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Effects of a Remotely Delivered Cognitive Behavioral Coaching Program on the Self-Rated Functional Disability of Participants with Low Back Pain

Jaynie Bjornaraa, PhD, MPH, PT[*,†,1], Anne Bowers, PhD[‡], David Mino, MD, MBA[‡], Denee Choice, MD, PT[*], Douglas Metz, DC[*], Kimberly Wagner, RN[‡]

[*] *American Specialty Health, Carmel, IN*
[†] *Doctor of Physical Therapy Program, St. Catherine University, St. Paul, MN*
[‡] *Cigna, Bloomfield, CT*

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ABSTRACT

Purpose: A remotely delivered cognitive behavioral coaching (CBC) program was offered as a service benefit for commercial health plan members with low back pain (LBP). This study describes changes in self-rated functional disability in a sample of plan members participating in the program (N=423).
Methods: Independent measures included demographics, length of program enrollment, total CBC sessions, and baseline self-reported patient activation and presenteeism levels. Participants rated their functional disability level due to LBP using the Oswestry Disability Index (ODI). Dependent outcomes quantified change in participant functional disability rating (final ODI score minus baseline ODI score). Nonparametric tests compare differences between groups and within-group ODI score change. Two generalized linear models test for associations between independent variables and the ODI change score.
Results: A significant difference between baseline and final ODI scores was observed at the overall program level (p<.001) and within all independent variable categories of interest. Over 68% of total participants (n=289) reported improved functional ability from baseline to final (decrease in ODI score). Participants who completed more CBC sessions demonstrated significantly greater improvement in functional ability (p=.038) compared to those who completed fewer sessions. Participants aged 55 and older were significantly more likely to show deterioration in functional ability from baseline to final (p=.021).
Conclusion: Outcomes suggest that program participation can influence self-rated functional disability in the management of LBP.

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Addressing the complex drivers of low back pain (LBP) requires interdisciplinary, evidence-based management techniques to improve patient health outcomes (Tousignant-Laflamme et al., 2017; Kamper et al., 2015; Gatchel et al., 2008; van Tulder et al., 2002). Person-centered services that approach pain management from a biopsychosocial perspective can reduce functional disability and increase the quality of life in persons with LBP (Hajihasani et al., 2019; Cherkin et al., 2016; Carpenter et al., 2012; Hoffman et al., 2007). Beginning in 2017, a new cognitive behavioral therapy (CBT)-based coaching program for LBP management was offered remotely to qualifying members of a national health plan in partnership with a musculoskeletal-focused care management organization. This descriptive study uses a pre-post observational design to explore how member participation in the remotely delivered pain management program influenced self-reported ratings of functional disability from LBP.

Background

For decades, chronic pain has been a leading cause of long-term disability among working-age adults in the United States (Hartvigsen et al., 2018; Maher et al., 2017; Henschke et al., 2015; van Hecke et al., 2013; Gaskin and Richard, 2011; Loeser and

[1] Address correspondence to Jaynie Bjornaraa, PhD, MPH, PT, Health Quality and Analytics, American Specialty Health, 12800 North Meridian St. Suite 190, Carmel IN 46032.
E-mail address: jaynieb@ashn.com (J. Bjornaraa).

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Melzack, 1999). Low back pain affects approximately 80% of Americans during their lifetime (Rubin, 2007). It is often recurrent, with 24%-87% of those who experience an episode of LBP reporting more than one episode within the year (Stanton et al., 2009). Up to 20% of individuals with LBP transition into a chronic state of pain (LBP lasting 12 weeks or more in duration; National Institute of Neurological Disorders and Stroke, 2020). National healthcare costs for patients with LBP are estimated to be between $88 and $100 billion annually (Dieleman et al., 2016; Katz, 2006). The prevalence and multifaceted effects of LBP require innovative, evidence-based methods of management and care for this condition (Mutubuki et al., 2020; Tousignant-Laflamme et al., 2017; Gatchel et al., 2008).

Conservative approaches, such as exercise and manual therapy (e.g., spinal manipulation), have been widely regarded as first-line treatments to improve pain and function for individuals with LBP. Overall healthcare costs are reduced and prognosis is typically improved when services from providers of conservative interventions, such as physical therapists (PTs) and chiropractors, are used by patients within a few weeks of LBP symptom onset (Carey et al., 2019; Kazis et al., 2019; Carvalho et al., 2017; Gay et al., 2016; Iles et al., 2014; Kosloff et al., 2013; Nelson et al., 2005; Legorreta et al., 2004). However, long-term recovery is not always sustained. Many patients with LBP return to the healthcare system for further care, particularly when secondary issues related to the experience of chronic pain "exacerbate and maintain the problem" (Turk & Monarch, 2018, p. 3). Prescription pain medications (e.g., opioids) are also used to manage LBP, with little evidence supporting long-term use (Chou et al., 2020, 2017; McDonagh et al., 2020; Tick et al., 2018; Müller-Schwefe et al., 2017; Qaseem et al., 2017; Chou et al., 2016). Although rates of prescription opioid use have fallen precipitously since 2016, the much-publicized U.S. opioid crisis highlighted the need for care alternatives for treating chronic pain and improving functional outcomes (Cherkin et al., 2018; National Academies of Sciences, Engineering, and Medicine, 2017).

In contrast to more commonly provided medical interventions, such as injections or surgery, other healthcare approaches could better facilitate holistic and person-centered management of LBP by considering the interplay of multidimensional factors affecting a patient's lived experience of pain (Tousignant-Laflamme et al., 2017; Kamper et al., 2015). The biopsychosocial model has emerged as an accepted framework for understanding LBP, which posits that LBP is a subjective experience best understood by addressing the complex interaction of physical, psychological, and sociocultural influences on an individual's perception of health and wellbeing (van Erp et al., 2019; Kamper et al., 2015; Roditi and Robinson, 2011; Gatchel et al., 2004). Treatment approaches from a biopsychosocial perspective are largely aimed at managing, rather than attempting to cure, chronic pain (Roditi and Robinson, 2011). The deconditioning and inactivity stemming from chronic LBP can lead to an individual becoming preoccupied with the body and pain, and "these cognitive-attentional changes increase the likelihood of misinterpreting symptoms, the overemphasis on symptoms, and the patient's self-perception as disabled" (Turk & Monarch, 2018, p. 3). The result is often an avoidance or fear of movement (Alaca et al., 2019). Given the considerable influence of psychogenic factors in the development of chronic pain (Pincus et al., 2002), it makes good sense to manage LBP from a biopsychosocial standpoint (Roditi and Robinson, 2011).

