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RESEARCH REPORT

Catastrophising, pain, and disability in patients with nonspecific low back pain

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KEYWORDS
catastrophising;
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pain

Abstract *Background:* Attention has been drawn to examining the contributions of "catastrophising" to the prediction of pain and disability in individuals with low back pain (LBP).
Objectives: This study investigated the proportion of patients with LBP who engaged in catastrophic thinking about pain and its association with pain intensity and disability. We also investigated the components of pain catastrophising that is predictive of disability.
Methods: A total of 275 participants with nonspecific LBP completed the Pain Catastrophizing Scale, the quadruple visual analog scale, and the Revised Oswestry Disability Questionnaire (RODQ). The associations among pain intensity, disability, and catastrophising were investigated using *t* test. The components of catastrophising that best predicts disability were investigated using multiple linear regressions, and the level of significance was set at 0.05.
Results: The majority (85.5%) of the participants had LBP for more than 6 weeks, with 45.5% of the participants having moderate disability and 52.7% being high catastrophisers. High catastrophisers to pain had a significantly higher rating of pain intensity ($p < 0.001$) and higher score on the RODQ than low catastrophisers to pain. The main components of catastrophising that predicts disability were magnification ($p < 0.001$) and rumination ($p = 0.006$).
Conclusion: Clinicians should screen patients with nonspecific LBP for a heightened level of catastrophic thinking and endeavour to manage such when present.

Background

Nonspecific low back pain (NSLBP) is pain between the costal margins and the inferior gluteal folds, usually accompanied by painful limitation of movement, often influenced by physical activities and posture, and which may be associated with referred pain in the leg; moreover, this pain is not related to such conditions as fractures,

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spondylitis, direct trauma, or neoplastic, infectious, vascular, metabolic, or endocrine-related processes [1]. NSLBP accounts for 85% of back pain [2]. Chronic NSLBP is one that persists for at least 12 weeks, and this is mostly the case in a large proportion of patients with NSLBP [3]. Acute and subacute NSLBP have durations of $\leq$6 and 12 weeks, respectively. Management of low back pain (LBP) is a challenge for healthcare professionals as well as the healthcare system as a whole [4]. This may be associated with the high incidence and prevalence rates of LBP, as approximately 62–85% of adults experience LBP during their lifetime [5,6]. Patients with LBP often suffer from physical discomfort and functional limitations that might result in disability and suboptimal quality of life [6]. LBP can interfere with activity that ranges from basic activities of daily living such as walking and dressing to many work-related functions. It seems obvious that pain intensity (either chronic or acute) determines disability in patients with LBP; however, studies [4,7] have shown that the intensity of pain and the degree of disability do not correlate well, and both are associated with different risk factors [1].

Increased attention has been drawn to examining the contributions of "catastrophising" to the prediction of pain and disability in individuals suffering from chronic pain. Catastrophising has been broadly defined as an exaggerated negative orientation toward pain stimuli and pain experience [8,9]. Numerous clinical and experimental investigations in countries other than Nigeria have shown that catastrophising is associated with heightened pain experience [8,10–12]. A relationship between catastrophising and pain has been observed in several populations including patients with acute or chronic LBP [10]. A number of studies from cultures different from those of Nigeria have shown that measures of catastrophising are significantly correlated with objective and subjective measures of disability [11–14].

There is a dearth in documentary evidence on exaggerated negative orientation towards pain stimuli and pain experiences in patients with musculoskeletal pain (LBP inclusive) in Nigeria. Some studies [15,16] have reported negligible ethnic and racial differences in response to chronic pain when participants are closely matched on confounding variables such as sex and marital status. Furthermore, anecdotal information has revealed that certain tribal groups in Nigeria treat pain catastrophising as an alien concept or taboo. If there are no ethnic and racial differences in catastrophic thinking to pain, interventions used in minimising catastrophic thinking to pain is expected to be effective across racial and ethnic boundaries. It is noteworthy that although catastrophising is not acceptable as a regular behaviour trait, its presence is worsened by pain and manifests in the form of activity limitation [10]. This study, therefore, investigated the proportion of LBP patients who engage in catastrophic thinking to pain and its correlation with pain intensity and disability. We also investigated the components of catastrophising that is predictive of disability because knowledge of the predictor of pain catastrophising may be necessary to help tailor interventions for NSLBP (either acute or chronic) that may facilitate positive rehabilitation outcome. This study was anchored on the hypothesis that pain intensity and disability would not be significantly associated with extent of catastrophising in patients with NSLBP.

