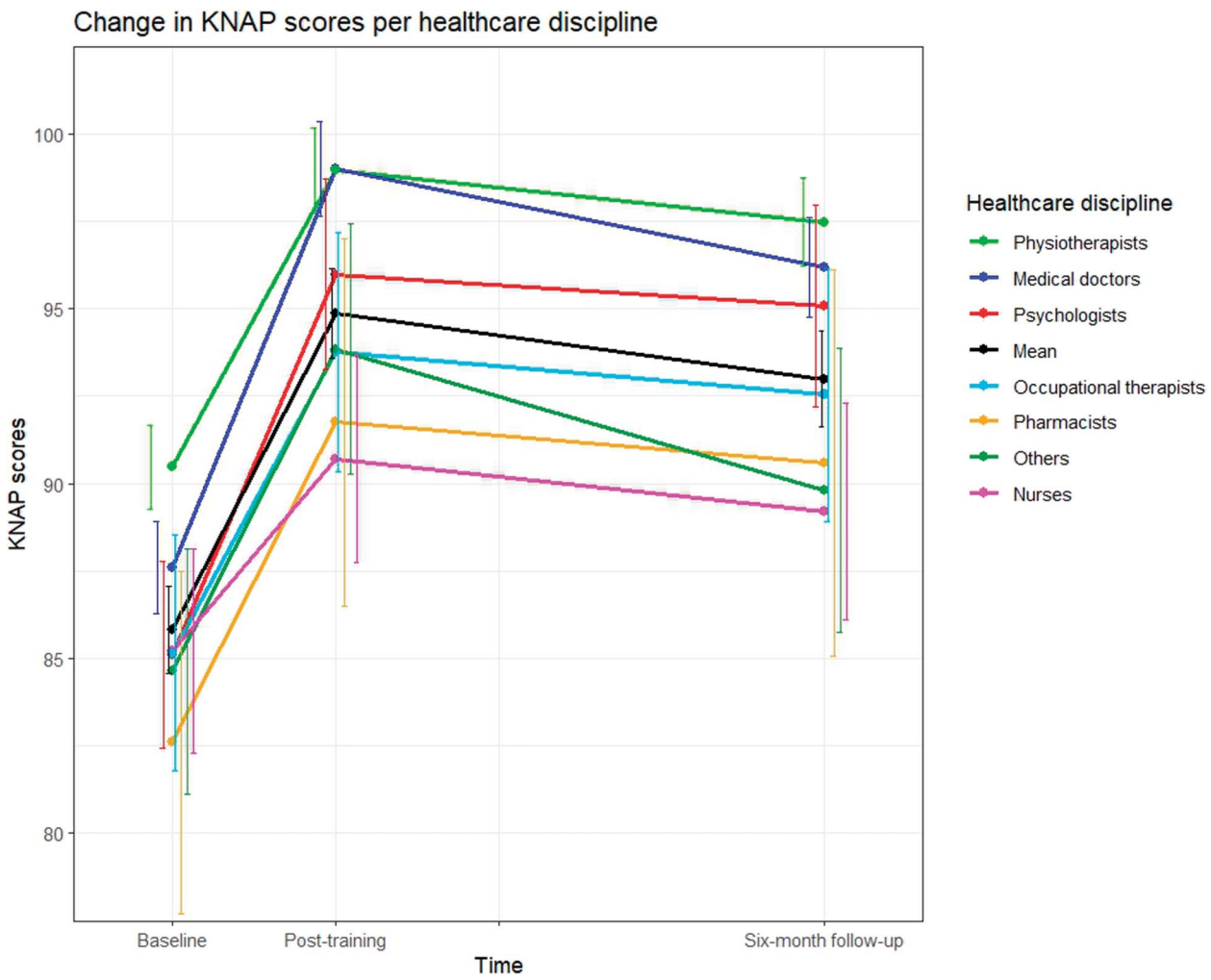

Figure 2. Pain knowledge and attitudes improved in short-term and mid-term in the overall group and within all healthcare disciplines after the ITP (N = 405). Lines represent mean KNAP scores for the overall mean and per healthcare discipline with 95% confidence intervals. Higher KNAP scores mean that knowledge and attitudes of pain are more congruent with modern pain science. KNAP total scores can range from 0 to 150; the current figure ranges from 77.5 to 102.5. ITP, interdisciplinary training program; KNAP, knowledge and attitudes about pain.

