Research Square

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Biopsychosocial variables predict disability but not pain outcomes in individuals experiencing chronic pain and prolonged work absence: A prospective cohort study

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Abstract

Purpose

Return to work (RTW) in individuals experiencing chronic pain is a complex process involving barriers that include pain and disability. We examined the association of biopsychosocial factors in predicting pain and disability in individuals experiencing chronic pain and were off work.

Methods

n = 87; recruited from community pain clinics; prospective cohort study with follow-up at 6 months after baseline assessment. Baseline data included questionnaires and in-person assessments of pain, function, and health perceptions. 81 participants completed follow-up at 6 months. Multivariable linear regression was used to model pain and disability. In exploratory analysis, we compared those who had and had not RTW 6 months after initial visit.

Results

The cohort averaged 7.8 (SD 6.9) years off work and were between the 2nd and 3rd percentile of normative general population data for bodily pain score (0th percentile = low score, most severe pain). The multivariable model explained a substantial proportion of variance in disability ($R^2 = 0.58$, $p < 0.001$). In contrast, the model predicting pain intensity/interference explained less variance ($R^2 = 0.29$) and was not statistically significant ($p = 0.067$). Walking performance and working with an RTW coordinator were significant individual predictors of disability. Walking performance and psychological variables showed the strongest correlations across pain and disability.

Conclusion

Disability—but not pain—was predicted in regression modelling, suggesting different underlying determinants for these outcomes in individuals experiencing chronic pain and prolonged work absence. Additional research is warranted to improve chronic pain and disability and increase RTW rates in this population.

CME Learning Objectives

After reading this article, the learner will be better able to:

- Describe associations between biopsychosocial variables and pain and disability
- Explain how perceived pain and disability may impact return to work

INTRODUCTION

In Canada, it is estimated that about 6 million people (~ 1 in 6) suffer from a form of chronic pain (1). Chronic pain disproportionately affects women (2, 3), Veterans (4), Indigenous populations (4), and lower socioeconomic status individuals (5) while limiting their functionality in conducting daily routines. Chronic pain is associated with 2X suicide risk (6) and poor quality of life (7–9)— often worse than other chronic diseases (10, 11). Whereas the minimum threshold definition of chronic pain is- 'pain lasting or recurring for at least three months', approximately one-half of those with chronic pain reported suffering for more than 10 years (12), adding complexity to their management/treatment.

A major consequence of chronic pain is reduced functional capacity, increasing risk of losing participation in the workforce and difficulty to return to work (RTW) (13). RTW in individuals experiencing chronic pain is a complex process that impacts– individuals, families, employers, and healthcare systems (14, 15). The process is complex for reasons that include the circular and reciprocal dynamics between chronic pain, biopsychosocial factors, and work status. For example, unemployment predicts psychological distress (16), and psychological distress and depressed mood can augment chronic pain (17, 18). An example of this process that has been cited in the RTW literature is low back pain, where depression and pain often predicts failure to RTW (19). Reciprocally, in low back pain, depression predicts failure to RTW (19). Whereas acute and chronic pain in the off-work individual are certainly different scenarios, it is expected that similar reciprocal dynamic exists for chronic pain. Chronic pain is a predictor of disability which mediates risk of pain on depression (20). Reciprocally, psychological and social–contextual variables can cause and perpetuate chronic pain (18).

As opposed to the recently injured worker, chronic pain patients are long-past a normal healing time-frame of an acute injury involving tissue damage and associated nociceptive-driven pain (21). Compared to the acute/subacute patient, for whom successful/unsuccessful RTW predictions can be made with reasonable accuracy (19, 22), less progress has been made toward understand RTW in patients who are off work for multiple months-to-years, who may have pain that is longstanding, multi-site and related to co-morbid complexity (23). One approach to better understanding this complexity is to employ a biopsychosocial lens (23) and look at a range of factors that may be associated with RTW and that include symptoms, physical function, disability and perceptions of health and work.