Methods

Study population and design

The sample size was determined using data from a previous study [17], where the proportion of the population of LBP patients was 0.62, and assuming an alpha of 0.05 and beta of 0.10 and a two-tailed test at a precision of 0.06. It was necessary to involve at least 252 participants in the study using the Kish [18] formula for estimating proportions. This study was designed as cross-sectional, documenting the proportion of patients who engage in catastrophic thinking to pain among patients receiving treatment for low back pain (NSLBP) at the physiotherapy outpatient clinic of the Federal Medical Centre Abeokuta and the State Hospital Ijaye Abeokuta. Participants were all consecutive patients (18 years of age) who had been diagnosed to have LBP of a nonspecific aetiology and were receiving treatment at the physiotherapy outpatient clinic between November 2012 and October 2013. Participants with evidence of red flags were excluded from this study. Participation in the study was totally voluntary, and the participants were asked to complete the Pain Catastrophizing Scale (PCS), the quadruple visual analogue scale (QVAS), and the Revised Oswestry Disability Questionnaire (RODQ) via interviews after their informed consent had been obtained. Ethical approval for the study was obtained from the Federal Medical Centre Health Research Committee. All procedures were conducted with strict adherence to the principles outlined in the Declaration of Helsinki.

The sociodemographic variables obtained in this study were sex, age, marital status, religious affiliation, and educational status. Marital status was categorised as married, single, divorced, and widowed. Educational status was divided into four levels: no education, primary education, secondary education, and tertiary education. The main anthropometric parameters measured were weight and height of the participants. The duration of NSLBP was measured as less than 6 weeks for acute pain, between 6 and 12 weeks for subacute pain, and more than 12 weeks for chronic pain.

Research questionnaires

The PCS was used to measure the degree of catastrophic thoughts about pain. Sullivan et al [9] developed the scale with three dimensions of pain catastrophising *vis-à-vis* rumination, magnification, and helplessness. This 13-item 5-point Likert scale has scores ranging from 0 (not at all) to 4 (all the time), relating the items to the past painful experience. Separate subscores for the dimensions (range, rumination 0–16; magnification 0–12; and helplessness 0–24 points) or a total score (range, 0–52 points) can be calculated for the PCS. Higher scores denote a higher degree of catastrophising. A score of 26 differentiates between high and low scores [9]. The PCS has been shown to have adequate to excellent internal consistency (Cronbach coefficient alpha: total PCS = 0.87, rumination = 0.87,

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magnification = 0.66, and helplessness = 0.78) [19]. The MCID for the PCS has been found to range from 3.2 to 4.5 in patients undergoing cognitive behavioural therapy for pain catastrophising [20].

The QVAS was used to assess pain intensity. This scale measures pain intensity at four levels; "pain right now", "average pain", "best pain" and "worst pain". It consists of four visual analogue scales. Each scale consists of a line that is 10 cm long, the ends of which are marked with the extreme states of the items being measured [21]. For the purpose of this research, the worst pain subscale was used for analysis. The QVAS was preferred for data collection over the conventional visual analogue scale, because it easily elicits the appropriate response in cases of pain intensity that varies with time.

The RODQ was used to measure limitation in activity associated with NSLBP. It is based on 10 sections with six levels each, assessing the limitation of various activities of daily living [22,23]. The range of possible values is from 0 (the best health state) to 100 (the worst health state). Scoring of this questionnaire was done to compute the disability index percent (DIP). For each section of the questionnaire, the total possible score is 5. The first statement was scored 0, and consecutive statements were scored from 1 to 5. The total score was then divided by the total possible score and expressed in percentage to produce the DIP. The DIP is interpreted as follows: 0–20%, minimal disability; 21–40%, moderate disability; 41–60%, severe disability; 61–80%, crippled; 81–100%, bed-bound or exaggerated symptoms. The RODQ was administered by interview to the participant. The MCID for the RODQ has been found to range from 11 to 12.8 in patients undergoing lumbar spine surgery [24].

Statistical analysis

Data summary and analysis were done using the Statistical Package for Social Sciences version 17 (SPSS Inc., Chicago, IL, USA). Descriptive statistics of frequency distributions, mean, standard deviation, and percentages was used in summarising the sociodemographic and clinical characteristics of the participants. The proportion of patients presenting with NSLBP who engaged in catastrophic thinking was also investigated using the frequency distribution tables. The association among pain intensity, disability, and catastrophising was investigated using t test. The components of catastrophising that best predicts disability was investigated using multiple linear regressions (enter method), and the collinearity diagnostics (variation inflation factor) of the predictor variables were reported. The level of significance was set at 0.05.

