Translating an Intervention to Address Chronic Pain among Home Care Workers

The COMPASS-NP Pilot

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Objective: To pilot test the COMmunity of Practice And Safety Support for Navigating Pain (COMPASS-NP) intervention for home care workers experiencing chronic pain. **Methods:** Home care workers with chronic pain participated (n = 19; 2 groups) in a 10-week online group program focused on workplace safety and pain self-management. Primary outcomes were changes in pain interference with work and life. Other outcomes related to ergonomics, pain levels, opioid misuse risk, mental health, sleep, and physical activity. **Results:** The intervention produced a large reduction in pain interference with life ($d = -0.85$) and a moderate reduction in pain interference with work time demands ($d = -0.61$). Secondary outcomes showed favorable effect sizes, including a substantial increase in the use of ergonomic tools and techniques ($d = 1.47$). **Conclusion:** Findings were strongly encouraging. The effectiveness of COMPASS-NP will be evaluated in a future randomized controlled trial.

Keywords: chronic pain, cognitive-behavioral therapy, ergonomics, home care workers, injury prevention, safety, total worker health

LEARNING OUTCOMES

- Understand why home care workers are an important occupational group to address with chronic pain interventions.
- Learn the details of the COMPASS program and how this online intervention may benefit a wide range of home care workers.
- Gain a better understanding of how cognitive behavioral therapy and ergonomic practices—both well-established independent approaches—can be integrated into occupational training programs for workers with chronic pain.

It has been estimated that 20.9% of US adults experienced chronic pain (pain lasting >3 months) and that women are more likely to have chronic pain (+21.7%) than men.[1] Chronic pain is linked to depression, dementia, higher suicide risk, and substance use and abuse.[2–6] Between 1999 and 2015, middle-aged women experienced a disproportionate increase in prescription opioid-related overdoses (compared with 218% for men).[7]

There are an estimated 3.6 million home care workers (HCWs) and personal care aides in the United States, an occupation that is expected to grow by 25% in the next 7 years.[8] HCWs are predominantly female, older, lower income, and from racial and ethnic minority backgrounds.[9] Their job duties typically include tasks that place workers at high risk for injury, including bathing, transferring and transporting clients, as well as shopping and housekeeping tasks such as making beds, doing laundry, vacuuming, and scrubbing bathrooms and kitchens. Many HCWs are individual providers who work in private residences for a client who is also their employer. As such, they do not have the benefit of health and safety training and supervision provided by most employers, or the social support provided by coworkers.

HCWs are part of a demographic that places them at high risk for opioid use, misuse and mortality. These characteristics include lower socioeconomic position, lower education levels, and job insecurity.[10,11] Other risk factors include being middle-aged and female. As noted above, middle-aged women experienced a 471% increase in prescription opioid-related doses relative to men during a 16 year period.[7] Further, women who have been injured at work have demonstrated a 2.6-fold increased risk of suicide and drug-related death.[12] In particular, low back pain is prevalent among HCWs, and those exposed to client moving/transferring tasks frequently experience chronic pain in their upper extremities.[13] In 2020, HCWs reported rates of general soreness and pain that was almost double the rate of all occupations combined (27.0 vs. 15.4 per 10,000 full-time workers).[14] A recent study of HCWs in Washington State found that 54.2% of respondents self-reported elevated pain (pain worse than normal in the last week or perceived need for daily pain medication).[15] The same study also found that over-the-counter medications were a common pain management strategy reported by 67.3% of respondents and that 4.8%

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Ethical considerations & disclosures: All study procedures were reviewed, approved, and overseen by the Oregon Health & Science University Institutional Review Board. Preliminary studies and ongoing research have been reviewed and approved (IRB000020412), and modifications for each phase of implementation were submitted, reviewed, and approved before implementation. Potential participants were provided written informed consent and informed that they could withdraw from the study at any time, for any reason. They were informed that their enrollment would in no way affect their relationship with their union, consumer-employers, or with Oregon Health & Science University. The study's approved institutional review board documents include the original grant application's data safety and monitoring plan, which includes procedures for the principal investigator's monitoring and prompt reporting of any adverse events.

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reported current prescription opioid use. The prevalence of opioid use among HCWs in others states is likely to vary and trend higher, as Washington has been among the more responsive states in enacting policies to attenuate the opioid crisis. HCWs are also at risk for work-related disability as they have higher rates of lost time injuries than many other occupations.[14] For example, the lost time injury rate for home health and personal care aides in 2020 was 166.9 per 10,000 full-time workers, compared with 120.7 for all occupations.[14]

Since the Centers for Disease Control and Prevention (CDC) declared the US opioid crisis a national public health emergency in 2017,[16] promotion of pain management using nonpharmacological strategies has become a public health imperative. To date, the most common treatments for pain center on prescribed medications. These interventions have been only modestly effective and may have adverse effects; moreover, they do not address the cognitive and behavioral difficulties of living and working with chronic pain.[17] Nonpharmaceutical work-based interventions are an important prevention strategy for addressing this problem among at-risk populations, as many pain problems have origins in work-related injuries.[18] However, typical work-based intervention strategies focus on return to work after an injury with limited attention to pain education and self-management strategies. Work-based secondary and tertiary prevention interventions for workers with chronic pain are limited, and to our knowledge, have not been developed or evaluated with HCWs.

To address the critical need for nonpharmaceutical chronic pain management strategies emphasized by the Institute of Medicine,[19] we developed a work-based prevention intervention for HCWs. The intervention represents a translated (ie, adapted) version of an effective safety, health, and well-being program for HCWs called COMPASS (COMmunity of Practice And Safety Support).[10,20] The original COMPASS program was developed within the Oregon Healthy Workforce Center, which is a National Institute for Occupational Safety and Health (NIOSH) Center of Excellence for *Total Worker Health*®. In a randomized controlled trial, COMPASS produced a range of moderate to large improvements in safety and health outcomes[20] and was subsequently adopted by the Oregon Home Care Commission (OHCC) and disseminated statewide.[10] However, the original program did not specifically address the needs of workers with chronic pain.

It is now accepted that chronic pain is a biopsychosocial illness that alters the brain,[21,22] affecting sleep, thought, emotion, and perceptions of pain severity.[19] Recently, the CDC[23] and the Department of Health and Human Services[24] expanded the scope of chronic pain treatment to include cognitive-behavior therapy (CBT) for pain management to reduce progression of pain, opioid use and misuse, and disability. There is a growing body of evidence supporting the efficacy of CBT for improving physical and emotional functioning and reducing pain-related disability.[25–27] Further, when CBT is combined with other strategies such as exercise[28] and sleep hygiene,[29] it produces significantly better pain outcomes.

