Psychology Research and Behavior Management

Dovepress
Taylor & Francis Group

Open Access Full Text Article

ORIGINAL RESEARCH

Secondary Analysis of Helplessness, Depressive Symptoms, and Sleep Quality on Health Status: A Moderated Mediation Analysis

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Purpose: The objective of the study was to determine whether depressive symptoms mediated the association between helplessness and health status, and to assess whether sleep quality moderated this relationship for people with fibromyalgia (FM) in a moderated mediation model.

Patients and Methods: The participants were 600 members of a health maintenance organization. The Arthritis Helplessness Index (AHI) was used to assess helplessness. The Center for Epidemiological Studies Depression Scale (CES-D) was used to measure symptoms of depression. Sleep quality was assessed using The Pittsburgh Sleep Quality Index (PSQI). Health Status was measured using the Quality of Well-Being Scale (QWB).

Results: Depressive symptoms partially mediated the relationship between helplessness and health status. Sleep quality fully moderated the association between depressive symptoms and health status. However, worse sleep quality was associated with a weaker relationship between depressive symptoms and health status.

Conclusion: The findings extend the literature by explaining the impact of helplessness on health status via depressive symptoms, and emphasize the importance of reducing feelings of helplessness and depression in people with FM. The results suggest that depressive symptoms may be more critical than addressing sleep quality problems in interventions designed for people with FM.

Keywords: fibromyalgia, psychological health, quality of life, behavioral health

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Introduction

Fibromyalgia (FM) is a chronic health condition characterized by widespread musculoskeletal pain, sleep problems, fatigue, and cognitive difficulties.[1] The prevalence of FM in the general population ranges from 0.2% to 6.6%, and it is diagnosed nine times more frequently in women than in men.[2,3] The etiology of FM remains unclear, with a clinical diagnosis focused on a patient's level of pain and symptom severity, such as fatigue, cognitive difficulties, and somatic symptoms.[1] The treatment of FM has typically focused on reducing pain and improving sleep and physical functioning through non-pharmacological interventions.[1]

FM negatively impacts physical and psychological functioning.[4] The symptoms of FM can disrupt social and familial relationships, daily activities, and work and educational responsibilities, which may impair quality of life and mental health.[4] Further, depression is common among people with FM with a prevalence estimated at 25%, with a lifetime prevalence of 65%.[5] Individuals with FM and comorbid depression are more likely to exhibit increased sleep disturbances, sexual dysfunction, lowered physical functioning, and decreased quality of life than individuals without depression.[6] Perceived disability has also been reported to be influenced by psychological distress among people with FM.[7]

Received: 6 November 2024
Accepted: 5 March 2025
Published: 21 March 2025

People with FM experience a complex and diverse range of symptoms. For this reason, tailored treatment plans that incorporate multidisciplinary approaches are most effective.[8] Food and Drug Administration pharmacological treatments include Lyrica (pregabalin),[9] Cymbalta (duloxetine),[10] and Savella (milnacipran).[11] Other common medications used include pain relievers, nonsteroidal anti-inflammatory drugs (NSAIDs), antidepressants, analgesics, and muscle relaxants.[12] Non-pharmacological treatments include cognitive behavioral therapy (CBT), patient education, and physical exercise.[13]

One explanation proposed for why people with FM were more likely to experience psychological problems was the lack of scientific evidence surrounding the disorder, specifically, the etiology and prognosis of the condition.[1,14] These factors may elicit feelings of helplessness among people with FM.[14] Researchers have also found that feelings of helplessness predicted depression among people with FM,[15–17] which may at least partially account for the higher rates of depression observed in FM than those with rheumatoid arthritis or those with other chronic health conditions.[18,19] In addition, feelings of helplessness predicted subjective well-being in people with FM.[20]

Evidence suggests that helplessness impacts health status via a mediating mechanism. Pereira et al[21] demonstrated that among skin tumor patients, psychological morbidity mediated the relationship between helplessness and quality of life. In addition, depression was positively associated with helplessness[22] and negatively associated with health status.[14] Furthermore, Tesio et al[23] found that depression mediated the relationship between alexithymia and health related quality of life, suggesting that depression may be a mechanism by which other factors influence health status among people with FM. Given the evidence supporting the predictive relationship between helplessness and depression,[15–17] and the associations demonstrated between the variables, depression may mediate the relationship between helplessness and health status.

