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Pain prevalence rates and the mediating role of negative affect in adults referred to personality disorder treatment: A cross-sectional study

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ABSTRACT

Personality disorders (PDs) are prevalent among individuals with chronic pain, but less is known about the prevalence of pain in the PD population. This study therefore sought to explore the prevalence of current or everyday pain among individuals referred to outpatient PD treatment, and further explore the mediating role of negative affect in the relationship between PD severity and current pain. Data was retrieved from the Norwegian Network for PDs' quality register which included 4361 participants. Pain was operationalized using the EQ-5D-3L "pain or discomfort" item and four SCL-90-R pain-related items ("pain bothersomeness"). Rates of self-reported pain were explored both pre and post treatment to determine the persistency of the pain-related symptoms. The role of negative affect in the relationship between PD severity and pain was investigated by linear regression analysis. A substantial burden of pain-related symptoms was demonstrated, as 71 % and 80 % reported moderate to extreme pain or discomfort and pain bothersomeness, respectively. Muscle soreness was the most common pain (59 %) followed by headache (48 %), low back pain (46 %), and heart or chest pain (34 %). Moderate to extreme pain or discomfort was persistent for 77 % of the participants who provided end of treatment data (mean treatment duration was 82 weeks). Negative affect mediated the relationship between PD severity and pain. To our knowledge, this is the first large-scale study on everyday pain in patients with PDs. The findings reveal that moderate to extreme pain is prevalent among persons with PDs and that this co-occurrence is driven by negative affect.

Perspective: Pain is a prevalent and potentially underrecognized symptom in personality disorders and persists until treatment termination for a large group of patients. This co-occurrence may be driven by a susceptibility to negative affect that is enhanced by personality disorder features.

Introduction

Personality disorders (PDs) are a group of long-lasting mental disorders that are associated with a vulnerability to developing several somatic health conditions, including pain-related symptoms.[1,2] Up to 70 % of individuals with chronic pain may fulfil the diagnostic criteria for a PD.[3–6] The prevalence of chronic pain in PDs is less known, but one study found that 65 % of participants seeking treatment for borderline PD had a lifetime DSM-IV pain disorder diagnosis.[7] Together, these findings imply that PDs and chronic pain frequently co-occur.

As pointed out by Carpenter et al.,[8] not all pain is chronic. Short-lived or everyday pains may affect 50–89 % of individuals with PDs.[7,9] Pain, both chronic or short-lived, represent potent stressors that may accentuate PD symptomatology and ultimately worsen functional outcomes.[10] Increasing the attention towards everyday pain may thus create a window of opportunity for intervening before the pain becomes chronic.

Most of the research on chronic and everyday pain has focused on

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borderline PD. Although individuals with borderline PD tend to report higher levels of current pain relative to other PDs[9,11,12], it is not necessarily the most prevalent PD within chronic pain samples. Obsessive-compulsive, paranoid, histrionic, and avoidant PDs seem to be equally or even more prevalent in some studies on chronic pain.[6,13–15] As such, both chronic and everyday pain seem to be prevalent but underrecognized symptoms among persons suffering from PDs. The evidence base is still scarce, however, and warrants further investigations in larger samples that also include non-borderline PDs.

Personality disorders, pain, and negative affect

Negative affect is among the most studied psychological factors in chronic pain.[16] A large body of research suggests that negative affect modulates pain perception and is a vulnerability factor for developing chronic pain.[16,17] People with PDs are particularly prone to experiencing negative affect.[18] This vulnerability offers a plausible explanation for why PDs and chronic pain frequently co-occur[3], as well as why people with PDs experience elevated levels of everyday physical pain.[8] This notion is supported by several studies that have found negative affect to mediate the relationship between borderline PD and current pain.[19–22] However, this mechanism has to date not been investigated beyond borderline PD or by using general severity measures for PDs. As the DSM-5 and ICD-11 are moving away from the traditional categorical classifications of PDs, studies investigating pain and PDs in line with these contemporary models are becoming increasingly important. In the DSM-5 Alternative Model for Personality Disorders and the ICD-11, PDs are viewed as dimensional phenomena that exist along a continuum ranging from no personality problems to severe PD.[23,24] Adopting dimensional approaches to assessing PDs may thus offer greater promise in understanding the co-occurrence of PDs and pain-related symptoms.