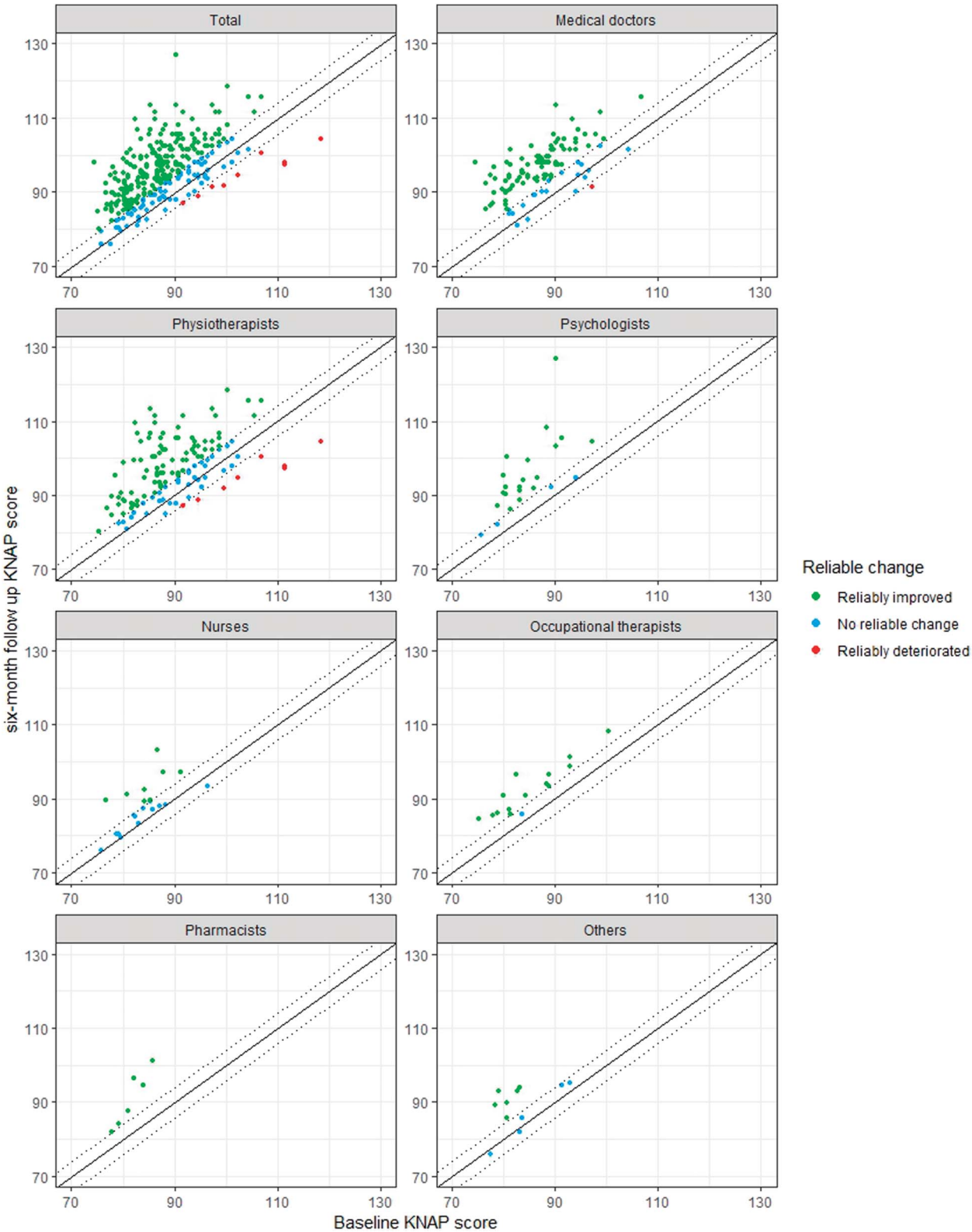

Figure 3. Reliable improvements were found in the majority of the individuals within each discipline, except within nurses. Figure visualizes the reliability of individual changes of participants for the total group and within each healthcare discipline. Each dot represents a participant with their baseline KNAP scores on the x-axis and 6-month follow-up KNAP scores on the y-axis. Green dots are participants who reliably improved (positive change larger than 4.16), red dots who reliably deteriorated (negative change larger than −4.16), and blue dots who had no reliable change (change between 4.16 to −4.16). Dashed line = a change of 0.00; dotted line = reliable change index thresholds; KNAP, knowledge and attitudes about pain.

issue of multiple comparisons. The evaluation of the training was reported descriptively.

A *P* value of 0.05 was considered statistically significant. Q/Q′-plots were used to evaluate normality assumptions. Rstudio V2023.06.1 was used for statistical analysis.[60]

3. Results

3.1. Participants' demographics

A total of 509 HCPs enrolled in the ITP (**Fig. 1**). Of these, 104 (20.4%) were excluded for not completing the baseline questionnaire and the post-training or 6-month follow-up questionnaire. Most participants (94.3%) in the study attended both workshops. Among the 405 participants, the majority were medical doctors (n = 141) and physiotherapists (n = 162) (**Table 2**). The other priority groups included 30 psychologists, 26 nurses, 19 occupational therapists, and 9 pharmacists. Eighteen participants belonged to a healthcare discipline other than the priority groups. The median age was 36 years, 78.0% were female, and participants reported a median of 10 years of clinical experience. The majority (66.6%) worked in primary care. Only 17.7% worked in a solo practice, 14.9% in a monodisciplinary team, and 67.4% worked in a multidisciplinary team.

3.2. Pain knowledge, attitudes, and guideline adherence

Overall, HCPs' had significantly improved biopsychosocial pain knowledge and attitudes of pain from baseline to directly after the ITP (Δ = 9.04, 95% CI 7.72-10.36) and 6-month follow-up (Δ = 7.16, 95% CI 5.73-8.59) (**Fig. 2**). A small reduction was found between post-training and 6-month follow-up (Δ = −1.88, 95% CI −3.38 to −0.37). At 6-month follow-up, 70.9% reliably improved (n = 224), 26.2% had no reliable change (n = 83), and 2.8% reliably deteriorated (n = 9) (**Fig. 3**).

Guideline-adherent recommendations improved significantly from baseline to post-training and to 6-month follow-up in all domains, resulting in a high percentage of HCPs' recommending to continue activities, return to sports, return to work, and avoid bed rest, and being less likely to support opioids (**Table 3**). Recommendations regarding bed rest and opioids remained relatively less guideline-adherent compared with others at each measurement. However, a significant decrease in guideline-adherent bed rest recommendation was found between post-training and 6-month follow-up in the clinical vignette about chronic neck pain.

At 6-month follow-up, a significant portion of participants demonstrated a substantial biopsychosocial understanding of pain and supporting nonpharmaceutical pain management, including exercise therapy and pain science education (**Fig. 4**). However, only 66.9% of the participants agreed to a large extent that pain is always the outcome of the brain and 40.7% that hypersensitivity of the pain system can sometimes be beneficial. Moreover, a notable proportion of the participants disagreed to a large extent that correcting malaligned spine (59.6%) and correcting poor posture (30.3%) reduce chronic pain, that painful exercise should be avoided (59.3%), and that activity levels should be increased based on pain experience (23.7%).