The biopsychosocial model is especially germane given biopsychosocial factors are thought to play a central role in pain manifestation (23). In the acute/subacute low back pain, psychosocial variables like coping strategies and catastrophizing were better predictors of disability (Roland & Morris Disability score) at one year than clinical variables (e.g., history, exam) (24). In the chronic low back pain patient population, the association between psychological risk factors and outcome measures of pain intensity, disability and health-related quality of life 'grew' over time: initially the outcomes were weakly correlated, yet increase and become significantly correlated at 6 month follow-up to an exacerbation (25). Taken together, biopsychosocial factors may play a (more) important role in determining pain, disability and RTW success of the off-work individual experiencing chronic pain.

Together with biopsychosocial factors, RTW can be influenced by external work context factors – e.g., organizational factors like organizational communication (26), job demands including physical, cognitive and interpersonal work demands (27), and the presence of a RTW coordinator (28). Analogous to pain, work context has a reciprocal relationship with psychosocial factors (29). That is, psychosocial work stressors (e.g., high job demands and low job control) are associated with depression and anxiety, while at the same time poor mental health may lead to adverse psychosocial working conditions (29), sometimes called the 'drift hypothesis' (30) and inability to maintain healthy workplace relationships (31). Taken together, there is scattered evidence that pain/disability interact with biopsychosocial and work-context factors in reciprocal/bi-directional manner. However, how these factors collectively relate to the return to work in the context of chronic pain is not well understood. The present work aimed to examine the associations between biopsychosocial variables and pain and disability in chronic pain patients who have been off work for a prolonged period.

MATERIALS AND METHODS

Data collection

Participants for this observational cohort study were recruited from two community pain clinics in the Greater Toronto and Hamilton Area. Potential participants were told that the study was about understanding how to better assess people with chronic pain to identify those that are at high-risk of not being able to return to work and who might require specialized care. Data was collected in the form of questionnaires and assessments of pain, function, and health perceptions. The study was approved by the University Health Network Research Ethics Board (#20-5564). All participants provided written consent. Inclusion criteria were: 18–70 years old, currently off work, have pain lasting or recurring for at least 3 months. Participants with suspected drug or alcohol use problems were excluded from the study. Functional data were collected in-person by a researcher, and questionnaires were administered electronically (in-person/onsite) via REDCap (32). The 3 minute walk test, which shows strong agreement with the 6 minute walk test (33), was conducted as 25 meter shuttles, measured to the nearest half meter. Handgrip strength was measured using a Jamar dynamometer; average of left and right hand, at handle position 2 (34). For each participant, a telephone follow-up was conducted at 6 months to determine RTW status.

Data analysis

Descriptive statistics were used to characterize the study participants with categorical variables summarized as counts (percent) and continuous variables summarized as means and standard deviation. SF-36 Bodily Pain percentiles were calculated by comparing SF-36 Bodily Pain scores (0-100; 0 = worst) in the present study to normative values from McHorney et al. (35). Additionally, three further analyses were conducted. First, among the participants who had not returned to work, we investigated the factors associated with individuals' perception of chronic pain and disability using multivariable linear regression models (separate models for chronic pain and disability). Dependent and independent

variables are described below. Model fit was assessed using the R^2 statistic. Regression coefficients, 95% confidence intervals and p values are reported. Second, we ran Pearson product moment correlations to understand associations between variables. Third, we compared the characteristics of people who had returned to work at 6 months compared to those who did not using Chi-square and t-tests as appropriate. The estimates are presented as odds ratios (95% Confidence Intervals) and mean differences (95% Confidence Intervals).

Regression modeling variables

Dependent variables. 1) SF-36 Bodily Pain, from the RAND 36-Item Short Form Health Survey of the Medical Outcomes Study (36) and 2) Roland-Morris Pain and Disability Questionnaire (37), a patient reported health status measure to assess physical disability due to low back pain (note: in the present study with heterogenous sources of chronic pain, the language of questions specifying 'because of my back' was modified to 'because of my pain').