The goal of COMPASS for Navigating Pain (COMPASS-NP) was to leverage an established intervention approach to address the needs of HCWs living and working with chronic pain and its associated symptoms. Specifically, in addition to injury prevention, the intervention was designed to address and halt the progression of pain and its related problems, including work-related disability and risk for opioid initiation and misuse. The intervention adaptation strategy was twofold. First, we aimed to enhance the ergonomic and safety protections in the program. This included the addition of an online ergonomic self-assessment adapted from the NIOSH handbook, *Caring for Yourself While Caring for Others*.[30] This adapted assessment helps workers identify hazardous job tasks and then identify low-tech ergonomic tools that are then purchased for them by the COMPASS-NP program. Second, we integrated concepts from the cognitive-behavioral perspective[31] and techniques outlined in cognitive-behavioral treatment for pain management,[21,32] aligning with the biopsychosocial model of pain.[33] Educational content in these areas was adapted in part from *The Pain Survival Guide*[34] with permission from the publisher.

This article presents findings from the pilot phase of the COMPASS-NP project. This translational research project is part of the current research core of the Oregon Healthy Workforce Center and includes a recently initiated randomized controlled trial.[35] Our primary hypotheses were that COMPASS-NP would reduce the interference of pain with work and with life. Our secondary hypotheses were that COMPASS-NP would improve additional safety-related and pain- and health-related outcomes. In the safety domain, these anticipated improved outcomes included increased ergonomic tool use for household chores and patient mobility, and reduced injuries (first aid only and lost work time). In the pain and health domains, anticipated improved outcomes included reduced pain intensity, reduced prescription pain medication use, reduced risk for opioid misuse, improved mental health, reduced burnout, and improved sleep and physical activity. We adhered to STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines in preparing this article; they are included as Supplementary Digital Content (http://links.lww.com/JOM/B616).

METHODS

Design

The pilot study employed a within-group pretest and posttest design that lasted for approximately 12 weeks. Preintervention and postintervention measures were collected via online survey and actigraphy. Intervention process measures, including attendance and postmeeting evaluations, were also collected (see Measures below). All study procedures were reviewed and approved by the Oregon Health & Science University Human Subjects Institutional Review Board. The Service Employees International Union (SEIU) 775 Benefits Group in Seattle, Washington, was the study partner. This organization is affiliated with the SEIU Local 775 but is a separate trust that facilitates and provides services related to benefits, as well as training and continuing education for HCWs in Washington State. Researchers and staff at the Benefits Group met regularly in advance of the study to collaboratively plan study methods. Researchers sought and implemented advice related to messaging, recruitment methods, and conducting online group meetings via Web format. The study was conducted between March and June 2023.

COMPASS-NP Intervention

COMPASS-NP is a scripted and peer-led group program involving 10 weekly meetings. In the pilot, a researcher facilitator helped groups get started and supported peer leaders during their online group meetings. As the project progresses, future facilitators will include professional trainers from partner organizations. The first meeting lasted 120 minutes and was led by a facilitator. Each of the remaining meetings lasted 90 minutes, with group members taking turns being the peer leader. All meetings were held online using Webex, a secure online video-conference system. This online approach was selected to extend the intervention's reach to HCWs in rural areas and to reduce travel burdens. Each participant received printed COMPASS-NP Guidebook materials in advance of each of the 10 scripted meetings and was provided technical support and coaching on Webex in advance of the first meeting. Guidebooks were evaluated for reading level and tested at sixth- and seventh-grade levels. As described in prior publications,[10,20,36] workers took turns reading from the COMPASS Guidebooks during each meeting. The group leader followed additional instructions in the book to guide members through meeting exercises and activities. Each meeting had the same structure (Fig. 1). Meetings began with a "WorkLife" check-in where HCWs rated how they were feeling about work and life that past week. This was followed by educational content and exercises, group and individual goal setting, and then a structured WorkLife support session where a worker with a pressing issue could draw on the knowledge, ideas, and support of others in the group for help. Each meeting then ended with group reflections and selection of the peer leader for the next meeting (Table 1).

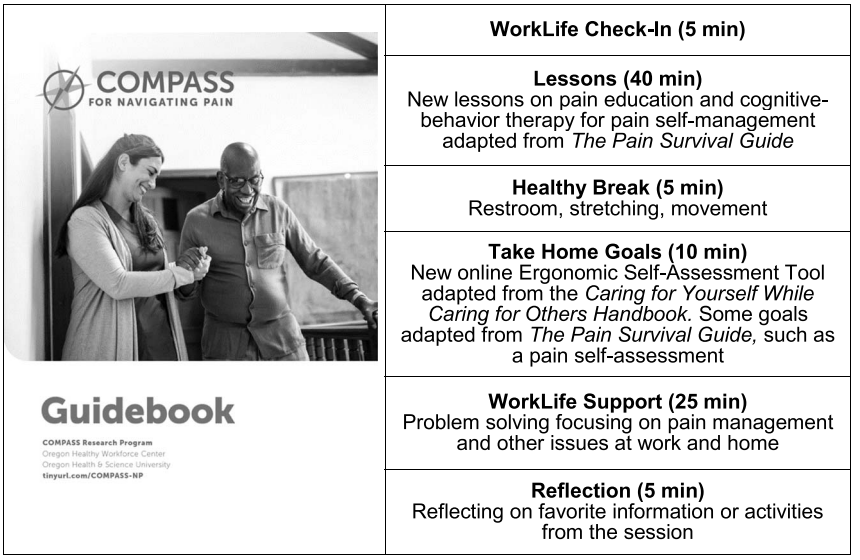

FIGURE 1. Steps in each scripted guidebook meeting: COMPASS for Navigating Pain intervention pilot study.

Existing COMPASS educational topics were adapted to address the needs and limitations of HCWs with chronic pain. The online group format required adaptations to participant instructions in meeting 1 (such as how to navigate Webex), adjusted scripts and methods for small group activities, and interactions such as use of the chat feature. New meetings were created that included well-established CBT educational topics and strategies adapted from *The Pain Survival Guide*[34] with permission from the publisher (Fig. 1). These strategies have been previously used successfully with individuals experiencing chronic pain (eg, activity pacing, relaxation, problem solving, cognitive and behavioral coping strategies).[37] Several randomized trials have validated the use of online CBT training for pain management for helping people with chronic pain.[25,38] Safety protections were enhanced with the addition of a novel online ergonomic self-assessment based on a NIOSH resource developed for HCWs[30] and provision of low-tech tools chosen by workers (workers could choose a combination of tools of about $100 in value). The ergonomic self-assessment was programed in Adobe Articulate with a menu of ergonomic tool options for workers to choose from. The online ergonomic self-assessment and the overall program (eg, program schedule, meeting links) were hosted as a "course" designed in the Docebo Learning Management System (Docebo, Toronto, Ontario, Canada). Ergonomic tool choices in the pilot included a long-handled duster, long-handled scrub brush, grabber tool, step stool, durable reusable bags, a utility cart, mattress lifter, small and large slide sheets, portable stool, transfer belt, standard or angled slide board, swivel seat, knee pads, knee cushion, broom or mop with an ergonomic handle, mop with wringing bucket, and a handheld cordless vacuum.