Aims and hypotheses

The aims of this study were to determine the prevalence rates of current pain-related symptoms in individuals referred to PD treatment and to explore the relationships between PDs, negative affect, and current pain. Our hypotheses were: 1) Individuals referred to PD treatment frequently suffer from pain-related symptoms and 2) the association between PD severity and current pain is mediated by negative affect. To the best of our knowledge, this is the first large-scale study to investigate the prevalence of pain among individuals seeking treatment for PDs.

Materials and methods

Design and study sample

This is a multisite, cross-sectional study on individuals referred to outpatient PD treatment within the Norwegian Network for Personality Disorders (The Network).[25] The Network consists of treatment units across urban and rural areas in the South-East, Mid, and Western health regions of Norway. Data was retrieved from the Network's quality register database which included 5429 individuals referred between 2009 and 2016. At the time of data retrieval, 1068 individuals had not completed the diagnostic assessments, which left 4361 participants eligible for the study. Post treatment data was available for 2214 participants. Of these participants, 1354 provided data on pain bothersomeness and pain or discomfort which allowed us to explore the persistency of the pain-related symptoms following treatment termination.

Collection and transferal of data

The treatment units, quality register, and data collection procedures for the same time period have been described in former publications by the Network.[26] In short, the data collection was paper-based and included both patient-reported and therapist-reported questionnaires. The collected data was transferred anonymously from each treatment unit to a common quality register at Oslo University Hospital. The present study retrieved variables relevant for our research questions. The main analyses were based on the pretreatment assessments following referral. End of treatment data represented the assessments on treatment termination.

Ethics

All participants in the quality register provided written informed consent allowing the use of anonymous data for research purposes. The security procedures for the local data collection, data transferal, and storage at Oslo University Hospital were approved by the Data Protection Officers at the respective hospitals. As the data was anonymous, further approval from the regional ethical committee was not required.

Inclusion and representativeness of study samples

The Network emphasizes user participation on all levels.[25] In the study period (2009–2016), this included running utility evaluations of the assessment instruments in half-yearly meetings with users on the level of treatment units and therapists. Patient involvement was introduced in 2015.

Diagnostic assessments

The diagnostic assessments were performed by trained clinicians at each specialized treatment unit. Regular training courses and seminars on PDs were provided by experienced researchers and psychiatrists within The Network. The diagnostic evaluations followed the principles of the "Longitudinal, Expert, All Data" procedure[27,28] and were based on all available information, including diagnostic interviews supplemented by information in referral letters, self-reported history and complaints, and overall clinical impressions.

The participants were assessed for symptom disorders according to the DSM-IV with the Mini International Neuropsychiatric Interview (M.I.N.I.),[29] and for PDs with the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II).[30] The reliability of the diagnostic evaluation with the SCID-II interview was not investigated for the present study period, but has previously been tested within the Network (period 2004–2008) where acceptable kappa values were obtained.[31]

Instruments

Socio-demographic data include clinician- and patient-reported information on gender, age, educational level (years after compulsory school), occupational status, civil status, and living situation. Gender was clinician-rated with male and female as response alternatives.

Pain severity and pain bothersomeness were assessed by the EuroQoL EQ-5D-3L and by the four pain-related items in the Symptom Check List-90-Revised (SCL-90-R), respectively. EQ-5D-3L is a self-report questionnaire developed to assess health-related quality of life.[32] We used the 4th item which assesses "pain or discomfort" with the following three response alternatives: "I have no pain or discomfort" = 1, "I have moderate pain or discomfort" = 2, and "I have extreme pain or discomfort" = 3.