Independent variables. Variables were selected to represent biological, psychological, and social factors within the biopsychosocial framework (38). Biological variables were: Handgrip strength, 3-minute walk distance, number of chronic condition diagnoses by a physician, and number of body regions affected by pain (39). Psychological variables were: Tampa Scale of Kinesiophobia (40); Brief Resilience Scale (41), Generalized Anxiety Disorder-7 (42), Pain Catastrophizing Scale (43), Centre for Epidemiological Studies-Depression (CES-D; (44)). Social variables were: Perceived Social Support From Family-13 (45), Perceived Social Support From Friends-13 (45). Work context variables were- presence of a RTW coordinator (46), and a 32-item subset of the Copenhagen Psychosocial Questionnaire, third version (COPSOQ III) (47). The 32 selected items (*see* Supplemental Table 1) were drawn from the international middle version (60 items across 26 dimensions), which is a standardized short form of the full COPSOQ III (148 items, 45 dimensions) (47). The selected items cover five major domains: Demands at Work (6 items), Work Organization and Job Contents (8 items), Interpersonal Relations and Leadership (12 items), Work–Individual Interface (3 items), and Social Capital (3 items). This subset was selected to capture a broad range of validated psychosocial constructs while reducing respondent burden.

RESULTS

Figure 1 shows a Consolidated Standards of Reporting Trials (CONSORT) schematic of the study. Participant demographics (n = 81; 51.2 ± 11.9 years; 72.8% women) are shown in Table 1. The study cohort averaged 7.8 (SD = 6.9) years off work and were between the 2nd and 3rd percentile of normal for SF-36 Bodily Pain score. Multivariable linear regression results for pain and disability are shown in Tables 2 and 3, respectively. Multivariable regression analysis revealed that biopsychosocial variables predicted disability ($R^2 = 0.58$, $p < 0.001$) but were poor predictors of pain ($R^2 = 0.29$, $p = 0.067$).

Table 1
Patient characteristics and work context factors in off-work chronic pain cohort

Number in study	**81 (100.0%)**
Biological sex	
Female	61 (75.3%)
Male	20 (24.7%)
Gender (social identity)	
Man	21 (25.9%)
Woman	59 (72.8%)
Non-binary	1 (1.2%)
Age, years	51.2 (11.9)
Returned to work	
Yes	7 (8.6%)
No	74 (91.4%)
Time off work, years	7.79 (6.9)
Hours worked per week in last job	40.6 (19)
Currently receiving workers' compensation due to work-related pain/injury	
No	75 (92.6%)
Yes	6 (7.4%)
Disability Support Program	
Canada Pension Plan Disability	13 (16.2%)
Ontario Disability Support Program	25 (31.2%)
Long-term disability (employer)	10 (12.5%)
Short-term disability (employer)	3 (3.8%)
None	29 (36.2%)
Highest level of education	
College	35 (43.2%)
High school	23 (28.4%)
Continuous variables are reported as mean (standard deviations); categorical variables are n (%)	

Number in study	**81 (100.0%)**
Less than high school	6 (7.4%)
Technical/trade certification	2 (2.5%)
University	15 (18.5%)
Healthcare benefits	
Chiropractic	
No	57 (70.4%)
Yes	24 (29.6%)
Massage	
No	56 (69.1%)
Yes	25 (30.9%)
Physiotherapy	
No	51 (63.0%)
Yes	30 (37.0%)
Psychotherapy	
No	62 (76.5%)
Yes	19 (23.5%)
Continuous variables are reported as mean (standard deviations); categorical variables are n (%)	

Table 2
Linear regression modelling of chronic pain

SF-36 Bodily Pain	Coef.	St.Err.	t-value	p-value	95% CI lower	upper
Handgrip	− .005	.076	-0.07	.945	− .158	.147
3 min walk	.037	.021	1.75	.085	− .005	.078
# of Dx	− .295	.814	-0.36	.718	-1.926	1.336
# of pain regions	2.191	1.476	1.48	.143	− .767	5.148
TSK	.004	.351	0.01	.99	− .698	.707
Resilience	1.571	2.749	0.57	.57	-3.935	7.078
GAD7	− .414	.427	-0.97	.336	-1.269	.441
PCS	− .069	.182	-0.38	.705	− .435	.296
CESD	− .304	.241	-1.26	.213	− .787	.179
PSS-Fa	.472	.604	0.78	.438	− .737	1.681
PSS-Fr	− .776	.645	-1.20	.234	-2.068	.516
COPSOQIII32Q	− .154	.13	-1.19	.24	− .414	.106
RTWcoordinator	-5.756	7.043	-0.82	.417	-19.864	8.352
Constant	41.04	21.185	1.94	.058	-1.4	83.479