Each COMPASS-NP topic included group and individual goal setting commitments. The goals were activities or tasks that HCWs completed during the following week to apply what they had learned. The group goal was a single activity that everyone completed, whereas an individual goal was selected by each member from a menu of three to five options. On this theme, the WorkLife support activity also generated an action plan for the person whose issue was selected. At the following meeting, group members discussed completion of their prior week's goals and also reviewed the person's progress with their WorkLife support action plan.

Recruitment and Retention Methods

The SEIU 775 Benefits Group identified a random subsample of 3000 HCWs in Washington State to potentially be invited to participate in one of two pilot intervention groups (8 to 12 people/group). Study invitations were sent by email to 500 of these workers at a time (randomly sampled from the 3000 without replacement) staggered over 3 weeks. Each email group received a weekly follow-up for 1 month. This pacing was selected due to unknown volunteerism and eligibility rates and to enable researchers to be maximally responsive to interested and eligible workers. After 1500 total workers were contacted, researchers stopped new recruitment invitations due to a sufficient response rate. Interested potential participants followed a link in the invitation email to complete an online eligibility screener survey. Eligibility criteria included the presence of chronic pain (pain lasting 3+ months and occurring on most days of a typical week), working as an HCW >4 hours per week, ability to read and speak English, willingness to read out loud in English, and access to an Internet-capable device. Exclusion criteria included previous experience with the COMPASS program; surgery in the past 6 months or scheduled in the coming 6 months, given birth in the past 6 months, current pregnancy, and psychiatric problems resulting in hospitalization in the prior 6 months.

One hundred thirty-three caregivers started the eligibility screener. Of the 85 who completed the screener, 32 were eligible for the study based on the above stated inclusion/exclusion criteria and were contacted by researchers. Twenty HCWs completed an informed consent process with a researcher over the phone (see Fig. 2 for the consort

TABLE 1. Meeting Topics: COMmunity of Practice And Safety Support for Navigating Pain (COMPASS-NP) Pilot Study

COMPASS-NP Meeting Topics
1. How COMPASS-NP Groups Work
2. Sleep, Rest, and Activity Pacing
3. Back to Healthy Postures
4. Take a Load Off with Tools
Online Ergonomic Self-assessment Tool
5. Relaxation and Stress Management
6. Improving Safety and Relationships Through Better Communication
7. Changing Behavior for More Diversion and Fun
8. Changing Our Thoughts and Feelings
9. Functional Fitness
10. Maintaining Success and Navigating Setbacks

Note. Adapted topics are in plain text. New or substantially edited topics are in bold font.

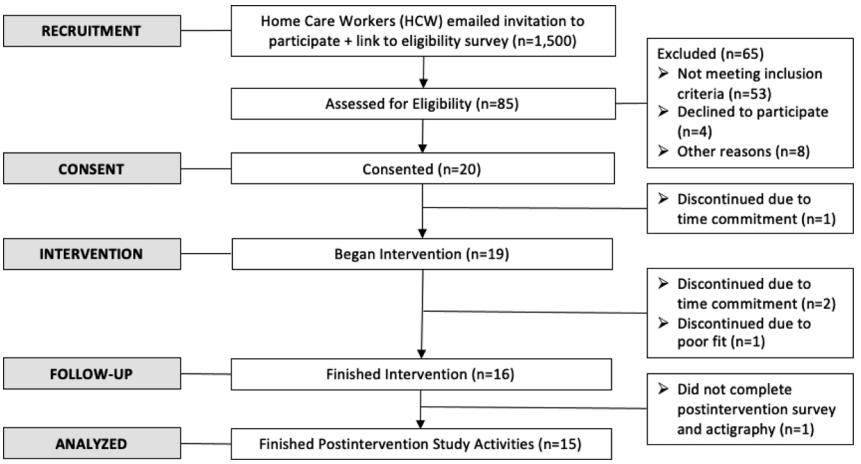

FIGURE 2. Participant flow diagram for the COMPASS Navigating Pain intervention pilot study.

diagram). Once consented, participants were emailed or texted the preintervention surveys programmed in REDCap (REDCap, Vanderbilt University, Nashville, TN), a secure online data collection and database management tool. Participants were also mailed two triaxial accelerometers (Actigraph wGT3X-BT; Actigraph, Pensacola, Florida) to wear to measure sleep (wrist-worn) and physical activity (hip-worn) for 1 week (returned to researchers via prepaid addressed envelopes), while simultaneously completing a daily electronic sleep diary survey. Workers were organized into two intervention groups based on their availability.

Participants received up to $480 in total compensation for participating. This included $20 for completing the preintervention measures (survey, wearing Actigraphs, and completing a daily sleep diary for 1 week); $25 for attending each intervention meeting; approximately $100 in value of ergonomic tools; and $40 for completing the postintervention measures (survey, wearing Actigraphs, and completing a daily sleep diary for 1 week). Participants also received $20 for completing a postintervention one-on-one 30-minute interview and a $50 bonus if they completed 8 of 10 weekly meeting feedback surveys.

Measures

Primary Study Outcomes

Pain Interference With Work

The Work Limitations Questionnaire[39] was used to assess pain interference with work. The Work Limitations Questionnaire consists of 25 items that measure four dimensions: on-the-job time management, physical performance, mental performance, interpersonal functioning, and output. One item pertaining to break time was removed from the time dimension as its phrasing was not consistent with healthy rest break behavior for HCWs experiencing chronic pain. Responses were provided on a 5-point Likert type scale ranging from 1 (difficult none of the time 0%) to 5 (difficult all of the time 100%). Additionally, participants could choose an option "does not apply to my job." Subscales are scored by multiplying the mean of the subscale items by 25. An example item is "In the past 1 week, how much of the time did your physical health or emotional problems make it difficult for you to finish work on time?"

Pain Interference With Life

Pain interference with life was assessed with a seven-item subscale from the Brief Pain Inventory (BPI).[40] This scale addresses pain interference with general activity, mood, walking ability, work inside and outside the home, relations with other people, sleep, and enjoyment of life. An example item is "Select the one number that describes how, during the past week, pain has interfered with your normal work (includes both work outside the home and housework)." Response options range from 0 (does not interfere) to 10 (completely interferes).

Secondary Study Outcomes

Injury prevention measures were assessed with eight items written by researchers and used in prior COMPASS studies.[20,36] These items addressed the frequency of injury risk reduction actions taken at work, in the past 3 months, such as the use of ergonomic tools and techniques, and reporting the frequency of injuries and illnesses, including missed work days due to illness, first aid injuries, and lost work time injuries, in the past 3 months (range 0 to 5 or more).