The SCL-90-R is a 90-item self-report mental health screening questionnaire[33] which includes four pain-related items: "For the past week, how much were you bothered by headaches (item 1), pains in heart or chest (item 12), pains in lower back (item 27), or soreness (item 42) (in the Norwegian version: 'aching or tenderness') of your muscles?". Each item is rated on a five-point scale with the following response alternatives: "Not at all" = 0, "a little bit" = 1, "moderately" = 2, "quite a bit" = 3, "extremely" = 4. The response alternatives of the four SCL-90-R pain-related items were dichotomized for the prevalence

rate presentations so that only levels 2–4 (i.e., moderate to extreme) qualified as having meaningful pain. Thus, we avoided including mild or insignificant pain in the prevalence estimates. For the regression analysis we constructed a variable by averaging the four pain items from the SCL-90-R which we termed "pain bothersomeness". Missing data on any of the four items were coded as missing on the pain bothersomeness variable.

The psychometric properties of this four-item pain bothersomeness subscale were assessed using confirmatory factor analysis and were deemed satisfactory: RMSEA = .049, 90 % *CIs* = .034, .067, CFI = .993, TLI = .979, SRMR = .014. Omega reliability was .712, 90 % *CIs* = .701, .723. The construct validity was assessed using one-way ANOVA comparing mean pain bothersomeness across the three levels of the EQ-5D-3L "pain or discomfort" item which served as three groups, i.e., "no pain or discomfort" (n = 1217), "moderate pain or discomfort" (n = 2346), and "extreme pain or discomfort" (n = 585). The analysis revealed significant mean group differences in the predicted direction with pain bothersomeness being highest in the extreme pain or discomfort group (M = 2.51, SD = 0.88), intermediate in the moderate pain or discomfort group (M = 1.71, SD = 0.88), and lowest in the no pain or discomfort group (M = 0.82, SD = 0.73): $F(2, 4145) = 889.32$, $p < .001$, $\eta^2 = .300$. All group differences were statistically significant at the $p < .001$ level, using Games-Howell post-hoc tests. In addition, among those who reported moderate to extreme pain or discomfort in the EQ-5D-3L (n = 2943), 89 % reported moderate to extreme levels in at least one pain bothersomeness item (i.e., headache, heart or chest pains, low back pains, or muscle soreness). This provided additional support for the construct validity of the pain bothersomeness scale.

PD severity was operationalized using the number of fulfilled SCID-II criteria as a dimensional measure for PD severity in line with previous recommendations.[18,34] We did not include the adolescent antisocial PD criteria, leaving 79 as the maximum score for the variable.

Negative affect was operationalized using the 9-item version of the SCL-90-R Global Severity Index (SCL-K-9).[35,36] We chose to use this version as an index of negative affect rather than the full scale to avoid statistical dependencies with the pain bothersomeness subscale. Cronbach's alpha for the SCL-K-9 in the current sample was .81, 95 % *CIs* = .81, .82.

Statistical analyses

The statistical analyses were performed using SPSS version 29[37] and RStudio version 4.2.3[38] for Windows. To explore differences between the participants with and without pain or discomfort, we divided the sample into two groups based on their EQ-5D-3L responses. Specifically, the moderate and extreme response alternatives were collapsed into one "Pain or discomfort" group while the participants endorsing no pain or discomfort were allocated to the "No pain or discomfort" group. Group comparisons were performed using Independent Samples t-tests for continuous variables and Chi-Square Tests of Independence for categorical variables. With a total of 23 statistical comparisons, the alpha level was set to $p \leq .002$.