Mean dependent var	22.036	SD dependent var	16.612
R-squared	0.294	Number of obs	70
F-test	1.793	Prob > F	0.067
Akaike crit. (AIC)	594.704	Bayesian crit. (BIC)	626.183

3 min walk, 3 minute walk test score; #Dx, number of diagnosis by a doctor (self-reported); #pain regions, number of pain regions (2016 American College of Rheumatology Fibromyalgia Criteria); TSK, Tampa Scale of Kinesiophobia; GAD-7, General Anxiety Disorder-7; PCS, Pain Catastrophizing Scale; CES-D, Center for Epidemiological Studies-Depression; PSS-Fa SS-13, Perceived Social Support- Family 13Q; PSS-Fr SS-13, Perceived Social Support-Friends 13Q; COPSOQIII-32Q, 32-question subset from the Copenhagen Psychosocial Questionnaire 3rd version (*see* Supplemental Table 1); RTWcoordinator, working with a RTW coordinator (self-reported).

Table 3
Linear regression modelling of disability

Roland-Morris Disability	Coef.	St.Err.	t-value	p-value	95% CI lower	upper	Sig.
3 min walk	− .027	.005	-4.89	0	− .038	− .016	***
# of Dx	.302	.224	1.35	.183	− .146	.751	
# of pain regions	− .09	.395	-0.23	.821	− .879	.699	
TSK	.058	.096	0.60	.551	− .135	.25	
GAD7	− .028	.11	-0.26	.796	− .248	.191	
PCS total	.059	.049	1.20	.236	− .039	.156	
CES-D total	.098	.061	1.61	.112	− .024	.22	
PSS-Fa	− .071	.172	− .41	.682	− .416	.274	
PSS-Fr	.307	.144	2.13	.037	.019	.595	**
COPSOQIII32Q	.05	.035	1.41	.163	− .021	.121	
RTWcoordinator	5.257	1.949	2.70	.009	1.359	9.155	***
Constant	-1.197	4.549	-0.26	.793	-10.293	7.898	
Mean dependent var	14.542		SD dependent var	6.164			
R-squared	0.582		Number of obs	72			
F-test	8.510		Prob > F	0.000			
Akaike crit. (AIC)	424.338		Bayesian crit. (BIC)	449.381			

*** p<.01, ** p<.05. 3 min walk, 3 minute walk test score; #Dx, self-reported number of diagnosis by a doctor; #pain regions, number of pain regions (2016 American College of Rheumatology Fibromyalgia Criteria); TSK, Tampa Scale of Kinesiophobia; GAD-7, General Anxiety Disorder-7; PCS, Pain Catastrophizing Scale; CES-D, Center for Epidemiological Studies Depression; PSS-Fr SS-13, Perceived Social Support- Friends 13Q; COPSOQIII-32Q, Copenhagen Psychosocial Questionnaire 3rd version-32Q; RTWcoordinator, self-reported working with a RTW coordinator.

Rates of RTW work were low (n = 7/81). In exploratory analysis (Table 4), there was a high degree of variability across variables in odds ratio-based comparisons of those that returned to work versus those that did not. Despite similar level of pain (95% CI for RAND pain score, -9.1 to 16.6, p = 0.56) and disability (95% CI for Roland-Morris Disability score, -5.45 to 4.35, p = 0.82) as those who did *not* RTW, individuals who *did* RTW tended to— i) walk further on 3 minute walk test (134 ± 108 vs. 217 ± 112, p = 0.076), ii) have better access to psychotherapy benefits (20% vs. 57%, respectively, p = 0.042), and iii) have a shorter duration off-work (3.2 ± 3.4 vs. 8.2 ± 6.9 years, respectively; p = 0.061). There were no differences between those who returned to work and those who did not, for age or number of doctor-

diagnosed health conditions, or indices of anxiety, depression, catastrophizing, or social support. Correlations between variables are shown in Table 5; 3-minute walk test and psychological variables showed the strongest associations with chronic pain and disability.