3.3. Predictors of pain knowledge and attitudes

Being female and having more years of clinical experience predicted lower KNAP scores independently of the measurement time, and the healthcare discipline also predicted different baseline KNAP scores and the change over time (**Fig. 2** and **Table 4**). Physiotherapists had higher KNAP scores at baseline compared with all other disciplines. After 6 months, there were no differences observed between physiotherapists, medical doctors, and psychologists. However, differences persisted between these healthcare disciplines and nurses, occupational therapists, pharmacists, and others. Working region and type of clinical team were not predictors for KNAP scores.

The proportion of variance in KNAP scores was largely explained (59.6%) by random differences between participants, and a smaller proportion (4.5%) was attributed to random differences between training groups. Random differences between the area of implementation did not explain the variance (0.0%) in KNAP scores and was therefore excluded from the model.

3.4. Training evaluation

The training evaluation scores can be found in the Supplemental Materials (available at http://links.lww.com/PAIN/C132). The participants reported high satisfaction scores on the training evaluation directly after each workshop and at 6-month follow-up. After 6 months, 98.7% would recommend the

Table 3

Short-term and mid-term changes resulted in a high percentage of guideline-adherent recommendations after the interdisciplinary training program (N = 405).

	Baseline	Post-training	Six-month follow-up
Clinical vignette about chronic low back pain			
↑ Activity	91.1 (87.1-93.9)	99.5 (97.1-99.9)*	99.0 (96.2-99.8)*
↑ Sports	93.6 (89.9-95.9)	98.1 (95.4-99.2)*	99.0 (96.2-99.8)*
↑ Work	75.2 (69.8-80.0)	93.7 (89.9-96.2)*	92.3 (88.5-95.7)*
↓Bed rest	55.2 (49.2-61.0)	82.8 (77.6-87.0)*	77.7 (77.6-87.0)*
↓ Opioid	51.1 (45.1-56.9)	85.0 (80.0-89.0)*	82.3 (76.5-86.9)*
Clinical vignette about chronic neck pain			
↑ Activity	93.6 (89.9-95.9)	97.8 (94.9-99.0)*	97.7 (94.5-99.1)*
↑ Sports	88.9 (84.5-92.1)	96.9 (93.8-98.5)*	97.1 (93.7-98.7)*
↑ Work	76.2 (70.8-80.9)	94.2 (90.4-96.5)*	93.9 (89.7-96.4)*
↓ Bed rest	60.6 (54.7-66.3)	87.5 (82.7-91.1)*	80.3 (74.4-85.2)*
↓ Opioid	57.8 (51.8-63.5)	87.8 (83.0-91.3)*	81.6 (75.8-86.3)*

Data represents percentages and 95% confidence interval of participants whose recommendations were in accordance with guidelines.
* $P < 0.05$.