The relationships between PD severity, negative affect, and pain bothersomeness were explored in a mediation model using the "lavaan" package.[39] From a total of 4361 participants, 3642 provided complete data across age, gender, PD severity, negative affect, and pain bothersomeness. Missingness was assessed using the "naniar" package[40] and found to be missing completely at random (p = .517). Missing data was handled using full information maximum likelihood estimation. All regressions were adjusted for age and gender. Bootstrapped 95 % confidence intervals with 1000 samples for the standardized solution of the indirect effect were obtained using the "semhelpinghands" package.[41] Unstandardized (b) and standardized (β) beta coefficients are reported.

It should be noted that the dataset had additional variables that could have been included in the analyses. Some variables were excluded for being based on non-validated questionnaires or having low correlations with the outcome variable ($r < .10$). Employment status was excluded as a covariate because it could rather be a consequence of both the independent variable (PDs) and the dependent variable (pain). To foster transparency for this selection process, we have included a table with sample characteristics for the excluded variables in Table S1 and present Pearson correlations between pain bothersomeness and the excluded variables in Table S2.

Results

Sociodemographic and clinical characteristics

Mean age of the total sample was 33.0 (SD = 10.1) years and 75 % were female. Sixty one percent reported to be single and 53 % to be unemployed. Sixty-eight percent of the study sample met the criteria for one or more PDs. Avoidant (29 %), borderline (21 %), and NOS (17 %) were the most common PD diagnoses. The average number of fulfilled PD criteria (reflecting PD severity) was 9.7 (SD = 6.4). A large majority of the sample reported one or more adverse experiences during childhood and adolescence (69 %). Anxiety disorders (41 %), unipolar depressive disorders (56 %), and PTSD (12 %) were the most prevalent symptom disorders. Separate sociodemographic and clinical characteristics for the participants with no or moderate to extreme pain are presented in Table 1. Sociodemographic and clinical characteristics for the total sample are reported in Supplementary Table S3. Exploratory group comparisons between participants with above or below threshold PDs were additionally conducted and are reported in Supplementary Table S4.

Pain prevalence rates

The prevalence of pain when referred to PD treatment was high with 71 % reporting moderate to extreme pain or discomfort and with 80 % reporting moderate to extreme pain bothersomeness in at least one location. Muscle soreness was the most common location, followed by headache, low back, and heart or chest pain. There was a small difference between the participants above or below the PD threshold in terms of pain bothersomeness: Mean group difference: 0.15, 95 % *CIs* = 0.08, 0.21, $t(4217) = 4.41$, p = <.001, Cohen's d = 0.145 (Table S4). See Table 2 for a more detailed presentation of the pain rates in the total sample.

Among the participants with pretreatment moderate to extreme pain or discomfort (n = 2943), 77 % still reported this at treatment termination (n = 759). The proportions of participants reporting moderate to extreme pain bothersomeness for the same location both pre and post treatment were 66 % for muscle soreness (n = 542), 58 % for low back pain (n = 365), 58 % for headaches (n = 384), and 40 % for heart or chest pain (n = 177). Mean treatment duration was 82 weeks (SD = 66), and for 96–98 % of the participants, the assessments were collected more than three months apart.

We further investigated the possibility for selection bias among the participants who provided post treatment data by performing a set of post-hoc exploratory independent samples t-tests comparing baseline characteristics of those with post treatment data (n = 2214) to those without (n = 2147). The two groups did not differ in baseline pain bothersomeness (p = .803), negative affect (p = .704), or PD severity (p = .247), but differed marginally in age by 1.2 years: Cohen's d = .117, $p < .001$.

Predictors of pain bothersomeness

Pearson correlations between pain bothersomeness and the investigated predictors are presented in Table 3. The strongest associations emerged for negative affect followed by gender. Number of paranoid, borderline, avoidant, and obsessive-compulsive PD criteria are additionally included in the table to allow for comparisons of the

Table 1
Demographic and clinical characteristics across participants with and without moderate to extreme pain or discomfort.