Table 4
Exploratory comparison of biopsychosocial variables individuals who RTW at 6 months and those who did not

Return to work at 6 months					
	No (n = 7)	**Yes (n = 74)**	**Total (n = 81)**	**OR (95% CI)**	**P-value**
Handgrip strength, lb	49.19 (25.46)	51.57 (17.94)	49.40 (24.80)	-2.38 (-22.05 to 17.28)	0.810
3-minute walk test distance (m)	134.20 (107.80)	216.83 (111.88)	140.56 (109.63)	-82.63 (-174.1 to 8.82)	0.076
Number of chronic condition diagnoses	5.34 (2.88)	4.14 (3.13)	5.24 (2.90)	1.19 (-1.08 to 3.47)	0.300
Pain body regions (0-5worst)	3.28 (1.57)	2.43 (2.07)	3.21 (1.62)	0.85 (-0.41 to 2.12)	0.183
Tampa Scale of Kinesiophobia	44.46 (7.00)	42.00 (7.90)	44.25 (7.06)	2.46 (-3.10 to 8.02)	0.382
Brief Resilience Scale	2.84 (0.80)	2.95 (1.00)	2.85 (0.81)	-0.01 (-0.75 to 0.53)	0.730
General Anxiety Disorder-7	12.22 (6.26)	10.57 (7.02)	12.07 (6.29)	1.64 (-3.33 to 6.62)	0.512
Pain Catastrophizing Scale	29.20 (13.72)	28.14 (12.58)	29.11 (13.55)	1.06 (-9.67 to 11.79)	0.845
CES-D	29.27 (12.99)	31.86 (17.39)	29.49 (13.31)	-2.58 (-13.11 to 7.94)	0.626
Perceived Family Support-13	7.40 (4.09)	7.571 (4.65)	7.42 (4.11)	-0.16 (-3.42 to 3.09)	0.919
Perceived Friends Support-13	7.57 (3.86)	6.29 (3.59)	7.46 (3.83)	1.28 (-1.74 to 4.30)	0.401
RTW coordinator?					

Note: Given low sample size in RTW-Yes, statistical comparisons between RTW No vs. Yes are exploratory and should be interpreted with caution

*Continuous variables are reported as mean (standard deviations); categorical variables are n (%)

**Tests are regression-tests for continuous variables and logistic for categorical variables

***NE: Not estimable

****Estimates are Odd Ratio (95% CI) to Mean Difference (95% CI)

CES-D, Center for Epidemiological Studies Depression; COPSOQIII-32Q, Copenhagen Psychosocial Questionnaire 3rd version-32Q

Return to work at 6 months					
	No (n = 7)	**Yes (n = 74)**	**Total (n = 81)**	**OR (95% CI)**	**P-value**
No	67 (90.5%)	5 (71.4%)	72 (88.9%)	1	0.147
Yes	7 (9.5%)	2 (28.6%)	9 (11.1%)	3.83 (0.62–23.52)	
COPSOQIII-32Q	62.18 (16.01)	62.84 (12.63)	62.24 (15.68)	-0.65 (-13.07 to 11.77)	0.917
RAND- Bodily Pain	21.28 (16.78)	17.50 (8.54)	20.96 (16.24)	3.78 (-9.05 to 16.61)	0.559
Roland-Morris Disability	14.60 (6.09)	15.14 (7.62)	14.64 (6.18)	-0.55 (-5.45 to 4.35)	0.824
Note: Given low sample size in RTW-Yes, statistical comparisons between RTW No vs. Yes are exploratory and should be interpreted with caution					
*Continuous variables are reported as mean (standard deviations); categorical variables are n (%)					
**Tests are regression-tests for continuous variables and logistic for categorical variables					
***NE: Not estimable					
****Estimates are Odd Ratio (95% CI) to Mean Difference (95% CI)					
CES-D, Center for Epidemiological Studies Depression; COPSOQIII-32Q, Copenhagen Psychosocial Questionnaire 3rd version-32Q					

DISCUSSION AND CONCLUSIONS

Understanding barriers to RTW such as chronic pain and disability is important for developing effective interventions that promote successful RTW outcomes in individuals navigating the complexities of chronic pain management. The main finding of the present study was that disability but not chronic pain was understood in models using biopsychosocial predictor variables for chronic pain patients experiencing prolonged time off work. Within the respective models for chronic pain and disability, 3-minute walk performance, presence of a RTW coordinator and Perceived Social Support-Friends were significant predictors of disability but not pain severity/interference.