Cognitive behavioral therapy (CBT) is one method that uses a biopsychosocial approach when incorporated into the comprehensive treatment of chronic conditions (Skelly et al., 2020; Clauw et al., 2019; Chou et al., 2017; Qaseem et al., 2017; Williams et al., 2016; Carpenter et al., 2012; Gatchel et al., 2008). CBT focuses on restructuring and reframing negative thoughts associated with the patient's persistent pain and other related health concerns through both cognitive and behavioral skill-building. Skills developed by patients through various psychosocial and behavioral interventions can enable them to "become active participants in the management of their illness and instill valuable skills that patients can employ throughout their lives" (Roditi and Robinson, 2011, p. 41). Strategies used to promote behavior activation include problem-solving skills to assist with coping in difficult situations and learning that one's thinking patterns are distorted relative to reality. Patients' development of these new skills and reframing of thoughts should create a greater sense of confidence in their ability to manage pain and other related situations and result in behavior that is more productive and positive. Learning to change one's own thinking, problematic emotions, and behavior is the goal of CBT, with a result of gaining more effective coping mechanisms for pain management. The patient's perspective is reframed into a more realistic assessment of their health status, with confidence to engage in life activities (Carpenter et al., 2012). Replacing negative thinking or self-talk with less severe and more favorable statements can improve a patient's management of their chronic condition (Gatchel et al., 2008). Mental and behavioral healthcare professionals have traditionally used CBT to support patients with conditions such as depression and anxiety (Viswanathan et al., 2020; Hofmann et al., 2017). However, CBT principles are applied by other types of providers to address different health concerns. It is now increasingly common for registered nurses (RNs) and PTs to use CBT techniques with patients who have musculoskeletal conditions (Urits et al., 2019; Hall et al., 2018; Moseley et al., 2015). Research has shown that psychological interventions, such as health coaching based on CBT principles, can be advantageous for improving health outcomes, reducing pain-related disability, and enhancing quality of life for patients with LBP (Cherkin et al., 2017, 2016; Huber et al., 2017; Kamper et al., 2015; Williams et al., 2012; Carpenter et al., 2012; Hoffman et al., 2007; Buhrmann et al., 2004) and when added to standard conservative rehabilitation (Hajihasani et al., 2019; Marin et al., 2017; Mannion et al., 2013; Froholdt et al., 2012; Vong et al., 2011; Brox et al., 2006, 2003). Telephonic and digitally based coaching and educational services for pain management have demonstrated promising results when incorporated into the multidisciplinary treatment of LBP (Toelle et al., 2019; Huber et al., 2017; Buhrman et al., 2004). Mecklenburg et al. (2018) developed a 12-week program for chronic knee pain that consisted of recommended components of nonpharmacological care for chronic musculoskeletal pain, which included sensor-guided exercise therapy, education, CBT, and psychosocial support through teams and personal health coaches, weight loss, and activity tracking. Results demonstrated that the digital care program group had a significantly greater reduction in pain and improved physical function compared to the control group at the end of the program. Other research supports telephonic health coaching for high-risk populations (Lawson et al., 2013) and individuals with chronic low back pain (Hüppe et al., 2019; Iles et al., 2014), digital self-management support programs for chronic pain (Buhrman et al., 2016; Beatty & Lambert, 2013), and telephonic health coaching with digital resource support for patients with low back pain (Amorim et al., 2019).

Given the growing body of evidence demonstrating the success of biopsychosocial-informed approaches for supporting individuals with LBP and the encouraging results of telephonic and digital interventions on LBP, a national health plan partnered with a musculoskeletal-focused care management company in late 2017 to deliver and evaluate a new remotely delivered health coaching program for pain management. The program integrates a CBT philosophy within a telephonic health coaching intervention, with the goal of supporting individuals with LBP to achieve their pain management goals and experience improvements in their perception of functional health and capability of performing activities of daily living. The approach is participant-focused and flexible. As an example, coaches helped participants to change how they think about their pain and daily activities. They also assisted the participants with learning to address pain in different terms and develop new thought processes that overcome anxiety and fear of pain or movement.

This study describes how participating in the remotely delivered cognitive behavioral coaching (CBC) program influenced the functional disability ratings of health plan member participants with LBP by addressing the following questions:

- *Did participating members with LBP have significant changes in their self-reported functional disability ratings after receiving program services?*
- *What individual and program factors are associated with participant likelihood of showing change in their self-reported functional disability ratings?*

Methods

This observational study uses an uncontrolled pre-post design to explore whether program participation significantly influences member ratings of functional disability from LBP. A retrospective secondary data analysis was performed using de-identified administrative and survey data collected from individuals during their enrollment in the remotely delivered CBC program, as well as linked data from the associated commercial health plan member record extracted for determining program eligibility. This study is considered a quality improvement project and does not meet criteria for human subject research. All methods conform to the ethical guidelines of the 1975 Declaration of Helsinki (sixth revision, 2008).

Participant Eligibility and Recruitment

The program was offered as a free elective benefit for qualifying members of the commercial health plan beginning in mid-October of 2017. Program eligibility was determined using individual information contained in the health plan member record. Adult enrollees (18 years or older) in all states where the national health plan had active business were eligible if a qualifying ICD-10 code was associated with their electronic member record. ICD-10 codes referencing one or more of the following diagnoses or medical events qualified a member for the program: (1) chronic nonspecific low back pain, (2) spinal spondylosis, (3) degenerative disc disease with or without neurologic involvement, (4) lumbar spine degenerative joint disease, and (5) lumbar spinal stenosis. In addition to the aforementioned qualifying ICD-10 codes, members also had to have one or more of the following criteria in their associated electronic record to be eligible for the program: (1) request for lumbar spine fusion surgery was denied due to lack of completing conservative care including CBT; (2) request for a lumbar fusion surgery was denied due to lack of appropriate medical necessity indications for surgery (including those with multilevel disc disease requesting a fusion for axial back pain); (3) referred and requested authorization for advanced lumbar imaging (magnetic resonance imaging or computed tomography scan), lumbar facet injection, or radiofrequency ablation (RFA) for a qualifying ICD-10 code (per conditions listed previously); (4) one or more prescription fills of a defined opioid, nonsteroidal anti-inflammatory drug, steroid, or muscle relaxer prescription medication for a qualifying ICD-10 condition; (5) received physical therapy or chiropractic care for a qualifying ICD-10 condition within the previous 12 months. Any member who had an ICD-10 code associated with one or more of the following conditions was automatically deemed ineligible for the program: fracture, infection, cancer, scoliosis, myelopathy, spondylolysis/spondylolisthesis, failed lumbar spine surgery syndrome, pseudarthrosis, cauda equina syndrome, addiction/substance abuse, severe mental health disorders, or unstable medical conditions. Examples of severe mental health disorders or unstable medical conditions included any form of dementia or Alzheimer's.

A voluntary, self-elected recruitment approach was used to enroll eligible members in the remotely delivered pain management program. Recruitment techniques involved both postal mail and email outreach. All eligible plan members received an informational letter in the mail describing the program and terms of participation. Interested members were prompted to call a number or access a secure online web portal to learn more about participating and consent to program enrollment. If a member did not respond to the mailed written letter, up to three follow-up email communications containing similar recruitment information were sent over a 2-week period (if an email address was available for the member). If no email address was available, recruitment outreach to the member ceased. Members were unable to be recruited by phone per federal regulatory restrictions (see Limitations section below). Recruitment outreach attempts by postal mail and email were made to 53,153 eligible plan members in the United States. Of these, 1,333 members responded and elected to enroll in the program, for an enrollment rate of about 2.5% from the total population originally contacted. Before enrolling in the program, all individuals were required to give their informed consent (verbally over the phone or electronically via the secure online portal) to have their program data collected and shared with their health plan and its contracted entities. Of those enrolled, a total of 993 (74.5%) participated in the coaching program, of which 423 (42.6%) were selected for the study analysis (program inclusion criteria are described below and in Appendix A).