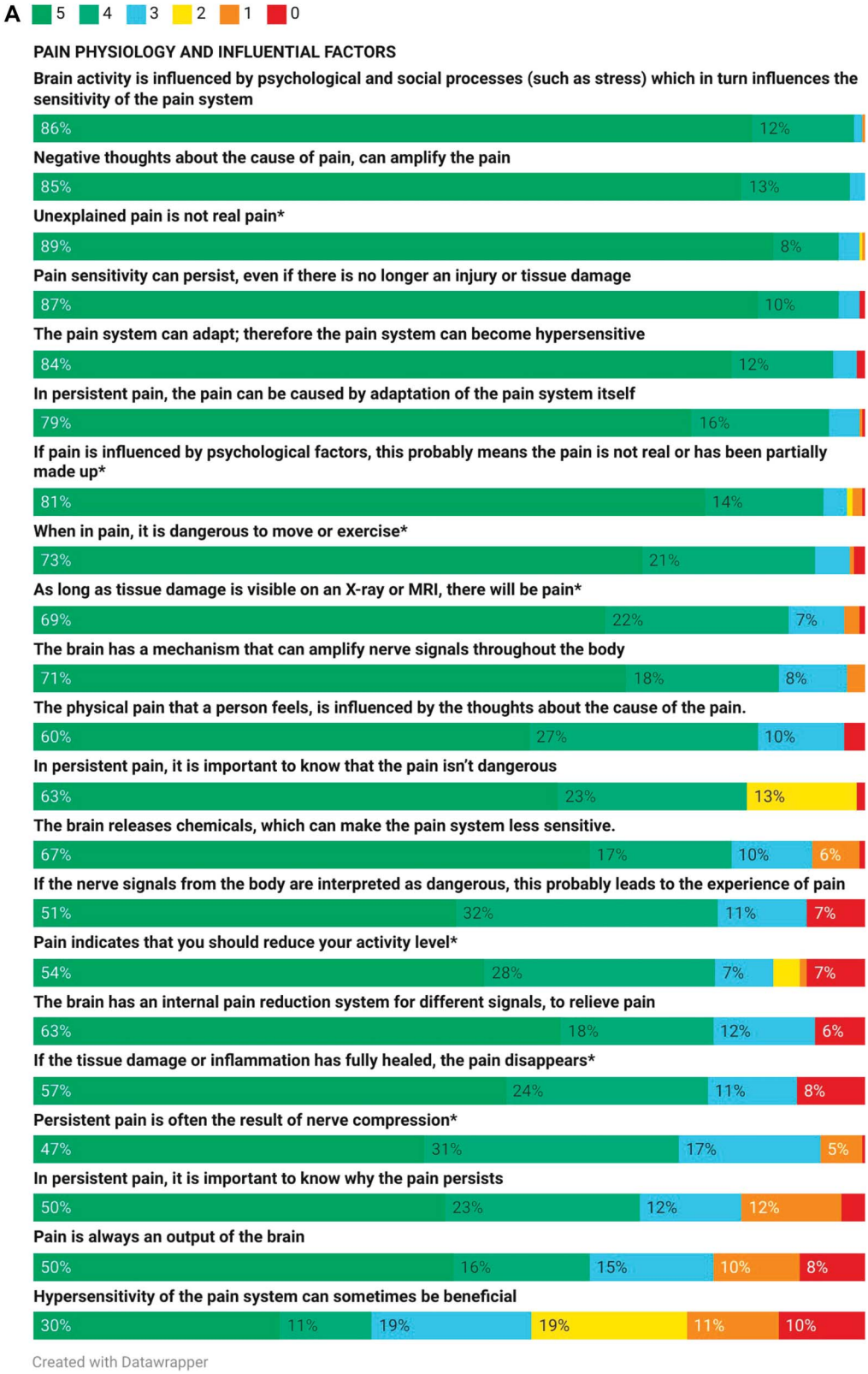

Figure 4. At 6-month follow-up, a significant portion of participants demonstrated a substantial biopsychosocial understanding of pain and supporting nonpharmaceutical pain management (n = 316). The distribution of Rasch scores ranging from 0 to 5 per KNAP item is presented in percentages of total observations. Higher scores are more congruent with modern pain science. Scores 4 and 5 are considered "to a large extent agree." (A) The domain "pain physiology and influential factors' containing 21 items." (B) The domain "treatment of pain" containing 9 items. * Disagreeing with this statement was congruent with modern pain science and, therefore, scores inverted before analysis. KNAP, knowledge and attitudes about pain.

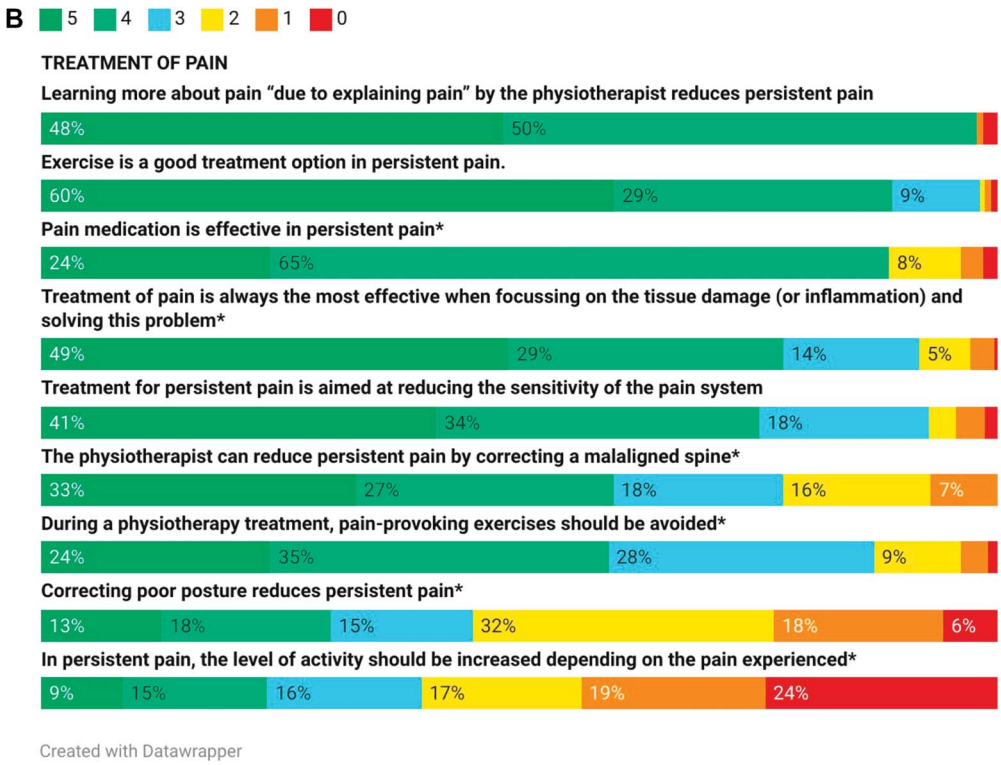

Figure 4. Continued.

course to colleagues or other HCPs. On the 13 workshop criteria, satisfaction ranged between 84% and 99%. At 6-month follow-up, participants' ratings were high for training satisfaction, utility, gained knowledge, application of the knowledge, and impact on their individual and global chronic pain management.

4. Discussion

Implementation of an ITP resulted in marked short-term and mid-term improvements in HCPs' biopsychosocial knowledge and attitudes, and their recommendations were more in accordance with clinical guidelines. Six months after the ITP, 70.9% of the participants showed a reliable improvement in knowledge and attitudes, and a significant proportion of participants demonstrated substantial alignment with contemporary pain science, although some biomedical perspectives remained.

This study underscored both the potential and the necessity for improving (interdisciplinary) training programs and thereby HCPs perspectives,[59] particularly regarding work participation, bed rest recommendations,[35,36] and supporting opioids.[31,65] At 6-month follow-up, two-thirds of the HCPs had improved knowledge and attitudes, with a significant portion of participants demonstrating substantial biopsychosocial understanding of pain and supporting nonpharmaceutical pain management, including exercise therapy and pain science education. However, this study also identified the need in educational programs for a greater focus on the fact that chronic pain is often unrelated to physical impairment and that treatments only targeting physical impairment are, thereby, often not effective in chronic pain. A 2-day training program with 2 e-learning modules might be insufficient to effectively address these misbeliefs. Moreover, as found in previous studies, the impact of the ITP marginally declined over time, which could indicate the need for long-term support.[1,14,33]

This study also showed that HCPs with fewer years of clinical experience seem to have slightly stronger biopsychosocial pain management perspectives,[6,18,32] potentially benefiting from updated curricula.[42] Male sex predicted stronger pain knowledge and attitudes. However, more comprehensive studies are needed to explore these differences because previous studies' findings are contradictory.[6,18,19,32] Moreover, it showed that the ITP can improve pain knowledge and attitudes in a variety of healthcare disciplines. Yet, pain knowledge and attitudes differed between healthcare disciplines[4,50]; the change was also healthcare discipline–specific. The study of Louw et al.[33] also found significant and discipline-specific improvements in pain attitudes and beliefs in a variety of HCPs. However, no significant differences between healthcare disciplines were found at baseline or follow-up, potentially due to the use of different questionnaires.