The SF-36 Bodily Pain score in the present study was 21 ± 16 (mean ± SD), placing the average participant between the 2nd and 3rd percentiles of the general population (35). There are many detrimental consequences, including social (48), economic (49), and impaired quality of life, the most severe of which is that chronic pain predicts risk of subsequent death, even a decade in the future (50). These consequences highlight the urgency of identifying the factors that affect chronic pain, disability and RTW status.

We analysed the interrelationship between predictor variables in order to better understand the biopsychosocial framework in our study population. Psychological variables (kinesiophobia, pain catastrophizing, anxiety, depression) tended to be associated together, as well as with pain and disability scores. Kinesiophobia is associated with pain intensity (51), pain-related anxiety (52), depression (53) and disability – perceived (52), and 'actual' with respect to an objective lifting task (54). Here, kinesiophobia was positively correlated with pain catastrophizing and depression and inversely correlated with walk score. This finding of interrelationship between psychological variables is consistent with a previous study reporting catastrophic thinking as a barrier to RTW in depressed individuals with occupational disability (55). In the present study, number of physician diagnoses was also associated with disability; however, 3 min walk test score showed the strongest association with disability and was a significant predictor in regression modelling. In the future, the 3-minute walk test as an objective measure (together with self-report metrics) may be a useful tool for clinicians treating chronic pain patients to evaluate disability-related barriers – fixed and perceived – to RTW.

Work environment and social support networks, both within and outside the workplace, can provide emotional support, practical assistance, and positive coping mechanisms that can aid successful participation in the workplace. In the present study of chronic pain patients experiencing prolonged time off work (average of 8 years), Perceived Social Support-Family and work context factors, as measured by a COPSOQIII 32-question subset, were not major predictors of chronic pain or disability and, in our exploratory analysis did not differentiate RTW status at 6-month follow-up. We speculate that the influence of work context (trust in supervisor, colleagues etc.) in shaping perception of disability had diminished given the prolonged time off work of our sample cohort. Future research is required to determine whether workplace accommodations, such as modified duties, flexible scheduling, and ergonomic adjustments, can create supportive environments conducive to successful RTW outcomes (56) in chronic pain patients experiencing prolonged time off work.

To place the present study in context, it is important to briefly consider the *clinical* context— the patient with chronic pain, their biopsychosocial influences, and the care system that surrounds them. The biopsychosocial model (38) is generally accepted as a conscientious approach to clinical management of chronic pain (57). Yet, its availability to patients can be limited (58, 59), and health system incentives often continue to favour biomedical approaches such as imaging, surgery, and pharmacological management (e.g., opioid/anti-inflammatory overprescription). Thus, applying the biopsychosocial model in practice, particularly in supporting patients to manage chronic pain and return to work, presents several challenges. First, translating the biopsychosocial research into an operational patient care clinic can be difficult (developing models of care, patient flow, managing personnel). This translation challenge is linked to a second challenge which is the integration with the status quo of stepped care model in healthcare. That is, stepped care, which is designed to conserve resources, can become disconnected from the individual's biopsychosocial needs. Despite prevailing challenges, there is some evidence (60) that psychological assessment and a comprehensive protocol to address the identified obstacles for return to work achieved better return on investment than usual (stepped) care.