Program Background and Structure

The program's primary service consisted of remotely delivered CBC sessions, a CBT-based coaching intervention intended to assist and support individuals in the self-management of low back pain. The program's secondary service involved engaging participants in a structured curriculum of multimodal online educational resources delivered in conjunction with the coaching sessions. Program services were organized and administered by the musculoskeletal-focused care management company. All coaches had a background in nursing and are still licensed RNs, with a mean of 17 years of clinical experience and certified as Chronic Care Professionals by the Population Health Alliance. Every coach received 120 hours of training, including role-playing practice specific to the program, with ongoing phone call quality monitoring and additional training. Training included CBT communication and coaching techniques, survey tool administration procedures, self-care and conservative care measures, and musculoskeletal and pain management pathophysiology. This program was an educational health coaching service only, and did not prescribe or provide medical or psychological diagnosis, therapeutic consultation, treatment, or acute clinical care.

Upon enrollment, each member was required to register for an individual account on the program's secure web-based portal to be matched with a health coach. Participants had the option of communicating with their coach via telephone, web-based text chat, or web-based video calls. Participants were able to change their preferred coaching session format as needed. The first 60-minute meeting served primarily as an initial intake assessment between the coach and the enrolled member. The goals of the first session were to review the member's functional and pain management goals, current symptoms, prior and current treatments attempted, baseline knowledge related to back care and treatments, and level of functioning, and to collect baseline survey responses. Attaining this information allowed the coach to select appropriate coaching topics and resources for the future. Coaches were also trained to provide red-flag support and referral as necessary for high-risk or mental health issues requiring immediate or additional care.

After completing the initial intake session, up to seven 30-minute, one-on-one CBC sessions with the coach were available to each enrolled member. Enrolled members who used coaching services were considered participants in the program. For those participating in the program, coaching relationships were maintained between the same coach and member throughout the course of the multisession intervention. Intervals between coaching sessions varied by participant and could be up to 30 days. The amount and frequency of coaching sessions were determined by the participant based on their needs, personal goal attainment, and desired degree of participation. Participants did not have to complete all sessions, but rather the program was tailored to their needs and pain management goals. More sessions were added at the discretion of the coach for participants who requested additional services. Sessions were designed to be flexible and allow for both coach-member relationship-building and educational module consideration.

Educational components of the program were delivered via the secure web-based portal and used to supplement the coaching sessions. Coaches used the educational resources to support the participant based on the topic area/concepts discussed in the coaching session. The program's topic list covers specific concepts identified to educate and empower participants to learn how they could optimize their functional capacity and achieve their pain management-related goals. Domains of evidence-based educational content for the program and available to the participant included: (1) movement and function; (2) self-care; (3) reframing pain perception; (4) motivation and activation; (5) understanding options; and (6) self-advocacy with healthcare providers. Not all participants were required to use or be coached on each domain.

After the initial intake session, each participating member received an online self-care kit (via the web-based portal) to access their recommended educational resources. The secure web-based portal allowed members to routinely access their customized patient educational content and complete activities throughout the program between coaching sessions. These were multimodal learning activities that included options such as reading selected educational articles, watching short videos about therapeutic exercises and different pain self-management techniques, and setting personal goals for working towards improved musculoskeletal health. Content and materials used in educational activities communicated information using accessible, plain language. The reviewing of educational resources by the participant provided a basis for discussion between the coach and member during CBC sessions. See Appendix B for further information on the elements of the coaching intervention.

Measures

Survey data measures included the Patient Activation Measure (PAM), Stanford Presenteeism Scale-6 (SPS-6), and Oswestry Disability Index (ODI). Demographic data, number of sessions completed, and days enrolled were captured from administrative sources.

Participant-Reported Scale Variables

Coaches administered and collected patient-reported responses to baseline and follow-up surveys to use in the analysis of program outcomes. Participant survey responses for three composite scale measures were collected by the same coach via survey interview during a member's program enrollment, including baseline and follow-up survey responses.

- *Patient Activation Measure (PAM)* (baseline measure). The PAM is a 10-item validated scale measure that assesses an individual's "activation," or their skills, knowledge, and confidence in using the healthcare system and effectually managing their health (α=.90) (Hibbard et al., 2017, 2004). PAM scores can range between 0 and 100, with higher scores indicating greater personal activation. Previous research has suggested a possible relationship between participant-reported PAM levels and individual outcomes from telephonic health coaching (Huber et al., 2017). In regression analyses, the natural log transformation of the variable was used because the data were skewed.
- *Stanford Presenteeism Scale-6 (SPS-6)* (baseline measure). The SPS-6 is a six-question validated scale measure that describes the impact of a health condition on a person's ability to be focused on and attentive to occupational tasks and responsibilities (α=.80) (Koopman et al., 2002). The greater effect of pain on the person's focus and attention, the less productivity and presenteeism the individual will demonstrate while working. SPS-6 scores can range between 0 and 30 points, with higher scores indicating greater presenteeism. If a person was retired or not employed at the time of data collection, the SPS-6 measurement was not recorded. Dealing with common pain conditions can result in distraction and inattention, leading to a loss of productivity at work (Stewart et al., 2003). However, the degree of task interference will vary depending on the individual (Schulman-Green et al., 2012). In regression analyses, the natural log transformation of the variable was used because the data were skewed.
- *Oswestry Disability Index (ODI)* (repeated measure). The ODI is a validated questionnaire measuring the extent of a person's perceived functional disability due to low back pain (α=.85) (Saltychev et al., 2017; Davidson & Keating, 2002; Fairbank & Pynsent, 2000). Scores range between 0 and 100. ODI scores can be categorized as reflecting minimal disability (0-20), moderate disability (21-40), severe disability (41-60), crippling back pain (61-80), and bed-bound condition (81-100) (Davidson & Keating, 2002; Fairbank & Pynsent, 2000). The change in ODI score from baseline to final (ODI Change Score) is the primary dependent outcome in the analysis. Two outlier cases were capped to reflect a maximum score change of 36.51 and 25.51, as the original ODI change score values fell outside $\pm$3 standard deviations from the sample mean.

Participant responses to the PAM and SPS-6 scales were collected once (at baseline) via survey interview with the health coach to assess participant starting levels of patient activation and presenteeism. Participant responses to the ODI scale were collected via survey interview at baseline and multiple times throughout the participant's enrollment to establish a self-rated functional disability level at the outset and to measure the change in ODI scores from baseline to final as a dependent outcome. Baseline participant responses to the PAM, SPS-6, and ODI scale measures were collected by the participant's coach prior to the individual receiving their first coaching session. Responses to follow-up ODI surveys were collected by the participant's coach approximately every 30 days throughout the participant's enrollment in the program or at the time of their disenrollment. In the analysis of change on the

ODI scale measure, the last survey responses recorded for a program enrollee were considered the participant's final ODI score.

Program participation variables

- *Length of coaching program enrollment.* A continuous variable describing the participant's total length of program enrollment in days. Total days enrolled is determined by subtracting the date of the participant's final CBC session from the date of their initial program enrollment. In regression analyses, the natural log transformation of this variable was used because data were skewed. Five outlier cases were capped at a maximum of 241.73 days, as the original values fell outside +3 standard deviations from the sample mean.
- *Number of CBC sessions completed.* A count of the number of CBC sessions completed by the participant while enrolled in the program. In regression analyses, this variable is ordinally and categorically coded into those with two to four sessions, five to six sessions, and seven sessions. Seven participants used more than seven coaching sessions; these cases were capped to reflect a maximum of seven sessions to correct for skewing of the data distribution.