Sleep disturbances are one of the defining characteristics of people with FM and depression,[24] and the American College of Rheumatology included non-restorative sleep and fatigue as diagnostic criteria for FM in 2010.[24] Andrade et al[25] reported that 92.9% of participants with FM also had a sleep disorder, and Theadom et al[26] found that 99% of participants with FM reported poor sleep quality. Among people with FM, poor sleep quality was associated with greater depression,[27,28] increased helplessness,[29] lower health status,[30] and reduced health-related quality of life.[26] Additionally, individuals with FM who have poor sleep may be at greater risk of developing depression.[31] However, despite the well-established associations found between sleep quality, depression, and health status[26–28,30] researchers have not examined the moderating effects of sleep quality on the association between depression and health status.

The purpose of the present study was to examine the relationships between helplessness, depressive symptoms, sleep quality, and health status among people with FM using a moderated mediation model. It was hypothesized that symptoms of depression would mediate the relationship between helplessness and health status and that sleep quality would moderate the relationship between symptoms of depression and health status.

Materials and Methods

Participants

The participants (n = 600) were part of a large, randomized control trial intervention study conducted between the years 1997 and 2002, in which no intervention effects were found. The participants were members of a large health maintenance organization (HMO). Their ages ranged from 20 to 84 (*M* = 53.92, *SD* = 11.45). Participants were primarily women (95.5%). Furthermore, most of the participants were White (85.0%), had completed either high school or some college (68.5%), and about half worked either a full-time or part-time job (49.3%). To be eligible for the study, participants had to have an FM diagnosis from a physician, which was later confirmed through the review of medical records. Participants were also required to meet the 1990 American College of Rheumatology criteria conducted by a trained researcher. The mean length of time since diagnosis was 4.66 years (SD = 6.15). The study was reviewed and approved by the HMO and Institutional Review Board (IRB) of San Diego State University. All participants signed a consent form and were treated in accordance with the American Psychological Association ethical guidelines.[32] The study complied with the Declaration of Helsinki.

Demographic Variables

A demographic questionnaire administered at baseline assessed the participants' age, gender, marital status, ethnic origin, employment status, highest level of education, and family income.

Helplessness

Helplessness was measured using the Arthritis Helplessness Index (AHI)[33] which was adapted for use among people with FM by substituting the word "Arthritis" for "Fibromyalgia". The AHI consists of 15 items designed to measure participant's perceptions of their ability to control their condition.[34] Participants respond to statements such as "Fibromyalgia is controlling my life", using a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Nine items are reverse coded, and scores range from 15 to 60 in which higher scores indicate greater helplessness. Sufficient validity and reliability have been demonstrated.[35] Nicassio et al[33] found a Cronbach's alpha of 0.69 (n = 173), and a test-retest reliability of (r = 0.53). A McDonald's omega coefficient indicated that the reliability of the scale was 0.76.

Depressive Symptoms

The Center for Epidemiological Studies Depression Scale (CES-D) was used to assess depressive symptomology.[36] The items in the CES-D reflect the depressive symptoms that are used to make a diagnosis. The scale was designed to study the relationship between depressive symptomology and other variables. The scale consists of 20 items in which respondents rate the frequency of each symptom during the past week using a scale from 0 (*rarely or none of the time < 1 day*) to 3 (*most of the time 5–7 days*). Four items (4, 8, 12, and 16) are worded positively and reverse coded. Scores range from 0 to 60 and reflect a sum of the items with higher scores indicating greater depressive symptoms. A cut-off score of 19 was used as an indicator of depression as suggested by Turk and Okifuji[37] for people with chronic pain. High levels of reliability and validity have been established for this measure.[36,38] The McDonald's omega reliability coefficient obtained for the sample was 0.92.

Sleep Quality

The Pittsburgh Sleep Quality Index (PSQI) was used to assess global sleep quality within the last 1-month.[39] Sleep quality is measured using 19 self-rated items that produce seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction over the last month. Participants are asked to use a scale that ranges from 0 (*Not during the past month*) to 3 (*Three or more times a week*), and the seven component scores are summed to generate a global sleep quality score. Scores range from 0 to 21, with greater scores indicating worse sleep quality. In this study, a standard cutoff score of five was used to indicate the presence of a sleep disorder.[40] Adequate reliability and validity have been demonstrated.[41,42] The McDonald's omega coefficient for this measure was 0.65.