	No pain or discomfort		Pain or discomfort			
	n	%, *M* (*SD*)	*n*	%, *M* (*SD*)	*d, Phi*	*p*
Age	1222	30.9 (9.1)	3139	33.9 (10.2)	.308	<.001
Gender					.107	<.001
Females	819	67 %	2431	77 %		
Males	403	33 %	708	23 %		
Civil status					.065	<.001
Married/cohabiting	413	34 %	1224	41 %		
Single	803	66 %	1767	59 %		
Employment status					−.137	<.001
Working/studying	699	58 %	1268	43 %		
Unemployed	505	42 %	1686	57 %		
Years education after obligatory school	1192	4.2 (2.6)	2928	4.0 (2.7)	.053	.122
Personality disorders	1222		3139			
Schizoid	6	1 %	13	0 %	−.005	.729
Schizotypal	9	1 %	13	0 %	−.020	.177
Paranoid	62	5 %	251	8 %	.051	<.001
Antisocial	15	1 %	36	1 %	−.003	.824
Narcissistic	2	0 %	19	1 %	.029	.058
Borderline	246	20 %	678	22 %	.016	.287
Histrionic	1	0 %	5	0 %	.009	.535
Avoidant	341	28 %	917	29 %	.013	.392
Obsessive-compulsive	49	4 %	202	6 %	.048	.001
Dependent	38	3 %	126	4 %	.021	.159
Not otherwise specified	205	17 %	551	17 %	.009	.542
Number of PDs	1222		3139		.061	<.001
No PD/subthreshold PD	422	35 %	967	31 %		
One PD	688	55 %	1693	54 %		
Two or more PDs	132	11 %	479	15 %		
PD severity	1065	9.1 (6.1)	2745	9.9 (6.6)	.125	<.001
Symptom disorders	1189		3015			
Depressive disorders	628	53 %	1719	57 %	.038	.014
Anxiety disorders	484	41 %	1251	42 %	.007	.641
PTSD	74	6 %	442	15 %	.116	<.001
Negative affect	1198	1.5 (0.8)	2922	2.0 (0.8)	−.638	<.001
Treatment duration (weeks)	849	79.6 (64.8)	2215	82.2 (66.4)	.038	.343

Symptom disorders are based on M.I.N.I International Neuropsychiatric Interview screening. Anxiety disorders include panic disorder, agoraphobia, social phobia, obsessive compulsive disorder, generalized anxiety disorder, unspecified anxiety, and specific phobia. Depressive disorders include major depressive disorder, depression not otherwise specified, and dysthymia. Negative affect is assessed by the SCL-K-9. Abbreviations: SCL-90-R = Symptom Check List-90-Revised, *M* = mean, *SD* = standard deviation. Effect sizes are presented as Cohen's *d* for continuous variables and Phi for categorical variables.

associations between pain bothersomeness and the number of individual PD diagnoses against the total number of PD criteria (i.e., PD severity). Number of borderline PD criteria had slightly stronger associations to pain bothersomeness than PD severity.

The relationships between PD severity, pain bothersomeness, and negative affect were investigated in a mediation model adjusted for age and gender. Personality disorder severity significantly predicted pain bothersomeness (path *c*/total effect): unstandardized $b = 0.024$, $\beta = .158$, $p < .001$ and negative affect (path *a*): unstandardized $b = 0.044$, $p < .001$, while negative affect significantly predicted pain bothersomeness (path *b*): unstandardized $b = 0.618$, $p < .001$. The indirect effect was significant (path *ab*): unstandardized $b = 0.027$, $\beta = .176$, 95 % bootstrap *CIs* for the standardized solution = .158, .192. The association between PD severity and pain bothersomeness was no longer

Table 2
Pain or discomfort and pain bothersomeness in the total sample.