Results

A total of 280 patients with NSLBP were invited to participate in this study, of which 275 participated—thus giving a response rate of 96.4%. The mean age of the participants was 51.6 ± 13.4 years. Less than half of the respondents (40%) were male, and more than half had tertiary education (56.4%). The majority (85.5%) was of the Yoruba tribe, and 73.3% were married. More than half of the participants were Christians (63.6%), and the majority (75.6%) belonged to the white-collar social class. The frequency distribution of social and demographic characteristics of respondents is presented in Table 1. The majority (85.5%) of the respondents had LBP for more than 6 weeks, with 45.5% of the participants having moderate disability. It was noted that less than half (47.3%) of the respondents were low catastrophisers of pain (Table 2). The mean PCS value was 24.0 ± 10.4, whereas the mean score on RODQ was 37.0 ± 16.0. On average, participants rated their worst level of pain as 7.4 ± 1.9.

High catastrophisers to pain had significantly higher rating of pain intensity ($p < 0.001$, $t = 5.95$) than low catastrophisers to pain. High catastrophisers to pain also had significantly higher scores on the RODQ ($p < 0.001$, $t = 5.56$). Table 3 shows the association among the extent of catastrophising, pain, and functional disability. The main components of catastrophising that predicts disability were magnification ($\beta = 0.28$, $p < 0.001$) and rumination ($\beta = 0.18$, $p = 0.006$) in a model with a coefficient of determination (R^2) of 0.226 (Table 4). Moreover, the variation inflation factors of the predictor variables were all less than 4, showing no multicollinearity. On the association between different duration of pain and catastrophising, subacute and chronic NSLBP was significantly more associated with catastrophising, and high catastrophisers had significantly higher pain intensity; however, this trend was not observed among participants with acute NSLBP, as they had heightened pain intensity and low catastrophising status (Table 5).

Discussion

The findings of the present study show that slightly more than half of the participants are high catastrophisers. This

Table 1 Sociodemographic characteristics of participants.

Variable	Characteristics	Frequency ($n = 275$)	Percentage (%)
Sex	Male	110	40.0
	Female	165	60.0
Educational status	None	10	3.6
	Primary	55	20.0
	Secondary	25	9.1
	Tertiary	155	56.4
	Others	30	10.9
Tribe	Yoruba	235	85.5
	Hausa	25	9.1
	Igbo	5	1.8
	Others	10	3.6
Marital status	Single	65	23.6
	Married	201	73.1
	Widowed	9	3.3
Religion	Christianity	175	63.6
	Islam	100	36.4
Social class	White collar	215	78.2
	Blue collar	15	5.5
	Self-employed	45	16.4

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Table 2 Clinical characteristics of participants.

Variable	Characteristics	Frequency (n = 275)	Percentage (%)
Duration of pain	Less than 6 wk	10	3.6
	Between 6 and 12 wk	30	10.6
	More than 12 wk	235	85.5
Pain catastrophisers	Low catastrophisers	145	52.7
	High catastrophisers	130	47.3
Extent of disability using RODQ Scores	Mild disability	45	16.4
	Moderate disability	125	45.5
	Severe disability	80	29.1
	Crippled	10	3.6
	Bedridden or catastrophising	5	1.8

RODQ = Revised Oswestry Disability Questionnaire.

Table 3 Association among the extent of catastrophising, pain and functional disability.

Variable	Characteristics	Mean ± SD	t	p
Pain	Low catastrophisers	6.7 ± 2.1	5.95	<0.001
	High catastrophisers	8.0 ± 1.5		
Disability	Low catastrophisers	32.3 ± 14.1	5.56	<0.001
	High catastrophisers	42.7 ± 16.3		

SD = standard deviation.

may imply that high catastrophisers to pain are less than 50% in the general population, as it is popularly accepted that hospital-based proportion estimates are higher than the population-based estimates. Sullivan et al [25] showed that catastrophising contributed to increased levels of pain and disability. In this study, pain catastrophising was significantly associated with increased activity limitation as assessed by the ROQD. Furthermore, high scores on the PCS were significantly associated with greater pain intensity, and subacute and chronic duration of LBP were more associated with high extent of catastrophising. Previous studies have shown a similar relationship in different populations of patients who are not Nigerians [26,27]. The present study revealed that Nigerians also exhibit catastrophic thinking to pain. More importantly, this study has confirmed that pain catastrophising is associated with LBP and LBP-related disability in a Nigerian population. Anecdotal information that regards pain catastrophising as alien to Nigerians may not be accurate. This also corroborated by Edwards et al [15], who reported that patients with chronic pain experienced catastrophic thinking to pain irrespective of ethnic or racial peculiarity.