Pain medication frequency was assessed with 2 items from the BPI.[40] Risk for future problematic drug-related behaviors, for individuals not currently prescribed opioids, was measured using the Butler[41] 18-item Screener and Opioid Assessment for Patients With Pain—Revised. Responses range from 0 (never) to 4 (very often). Average pain severity was measured with a four-item subscale from the BPI.[40] Responses ranged from 0 (no pain) to 10 (pain as bad as you can imagine). An example question is "Please rate your pain by selecting the one number that tells how much pain you have right now." To assess how much pain dominates or "takes over" one's life, the Nicolaidis[42] 10-item Centrality of Pain Scale was used to assess the degree to which pain dominates a person's life. An example question is "Pain controls my life," and response options range from 1 (strongly disagree) to 5 (strongly agree). Well-being was measured with the four-item PROMIS Global Mental Health subscale.[43] Responses ranged from 1 to 5, and an example question is "In the last 7 days, how often have you been bothered by emotional problems?"

Other measures included two subscales from the Copenhagen Burnout Inventory to assess work-related burnout (seven items) and client-related burnout (six items).[44] Reponses for both scales were assessed on a 1- to 5-point Likert type scale (with different anchors), where higher scores indicate a higher degree of burnout. Sleep duration was measured with a question from the Pittsburgh Sleep Quality Index.[45] Physical exercise was measured using walking items from the International Physical Activity Questionnaire short form.[47] Objective information on physical activity and sleep was assessed with hip- and wrist-worn Actigraphs, respectively, worn for 1 week (GT3x + BT; Actigraph), but analyses were not complete at the time of this submission.

Process Measures

Facilitators recorded meeting attendance and took notes on reported goal commitments and completion. Participants also completed evaluation surveys following each meeting focused on affective and

utility reactions and intentions to do something new or different as a result of attending.[46] Qualitative measures consisted of postintervention semistructured one-on-one interviews, with participants asked about their experience with the COMPASS-NP program such as what they liked or did not like, what they found useful, if it has improved their pain, and how it has impacted their work and life. The interviews were conducted on Webex and were video recorded or audio recorded or had only written notes taken based on the participant's preference.

Data Analysis

Data analyses focused on descriptive statistics for demographics and postmeeting evaluation surveys. Analyses of pre-intervention and postintervention outcomes focused on reporting descriptive statistics and estimating standardized effect sizes (Cohen's *d* and Phi coefficients). All analyses were performed using R version 4.3.2.

RESULTS

Nineteen HCWs completed the informed consent process and also attended at least one meeting. Sixteen completed the majority of program meetings, and fifteen completed preintervention and postintervention measurements (see below for attendance statistics). One HCW discontinued the study before the intervention began because of the anticipated time commitment. Three other HCWs discontinued the study after meeting 3: two due to competing life demands and one because the intervention content and style were reported to not be a good fit (see Fig. 2 for the consort diagram).

Summary of Demographics

Participating HCWs at baseline (n = 19) were predominantly female (n = 17) with an average age of 44.47 (SD = 15.26) years. Gender identity was also asked, but not reported due to small numbers in particular categories. The sample was relatively diverse, with 42.11% reporting being from a racial or ethnic minority background. Two HCWs reported speaking a language other than English in their home. Average tenure as an HCW was 8.29 (SD = 7.03) years, and caregivers reported working an average of 36.74 (SD = 15.71) hours per week. Seven participants reported working an additional job (see Table 2 for additional Demographics). At baseline, the most prevalent body regions with pain for workers included the low back, neck, shoulders, and knees (see Fig. 3 for a heat map of workers' body regions with pain).

TABLE 2. Demographics: COMmunity of Practice And Safety Support for Navigating Pain Pilot Study (n = 19)

Variable	Mean (SD) or n (%)
Age	44.47 (15.26)
Sex	
Male	2 (10.53)
Female	17 (89.47)
Race	
White/Caucasian	11 (57.89)
Black/African American	4 (21.05)
Other (specified and not specified)	4 (21.05)
Ethnicity—Hispanic/Latino/a/e	3 (15.79)
Education	
High school graduate	2 (10.53)
Some college or technical school	14 (73.68)
College graduate	2 (10.53)
Professional degree	1 (5.26)
Language spoken at home—English	16 (84.21)
Relationship	
Married	5 (26.32)
Committed relationship (living together or not)	5 (26.32)
Single	9 (47.37)
Income	
Single-income household	13 (68.42)
Dual-income household	6 (31.58)
Financial strain (1–10)	3.58 (2.52)
Number of children	1.53 (1.81)
Tenure in years	8.29 (7.03)
Weekly hours	36.74 (15.71)
Number of clients	2.74 (4.28)
Working an additional job	7 (36.84)
Weekly commute in hours	4.59 (6.75)

Note. Race categories with single individuals reporting were combined into an "other" category.

Results for Primary and Secondary Outcomes

Intervention effects are reported for those who completed both preintervention and postintervention surveys (n = 15). Traditionally, effect sizes of 0.20, 0.50, and 0.80 have been considered small, moderate, and large in magnitude, respectively.[48] On the whole, outcomes changed in expected directions and included a number of moderate to large effect sizes. Among primary outcomes, such changes included reductions in pain-related work limitations related to time demands ($d = -0.61$) and pain-related life limitations ($d = -0.85$; Table 3). Among secondary safety-related outcomes, the largest effects were observed for using new ergonomic tools and techniques for assisting client mobility ($d = 0.80$) and for housekeeping ($d = 1.47$; Table 4). Among secondary pain-related and behavioral health outcomes, moderate to large reductions were observed for pain severity ($d = -0.65$) and centrality of pain ($d = -1.20$). Small reductions in pain medication use per 24 hours and in risk for future opioid misuse were also observed. Global mental health increased ($d = 0.81$), and work-related burnout reduced ($d = -0.71$; Table 5). Unexpected small reductions were observed in sleep duration and walking.

Results for Process Measures

For the 15 participants who remained in the program and completed both preintervention and postintervention measurements, meeting attendance averaged 7.60 (SD = 2.92) meetings. An additional participant attended 8 of 10 meetings, but did not complete the postprogram measurements. Ratings collected from participants following each meeting were highly favorable. Average overall ratings (5 = strongly agree) indicated that participants liked the meeting (M = 4.45, SD = 0.70) and found it useful (M = 4.46, SD = 0.68) and that they planned to do something new or different as a result of attending (M = 4.28, SD = 0.76). Group and individual goal completion in between meetings was self-reported during meetings and not systematically measured. However, facilitators estimated that the weekly percentage of attending workers who reported completing their goals ranged from about 40% to 100%.