	n	%	*M* (*SD*)
Pain or discomfort	4165		
None	1222	29	
Moderate	2355	57	
Extreme	588	14	
Mean pain bothersomeness	4146		1.6 (1.0)
Pain bothersomeness items	4219		
Headache	2018	48	1.6 (1.3)
Heart or chest pain	1423	34	1.1 (1.3)
Low back pain	1925	46	1.6 (1.5)
Muscle soreness	2485	59	2.0 (1.5)
Number of concomitant pain locations	4219		
0	844	20	
1	883	21	
2	960	23	
3	893	21	
4	566	13	

Pain or discomfort = EQ-5D-3L item 4. Mean pain bothersomeness = mean of the four SCL-90-R pain-related items. Pain bothersomeness item percentages are based on ratings ≥ 2 on pain bothersomeness with a scale from 0 to 4. *M* = mean, *SD* = standard deviation.

Table 3
Exploratory Pearson correlations between investigated predictors and pain bothersomeness.

	R	*n*
Age	.053**	4146
Gender	.214**	4146
PD severity	.147**	3642
Paranoid PD	.114**	3642
Borderline PD	.158**	3642
Avoidant PD	.053**	3642
Obsessive-compulsive PD	.093**	3642
Negative affect	.528**	4058

PD diagnoses with prevalence rates below 5 % were excluded from the table. Negative affect was assessed using the SCL-K-9. Abbreviations: PD = personality disorder.
** p < .001 level.

significant when including the mediator (path *c*′): $b = -0.003$, $p = .231$. The mediation model was significant, $p < .001$ and explained 29.6 % of the variance in pain bothersomeness. Fig. 1 depicts the standardized beta coefficients for each path in the mediation model.

An alternative mediation model was additionally tested by switching the position of the mediator and the dependent variable while keeping PD severity as the predictor and age and gender as covariates. This greatly reduced the mediation effect: unstandardized $b = 0.009$, $\beta = 0.073$, p < .001, 95 % bootstrap *CIs* for the standardized solution = .059, .092 which in turn strengthened our initial hypothesized mediation model.

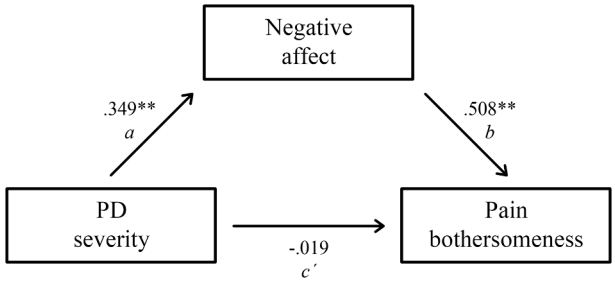

Fig. 1. Mediation model predicting pain bothersomeness. ** p < .001. Standardized beta coefficients adjusted for age and gender are displayed. Abbreviations: PD = personality disorder. Letters *a*, *b*, and *c*′ refer to the mediation paths.

Predictors of pain or discomfort

We further repeated the correlation and mediation analyses reported in the previous section by replacing pain bothersomeness with the EQ-5D-3L "pain or discomfort" item as the dependent variable. These results are presented in Supplementary Table S5 and Supplementary Fig. 1. In short, the effects were largely replicated, albeit with lower magnitudes. As with pain bothersomeness, the indirect effect was greatly reduced when the order of the dependent variable and mediator were switched (Supplementary Fig. 1).

Discussion

To our knowledge, this is the first large-scale study to explore the prevalence of pain-related symptoms and the mediating role of negative affect in individuals referred to outpatient PD treatment. Our results revealed substantial rates of moderate to extreme pain bothersomeness as well as pain or discomfort pretreatment. These symptoms persisted following treatment termination for a large group of individuals. The results indicate that everyday pain-related symptoms are prevalent and long-lasting for individuals with personality problems. The relationship between PD severity and pain-related symptoms dissipated when negative affect was included as a mediator.