Healthcare professionals were highly satisfied with the ITP, and there are strong indications that ITP implementation is feasible across healthcare disciplines.[17] However, although satisfaction scores are positively related to the perceived usefulness of a training program,[22] they weakly predict behavior change among HCPs in clinical practice. Moreover, while current training programs seem to be particularly effective in improving HCPs' pain knowledge and attitudes, translating these improvements into clinical practice remains a significant challenge.[25,53,54,59] In fact, this may pose a larger barrier for interdisciplinary training groups, as it restricts considerable time devoted to healthcare discipline–specific content and skills.[20]

Table 4

Sex, years of clinical experience, and healthcare discipline predict knowledge and attitudes about pain scores, including the random effects (N = 405).

Independent variables	Estimate	95% CI
(Intercept)	89.80	87.83 to 91.77
Post-training*	11.42	10.28 to 12.56
Six-month follow-up*	8.59	7.37 to 9.80
Sex (female)*	−2.07	−3.62 to −0.53
Years of clinical experience*	−0.09	−0.14 to −0.03
Doctors	Reference	
Physiotherapists*	2.89	1.20 to 4.57
Psychologists	−2.50	−5.43 to 0.44
Nurses	−2.39	−5.51 to 0.73
Occupational therapists	−2.44	−5.99 to 1.12
Pharmacists	−5.00	−10.00 to 0.00
Others	−2.97	−6.62 to 0.68
Post-training × doctors	Reference	
Post-training × physiotherapists*	−2.93	−4.49 to −1.38
Post-training × psychologists	−0.54	−3.24 to 2.16
Post-training × nurses*	−5.92	−8.76 to −3.09
Post-training × occupational therapists	−2.81	−6.08 to 0.45
Post-training × pharmacists	−2.26	−7.17 to 2.65
Post-training × others	−2.20	−5.54 to 1.14
Follow-up × doctors	Reference	
Follow-up × physiotherapists	−1.60	−3.24 to 0.04
Follow-up × psychologists	1.38	−1.51 to 4.28
Follow-up × nurses*	−4.58	−7.60 to −1.56
Follow-up × occupational therapists	−1.21	−4.69 to 2.27
Follow-up × pharmacists	−0.58	−5.79 to 4.62
Follow-up × others	−3.41	−7.30 to 0.48
Random effects		
ICC-participants	0.596	
ICC-training group	0.045	
Model		
Marginal R^2/conditional R^2	0.320/0.725	
AIC	7128.2	

Doctors were the reference category in the estimates for each healthcare discipline. ICC-area-of-implementation was 0.00 and was therefore excluded from the model.

AIC, Akaike Information Criterion; CI, confidence interval; ICC, intralevel correlation coefficient; SE, standard error.

* $P < 0.05$.

4.1. Strengths and limitations

The strength of this study is the inclusion of a large and diverse sample of HCPs. The implementation of the ITP was standardized in both Dutch and French by different teachers in 5 different cities in Belgium. Simultaneously, it included optional workshop phases to meet the participants' needs. This favored the external validity of the results and the ITP, which was strengthened by the small variances of random differences between the training groups and neglectable variances between the areas of implementation. Furthermore, we assessed both the impact on HCPs' outcomes and the acceptability of the ITP.

Limitations of this study are the challenges in recruiting certain groups of HCPs, which may limit the internal and external validity of differences between healthcare disciplines. In addition, results are exposed to selection bias since the ITP was probably more likely attended by HCPs, particularly motivated in chronic pain management. Besides, we cannot exclude a potential social desirability bias.[63] Moreover, there were several limitations regarding the validity of the questionnaires. The KNAP questionnaire has not been psychometrically tested among all priority groups. Therefore, we have only little data about the responsiveness and content validity of this questionnaire. In addition, it is uncertain if recommendations made by HCPs based on clinical vignettes represent actual clinical behavior.[12,45–47] Furthermore, the uncontrolled prepost study design presents limitations in establishing conclusive attributions of the intervention to observed changes. A fidelity check could have assessed whether the training program was implemented as described within the protocol. It would also have enabled an evaluation of potential variation between training groups, the areas of implementation, and their potential impact on HCPs' knowledge, attitudes, and recommendations.

4.2. Clinical relevance and future research

The study underscores the potential of ITPs to improve pain knowledge and attitudes among a variety of HCPs. While 2-day courses may effectively change chronic pain knowledge and attitudes of HCPs, it remains uncertain if participants have the competencies to implement biopsychosocial chronic pain management with a cognitive behavioral approach in clinical practice. Two days is a short period to cover all relevant pain content comprehensively,[52] making it a fundamental course focusing on the basics of chronic pain management. Advanced training courses focusing on in-depth analysis of biopsychosocial factors, communication techniques (eg, motivational interviewing), and treatment modalities (eg, cognitive behavioral therapy and pain science education) often require multiple days to weeks of workshops that are challenging to fit into busy schedules of HCPs. Therefore, shorter courses are more accessible for HCPs[66] and easier to scale up if they prove to be clinically relevant. Therefore, future studies need to assess the impacts on patients' clinical outcomes and healthcare efficiency (eg, cost-effectiveness). This will also provide more insights into HCPs' competencies and the actual impact on chronic pain management.