Demographic variables

- *Age.* A count of the participant's age in years. To aid in the interpretation of results, age is coded in the analysis as a dichotomous variable. Participants aged 55 years or older are coded as 1, and those under 55 years of age are coded as 0. The median age of the total analyzed sample (55 years) was used as the dividing point for categorization due to the skew of the variable data distribution.
- *Gender.* A dichotomous variable using male (coded as 0) and female (coded as 1) categories. Gender data were unavailable or unknown for two participants; these individuals were excluded from group analyses of the gender variable.
- *Primary Condition.* A dichotomous variable established from primary ICD-10 diagnostic codes identified in individual participant health plan data (see Appendix A). ICD-10 codes were categorized based on whether the primary diagnosis was limited to the low back area alone (LBP without radiculopathy, coded as 1) or if neurologic symptoms existed in the lower extremity (LBP with radiculopathy, coded as 0). Radiculopathy indicates nerve irritation in the lower extremity, a more complex condition that can be more difficult to manage.

Sample Size

There were 1,333 total members who enrolled in the program during the time period observed (October 2017 through December 2019). Participants included in the study's analyzed sample must have completed two or more CBC sessions and provided responses to one baseline ODI survey and at least one follow-up ODI survey within this time frame. Completing two or more CBC sessions was chosen as a threshold for sample inclusion to ensure that participants had at least a minimum amount of intervention exposure for evaluation of the program's effectiveness. A single coaching session (1 hour) is unlikely to generate a substantive or enduring change in a participant's ODI score. After removing members that did not meet these minimum criteria, 423 participating members were included in the analysis. Of these participants, 1.4% had requested and were denied a lumbar fusion surgery. Participants with at least one fill of one or more prescriptions of a defined opioid, NSAID, steroid, or muscle relaxer made up 3.5% of total participants. Participants were unable to be stratified by prescribed medication. Most participants (66.7%) were eligible based on referral and request for authorization of advanced lumbar imaging, injection, or RFA. The remaining 28.4% had received physical therapy or chiropractic care within the previous 12 months.

Statistical Analysis

Descriptive statistics and one-way chi-square goodness-of-fit tests characterize variation in demographic differences across the analyzed sample of participants. Nonparametric two-sample Mann-Whitney U and Kruskal-Wallis H tests examine within-group differences of the study group, as the data were not normally distributed. Paired Wilcoxon signed rank tests analyze change in ODI score across the study group from baseline to final. Significance was established using a p value threshold of .05. Data were analyzed with IBM SPSS Statistics software, Version 26.

Generalized linear modeling (GENLIN command) using normal distribution and identity link function with robust parameter estimation were used to understand if any individual characteristics or number of CBC sessions were associated with the dependent variable of ODI Change Score from baseline to final. Two models were developed for the study, both of which include the same dichotomous variables for participant demographics (age, gender, and primary condition). However, the first model tests number of CBC sessions as an ordinal scale variable, and the second model tests number of CBC sessions as a categorical variable to understand if there are differences between the scale levels. The models also control for length of program enrollment, baseline PAM score, and baseline SPS-6 score. These variables and the demographic variables are included in the model alongside number of CBC sessions because they could influence outcomes and were important to consider when understanding change in participant ODI scores.

Prior to regression analyses, the dependent variable of ODI Change Score was transformed because the data contained negative and zero values and were also not normally distributed. The base-10 logarithm transformation applied is $\log(Y + a)$, where Y is the outcome variable and a is a constant term. A constant value of a=50 was selected to add to the Y value before log transformation, as this was the minimum term that allowed all negative values to be transformed into positive integers where the smallest transformed value (1.13, transformed from −36.51) was close to but slightly greater than 1. Thus the equation for the transformation of the ODI Change Score dependent outcome used in generalized linear modeling is represented as:

$$\text{Transformed ODI Change Score} = \text{Log}(\text{ODI Change Score} + 50)$$

When interpreting the transformed dependent outcome in regression analyses, having a higher value on the distribution of the ODI Change Score variable indicates a deterioration in functional ability, and smaller values indicate greater improvement in functional ability. In other words, having a lower value for the transformed dependent outcome is considered better than a higher value because higher values represent participants with positive change in ODI scores from baseline to final (increased ODI score = functional deterioration). The baseline PAM, baseline SPS-6, and length of enrollment variables were also transformed using their natural logs because the data were highly skewed. Model coefficients are exponentiated into odds ratios in the models to aid in the interpretation of outcomes.

Results

Table 1 outlines the characteristics of the study participant group (coaching program participants, N=423). In the study participant group there was a greater number of females (n=222) compared to males (n=201). Greater than 80% had a primary diagnosis of an LBP condition without radiculopathy (n=342). Over

Table 1
Participant Demographics (*N*=423)

Variable	Study Participants (Coaching Program Recipients)		
	n	% of Total	Significance
Gender			
Male	201	47.50%	χ^2=1.043;
Female	222	52.50%	*df*=1;
			p=.307
Primary condition[a]			
LBP with radiculopathy	81	19.10%	χ^2=161.040;
LBP without radiculopathy	342	80.90%	*df*=1;
			p<.001
Age distribution			
18-34 years	28	6.60%	χ^2=230.345;
35-44 years	60	14.20%	*df*=4;
45-54 years	107	25.30%	*p*<.001
55-64 years	196	46.30%	
65 years and older	32	7.60%	
Age (years)	*M*=53.0	*SD*=10.4	–
	Med=55.0	*IQR*=14.0	
Baseline survey scale outcomes[b]			
Patient Activation Measure (PAM) Score (max. 100)	*M*=67.5	*SD*=13.2	–
	Med=64.9	*IQR*=16.2	
Stanford Presenteeism Scale (SPS-6) Score (max. 30)	*M*=23.1	*SD*=5.3	–
	Med=24.0	*IQR*=9.0	
Oswestry Disability Index (ODI) Score (max. 100)	*M*=28.0	*SD*=13.0	–
	Med=26.0	*IQR*=17.6	
Baseline ODI score level[c]			
Minimal disability (ODI=0-20)	141	33.30%	χ^2=71.504;
Moderate disability (ODI=21-40)	212	50.10%	*df*=2;
Severe disability and above (ODI=41-100)	70	16.50%	*p*<.001

LBP=low back pain; M=mean, Med=median, IQR=interquartile range; ODI=Oswestry Disability Index.
[a] Category determined using participant's associated primary ICD-10 code.
[b] Baseline survey outcomes collected from comparison group members at initial intake session.
[c] Categorization determined using participant's baseline ODI survey score.