Thematic analyses of qualitative comments from postmeeting feedback surveys and from interviews with participants remain in process at the time of this article submission. However, at a high level, a common comment in postmeeting feedback was appreciation for meeting with and getting to know others who were having a similar experience managing pain as a caregiver. Participants reported being grateful to learn that they were not alone and to receive support from others experiencing similar challenges. Example quotes from two different participant interviews are provided below:

> I would like to share just how much it's helped me. That I feel like a totally different person. I was in so much pain when we started, and part of it was, I'd had an injury I fell down the stairs at work. Um. But, um, it just helped me heal and helped me be aware and it helped me communicate. And start good practices that I've continued. (Worker 1)

> My favorite part was having a community. Having people who saw everything, and were going through the exact same experience as I

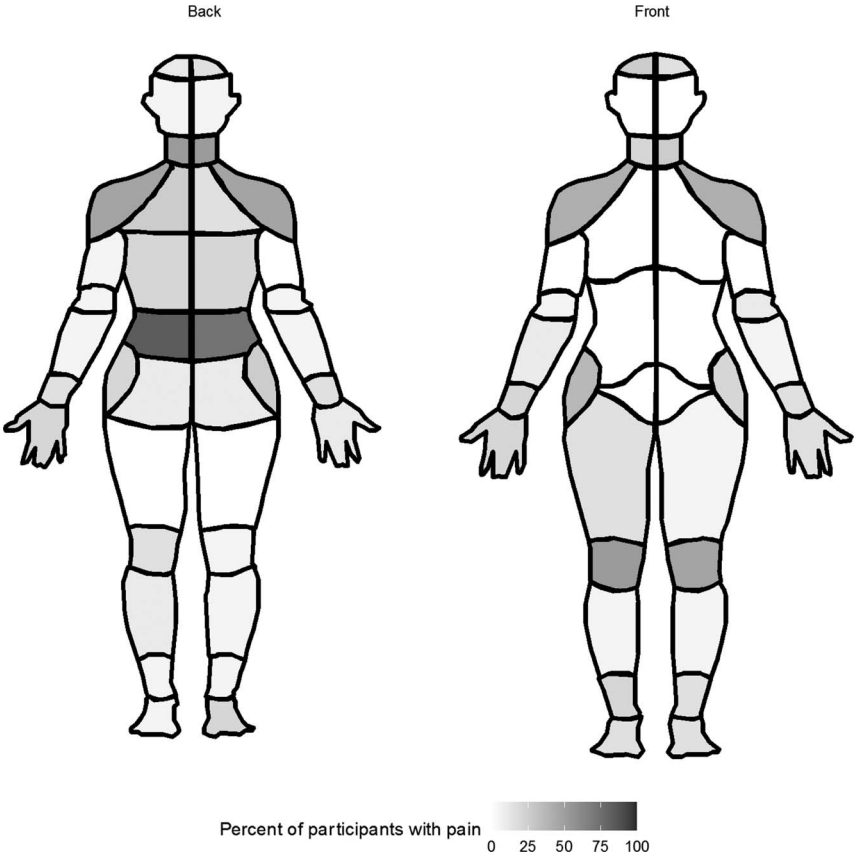

FIGURE 3. Baseline pain heat map: COMPASS for Navigating Pain intervention pilot study (n = 19).

was going through and just having that support from complete strangers, and just getting really good, good advice and feedback. And there's a section where, um each individual person puts in, like, one issue or problem that's going on in their life and when I put mine in, I got so much support and care and respect and I think that really changed my outlook on everything. (Worker 2)

Participants' comments on favorite or most helpful concepts and opportunities to improve meetings were used to revise the curriculum prior to initiation of the randomized controlled trial. Such feedback was collected both in postmeeting evaluation surveys and in interviews.

DISCUSSION

HCWs are a high-risk population for injury and pain. The goal of the intervention design was to address and prevent the progression of pain and its related problems for these important workers. To accomplish this goal, we translated an established and empirically evaluated health and safety program for HCWs to address the needs of HCWs with chronic pain. Specifically, safety components were enhanced through the addition of a novel online ergonomic self-assessment tool followed by direct provision of tools chosen by workers to reduce injury risk in their specific job. New educational content incorporated established CBT pain education and self-management strategies.

Results of the COMPASS-NP pilot study were very encouraging and informed the ongoing randomized controlled trial. The program was well attended, was rated favorably in evaluation surveys, and produced many moderate to large effect sizes in expected directions. The intervention reduced pain interference with work and life for HCWs experiencing chronic pain. Specifically, the "time demands" component of the work limitations questionnaire was reduced by a moderate effect size, and "life limitations due to pain" were reduced by a large effect size. Together these results provide initial pilot-level support for our primary hypotheses, that COMPASS-NP would reduce pain interference with work and life.

Our secondary hypotheses were also generally supported, namely, that COMPASS-NP would improve additional safety-, pain-, and mental health–related outcomes. Among the safety-related outcomes, large effects were observed for musculoskeletal injury risk reduction through the greater use of ergonomic tools and/or techniques for housekeeping

TABLE 3. Primary Outcomes: COMmunity of Practice And Safety Support for Navigating Pain Pilot Study (n = 15)

Outcomes	Mean (SD)	Effect Size[a]
Work limitations (WL): time demands (0–100)		
Preintervention	35.42 (16.81)	
Postintervention	22.50 (24.64)	−0.61
WL: physical demands (0–100)		
Preintervention	53.11 (25.17)	
Postintervention	47.39 (33.70)	−0.19
WL: mental and interpersonal demands (0–100)		
Preintervention	26.30 (15.67)	
Postintervention	25.46 (26.02)	−0.04
WL: output demands (0–100)		
Preintervention	29.58 (20.87)	
Postintervention	27.33 (29.39)	−0.09
Life limitations (0–10)		
Preintervention	4.01 (1.42)	
Postintervention	2.60 (1.87)	−0.85

[a] Cohen's *d* computed as (postintervention mean − preintervention mean) / pooled SD.

TABLE 4. Secondary Safety and Health Outcomes: COMmunity of Practice And Safety Support for Navigating Pain Pilot Study (n Range = 14–15)[a]

Outcomes	Mean (SD)	Effect Size[b]
Talking with client about improving safety (0–5)		
Preintervention	1.07 (1.49)	
Postintervention	1.73 (1.44)	0.45
Correcting slip, trip, and fall hazards in homes (0–5)		
Preintervention	1.27 (1.03)	
Postintervention	1.47 (1.41)	0.16
Correcting "other" hazards in homes (0–5)		
Preintervention	0.47 (0.92)	
Postintervention	0.67 (0.90)	0.22
New ergonomic tool use or techniques for moving objects or assisting client mobility (0–5)		
Preintervention	0.93 (1.28)	
Postintervention	1.80 (0.86)	0.80
New ergonomic tools or techniques for housekeeping (0–5)		
Preintervention	0.93 (1.00)	
Postintervention	2.57 (1.22)	1.47
Missed work for illness or personal reasons (0–5)		
Preintervention	1.53 (1.60)	
Postintervention	1.13 (1.41)	−0.27
Minor injuries at work (0–5)		
Preintervention	0.47 (0.64)	
Postintervention	0.53 (0.92)	0.08
Injuries that required missed work (0–5)		
Preintervention	0.07 (0.26)	
Postintervention	0.20 (0.56)	0.30

[a] n = 14 for *new ergonomic tool use or techniques for moving objects or assisting client mobility*; n = 15 for all other variables.