To gain a more comprehensive understanding of improved HCPs' behavior and competencies towards chronic pain management, hybrid mixed-method studies integrating qualitative evaluations and different evaluation tools—such as patient simulations and/or clinic observations—are needed.[15] These methods offer insights into HCPs' competencies, which refer to their ability to successfully execute tasks in clinical practice and the barriers and facilitators they experience, such as a potential lack of confidence[3,43,48] or poor communication between HCPs and patients.[30,43] Indeed, these competencies are not solely determined by HCPs' knowledge and attitudes. Therefore, it may be necessary to reformulate competencies, providing more specificity in the formulation of competencies and integrating HCPs' actions and performances within clinical practice.[37]

In addition, these insights would provide valuable feedback for refining training programs regarding training content,[52] teaching methods, duration of the training, and follow-up seminars. A better understanding is needed of which elements, such as physical impairment and chronic pain,[21] work participation,[21] bed rest, and opioids,[26] require more emphasis and how to tailor this to trainees' needs. It will be crucial to evaluate changes in

educational programs to understand their impact. This includes assessing the effect of increased or shortened training hours, differences in training content, and methods or follow-up seminars. In addition, evaluating initiatives such as creating a network for sustainable feedback and information from experts to optimally improve these competencies and potentially help mitigate the small decline over time.

5. Conclusions

The implementation of an ITP about chronic pain management—including 2 e-learning modules and 2 workshops—marked a positive impact on various HCPs. This impact reflects stronger biopsychosocial knowledge and attitudes, embracing modern pain science and nonpharmaceutical treatments in both the short-term and mid-term. Despite high participant satisfaction, continued efforts are needed to refine interdisciplinary training programs for more effective and long-term translation into clinical practice and to improve traditional misconceptions.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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References

[1] Achaliwie F, Wakefield AB, Mackintosh-Franklin C. Does education improve nurses' knowledge, attitudes, skills, and practice in relation to pain management? An integrative review. Pain Manag Nurs 2023;24:273–9.
[2] Albanese MA, Mejicano G, Mullan P, Kokotailo P, Gruppen L. Defining characteristics of educational competencies. Med Educ 2008;42:248–55.
[3] Alexanders J, Anderson A, Henderson S. Musculoskeletal physiotherapists' use of psychological interventions: a systematic review of therapists' perceptions and practice. Physiotherapy 2015;101:95–102.
[4] Alhowimel A, Alodaibi F, Alotaibi M, Alamam D, Fritz J. Comparison of attitudes and beliefs of physical therapists and primary care physicians regarding low back pain management: a cross-sectional study. J Back Musculoskelet Rehabil 2022;35:803–9.
[5] Barth JH, Misra S, Aakre KM, Langlois MR, Watine J, Twomey PJ, Oosterhuis WP. Why are clinical practice guidelines not followed? Clin Chem Lab Med 2016;54:1133–9.
[6] Bartley EJ, Boissoneault J, Vargovich AM, Wandner LD, Hirsh AT, Lok BC, Heft MW, Robinson ME. The influence of health care professional characteristics on pain management decisions. Pain Med 2015;16:99–111.
[7] Beetsma AJ, Reezigt RR, Paap D, Reneman MF. Assessing future health care practitioners' knowledge and attitudes of musculoskeletal pain; development and measurement properties of a new questionnaire. Musculoskelet Sci Pract 2020;50:102236.
[8] Bishop A, Foster NE, Thomas E, Hay EM. How does the self-reported clinical management of patients with low back pain relate to the attitudes and beliefs of health care practitioners? A survey of UK general practitioners and physiotherapists. PAIN 2008;135:187–95.
[9] Brand RA. Editorial: standards of reporting: the CONSORT, QUORUM, and STROBE guidelines. Clin Orthop Relat Res 2009;467:1393–4.
[10] Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. Eur J Pain 2006;10:287–333.
[11] Briggs EV, Battelli D, Gordon D, Kopf A, Ribeiro S, Puig MM, Kress HG. Current pain education within undergraduate medical studies across Europe: Advancing the Provision of Pain Education and Learning (APPEAL) study. BMJ Open 2015;5:e006984.
[12] Brunner E, Probst M, Meichtry A, Luomajoki H, Dankaerts W. Comparison of clinical vignettes and standardized patients as measures of physiotherapists' activity and work recommendations in patients with non-specific low back pain. Clin Rehabil 2016;30:85–94.
[13] Cate Polacek M, Christopher R, Mann M, Udall M, Craig T, Deminski M, Sathe NA. Healthcare professionals' perceptions of challenges to chronic pain management. Am J Manag Care 2020;26:e135–9.
[14] Cox T, Louw A, Puentedura EJ. An abbreviated therapeutic neuroscience education session improves pain knowledge in first-year physical therapy students but does not change attitudes or beliefs. J Man Manip Ther 2017;25:11–21.
[15] Curran GM, Bauer M, Mittman B, Pyne JM, Stetler C. Effectiveness-implementation hybrid designs: combining elements of clinical effectiveness and implementation research to enhance public health impact. Med Care 2012;50:217–26.
[16] Darlow B, Fullen BM, Dean S, Hurley DA, Baxter GD, Dowell A. The association between health care professional attitudes and beliefs and the attitudes and beliefs, clinical management, and outcomes of patients with low back pain: a systematic review. Eur J Pain 2012;16:3–17.
[17] Fernandez M, Young A, Kongsted A, Hartvigsen J, Barton C, Wallis J, Kent P, Kawchuk G, Jenkins H, Hancock M, French SD. GLA:D Back Australia: a mixed methods feasibility study for implementation. Chiropr Man Therap 2022;30:17.
[18] Fullen BM, Baxter GD, Doody C, Daly LE, Hurley DA. General practitioners' attitudes and beliefs regarding the management of chronic low back pain in Ireland: a cross-sectional national survey. Clin J Pain 2011;27:542–9.
[19] Fullen BM, Baxter GD, O'Donovan BGG, Doody C, Daly L, Hurley DA. Doctors' attitudes and beliefs regarding acute low back pain management: a systematic review. PAIN 2008;136:388–96.
[20] Gardner SF, Chamberlin GD, Heestand DE, Stowe CD. Interdisciplinary didactic instruction at academic health centers in the United States: attitudes and barriers. Adv Health Sci Educ 2002;7:179–90.
[21] Gardner T, Refshauge K, Smith L, McAuley J, Hubscher M, Goodall S. Physiotherapists' beliefs and attitudes influence clinical practice in chronic low back pain: a systematic review of quantitative and qualitative studies. J Physiother 2017;63:132–43.
[22] Giangreco A, Sebastiano A, Peccei R. Trainees' reactions to training: an analysis of the factors affecting overall satisfaction with training. Int J Hum Resour Manag 2009;20:96–111.
[23] Grohmann A, Kauffeld S. Evaluating training programs: development and correlates of the Questionnaire for Professional Training Evaluation. Int J Train Dev 2013;17:135–55.
[24] Gron S, Bulow K, Jonsson TD, Degn J, Kongsted A. What do people believe to be the cause of low back pain? A scoping review. Braz J Phys Ther 2023;27:100562.
[25] Holopainen R, Simpson P, Piirainen A, Karppinen J, Schütze R, Smith A, O'Sullivan P, Kent P. Physiotherapists' perceptions of learning and implementing a biopsychosocial intervention to treat musculoskeletal