46% of participants were 55-64 years old, with a mean age of 53 years (*SD*=10.4 years) and a median age of 55.0 years (interquartile range=14.0 years). Study group participants had a mean PAM score of 67.5 (*SD*=13.2), a mean SPS-6 score of 23.1 (*SD*=5.3), and a mean ODI score of 28.0 (*SD*=13.0) at baseline. Over half (50.1%) of all study group participants reported having moderate functional disability due to LBP at baseline (ODI scores between 21 and 40 points). An additional 16.5% of participants had severe functional limitations or more serious disabling pain (ODI scores between 41 and 100). In total, 66.6% of study group participants reported greater than minimal functional disability limitations from LBP at baseline (*n*=282). One-way chi-square goodness-of-fit tests detected significant differences in the distribution of participants across group categories for age (χ^2=230.345; *df*=4; *p*<.001), primary condition (χ^2=161.040; *df*=1; *p*<.001), and baseline ODI score level (χ^2=71.504; *df*=2; *p*<.001). There were no significant differences in the distribution of participants by gender (χ^2=1.043; *df*=1; *p*=.307).

Table 2 reports survey scale outcomes, length of coaching program enrollment, and total CBC sessions by variable categories of interest. Nonparametric two-sample Mann-Whitney U and Kruskal-Wallis H tests were performed to examine group differences, as the data were not normally distributed. Results show no significant differences (*p*>.05) between the dichotomous categories for gender (male vs. female), primary condition (with vs. without radiculopathy), or age (<55 years vs. ≥55 years) on measures of baseline PAM score, baseline SPS-6 score, length of coaching program enrollment, or number of CBC sessions completed. Across all variable categories, the average number of completed CBC sessions was approximately five total. Mean baseline PAM and SPS-6 scores across the variable categories were similar to those of the total study group (67.5 and 23.1, respectively). The average length of participant enrollment fell between 86.4 and 96.2 days across the variable categories, with a mean of 92.6 days (*SD*=45.7 days) for the total study group. There were also no significant differences (*p*>.05) in baseline PAM score, baseline SPS-6 score, or length of program enrollment across the three categories for number of CBC sessions completed (2-4 sessions, 5-6 sessions, 7 sessions).

Table 3 shows the baseline, final, mean difference, and percent change in ODI scores for the total study group and by variable categories of interest. Due to non-normal distribution of the data, nonparametric paired Wilcoxon signed rank tests were performed to understand if there was a significant within-category difference in ODI score from baseline to final. Nonparametric two-sample Mann-Whitey U tests are performed to understand if there is a significant difference between variable group categories relative to mean ODI Change Score. The total study group had an overall significant decrease of 19.6% in mean ODI score from baseline to final (*z*=10.190, *p*<.001), with an average baseline score of 28.0 (*SD*=13.0) and an average final score of 22.5 (*SD*=14.5). There was also a significant decrease in mean ODI score from baseline to final detected within each category level for all the variables of interest (*p*<.001). Participants younger than 55 years old had a 22.7% decrease in ODI score from baseline to final, while those 55 and older had only a 17.0% decrease in mean ODI score. Males had a lower percent change in ODI score from baseline to final (17.9% decrease) than female participants (22.1% decrease). Participants in the "with radiculopathy" and "without radiculopathy' categories showed a similar change in their mean ODI scores from baseline to final (19.6% decrease and 19.7% decrease, respectively). A larger percent change in mean ODI score from baseline to final was observed for participants completing five to six CBC sessions (21.7%

Table 2
Baseline PAM and SPS-6 Survey Scale Outcomes, Length of Enrollment, and Total CBC Sessions Completed By Variable Category (*N*=423)

Variable	Patient Activation Measure (PAM) (baseline score, max. 100)		Stanford Presenteeism Scale-6 (SPS-6) (baseline score, max. 30)		Length of Coaching Program Enrollment (count of days)		No. of CBC Sessions Completed (max. 7)	
	Mean (*SD*)	Sig.[ab]	Mean (*SD*)	Sig.[ab]	Mean (*SD*)	Sig.[ab]	Mean (*SD*)	Sig.[ab]
Total Sample (*N*=423)	67.5 (13.2)	–	23.1 (5.3)	–	92.6 (45.7)	–	5.10 (1.52)	–
Age								
<55 years (*n*=195)	66.6 (12.8)	*U*=21508 *z*=−1.211 *p*=.226	22.6 (5.3)	*U*=12813.5 *z*=−1.849 *p*=.064	92.5 (46.1)	*U*=22189.5 *z*=−0.032 *p*=.974	5.13 (1.51)	*U*=21801.5 *z*=−0.349 *p*=.727
≥55 years (*n*=228)	68.2 (13.6)		23.7 (5.2)		92.7 (45.5)		5.08 (1.53)	
Gender								
Male (*n*=201)	67.5 (13.2)	*U*=21508 *z*=−0.230 *p*=.818	23.6 (5.3)	*U*=12848 *z*=−1.857 *p*=.063	96.2 (45.4)	*U*=19965.5 *z*=−1.868 *p*=.062	5.10 (1.53)	*U*=22289 *z*=−0.018 *p*=.986
Female (*n*=222)	67.4 (13.3)		22.6 (5.2)		89.3 (45.9)		5.10 (1.51)	
Primary condition								
LBP with radiculopathy (*n*=81)	68.2 (13.1)	*U*=13068.5 *z*=−0.467 *p*=.641	23.0 (6.2)	*U*=8795 *z*=−0.245 *p*=.806	86.4 (39.1)	*U*=12809 *z*=−1.053 *p*=.292	5.05 (1.52)	*U*=13467 *z*=−0.396 *p*=.692
LBP w/o Radiculopathy (*n*=342)	67.3 (13.3)		23.2 (5.0)		94.1 (47.1)		5.11 (1.52)	
No. of CBC sessions completed								
2-4 sessions (*n*=159)	67.5 (13.6)	*H*(2)=1.365 *p*=.505	23.5 (5.1)	*H*(2)=1.048 *p*=.592	93.6 (43.5)	*H*(2)=0.775 *p*=.679	_	_
5-6 sessions (*n*=157)	68.2 (13.5)		22.8 (5.2)		91.4 (48.5)		_	
7 sessions (*n*=107)	66.4 (12.4)		23.0 (5.6)		92.6 (45.7)		_	

CBC=cognitive behavioral coaching; SD=standard deviation; LBP=low back pain.
[a] Mann-Whitney U test comparing categories of dichotomous variables (age, gender, primary condition).
[b] Independent-samples Kruskal-Wallis Test comparing Number of CBC Sessions Completed variable categories.

Table 3
Baseline and Final Mean Oswestry Disability Index (ODI) Survey Scale Scores and Outcomes by Variable Category (*N*=423)