Health Status

The Quality of Well-Being Scale (QWB)[43] was used to measure health status and was administered by a trained research assistant. The preference-weighted measure consists of three functioning scales and one symptom scale to yield a numerical expression of health status ranging from 0 (death) to 1 (optimal asymptomatic full function); thus, higher scores indicate greater health status. The reliability and validity of the scale have been demonstrated in FM samples.[30] Because of this scale's construction method, internal consistency reliability using McDonald's omega coefficient was not possible.[44]

Procedures

The data and participants were part of a previous study that examined the effects of social support and education on healthcare use and health status, of which no intervention effects were found. All measures mentioned in this study were taken from the baseline assessment. All participants were members of a large HMO in San Diego, California, and were recruited through mass mailing, flyers posted in HMO waiting rooms, requests for participant referrals from physicians via email, and advertisements in the local Sunday newspapers.

Participants were required to have a previous FM diagnosis from a physician. Diagnoses were confirmed in the initial meeting by trained research assistants using the 1990 American College of Rheumatology (ACR) diagnostic criteria.[24] This included the presence of widespread pain spanning all four quadrants of the body in addition to a pain severity score of two or higher in at least 11 of the 18 tender point sites.[24] All information was collected in person using a paper and pencil battery of questionnaires that included the CES-D, AHI, PSQI, and QWB. A trained research assistant administered the QWB. The IRB committees at the university and HMO before data collection began.

Data Analysis

IBM Statistical Package for the Social Sciences (SPSS), version 27, was used for all data analyses. The PROCESS Macro software package version 4.1[45] was applied to test the moderated mediation model, which hypothesized that depressive symptoms would mediate the relationship between helplessness and QWB and that sleep quality would moderate this relationship. A bootstrapping approach with bias-corrected 95% confidence intervals (10,000 iterations) was used. The significance of the moderated mediation was tested with the index of moderated mediation; confidence intervals that did not contain zero indicated a significant effect at the 0.05 alpha level.

Results

Descriptive Statistics

The descriptive statistics results, including the means, standard deviations, and correlations for all study variables, are shown in Table 1. The mean CES-D score exceeded the cut-off score of 19 for a chronic pain population, indicating high levels of depressive symptoms in some participants.[37] The mean sleep quality score for participants exceeded the global cut-off score of five, suggesting cases of sleep disorders in participants.[40] All study variables were significantly correlated with one another. Helplessness, depressive symptoms, and sleep quality were all positively correlated, while health status was negatively correlated with helplessness, depressive symptoms, and sleep quality.

Moderation Mediation Analysis

Model 14 from PROCESS[45] was used for the analysis with variables mean-centered. It was hypothesized that sleep quality would moderate the extent to which depressive symptoms related to health status and that depressive symptoms would mediate the relationship between helplessness and health status, all in the context of a moderated mediation model. The moderated mediation model accounted for approximately 27% of the variance in health status scores. As expected, people who reported more helplessness also reported greater symptoms of depression and in turn lower health status (see Figure 1). The indirect pathway was stronger for people reporting fewer sleep problems (−1 SD), b = –0.0187, 95% CI [−0.0248, −0.0131], than greater sleep problems (+1 SD), b = −0.0109, 95% CI [−0.0156, −0.0066]. There remained a significant direct effect of helplessness on health status after controlling for depressive symptoms (and its moderation by sleep quality), suggesting depressive symptoms were a partial mediator of the relationship. There was evidence that sleep quality significantly moderated the path between depressive symptoms and health status in the mediation model (index of moderated mediation = 0.0010, 95% CI [0.0003, 0.0017], although in the opposite direction from predictions. Instead of poorer sleep quality exacerbating the negative relationship between depressive symptoms and health status, it was associated with a weakening of the

Table 1 Descriptive Statistics and Correlations

Variable	M	SD	1	2	3	4
1. Helplessness	3.12	0.69	1			
2. Depressive Symptoms	19.74	11.43	0.439**	1		
3. Sleep Quality	11.25	3.97	0.290**	0.476**	1	
4. Health Status	0.5596	0.07	−0.372**	−0.455**	−0.346**	1

Note: $^{**}p < 0.01$.