Prevalence and characteristics of pain

Our prevalence rates align with three prior studies in PD samples.[7,9] Biskin et al.[9] compared inpatients with borderline PD to inpatients with other PDs and found that 80 % of the subjects with borderline PD reported pain the past 24 h compared to 50 % of the subjects with other PDs. On average, the group with borderline PD had moderate pain, while those with other PDs had mild pain.[9] Similarly, Bitran et al.[12] assessed pain in the past 24 h once every second year for 8 years in individuals with PDs and found again that participants with borderline PD reported moderate pain, while those with other PDs reported mild pain. Importantly, these pain ratings were consistent over time which aligns with the persistency of the pain-related symptoms observed in our study. Lastly, Heath et al.[7] found that 89 % of outpatients with borderline PD reported current pain, with 19 % rating their pain as mild, 48 % as discomforting, 13 % as distressing, 7 % as horrible, and 2 % as excruciating. Moreover, 65 % of the sample had a lifetime pain disorder diagnosis.[7]

Far more studies exist on the prevalence of PDs in chronic pain samples. Here, PD prevalence rates between 13 % and 70 % have been reported.[3–6] For example, one large study on individuals referred to multidisciplinary pain management for chronic work-related spinal injuries found that 70 % fulfilled the criteria for PDs.[6] This study employed gold standard diagnostic assessments with SCID-II for PDs which strengthened their findings.

Borderline, paranoid, histrionic, avoidant, and obsessive-compulsive PDs are generally the most frequent PDs in chronic pain samples, but between-study inconsistencies exist.[6,13–15] In the present study, avoidant, borderline, and NOS PDs were the most prevalent diagnoses irrespective of pain status, while paranoid and obsessive-compulsive PDs had significantly higher rates in the Pain or discomfort group. The effect sizes, however, were negligible. Thus, specific PD diagnoses had limited utility in predicting pain status.

Negative affect and its relationship with PD severity and pain

We found that the relationship between PD severity and our measures of pain-related symptoms were mediated by negative affect, and that the associations between PD severity and the pain-related symptoms disappeared when negative affect was included as a mediator. The total effect of PD severity on pain bothersomeness was small which implies that there may not be a distinct connection between PDs and current pain, but rather that individuals with PDs frequently experience negative affect which in turn is a vulnerability factor for pain. In other words, negative affect seems to reflect primary modulatory influences on pain, while PD traits indirectly contribute to pain via increased negative affect. This notion may also explain why PDs frequently co-occur in patients with chronic pain while PD severity at the same time only was modestly correlated with pain-related symptoms in our study.

The present study replicates prior findings of negative affect mediating the relationship between borderline PDs and current pain.[19–22] However, the present study is the first to demonstrate this mechanism using a general severity measure for PDs. Moreover, prior studies have been limited to chronic pain or student samples and used screening instruments to assess borderline PD.[19–22] Our sample consisted of individuals diagnosed with PDs using comprehensive clinical interviews. The present study therefore strengthens the evidence for the mediating role of negative affect in the relationship between PDs and current pain-related symptoms.

Number of borderline PD criteria showed the strongest association with pain bothersomeness, even slightly above PD severity. It is therefore possible that borderline PD criteria accounted for most of the variance in the association between PD severity and pain. This explanation is line with evidence suggesting that borderline PD criteria may be sufficient for capturing overall PD severity.[42,43] Although our findings lend some support for a stronger connection between borderline PD and current pain, it remains an open question whether it is borderline PD as a diagnostic category or certain borderline PD traits (e.g. affective instability) that drives this relationship.[3] One way forward would be to explore the associations between individual PD criteria and pain, but this was beyond the scope of our study.

Strengths and limitations

The large study sample derived from several mental health treatment units across urban and rural areas of Norway is highly representative for individuals referred to outpatient PD treatment. However, the observational and cross-sectional nature of our design precludes us from drawing firm conclusions on any causal relationships. Further, the study was based on available data from a quality register and our hypotheses were for that reason generated after data collection.