Variable	Oswestry Disability Index (ODI) Score		Mean ODI Change Score	% Change	Paired Wilcoxon Signed Rank Test (baseline to final)	Mann-Whitney U/ Kruskal-Wallis H Test (ODI score change)
	Baseline Mean (*SD*)	Final Mean (*SD*)				
Total Sample (*N*=423)	28.0 (13.0)	22.5 (14.5)	−5.5 (10.2)	19.6% decr.	*z*=−10.190 *p*<.001	–
Age						
<55 years (*n*=195)	27.8 (12.5)	21.5 (14.2)	−6.3 (10.0)	22.7% decr.	*z*=−7.717 *p*<.001	*U*=20398 *z*=−1.463 *p*=.143
≥55 years (*n*=228)	28.2 (13.4)	23.4 (14.8)	−4.8 (10.3)	17.0% decr.	*z*=−6.717 *p*<.001	
Gender						
Male (*n*=201)	30.8 (13.0)	25.3 (14.9)	−5.5 (9.9)	17.9% decr.	*z*=−7.087 *p*<.001	*U*=22123.5 *z*=−0.149485 *p*=.881
Female (*n*=222)	24.9 (12.4)	19.4 (13.5)	−5.5 (10.6)	22.1% decr.	*z*=−7.303 *p*<.001	
Primary condition						
LBP with radiculopathy (*n*=81)	26.0 (12.8)	20.9 (13.5)	−5.1 (9.4)	19.6% decr.	*z*=−4.567 *p*<.001	*U*=13571.5 *z*=−0.283 *p*=.777
LBP without radiculopathy (*n*=342)	28.5 (13.0)	22.9 (14.7)	−5.6 (10.4)	19.7% decr.	*z*=−9.109 *p*<.001	
No. of CBC sessions completed						
2-4 sessions (*n*=159)	27.5 (14.3)	23.2 (15.2)	−4.3 (9.6)	15.6% decr.	*z*=−5.513 *p*<.001	*H*(2)=5.535 *p*=.063
5-6 sessions (*n*=157)	28.6 (13.0)	22.4 (14.4)	−6.2 (10.8)	21.7% decr.	*z*=−6.514 *p*<.001	
7 sessions (*n*=107)	27.9 (11.1)	21.7 (13.9)	−6.2 (10.1)	22.2% decr.	*z*=−5.544 *p*<.001	

decr.=decrease; LBP=low back pain; CBC=cognitive behavioral coaching.

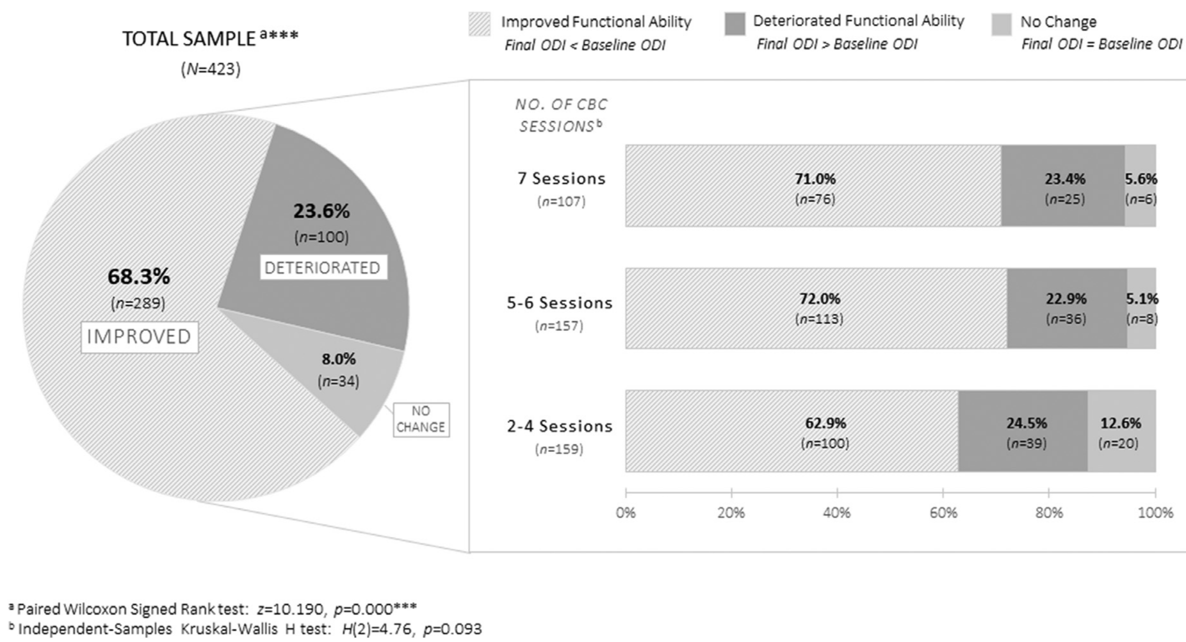

Figure 1. Direction of participant ODI change scores (baseline to final) by number of CBC sessions completed.

decrease) and seven CBC sessions (22.2% decrease), compared to participants that only completed two to four sessions (15.6% decrease in ODI).

Figure 1 describes the direction of participant ODI change scores (from baseline to final) for the total study group and by number of CBC sessions completed. Of the 423 study participants, 68.3% (n=289) reported improved functional ability from baseline to final (a decrease in ODI score). Approximately 23.6% (n=100) reported a deterioration in their functional ability (an increase in ODI score) from baseline to final, while 34 participants (8.0%) reported no change in their functional ability (final ODI score equals baseline ODI score). The Wilcoxon matched-pairs signed ranks test results find a significant median difference between paired baseline and final ODI scores among study group participants (z=10.190, p<.001). When observing the direction of ODI change by the number of CBC sessions completed, there was a greater percentage of participants with improved functional ability in the five to six sessions category (71%) and the seven sessions category (72%) compared to the two to four sessions category (62.9%). The three CBC session categories had relatively similar percentages (22.9-24.5%) of participants reporting a deterioration in their functional ability (increase in ODI score from baseline to final). There was a larger percentage of individuals reporting no change in their functional ability from the two to four sessions category (12.6%, n=20) compared to the five to six sessions (5.1%, n=8) and seven sessions (5.6%, n=6) categories. Outcomes of an independent-samples Kruskal-Wallis H test show that the distribution of participant directions of ODI change (improved, deteriorated, or no change) was not significantly different across the CBC sessions categories (H[2]=4.76, p=.093).

Table 4 shows two generalized linear models for the dependent outcome of ODI change score (final score minus baseline score). The dependent outcome and three independent variables were log transformed before regression modeling because data were not normally distributed. Higher values of the dependent variable indicate participants moving toward functional deterioration from baseline to final (final ODI > baseline ODI), while lower values indicate a move toward improved functional ability from baseline to final (final ODI < baseline ODI). The independent variables used in both regression models all had variance inflation factors (VIFs) of less than ±2.0, indicating low multicollinearity among the model terms. In Model 1, participants who were aged 55 years or older had a significant positive association with the ODI Change Score outcome (B=0.027, p=.021), meaning participants 55 years and older were more likely to report no change or a deterioration in their functional ability from baseline to final (odds ratio=1.03, 95% CI=1.00 to 1.05) compared to younger participants. This aligns with previous research on the relationship between LBP and age (Cedraschi et al., 2016). The ordinal scale variable measuring the number of CBC sessions completed by participants (two to four sessions [1], five to six sessions [2], seven sessions [3]) had a significant negative association with the dependent outcome (B=–0.015, p=.038). This means that as participants advanced on the number of CBC sessions scale, they were significantly less likely to have no change or a deterioration in their functional ability from baseline to final (odds ratio=0.99, 95% CI=0.97-1.00). Other variables in Model 1 were not significant to the outcome (p>.05).

In Model 2, shown in Table 4, participants aged 55 years or older again had a significant positive association with the ODI change score outcome (B=0.027, p=.021). In other words, participants aged 55 or older were significantly more likely to report no change or a deterioration in their functional ability from baseline to final (odds ratio=1.03, 95% CI = 1.00-1.05) compared with younger participants. Model 2 analyzes the Number of CBC Sessions Completed scale measure as a categorical variable. Findings show that participants completing seven CBC sessions had a significant negative association (B=–0.028, p=.048) with ODI change score when compared to participants who completed only two to four sessions. This indicates that participants completing seven CBC sessions were significantly less likely to report no change or a deterioration in their functional ability from baseline to final (odds ratio=0.97, 95% CI=0.95-1.00) in comparison to the reference group. There was no significant difference in ODI change scores between participants completing five to six CBC sessions (B=–0.024, p=.073) and those completing two to four sessions. Other variables in Model 2 were also not significantly related to the outcome (p>.05).