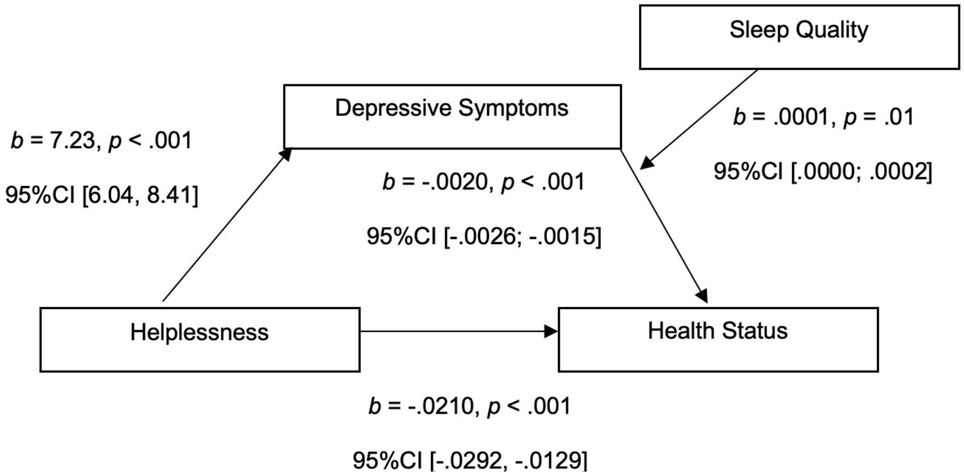

Figure 1 Moderated mediation model.

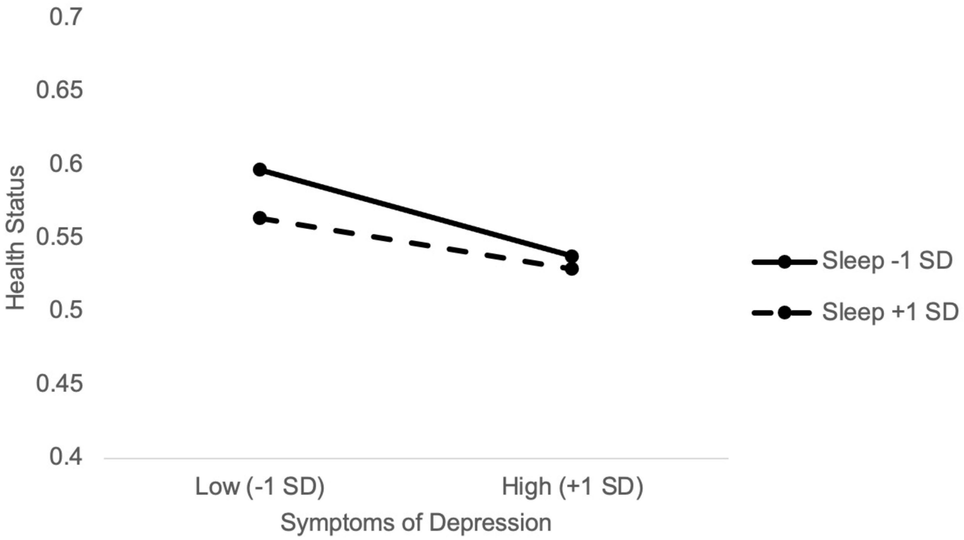

Figure 2 Conditional effects of depressive symptoms as a function of sleep quality.

negative relationship between the variables (see Figure 2). However, it is worthwhile noting that despite being weaker, the simple relationship between depressive symptoms and health status remained significant even for people reporting more sleep problems (+1 SD), *b* = - 0.0015, *p* < 0.001, 95% CI [−0.0021, −0.0009], as it was for those reporting fewer sleep problems (−1 SD), *b* = −0.0026, *p* < 0.001, 95% CI [−0.0033, −0.0018].