pain conditions: a systematic review and metasynthesis of qualitative studies. PAIN 2020;161:1150–68.
[26] Hooten WM, Dvorkin J, Warner NS, Pearson AC, Murad MH, Warner DO. Characteristics of physicians who prescribe opioids for chronic pain: a meta-narrative systematic review. J Pain Res 2019;12:2261–89.
[27] Husted M, Rossen CB, Jensen TS, Mikkelsen LR, Rolving N. Adherence to key domains in low back pain guidelines: a cross-sectional study of Danish physiotherapists. Physiother Res Int 2020;25:e1858.
[28] Jacobson NS, Truax P. Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. In: Methodological issues & strategies in clinical research. Washington: American Psychological Association, 1992. p. 631–48.
[29] Kent P, Haines T, O'Sullivan P, Smith A, Campbell A, Schutze R, Attwell S, Caneiro JP, Laird R, O'Sullivan K, McGregor A, Hartvigsen J, Lee DCA, Vickery A, Hancock M; RESTORE trial team. Cognitive functional therapy with or without movement sensor biofeedback versus usual care for chronic, disabling low back pain (RESTORE): a randomised, controlled, three-arm, parallel group, phase 3, clinical trial. Lancet 2023;401:1866–77.
[30] Kress HG, Aldington D, Alon E, Coaccioli S, Collett B, Coluzzi F, Huygen F, Jaksch W, Kalso E, Kocot-Kępska M, Mangas AC, Ferri CM, Mavrocordatos P, Morlion B, Müller-Schwefe G, Nicolaou A, Hernández CP, Sichère P. A holistic approach to chronic pain management that involves all stakeholders: change is needed. Curr Med Res Opin 2015;31:1743–54.
[31] Learman KE, Ellis AR, Goode AP, Showalter C, Cook CE. Physical therapists' clinical knowledge of multidisciplinary low back pain treatment guidelines. Phys Ther 2014;94:934–46.
[32] Linton SJ, Vlaeyen J, Ostelo R. The back pain beliefs of health care providers: are we fear-avoidant? J Occup Rehabil 2002;12:223–32.
[33] Louw A, Vogsland R, Marth L, Marshall P, Cox T, Landers M. Interdisciplinary pain neuroscience continuing education in the veterans affairs: live training and live-stream with 1-year follow-up. Clin J Pain 2019;35:901–7.
[34] Lugtenberg M, Zegers-van Schaick JM, Westert GP, Burgers JS. Why don't physicians adhere to guideline recommendations in practice? An analysis of barriers among Dutch general practitioners. Implement Sci 2009;4:54.
[35] Maguire N, Chesterton P, Ryan C. The effect of pain neuroscience education on sports therapy and rehabilitation students' knowledge, attitudes, and clinical recommendations toward athletes with chronic pain. J Sport Rehabil 2019;28:438–43.
[36] Mikhail C, Korner-Bitensky N, Rossignol M, Dumas J-P. Physical therapists' use of interventions with high evidence of effectiveness in the management of a hypothetical typical patient with acute low back pain. Phys Ther 2005;85:1151–67.
[37] Miller GE. The assessment of clinical skills/competence/performance. Acad Med 1990;65:S63–7.
[38] Miro J, Castarlenas E, Sole E, Marti L, Salvat I, Reinoso-Barbero F. Pain curricula across healthcare professions undergraduate degrees: a cross-sectional study in Catalonia, Spain. BMC Med Educ 2019;19:307.
[39] Monsalves MJ, Bangdiwala AS, Thabane A, Bangdiwala SI. LEVEL (Logical Explanations & Visualizations of Estimates in Linear mixed models): recommendations for reporting multilevel data and analyses. BMC Med Res Methodol 2020;20:3.
[40] Munneke W, De Kooning M, Nijs J, Leclercq J, George C, Roussel N, Bornheim S, Beetsma A, Reynebeau I, Demoulin C. Cross-cultural adaptation and psychometric testing of the French version of the Knowledge and Attitudes of Pain (KNAP) questionnaire. Ann Phys Rehabil Med 2023;66:101757.
[41] Munneke W, Demoulin C, Nijs J, Morin C, Kool E, Berquin A, Meeus M, De Kooning M. Development of an interdisciplinary training program about chronic pain management with a cognitive behavioural approach for healthcare professionals: part of a hybrid effectiveness-implementation study. BMC Med Educ 2024;24:331.
[42] Munneke W, Demoulin C, Roussel N, Leysen M, Van Wilgen CP, Pitance L, Reezigt RR, Voogt LP, Dankaerts W, Danneels L, Koke AJA, Cools W, De Kooning M, Nijs J. Comparing physical therapy students' attitudes and beliefs regarding chronic low back pain and knee osteoarthritis: an international multi-institutional comparison between 2013 and 2020 academic years. Braz J Phys Ther 2024;28:100592.
[43] Ng W, Slater H, Starcevich C, Wright A, Mitchell T, Beales D. Barriers and enablers influencing healthcare professionals' adoption of a biopsychosocial approach to musculoskeletal pain: a systematic review and qualitative evidence synthesis. Pain 2021;162:2154–85.