Table 4
Generalized Linear Models for ODI Change Score Outcome (Baseline to Final; *N*=341)

	Generalized Linear Model 1				Generalized Linear Model 2			
	Dependent Outcome: ODI Change Score (final-baseline)[a] *[lower is better]*				Dependent Outcome: ODI Change Score (final-baseline)[a] *[lower is better]*			
Independent Variable	*B* Coeff.	Odds Ratio [95% CI]	VIF	*p* value	*B* Coeff.	Odds Ratio [95% CI]	VIF	*p* value
Age[b]								
≥55 years	0.027	1.03 [1.00-1.05]	1.02	**.021**[c]	0.027	1.03 [1.00-1.05]	1.02	**.021**[c]
Gender[d]								
Female	0.006	1.00 [0.98-1.03]	1.01	.623	0.006	1.01 [0.98-1.03]	1.02	.631
Primary condition[e]								
LBP without radiculopathy	-0.006	0.99 [0.97-1.02]	1.01	.661	-0.005	1.00 [0.97-1.02]	1.01	.712
Baseline survey scale outcomes								
Patient Activation Measure (PAM) score[f]	-0.040	0.96 [0.90-1.02]	1.06	.193	-0.038	0.96 [0.91-1.02]	1.07	.208
Stanford Presenteeism Scale (SPS-6) score[f]	0.057	1.06 [0.99-1.13]	1.07	.075	0.056	1.06 [0.99-1.13]	1.08	.075
Coaching program participation								
Days enrolled in CBC program[f]	-0.022	0.98 [0.96-1.00]	1.02	.053	0.022	0.98 [0.96-1.00]	1.02	.052
No. of CBC sessions completed [ordinal, 1-3]	-0.015	0.99 [0.97-1.00]	1.01	**.038**[c]	–	–	–	–
No. of CBC sessions completed [categorical]								
7 sessions [3]	–	–	–	–	-0.028	0.97 [0.95-1.00]	1.28	**.048**[c]
5-6 sessions [2]	–	–	–	–	-0.024	0.98 [0.95-1.00]	1.26	.073
2-4 sessions [1] (ref. group)	–	–	–	–	–	–	–	–

CI=confidence interval; VIF=variance inflation factor; coeff=coefficient
[a] Dependent outcome = Log(ODI change score +50)
[b] Dichotomous variable, reference group <55 years
[c] $p<0.05$
[d] Dichotomous variable, reference group = male
[e] Dichotomous variable, reference group = LBP with radiculopathy
[f] Input variable is natural log transformed due to non-normal distribution of data.

Discussion

All too often, chronic pain conditions such as LBP are treated primarily by applying medical care and pharmaceutical regimens that largely overlook the influence of psychological and behavioral health factors that affect the successful management of pain (Moore et al., 2000). The biopsychosocial model considers the subjective lived experience of pain and acknowledges the role of underlying cognitive behavioral drivers in shaping self-perceptions of LBP-related disability (van Erp et al., 2019; Müller-Schwefe et al., 2017; Roditi & Robinson, 2011). This program addresses pain management using a biopsychosocial approach, with the aim of supporting participant reframing of their psychological response to LBP and building skills and constructive health habits for managing pain in the long term. The ultimate goal is to use CBT-based coaching and guided self-care education to improve the functional capabilities of members and, in turn, their quality of life (Mutubuki et al., 2020). Results indicate that using CBT-based coaching services can have a meaningful influence on the perceptions of participants with assorted degrees of LBP.

The prevalence, costs, and personal effects of recurring LBP require innovative, evidence-based methods of management (Mutubuki et al., 2020; Tousignant-Laflamme et al., 2017). A key feature of the CBC program is its remote delivery structure, which was purposefully designed to be more readily accessible than traditional in-office services. Attending health appointments in person can be challenging for individuals with pain-related disability who may have significant physical limitations or difficulty obtaining transportation and adequate funds to afford regular care (Carpenter et al., 2012). The program is structured to promote ease of access and service continuity without the burden of traveling and on-site attendance. Participation was at no additional cost to members, and enrollees were permitted to use CBC sessions and educational resources at their own discretion and in their preferred format. Overall, measurable improvement in self-rated functional disability was observed among two-thirds of the participants analyzed. Participants who attended seven CBC sessions showed a significant decrease in their ODI scores (improvement in functional ability) compared to participants who attended two to four sessions, even after adjusting for variable length of enrollment and differences in demographics, baseline patient activation (PAM scale), and presenteeism (SPS-6 scale) levels. These early outcomes suggest that the program's accessible, flexible, remotely delivered CBC services may be a useful technique for improving participant ratings of functional capacity in the management of various degrees of LBP.

However, this data reduction and analysis was completed as a quality improvement (QI) evaluation and is not based on a pre-planned research protocol, which may reduce the robustness of our conclusions.

Despite these limitations, findings from this study support the expanding pool of evidence demonstrating quantifiable benefits of cognitive behavioral interventions for chronic pain management (Hajihasani et al., 2019; Cherkin et al., 2017, 2016; Kamper et al., 2015; Carpenter et al., 2012; Hoffman et al., 2007) and digital interventions for managing chronic pain conditions (Toelle et al., 2019; Amorim et al., 2019; Hüppe et al., 2019; Mecklenburg et al., 2018; Huber et al., 2017; Buhrman et al., 2016; Iles et al., 2014; Beatty & Lambert, 2013; Lawson et al., 2013; Buhrman et al., 2004). These methods of pain management could also potentially mitigate the use of more expensive and invasive types of care that may pose greater risk of harm to the patient (Cherkin et al., 2018; Herman et al., 2017). Skills learned in the CBC sessions may moderate the service patterns of patients with LBP that typically trend towards costly, higher-risk treatment options. Further evaluations of participants receiving coaching services are underway, including measuring change in the health care use (e.g., emergency room, imaging, spinal injections, surgery, and outpatient rehabilitation) and prescription opioid use.

Limitations

The results of this study are subject to a number of limitations. Restrictions under the Telephone Consumer Protection Act (TCPA) limited telephone outreach attempts during the recruitment process (Waller et al., 2013). These restrictions likely affected the overall program enrollment rate (2.5%), although low enrollment rates are reported in similar studies of self-selected program participants (Lawson et al., 2013). Selection bias is known to be present, as the 423 members analyzed were a convenience sample who were not randomly selected for enrollment and participated by voluntarily opting in to the program. This study analyzes secondary data collected as part of member participation in the CBC coaching program, which prevented us from following up with a proper control group of individuals not electing to receive program services. Without a full control group design, we cannot guarantee that regression to the mean is absent from the analysis. Outcomes are therefore limited to the currently analyzed sample and do not necessarily reflect broader patient populations with LBP. Still, our findings align with outcomes from research on related program modalities (Huber et al., 2017; Lawson et al., 2013; Buhrman et al., 2004) and randomized controlled trials that indicate CBT-based interventions are beneficial to patients with LBP (Cherkin et al., 2017; Mannion et al., 2013; Brox et al., 2006; Buhrman et al., 2004). More evaluation is needed to understand whether outcomes of this particular program are replicable in additional member cohorts and in other patient populations with chronic pain conditions. Spectrum bias may be another potential limitation; however, given that most of the sample population fell within one eligibility group, this should have limited influence on findings.