Pain-related disability and catastrophising

The present findings suggest that after an episode of NSLBP, patients who engage in catastrophic thinking about their

Table 4 Components of catastrophising that predicts disability.

	Unstandardised beta coefficient	Standardised beta coefficient	t	Variation inflation factor	p	Lower CI	Upper CI
Constant	19.94	—	7.79	—	<0.001	14.900	24.970
Rumination	0.77	0.18	2.79	1.45	0.006	0.227	1.321
Magnification	1.37	0.28	4.42	1.34	<0.001	0.758	1.979
Helplessness	0.35	0.13	1.85	1.59	0.066	−0.023	0.716

R^2 = 0.226, F = 25.35, $p < 0.001$.
CI = confidence interval.

Table 5 Association between extent of catastrophising and different stages of NSLBP.

Variable	Characteristics	Frequency	Mean ± SD	t	p
Acute NSLBP	Low catastrophisers	10	9.5 ± 0.5	NA	NA
	High catastrophisers	NA	NA		
Subacute NSLBP	Low catastrophisers	15	4.7 ± 2.0	5.61	<0.001
	High catastrophisers	15	8.7 ± 2.0		
Chronic NSLBP	Low catastrophisers	120	6.8 ± 1.9	5.50	<0.001
	High catastrophisers	115	8.0 ± 1.4		

NA = not available; NSLBP = nonspecific low back pain; SD = standard deviation.

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pain may face greater challenges in overcoming pain-related disabilities. This agrees with the research outcomes of Sullivan et al [25], and contradicts the work of Foster and Delitto [28]. Sullivan [29] reported that catastrophising accounted for almost 30% of the variance in patients' rating of their disability, with the remaining percentage being accounted for by pain and other factors. The outcome of this research also suggests that catastrophic thinking to pain may be influenced by disability. Foster and Delitto [28] posited that psychological factors such as pain catastrophising, depression, and fear avoidance were not significantly associated with disability when all independent factors were controlled for. Smeets et al [27], in a randomised, controlled trial, nevertheless revealed that targeting pain catastrophising during treatment of patients with chronic NSLBP enhanced reduction in pain and disability, hence concluding that pain catastrophising was significantly associated with the level of disability. The biopsychomotor model of pain [30] describes disability as a behaviour that can be communicative or protective, with the communicative behaviour manifesting as catastrophising and protective behaviour manifesting as fear avoidance. Disability behaviours have been shown to have a linear relationship with pain-related disability [30]. In the authors' opinion, the contrary results that emerged from the work of Foster and Delitto [28] may be a sequel to the overlap in the definition of psychological constructs used in their analysis, as there may be a mix up of psychopathologies and psychological factors [31]. Pain catastrophising is classified as a psychological factor, not a psychopathology like anxiety and depression [32,33].

Pain intensity, duration, and catastrophising

From the results of this study, increase in pain intensity was associated with increased levels of catastrophic thinking to pain. Catastrophic thinking has been shown to correlate positively with many aspects of the pain experience, including pain intensity, emotional distress, pain-related disability, health services use, pain behaviour, and reliance on medication [29,34–38]. In this study, we also confirm that there was a significant association between pain intensity, pain-related disability, and pain catastrophising. Findings from the literature [38,39] revealed that people who exhibit high levels of catastrophic thinking are more likely to experience pain catastrophising. Hence, pain and increase in pain are not the precursors of catastrophic thinking, but catastrophic thinking is said to be instinctual and a "stable person-based characteristics" that usually predates the experience of pain [25]. Findings from this research revealed that duration of pain onset is significantly associated with extent of catastrophising as all participants with acute NSLBP were low catastrophisers, and high catastrophising was significantly preponderant among subacute and chronic NSLBP participants. Hirsh et al [40] reported that participants experiencing acute pain manifested more of fear avoidance behaviour than catastrophising, and catastrophising was more associated with individuals with chronic pain [26]. Quartana et al [41], in a critical review on pain catastrophising, posited that pain catastrophising was present in pain-free and chronic pain situations—hence, the duration of pain onset may not predict the extent of catastrophising. This opinion may be plausible when catastrophising is viewed as an instinctual and a "stable person-based characteristic" that usually predates the experience of pain [25]; however, when the presence of pain is the precursor of catastrophising—as seen in patients with NSLBP—then catastrophising may be more associated with the chronic duration of pain. The latter opinion is consistent with findings from the present research.