A barrier for the chronic pain patient to access escalated care is ‘inherent’ to the diagnostic process: there is no objective measure by which to quantify or monitor chronic pain and escalate care. By comparison to the acute injured worker whose clinical management is largely based on known healing trajectories, participants in our study involve chronic pain that is more complex and likely involves different pain mechanisms altogether - i.e., nociplastic pain (23, 61). The use of the pragmatic-but-limited SF-36 Bodily Pain tool in the present study precluded us from establishing the patient’s chronic pain mechanism(s) (e.g., consult lasting ~2h) the way a detailed pain assessment using contemporary diagnostic criteria would (21, 23). This may explain, at least in part, why biopsychosocial variables showed limited ability to predict chronic pain, raising questions about how chronic pain can be better modelled and understood. One possibility is to integrate assessment of pain mechanisms (nociceptive, neuropathic, and nociplastic (62–64)) with key biopsychosocial variables to develop models that more accurately predict pain outcomes and RTW.

Chronic nociplastic pain is mechanistically distinct from nociceptive pain (e.g., ongoing tissue damage/inflammation), and neuropathic pain (e.g., somatosensory disease/damage) (65). Diagnosing and treating chronic nociplastic pain can be complex, and psychological factors can be prominent. A seminal World Health Organization study (66) showed that chronic pain is consistently associated with psychological challenges (consistent findings across 15 centres; n = 5400; adjusted odds ratio [OR], 4.14 (95% CI: 3.52–4.86). Collectively, this i) precludes reliance on a straight-forward pathology-based assessment, and ii) raises the possibility that assessment of chronic pain mechanism could improve a biopsychosocial-based understanding of chronic pain and thus possibly influence therapeutic approaches.

While discussion of therapeutic strategy is generally beyond the scope of the present observational study, it’s worth noting that our findings seem to be in line with recommendations to deliver pain neuroscience education/pain reprocessing therapy in conjunction with other pain management approaches to decrease pain intensity and disability in adults with chronic pain. For example, Pain Reprocessing Therapy, which aims to promote patients’ reconceptualization of chronic nociplastic pain as a brain-generated false alarm, show promise for lasting meaningful beneficial effect (67).

Taken together, there is conflicting evidence (58, 68, 69) that stepped care would be the best model for participants in the present study who show psychological risk factors coincident with long-term chronic pain, and who may be perceived as ‘past’ care escalation. Further, the limited ability of typical biopsychosocial instruments to predict pain in our study may suggest that assessment of pain mechanism is worthwhile in future research and to ultimately align treatments with underlying pain mechanisms to enhance feasibility of RTW.

Limitations and Future Research

Our study design involved in-person prospective data collection at pain clinics. This environment presented time/patient flow constraints – e.g., limited allowable research time to fully assess pain

mechanism category or work context factors (e.g., the number of COPSOQIII questions was truncated). Several pain clinics we approached declined to participate in research collaboration because of potential disruptions of the study protocol to clinic flow and efficiency. These factors, combined with a patient participant sample that skewed toward a prolonged off-work period (7.8 ± 6.9 years), likely contributed to a small sample size of the RTW group. Ultimately the small sample size makes estimates of the RTW group, as well as RTW-Yes vs. RTW-No comparisons, less reliable and any significant difference findings between groups should be interpreted as exploratory.

Another possible study limitation is that our selection of questionnaires may have biased our results. – e.g., we had less coverage in the social domain (two questionnaires) than the psychological domain (four questionnaires). Nevertheless sample size limitations were countered by study strengths including low dropout rates (12%; 88% retention) and mitigation of non-response bias that can be a limitation in telephone/mail-out survey-based studies in chronic pain (70), versus the in-person data collection approach used herein, and which can be influenced by number of pain co-morbidities (71).

The biopsychosocial model was conceived to challenge clinicians to broaden their view of patients—away from one of objective/biomedical detachment, and toward a view that encompasses the patient experience (38); researchers are similarly challenged to suitably capture/apply biopsychosocial principles (72). In the present study, our measurement instruments and subsequent analyses are certainly imperfect approximations of circular/reciprocal and possibly shifting biopsychosocial dynamics in chronic pain.

CONCLUSION

The present study highlights the need for clinical research into chronic pain- and disability-related patient factors and their impact on RTW in chronic pain patients experiencing prolonged time off work. Our findings further suggest that while disability can be predicted from biopsychosocial variables, pain outcomes are more challenging to model, underscoring the need for improved assessment approaches.

DECLARATIONS

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Author Contribution

All authors reviewed the manuscript and contributed to its conception and study design.