Program services were received by participants in their natural environment and typically in their own home; they did not take place in a controlled setting. Unknown confounding elements may thus affect results in ways that cannot be detected. As an example, coaches administered survey scale measures. This may raise concerns of measurement bias. To minimize the influence of measurement bias, coaches were trained in administration of these survey measures, and the same coach collected both baseline and follow-up survey responses. However, it remains a limitation. The primary outcomes of this study are based on participant-reported functional disability ratings as measured by the ODI. Although the ODI is a validated scale, self-reported outcomes are subjective, and measurement may be unstandardized between respondents. Additionally, the current analysis describes only short-term results. It is important to understand the extent to which outcomes are sustained over time (Cherkin et al., 2017). Additional participant data are being collected to examine the program effects longitudinally.

Conclusions

Incorporating a biopsychosocial perspective into pain management methods can improve the health, functionality, and quality of life outcomes of patients with LBP (Hajihasani et al., 2019; Kamper et al., 2015; Carpenter et al., 2012; Hoffman et al., 2007). Study results find that participating in the CBT-based coaching program improved participant-reported functional outcomes of adults with LBP. However, these results should be understood in context of this being a quality improvement evaluation and not a research investigation. This limits the generalizability of results. Given the methodologic design, it is difficult to identify the specific coaching mechanism driving improvement, and more research is needed to elucidate this information. Despite this, findings are consistent with previous research and present plausible conclusions. The change in self-reported functional ability observed across participants warrants continued investigation as to whether the program may potentially benefit people with other kinds of chronic pain conditions. Health plans and specialty care management organizations should consider partnering to develop accessible and multidisciplinary pain management approaches for individuals with LBP.

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Appendix A

Table A1.
Participant ICD-10 Code Categorization for Primary Condition Variable (*N*=423)

Primary Condition Category	*ICD-10*	*Code Description*	*# of Participants*
LOW BACK PAIN WITHOUT RADICULOPATHY (*n*=342)	M54.5	Low back pain	195
	M47.816	Spondylosis without myelopathy or radiculopathy, lumbar region	30
	M99.03	Segmental and somatic dysfunction of lumbar region	23
	M51.26	Other intervertebral disc displacement, lumbar region	18
	M47.817	Spondylosis without myelopathy or radiculopathy, lumbosacral region	16
	M51.36	Other intervertebral disc degeneration, lumbar region	16
	M99.04	Segmental and somatic dysfunction of sacral region	6
	M51.37	Other intervertebral disc degeneration, lumbosacral region	6
	M48.07	Spinal stenosis, lumbosacral region	4
	M47.897	Other spondylosis, lumbosacral region	3
	M51.27	Other intervertebral disc displacement, lumbosacral region	3
	M99.05	Segmental and somatic dysfunction of pelvic region	3
	S33.5XXA	Sprain of ligaments of lumbar spine, initial encounter	3
	M43.06	Spondylolysis, lumbar region	2
	M99.14	Subluxation complex (vertebral) of sacral region	2
	S33.8XXA	Sprain of other parts of lumbar spine and pelvis, initial encounter	2
	S39.012A	Strain of muscle, fascia and tendon of lower back, initial encounter	2
	S39.012D	Strain of muscle, fascia and tendon of lower back, subsequent encounter	2
	M25.60	Stiffness of unspecified joint, not elsewhere classified	1
	M43.16	Spondylolisthesis, lumbar region	1
	M43.26	Fusion of spine, lumbar region	1
	M47.896	Other spondylosis, lumbar region	1
	M51.86	Other intervertebral disc disorders, lumbar region	1
	M53.3	Sacrococcygeal disorders, not elsewhere classified	1
LOW BACK PAIN WITH RADICULOPATHY (*n*=81)	M54.41	Lumbago with sciatica, right side	18
	M51.16	Intervertebral disc disorders with radiculopathy, lumbar region	11
	M54.16	Radiculopathy, lumbar region	11
	M54.31	Sciatica, right side	8
	M54.40	Lumbago with sciatica, unspecified side	8
	M54.32	Sciatica, left side	6
	M54.42	Lumbago with sciatica, left side	6
	M54.17	Radiculopathy, lumbosacral region	4
	M47.27	Other spondylosis with radiculopathy, lumbosacral region	2
	M51.06	Intervertebral disc disorders with myelopathy, lumbar region	2
	M51.17	Intervertebral disc disorders with radiculopathy, lumbosacral region	2
	M54.30	Sciatica, unspecified side	2
	M47.26	Other spondylosis with radiculopathy, lumbar region	1
	TOTAL ANALYZED SAMPLE=		423

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Appendix B

Table B1.
CBT-Based Coaching Program Multimodal Educational Curriculum

Module Description	Example Resources
Movement and Function Educational resources about the participant's strategies to overcome fear and avoidance of movement. Provides guidance on helpful behaviors.	• A 10-step Workout Plan to Remedy Low Back Pain (text article) • Strengthen Your Core with Abdominal Bracing (text article) • Mindful Movement (audio podcast) • Staying Active With Chronic Low Back Pain (video) • Posture and Ergonomics for Chronic Low Back Pain (online self-care tool)
Self-Care Educational resources about the participant's options to act on their own to help themselves, obtain the benefits of self-care, and self-adherence to doctor prescribed care.	• 7 Steps to Achieve Back Pain Relief (text article) • Tips for a better night sleep (tip sheet) • Relaxing Head to Foot (online self-care tool) • Managing Stress to Help Ease Low Back Pain (video) • Ideal Imagery for Weight Management Lesson (audio podcast)
Reframing Pain Educational resources about pain including its purpose and role in recovery, and guidance on learning how to respond and perceive pain differently.	• Retrain your Brain (video) • Present Moment Awareness Exercise (online self-care tool) • Reframing Your Thoughts About Pain (text article) • How Questioning Your Thinking May Free You from Pain (text article)
Motivation and Activation Educational resources about how to take personal control and responsibility for care and how to take action to control pain and treatment decisions.	• Overcoming Setbacks Step by Step (online self-care tool) • Overcoming Barriers (video) • Tools for Overcoming Barriers (online self-care tool) • In Her Own Words: Living With Sciatica (text article)
Understanding Options Educational resources about the current body of evidence for various treatment options that the participant might choose to consider.	• How to Choose a Physical Therapist (tip sheet) • Conservative Treatment Options: Can Acupuncture Help? (video) • Treatments for Low Back Pain and Sciatica (text article) • Getting Started with Yoga (online self-care tool) • Epidural Steroid Injection (video)
Self-Advocacy Educational resources about how to optimize the doctor-patient relationship, taking ownership of care plans.	• Is It Really Back Pain? 4 Issues to Consider (text article) • Talking to your Doctor (tip sheet) • Exercises for Learning Self-Efficacy (online self-care tool) • Preparing for CT or MRI Scans (audio podcast) • Learning Problem Solving in 7 Steps (video)

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