Components of catastrophising that predicts disability

The results of this study also revealed that the main components of pain catastrophising that significantly predicts disability were magnification ("I worry that something serious may happen") and rumination ("I can't stop thinking about how much it hurts"). Sullivan et al [25] reported that this rumination factor of the PCS was the component of catastrophising that significantly predicted disability explaining 53.3% of the variance in disability (i.e., $R^2 = 0.533$). A major difference in the results of this study and those reported by other authors such as Sullivan et al [25] and Rosenstiel and Keefe [42] is that the results of this study revealed that the magnification and rumination components of pain catastrophising were significant predictors of disability. These two components combined to explain 22.6% of the variance in disability (i.e., $R^2 = 0.226$).

The outcome of this study appears to give a higher credence to the worries of the participants (NSLBP patients), who may be more concerned about the aetiology and future consequence of pain, hence engaging in magnification ("I worry that something serious may happen") of the pain symptoms. Furthermore, the inability of the clinicians to successfully assuage the patients' concerns on the aetiology and future consequence of NSLBP (a fallout of the patients' preformed opinion on pain and sometimes a lack of knowledge on the part of the clinicians regarding current trends in the management of NSLBP) may lead patients to magnify the pain symptoms by catastrophising, thereby worsening pain-related disability.

The rumination component of pain catastrophising in the present study also predicted disability, and this is in concordance with the work of Sullivan et al [25], who inferred that individuals who attend excessively to their pain sensations are not only likely to experience more pain, but are likely to show evidence of greater disability as well. Hence, catastrophisers' tendency to focus on pain sensations may interfere with the efficacy of coping strategies [25,43]. It is possible that interference with the effective use of coping strategies may also contribute to increased disability. It is also possible that increased attention to pain may foster the development of a helpless orientation toward the management of pain, and, in turn, contribute to disability, which is consistent with the perspective of Rosenstiel and Keefe [42], who reported that the "helplessness" factor of the CSQ was associated with greater perceived disability.

The observed significant relationship among magnification, pain, and disability suggests that when patients have adequate information on the aetiology and consequence of pain, catastrophising and disability are reduced. Moreover,

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the observed relationship among rumination, pain, and disability suggests that interventions that assist individuals in avoiding excessive focus on pain sensations may be efficacious in reducing catastrophising and facilitating rehabilitation progress. However, the use of distraction techniques in reducing pain catastrophising has not been effective because of the presence of pain intrusions from pain schemes present in catastrophisers; hence, some clinicians have suggested the use of self-instructions and emotional disclosures techniques [25].

One of the results of the current line of research is that pain catastrophising is associated with disability. However, we did not investigate the occupational consequence (handicap) of disability that may be pronounced among pain catastrophisers. Hence, further research may be required to ascertain the occupational consequences of pain-related disability associated with catastrophising even though some researchers [26,44] have posited that restrictions in occupational participation (handicap) correlate significantly with pain-related disability. The influence of catastrophising may need to be investigated in a prospective research design as causality cannot be established in cross-sectional designs. Knowledge of this connection may further emphasis the need to manage pain catastrophising in holistic pain management.

Conclusion

Our results support existing evidence that pain catastrophising is significantly associated with increased pain intensity and pain-related disability among Nigerian NSLBP patients, with 52.7% of participants being high catastrophisers. Furthermore, two components of pain catastrophising (i.e., magnification and rumination) significantly predicted pain-related disability. This may imply that interventions directed at reducing catastrophising among Nigerian NSLBP patients must adequately reduce worries stemming from lack of information on the aetiology and diagnosis of pain that leads to magnification of pain symptoms. In addition, techniques such as emotional disclosures and self-instructions may reduce excessive focus on pain sensation.

Authors' contributions

M.O.O. and A.C.O. participated in the acquisition of the data and conceptualisation of the study, performed statistical analyses, and drafted the manuscript; A.A. and N.A.O. reviewed the data analysis results, drafted the manuscript, and critically revised the manuscript. All authors read and approved the final version of the manuscript.

Conflicts of interest

The authors declare that they have no competing interests.

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