[44] Nijs J, De Kooning M, Malfliet A, Jones MA, Jones M, Rivett D. Applying contemporary pain neuroscience for a patient with maladaptive central sensitization pain. In: Clinical reasoning in musculoskeletal practice. 2nd ed. London: Elsevier, 2019. p. 455–70.
[45] Overmeer T, Boersma K, Main CJ, Linton SJ. Do physical therapists change their beliefs, attitudes, knowledge, skills and behaviour after a biopsychosocially orientated university course? J Eval Clin Pract 2009;15:724–32.
[46] Peabody JW, Luck J, Glassman P, Dresselhaus TR, Lee M. Comparison of vignettes, standardized patients, and chart abstraction: a prospective validation study of 3 methods for measuring quality. JAMA 2000;283:1715–22.
[47] Peabody JW, Luck J, Glassman P, Jain S, Hansen J, Spell M, Lee M. Measuring the quality of physician practice by using clinical vignettes: a prospective validation study. Ann Intern Med 2004;141:771–80.
[48] Penlington C, Pornsukjantra P, Chazot P, Cole F, Denneny D. Confidence of practitioners to support self-management of pain: a multidisciplinary survey. Br J Pain 2024;18:148–54.
[49] Pinnock H, Barwick M, Carpenter CR, Eldridge S, Grandes G, Griffiths CJ, Rycroft-Malone J, Meissner P, Murray E, Patel A, Sheikh A, Taylor SJC; StaRI Group. Standards for Reporting Implementation Studies (StaRI) statement. BMJ 2017;356:i6795.
[50] Rainville J, Bagnall D, Phalen L. Health care providers' attitudes and beliefs about functional impairments and chronic back pain. Clin J Pain 1995;11:287–95.
[51] Rainville J, Carlson N, Polatin P, Gatchel RJ, Indahl A. Exploration of physicians' recommendations for activities in chronic low back pain. Spine (Phila Pa 1976) 2000;25:2210–20.
[52] Reezigt R, Beetsma A, Köke A, Hobbelen H, Reneman M. Toward consensus on pain-related content in the pre-registration, undergraduate physical therapy curriculum: a Delphi-study. Physiother Theor Pract 2024;40:1040–53.
[53] Richmond H, Hall AM, Hansen Z, Williamson E, Davies D, Lamb SE. Exploring physiotherapists' experiences of implementing a cognitive behavioural approach for managing low back pain and identifying barriers to long-term implementation. Physiotherapy 2018;104:107–15.
[54] Ris I, Boyle E, Myburgh C, Hartvigsen J, Thomassen L, Kongsted A. Factors influencing implementation of the GLA:D Back, an educational/exercise intervention for low back pain: a mixed-methods study. JBI Evid Implement 2021;19:394–408.
[55] Schectman JM, Schroth WS, Verme D, Voss JD. Randomized controlled trial of education and feedback for implementation of guidelines for acute low back pain. J Gen Intern Med 2003;18:773–80.
[56] Schiltenwolf M, Buchner M, Heindl B, von Reumont J, Muller A, Eich W. Comparison of a biopsychosocial therapy (BT) with a conventional biomedical therapy (MT) of subacute low back pain in the first episode of sick leave: a randomized controlled trial. Eur Spine J 2006;15:1083–92.
[57] Shipton EE, Bate F, Garrick R, Steketee C, Shipton EA, Visser EJ. Systematic review of pain medicine content, teaching, and assessment in medical school curricula internationally. Pain Ther 2018;7:139–61.
[58] Slade SC, Kent P, Patel S, Bucknall T, Buchbinder R. Barriers to primary care clinician adherence to clinical guidelines for the management of low back pain: a systematic review and metasynthesis of qualitative studies. Clin J Pain 2016;32:800–16.
[59] Sugavanam T, Williamson E, Fordham B, Hansen Z, Richmond H, Hall A, Ali U, Copsey B, Lamb SE. Evaluation of the implementation of the Back Skills Training (BeST) programme using online training: a cohort implementation study. Physiotherapy 2020;109:4–12.
[60] Team R. RStudio: integrated development environment for R. Boston: RStudio, PBC, 2023.
[61] Thompson K, Johnson MI, Milligan J, Briggs M. Twenty-five years of pain education research-what have we learned? Findings from a comprehensive scoping review of research into pre-registration pain education for health professionals. Pain 2018;159:2146–58.
[62] Turner P, Whitfield TWA. Physiotherapists' use of evidence based practice: a cross-national study. Physiother Res Int 1997;2:17–29.
[63] Van de Mortel TF. Faking it: social desirability response bias in self-report research. Aust J Adv Nurs The 2008;25:40–8.
[64] Voerman J, Chomrikh L, Huygen F, Nederland A, NVACP B, Nederland DO, en Samenleving F, Nederland MV, van Hoofdpijnpatiënten NV, Vereniging O. Patiënttevredenheid bij chronische pijn. Soest: SWP, 2015.
[65] Volkow ND, Blanco C. The changing opioid crisis: development, challenges and opportunities. Mol Psychiatry 2021;26:218–33.
[66] Ward J, Wood C. Education and training of healthcare staff: the barriers to its success. Eur J Cancer Care 2000;9:80–5.