Operationalizing pain using the SCL-90-R and the EQ-5D-3L prevented us from assessing chronic pain in accordance with the IASP definition (i.e., pain persisting for more than three months).[44] The EQ-5D-3L assesses current pain or discomfort, while the SCL-90-R assesses pain bothersomeness during the past week. That said, post treatment data indicated that pain (or discomfort) still was persistent for a large majority of the sample. In fact, for 96–98 % of the participants with available data on both timepoints, the assessments were taken more than three months apart. There was, furthermore, no serious evidence of selection bias between the participants who provided post treatment data and those who did not.

"Pain bothersomeness" was operationalized by constructing a novel subscale using the four pain-related items in the SCL-90-R. The scale showed sufficient reliability and validity in our preliminary analyses, but the results from the regression analyses must still be interpreted with caution until replicated in different samples. Self-reported symptoms also carry the risk of inflated correlations when they are rated by a common questionnaire.[45] To accommodate this limitation, we performed a corresponding mediation analysis using the EQ-5D-3L "pain or discomfort" item as the dependent variable. A similar effect was obtained, albeit with lower magnitudes, which strengthened our results. We attribute the lower effect size of "pain or discomfort" to the restricted variability caused by the three-level response alternatives which previously have been found to cause floor/ceiling effects.[46,47]

The SCL-90-R pain-related items were limited to only four pain locations, and the EQ-5D-3L item "pain or discomfort" did not distinguish individuals suffering from pain versus discomfort. The latter was shown

in one study on individuals seeking outpatient dermatological care were the participants who endorsed moderate to severe EQ-5D-3L pain or discomfort had both pain-related symptoms such as hidradenitis suppurativa and non-painful symptoms such as prurigo.[48] That said, the two instruments showed high convergence in our initial validation analysis of the pain bothersomeness scale which suggests that both operationalizations tapped into meaningful aspects of current or everyday pain. Altogether, these findings strengthen the assumption that current and long-lasting pain is prevalent among persons suffering from above or below-threshold PDs.

Lastly, the quality register only included "male" and "female" response options. This prevented us from capturing data on gender-diverse individuals which restricts the generalizability of our findings to non-binary populations. The study also lacked race and ethnicity data which further limits the generalizability in this regard. We acknowledge that these shortcomings not only reflect statistical limitations but also an ethical responsibility to strive for greater inclusivity in research.

Future research

Future research should explore whether co-occurring pain can interfere with treatment outcomes in PDs. This line of research could encourage clinicians to consider appropriate pain management interventions for individuals with co-occurring pain in PD treatment. Moving beyond the traditional diagnostic categories by incorporating dimensional models of PDs may be the way forward to elucidating the underlying mechanisms driving the increased rates of both chronic and everyday pain in PDs. This may allow pain researchers to identify transdiagnostic personality traits that influence pain experiences which in turn may uncover whether prevalent PDs in chronic pain samples (e.g., paranoid, obsessive-compulsive, and borderline PDs) share certain traits that increase the risk for either chronic or everyday pain.

Conclusion

Prior research on the associations between PDs and current pain has to a large extent involved chronic pain samples. The present study is the first large-scale study to demonstrate that a substantial proportion of individuals referred to PD treatment report moderate to extreme levels of current pain-related symptoms. Our sample included a broad range of PDs and severity levels, thus rendering our findings generalizable across PDs. We also demonstrate that negative affect mediates the relationship between PDs and pain which indicates that individuals with PDs may be susceptible to pain by being prone to negative affect.

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Declaration of Competing Interest

The authors report no conflicts of interest in this study.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jpain.2024.104724.

Data availability

Due to restrictions imposed by the Regional Medical Ethics Committee regarding patient confidentiality, data are available upon request. Requests for data may be sent to the hospital's Privacy and Data Protection Officer at: personvern@ous-hf.no.

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