[b] Cohen's *d* computed as (postintervention mean − preintervention mean) / pooled SD.

and for moving objects and/or assisting clients with mobility. Moderate and large effects were observed for average reductions in pain severity and the centrality of pain, respectively. The reduction in pain severity can be compared with previous relevant interventions. In a meta-analysis of 11 studies of Web-based CBT interventions for individuals with chronic pain, the average between-groups effect size for changes in pain scale ratings was $d = -0.29$.[49] Intervention durations ranged from 6 to 20 weeks, and the overall sample (n = 2953) was predominantly female (67.5%), with an average age of 41.3 years. In the current pilot study, our sample was also predominantly female (89.5%) with an average age of 44.5 years. The within-group effect size for changes in pain scale ratings after the 10-week COMPASS-NP program was $d = -0.65$. Mental health–related impacts included a large improvement in self-rated global health and a moderate reduction in burnout.

Results observed in unexpected directions were limited, but included a small increase in reported injuries requiring missed work and small reductions in sleep duration and time spent walking (on days when workers walked). Injury results should be interpreted mainly as informational in short duration and/or small sample size pilots, as injuries are rare events and only one occurrence can strongly impact a mean. In the current case, the mean frequency for lost work time injuries changed from 0.07 to 0.20. These statistics represented only one person with one injury reported at baseline and two people reporting one injury each at follow-up. The reduction in sleep duration was unexpected and will be followed up with analyses of more objective actigraphic measures of sleep that are in process. The reduction in walking minutes on days when workers walked could potentially reflect responsiveness to learning the pain self-management strategy of pacing, which encourages breaking activity bouts into smaller pieces with sufficient rest in between to prevent pain flare-ups. However, as with sleep, physical activity findings will be enriched through analyses of actigraphy.

Adoptability

The online video-conference nature of the overall COMPASS-NP intervention, including the online ergonomic assessment component, maximizes potential future access to the program and its resources. This includes access for HCWs who live in more rural areas or who are otherwise not able to travel easily to attend meetings. Working closely with study partners, such as the SEIU 775 Benefits Group, also enhances the likelihood of future dissemination and adoptability. The COMPASS-NP randomized controlled design includes additional partners in the region, further enhancing generalizability and potential early adopters. Overall, the resulting project should lead to COMPASS-NP materials being broadly adoptable by unions, training systems, and private home care agencies across the United States.

The overall partnering and implementation approach for COMPASS-NP represents a partial replication and extension of the

TABLE 5. Secondary Pain, Mental Health, and Health Behavior Outcomes: COMmunity of Practice And Safety Support for Navigating Pain Pilot Study (n Range = 12–14)[a]

Outcomes	n (%)	Phi Coefficient[b]
Took pain medication in the last week		
Preintervention	12 (80.00)	
Postintervention	10 (66.67)	−0.15
Took pain medication one or more times per day in the last week		
Preintervention	5 (33.33)	
Postintervention	3 (20.00)	−0.15
	Mean (SD)	**Effect Size[c]**
Risk of future opioid misuse[d]		
Preintervention	17.21 (6.97)	
Postintervention	14.21 (11.58)	−0.31
Average pain severity (0–10)		
Preintervention	4.53 (1.92)	
Postintervention	3.43 (1.40)	−0.65
Centrality of pain (10–50)		
Preintervention	28.43 (6.78)	
Postintervention	19.71 (7.69)	−1.20
Global mental health (*T* score)		
Preintervention	41.48 (6.29)	
Postintervention	47.54 (8.44)	0.81
Work-related burnout (0–100)		
Preintervention	45.66 (14.70)	
Postintervention	35.2 (14.75)	−0.71
Client-related burnout (0–100)		
Preintervention	28.27 (13.49)	
Postintervention	25.12 (16.22)	−0.21
Hours slept per night		
Preintervention	8.18 (3.59)	
Postintervention	7.80 (1.11)	−0.14
Days per week with at least 10 min of walking (0–7)		
Preintervention	5.31 (2.21)	
Postintervention	4.92 (2.18)	−0.18
Minutes of walking for each of these days		
Preintervention	59.80 (54.38)	
Postintervention	47.50 (31.73)	−0.28

[a] n = 15 for *average pain severity*; n = 14 for *centrality of pain*; n = 12 for *pain medication use per 24 hours*; n = 14 for *risk of future opioid misuse, global mental health, work related burnout, and client-related burnout*; n = 14 for *hours slept per night*; n = 13 for *days per week with at least 10 minutes of walking*; n = 10 for *minutes of walking for each of these days.*

[b] Phi coefficient computed as $\phi = \sqrt{\frac{\chi^2}{n}}$.

[c] Cohen's *d* computed as (postintervention mean − preintervention mean) / pooled SD. Since fewer than three participants reported current opioid use, current opioid misuse was omitted from the secondary outcomes analyses to protect anonymity.

[d] *Risk of future opioid misuse* represents a sum of 24 different items, each of which ranges from 0 (never) to 4 (very often), with a total sum of 18 indicating positive for being at risk for future opioid misuse.

research-to-practice strategy employed by the original team that developed COMPASS. The original COMPASS program was developed and extensively tested with input from our partners at the OHCC and SEIU Local 503, the union representing HCWs who provide publicly funded care in Oregon. The OHCC, created in 2000 to ensure quality home care services for individuals receiving publicly funded care, provides in-person and virtual training classes for Oregon HCWs. The OHCC found COMPASS to be valuable and well-received during its research phase and subsequently worked with the research team to adapt and expand the program for adoption.[10] COMPASS has been integrated into the OHCC's training system for many years, where workers across the state can complete it as a training course with pay for their time.

Implications for Occupational Psychology

CBT for pain management is specifically designed to build perceived control and self-efficacy for the self-management of pain. It accomplishes this through teaching and reinforcing skills such as cognitive reframing, problem solving, goal setting, self-monitoring, and other evidence-based cognitive and behavioral self-management strategies.[37,50] Additional behavioral pain self-management tactics that were taught in COMPASS-NP included pacing, rest, sleep, and changing one's own behavior to integrate more diversion and fun into life. COMPASS-NP integrated these proven CBT strategies with more traditional occupational safety approaches, including injury prevention and the use of low-tech ergonomic tools. Together, this approach demonstrates the potential value of integrating CBT with traditional safety topics to benefit a population of workers in need. Specifically, the approach was designed as a secondary or tertiary prevention strategy to identify and engage HCWs with chronic pain while they were still able to work. Results were encouraging that COMPASS-NP, and psychologically informed prevention programs like it, might be able to halt or slow the progression of pain and its associated problems (eg, escalating prescription drug use, potential opioid use) and preserve workers' ability to continue working and live enjoyable and full lives.