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Data Availability

De-identified data can be made available upon request from the corresponding author.

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TABLE

Table 5 is available in the Supplementary Files section.

Figures

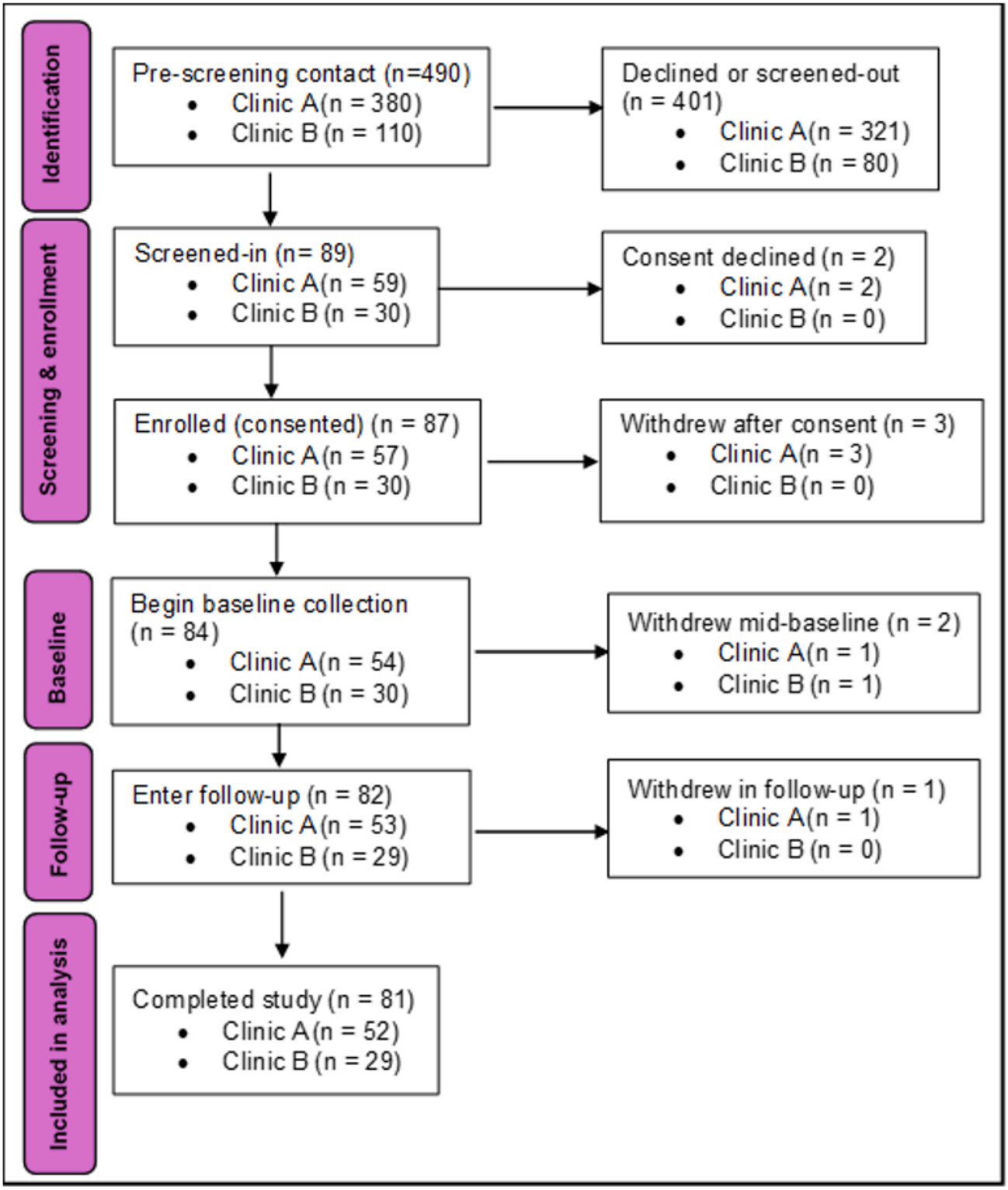


Figure 1

CONSORT flow diagram

Supplementary Files

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- Table5.docx