Although sleep quality was predicted to moderate the depressive symptoms to health status path specifically, a supplementary moderated mediation model (Model 59) was conducted to explore whether sleep quality moderated other paths in the mediation model. The results showed that sleep quality continued to moderate the relationship between depressive symptoms and health status, but there was no evidence that sleep quality moderated the relationship between helplessness and depressive symptoms or between helplessness and health status, *ps* > 0.07.

Discussion

The purpose of the present study was to determine whether participants' depressive symptoms mediated the relationship between their level of helplessness and health status and whether sleep quality moderated this relationship in a sample of people with FM. Findings from this study may inform beneficiary services for patients of FM, including support groups, interventions, and clinical guidelines. The results indicated that the symptoms of depression partially mediated the relationship between helplessness and health status, such that when participants scored higher on helplessness, they reported more symptoms of depression and lower health status. As expected, sleep quality significantly moderated the path between participants' symptoms of depression and health status, but the direction of the moderation was in the opposite direction of the original hypothesis. It was predicted that lower sleep quality would strengthen the relationship between the symptoms of depression and health status. However, the negative influence of participants' symptoms of depression on their health status was significantly stronger when sleep quality was high than when it was low, albeit the effect was significant at both levels of the moderator.

Although this model has not been tested by previous researchers among people with FM, the associations between the variables were consistent with those documented by previous researchers. Previous researchers have found that higher levels of helplessness predicted greater levels of depression.[15,17,46] People with FM reported experiencing high levels of stigma and illness uncertainty as a result of the disorder's undetermined etiology and outcomes,[16,20,47] which may help explain the higher levels of helplessness and symptoms of depression in FM than in other chronic pain disorders.[22] High helplessness and more symptoms of depression have also been shown to be negatively associated with subjective well-being and global health-related quality of life.[20,48,49] Arnold et al[50] found that depression among people with FM severely limited their ability to engage in tasks of daily life. Additionally, Okifuji et al[51] observed that those with co-occurring FM and depression were more likely to report greater functional limitations and maladaptive thoughts than non-depressed participants. Reibel and Hutti[20] found that an individual's perceptions of the impact of FM, and poor functional status, were associated with greater helplessness, which, in turn, reduced subjective well-being.

Contrary to the hypothesis, we found that depressive symptoms only partially mediated the relationship between helplessness and health status. It is possible that symptoms of depression were not the only variable by which helplessness influenced health status: other factors, including levels of pain and disability, may impact this outcome.[14] Further, Galvez-Sánchez et al[48] demonstrated that depression, trait anxiety, and fatigue mediated the relationship between clinical pain and health-related quality of life; therefore, helplessness may impact health status via a combination of other factors, including depression, anxiety, or fatigue. Further research is required to understand better whether an individual's level of helplessness influences other factors, such as their self-efficacy along with their social support, and whether this negatively impacts their health status along with symptoms of depression.

As predicted, sleep quality moderated the relationship between the symptoms of depression and health status, but the direction of the conditional effects did not align with expectations. When sleep quality was high (one standard deviation above the mean), the symptoms of depression had a weaker impact on the health status than when sleep quality was low (one standard deviation below the mean). In other words, as depressive symptoms increased, sleep quality had a weaker impact on health status. Thus, a possible explanation for this finding is that symptoms of depression may have a greater effect on health status than sleep quality for people with FM. This notion is supported by Lobentanz et al[52] who found that the symptoms of depression among multiple sclerosis (MS) patients significantly predicted quality of life while sleep quality did not. This finding may apply to FM, as similarities between the two conditions have been reported.[53] However, it should also be noted that 96% of participants' sleep quality index scores indicated disordered sleep, which is a common feature of both FM and depression.[25,54] It is plausible that the actual difference in sleep quality between the levels of the moderator was very small. More studies are warranted to investigate further the relationship between sleep quality, symptoms of depression, and health status among people with FM.

As in all studies, there were limitations in the present study. The analysis was cross-sectional, so no conclusions regarding causation may be made. The sample was primarily female (95.5%) and White (85.0%), and the recruitment was from one large HMO, which may limit the generalizability of the findings. Other limitations included that data on the use of treatment medications, lifestyle and diet, and blood inflammation levels were not collected. In addition, a self-report measure was used to assess sleep quality. Future researchers should include participants from more diverse backgrounds, collect treatment medication, lifestyle and diet information, and employ a more objective measure to assess sleep quality (eg, actigraphy). However, despite these limitations, the sample size was large, which increased the representation of the population from which they were drawn.