Strengths, Limitations, and Future Directions

Strengths of the project include the strong empirical foundation and adoption track record of the base intervention; integration of content from additional established resources such as *The Pain Survival Guide*[34] and an HCW handbook published by NIOSH[30]; collaboration with a union-affiliated benefits group that is also a potential intervention adopter; and a mixed-methods evaluation approach that included process measures, quantitative measures, and qualitative interviews.

Limitations include features that are common to most pilot studies, including a small sample, no control group, and the lack of a longer-term follow-up measurement. A larger scale and fully powered study is in progress that is employing a randomized controlled waitlist design. This will provide a control group and facilitate a 3-month follow-up measurement. However, neither the current pilot nor the forthcoming trial was designed to evaluate the relative contributions of each aspect of the multicomponent intervention. Future research is encouraged to assess the independent and/or additive effects of the occupational safety and CBT components of the intervention. Another potential limitation is that the online nature of the program required participants to have access to computer technology and knowledge of how to use it. Participants entered the study with varying levels of technology access and skill. For those with less technological knowledge, joining meetings on time and using Webex features sometimes proved to be difficult. Those with more knowledge appeared to sometimes feel frustration when meetings were delayed or disrupted due to others' technical issues. On at least two occasions, facilitators had to triage and skip some content in order to finish meetings on time. These occasions were partially due to delays caused by participants struggling with technology. This limitation is perhaps a necessary one to be managed and supported in order to make the program available online. For the intervention, preprogram technical support was provided to participants and will be refined to better help workers with little to no experience with online video meetings. Limitations or script difficulties in each of the meetings were noted, revised, and improved for the randomized controlled trial and represent an important function of pilot testing. To illustrate, the original in-person COMPASS format has workers sit in a circle (around a table or at desks) and take turns reading in order around that circle. We learned in the first meeting that having the leader call on workers, or having workers call on each other, was inefficient and sometimes confusing. We found that having the facilitator post a "reading order" in the chat worked well. This reading order method was integrated into the revised scripts as the guidebooks were edited. Lastly, the sample may not be representative of all HCWs in the United States, which could limit generalizability of results. The sample should be reasonably representative of Washington HCWs represented by the SEIU 775 who regularly use email, are relatively comfortable with online technology, and are comfortable reading and speaking English in groups. However, the sample may not be representative of HCWs who are employed outside of Washington or whose first language is not English. Further, although the SEIU 775 represents some workers who are employed by private home care agencies, pilot participants were predominantly individual providers caring for individuals who qualified for publicly funded in-home services.

CONCLUSIONS

COMPASS-NP provides vulnerable HCWs who are experiencing chronic pain with much needed specialized education, training, ergonomic tools, and social support. The intervention was designed to address and prevent injury and the progression of pain and its related problems, including work-related disability and risk for opioid initiation and misuse. The pilot study showed promising results in the expected directions in reducing pain interference with work and life, the primary study outcomes. Secondary study outcomes also showed encouraging results in expected directions for safety-related, pain-related, and health-related outcomes. The next step is to more fully evaluate the adjusted program in a fully statistically powered randomized controlled trial. Following that effort, as we have done with the original version of COMPASS, we will work with our multiple regional study partners to set the stage for program adoption. If successful, the overall effort has the potential to reach and impact HCWs in our region, and beyond. As an overall secondary or tertiary prevention strategy, the approach may also inform or encourage similar programs for workers with chronic pain in other industries where the chronic pain is prevalent.

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REFERENCES

1. Rikard, S.M., et al. *Chronic pain among Adults—United States, 2019–2021. Morbidity and Mortality Weekly Report* 2023, June 30, 2023; 72. Available at: https://www.cdc.gov/mmwr/volumes/72/wr/pdfs/mm7215-H.pdf.

2. Lerman SF, Rudich Z, Brill S, Shalev H, Shahar G. Longitudinal associations between depression, anxiety, pain, and pain-related disability in chronic pain patients. *Psychosom Med* 2015;77:333–341.
3. Dhanju S, Kennedy SH, Abbey S, et al. The impact of comorbid pain and depression in the United States: results from a nationally representative survey. *Scand J Pain* 2019;19:319–325.
4. Feingold D, Brill S, Goor-Aryeh I, Delayahu Y, Lev-Ran S. Depression and anxiety among chronic pain patients receiving prescription opioids and medical marijuana. *J Affect Disord* 2017;218:1–7.
5. Mills SEE, Nicolson KP, Smith BH. Chronic pain: a review of its epidemiology and associated factors in population-based studies. *Br J Anaesth* 2019;123:e273–e283.
6. De La Rosa JS, Brady BR, Ibrahim MM, et al. Co-occurrence of chronic pain and anxiety/depression symptoms in U.S. adults: prevalence, functional impacts, and opportunities. *Pain* 2024;165:666–673.
7. Office on Women's Health. Final Report: Opioid Use, Misuse, and Overdose in Women. Washington, DC: US Department of Health and Human Services; 2017:1–86.
8. Bureau of Labor Statistics. *Home Health and Personal Care Aides. Occupational Outlook Handbook*. 2021. Cited 2022 September 2, 2022. Available at: https://www.bls.gov/ooh/healthcare/home-health-aides-and-personal-care-aides.htm.
9. Quinn MM, Markkanen PK, Galligan CJ, et al. Healthy aging requires a healthy home care workforce: the occupational safety and health of home care aides. *Curr Environ Health Rep* 2021;8:235–244.
10. Olson R, Hess JA, Parker KN, et al. From research-to-practice: an adaptation and dissemination of the COMPASS program for home care workers. *Int J Environ Res Public Health* 2018;15:2777.
11. Hawkins D, Roelofs C, Laing J, et al. Opioid-related overdose deaths by industry and occupation—Massachusetts, 2011–2015. *Am J Ind Med* 2019;62:815–825.
12. Applebaum KM, Asfaw A, O'Leary PK, Busey A, Tripodis Y, Boden LI. Suicide and drug-related mortality following occupational injury. *Am J Ind Med* 2019;62:733–741.
13. Hignett S, Otter ME, Keen C. Safety risks associated with physical interactions between patients and caregivers during treatment and care delivery in home care settings: a systematic review. *Int J Nurs Stud* 2016;59:1–14.
14. Bureau of Labor Statistics. *Total Nonfatal Work Injuries and Illnesses, by Year, Private Industry*. Survey of Occupational Injuries and Illnesses Data; 2020. Cited 2022 January 10, 2022. Available at: https://www.bls.gov/charts/injuries-and-illnesses/total-nonfatal-work-injuries-and-illnesses-by-year.htm#.
15. Greenspan LS, Alley L, SPM R, Olson R. Exploring biopsychosocial correlates of pain, pain management strategies, and risk for opioid misuse among home care workers in Washington state. *Home Health Care Serv Q* 2021;40:54–74.
16. U.S. Department of Health & Human Services. *HHS Acting Secretary Declares Public Health Emergency to Address National Opioid Crisis*. 2017. August 1, 2023. Available at: https://www.hhs.gov/about/news/2017/10/26/hhs-acting-secretary-declares-public-health-emergency-address-national-opioid-crisis.html.
17. Turk DC, Wilson HD, Cahana A. Treatment of chronic non-cancer pain. *Lancet* 2011;377:2226–2235.
18. Rosen, J. Protecting Workers from Opioid Misuse and Addiction. In: Croff, J.M., Beaman, J. (eds) Family Resilience and Recovery from Opioids and Other Addictions. Emerging Issues in Family and Individual Resilience, Springer, Cham, 2021;15–43. https://doi.org/10.1007/978-3-030-56958-7_2.
19. Institute of Medicine, Committee on Advancing Pain Research Care and Education, and Board on Health Sciences Policy. *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research*. Washington, DC: National Academies Press; 2011.
20. Olson R, Thompson SV, Elliot DL, et al. Safety and health support for home care workers: the COMPASS randomized controlled trial. *Am J Public Health* 2016;106:1823–1832.
21. Apkarian AV, Hashmi JA, Baliki MN. Pain and the brain: specificity and plasticity of the brain in clinical chronic pain. *Pain* 2011;152:S49–S64.
22. Hashmi JA, Baliki MN, Huang L, et al. Shape shifting pain: chronification of back pain shifts brain representation from nociceptive to emotional circuits. *Brain* 2013;136:2751–2768.
23. Dowell D, Haegerich TM, Chou R. CDC guideline for prescribing opioids for chronic pain—United States, 2016. *JAMA* 2016;315:1624–1645.
24. Interagency Pain Research Coordinating Committee and Department of Health and Human Services. *A Comprehensive Population Health-Level Strategy for Pain. National Pain Strategy Report*. 2015. August 1, 2023. Available at: https://www.iprcc.nih.gov/national-pain-strategy-overview/national-pain-strategy-report.
25. Guarino H et al. Web-based cognitive behavior therapy for chronic pain patients with aberrant drug-related behavior: outcomes from a randomized controlled trial. *Pain Med* 2018;19:2423–2437.
26. Patel K, Turk D. Expanding treatment of chronic pain in older adults: community-based exercise + CBT. *J Pain* 2016;17:S110.
27. Ehde DM, Dillworth TM, Turner JA. Cognitive-behavioral therapy for individuals with chronic pain: efficacy, innovations, and directions for research. *Am Psychol* 2014;69:153–166.
28. Khan M, Akhter S, Soomro RR, Ali SS. The effectiveness of cognitive behavioral therapy (CBT) with general exercises versus general exercises alone in the management of chronic low back pain. *Pak J Pharm Sci* 2014;27(4 (Suppl)):1113–1116.
29. Morasco BJ, Greaves DW, Lovejoy TI, et al. Development and preliminary evaluation of an integrated cognitive-behavior treatment for chronic pain and substance use disorder in patients with the hepatitis C virus. *Pain Med* 2016;17:2280–2290.
30. National Institute for Occupational Safety and Health. *Caring for yourself while caring for others*. Cincinnati, OH: Department of Health and Human Services, Centers for Disease Control, and Prevention; 2014. DHHS (NIOSH) Publication No. 2015-103.
31. Turk, D.C., D. Meichenbaum, and M. Genest, *Pain and Behavioral Medicine: A Cognitive-Behavioral Perspective*. Vol. 1. 1983, New York: The Guilford Press
32. Eccleston C, Williams AC, Morley S. Psychological therapies for the management of chronic pain (excluding headache) in adults. *Cochrane Database Syst Rev* 2009;2:CD007407.
33. Turk, D., K.S. Swanson, and H.D. Wilson. Psychological aspects of pain. *Bonica's Management of Pain*, J.C. Ballantyne, R. Rathmell, and D. Turk, Editors. 2018, Lippincott, Williams, & Wilkins: Philadelphia, PA p 76-89.
34. Turk DC, Winter F. The pain survival guide: how to become resilient and reclaim your life. *APA LifeTools* 2020;230.
35. Olson R, Hess JA, Turk D, et al. COMmunity of Practice And Safety Support for Navigating Pain (COMPASS-NP): study protocol for a randomized controlled trial with home care workers. *Trials* 2023;24:264.
36. Olson R, Wright RR, Elliot DL, et al. The COMPASS pilot study: a Total Worker Health™ intervention for home care workers. *J Occup Environ Med* 2015;57:406–416.
37. Flor H, Turk D. *Chronic Pain: An Integrated Biobehavioral Approach*. Seattle, WA: IASP Press; 2011.
38. Garg S, Garg D, Turin TC, Chowdhury MF. Web-based interventions for chronic back pain: a systematic review. *J Med Internet Res* 2016;18:e139.
39. Lerner D, Amick BC 3rd, Rogers WH, Malspeis S, Bungay K, Cynn D. The Work Limitations Questionnaire. *Med Care* 2001;39:72–85.
40. Daut RL, Cleeland CS, Flanery RC. Development of the Wisconsin Brief Pain Questionnaire to assess pain in cancer and other diseases. *Pain* 1983;17:197–210.
41. Butler SF, Budman SH, Fernandez KC, Fanciullo GJ, Jamison RN. Cross-validation of a screener to predict opioid misuse in chronic pain patients (SOAPP-R). *J Addict Med* 2009;3:66–73.
42. Nicolaidis C, Chianello T, Gerrity M. Development and preliminary psychometric testing of the Centrality of Pain Scale. *Pain Med* 2011;12:612–617.
43. Hays RD, Bjorner JB, Revicki DA, Spritzer KL, Cella D. Development of physical and mental health summary scores from the Patient-Reported Outcomes Measurement Information System (PROMIS) global items. *Qual Life Res* 2009;18:873–880.
44. Kristensen TS et al. The Copenhagen Burnout Inventory: a new tool for the assessment of burnout. *Work & Stress* 2005;19:192–207.
45. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res* 1989;28:193–213.
46. Alliger GM et al. A meta-analysis of the relations among training criteria. *Pers Psychol* 1997;50:341–358.
47. Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc* 2003;35(8):1381–95.
48. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Earlbaum Associates; 1988.
49. Macea DD, Gajos K, Daglia Calil YA, Fregni F. The efficacy of Web-based cognitive behavioral interventions for chronic pain: a systematic review and meta-analysis. *J Pain* 2010;11:917–929.
50. Turk, D.C. and H. Flor, The cognitive-behavioral approach to pain management, In *Wall and Melzack's Textbook of Pain*, S. McMahon and M. Koltzenburg, Editors. 2006, Elsevier Churchill Livingstone: London, United Kingdoom.