Conclusion

The results of the present study highlight the importance of reducing helplessness in FM, a disorder characterized by uncertainty. These findings extend the literature by explaining how helplessness may play a role in the health status of people with FM through its effect on symptoms of depression. Further, we explored how sleep quality impacted this relationship in the present study. The findings from the current study imply a need to reduce feelings of helplessness and depressive symptoms among people with FM to improve their health status. Tailored behavioral interventions may reduce depression and helplessness and thereby enhance patient outcomes for those with fibromyalgia. More research is needed to determine the etiology of FM, which may provide patients with information to increase their self-efficacy and decrease their feelings of helplessness. The results indicated that a patient's symptoms of depression may be a more important factor to focus interventions on than poor sleep quality because low sleep quality had little effect when more symptoms of depression were present. Future researchers should explore what mechanisms, in addition to depression symptoms, enable helplessness to affect the health status of people with FM.

Abbreviations

FM, fibromyalgia; AHI, Arthritis Helplessness Index; CES-D, Center for Epidemiological Studies Depression Scale; PSQI, Pittsburgh Sleep Quality Index; QWB, Quality of Well-Being Scale; HMO, health maintenance organization; IRB, Institutional Review Board; ACR, American College of Rheumatology; SPSS, Statistical Package for the Social Sciences; MS, multiple sclerosis.

Acknowledgment

This work was supported by the National Institutes of Health [AR-44020].

Disclosure

The authors report no conflicts of interest in this work.

References

1. Bellato E, Marini E, Castoldi F, et al. Fibromyalgia syndrome: etiology, pathogenesis, diagnosis, and treatment. *Pain Res Manag*. 2012;2012:426130. doi:10.1155/2012/426130
2. Marques AP, Santo AD, Berssaneti AA, Matsutani LA, King Yuan SL. Prevalence of fibromyalgia: literature review update. *Revista Brasileira de Reumatologia*. 2017;57(4):356–363. doi:10.1016/j.rbre.2017.01.005
3. Wolfe F, Walitt B, Perrot S, Rasker JJ, Häuser W. Fibromyalgia diagnosis and biased assessment: sex, prevalence and bias. *PLoS One*. 2018;13(9): e0203755. doi:10.1371/journal.pone.0203755
4. Galvez-Sánchez CM, Duschek S, Reyes DEl Paso GA. Psychological impact of fibromyalgia: current perspectives. *Psychol Res Behav Manag*. 2019;12:117–127. doi:10.2147/prbm.s178240
5. Løge-Hagen JS, Sæle A, Juhl C, Bech P, Stenager E, Mellentin AI. Prevalence of depressive disorder among patients with fibromyalgia: systematic review and meta-analysis. *J Affective Disorders*. 2019;245:1098–1105. doi:10.1016/j.jad.2018.12.001
6. Lange M, Petermann F. Influence of depression on fibromyalgia: a systematic review. *Der Schmerz*. 2010;24(4):326–333. doi:10.1007/s00482-010-0937-8
7. Verbunt JA, Pernot DH, Smeets RJ. Disability and quality of life in patients with fibromyalgia. *Health Qual Life Outcomes*. 2008;6(8):8. doi:10.1186/1477-7525-6-8
8. Sarzi-Puttini P, Buskila D, Carrabba M, Doria A, Atzeni F. Treatment strategy in fibromyalgia syndrome: where are we now? *Semin Arthritis Rheumatism*. 2008;37(6):353–365. doi:10.1016/j.semarthrit.2007.08.008
9. Lyrica (pregabalin) capsules, CV/oral solution, CV [prescribing information]. New York: Pfizer; 2018.
10. Cymbalta (duloxetine hydrochloride) delayed-release capsules for oral use [prescribing information]. Indiana: Eli Lilly; 2023.
11. Savella (milnacipran HCl) tablets [prescribing information]. California: Allergan; 2022.
12. Bennett RM, Jones J, Turk DC, Russell IJ, Matallana L. An internet survey of 2596 people with fibromyalgia. *BMC Musculoskelet Disord*. 2007;8:27. doi:10.1186/1471-2474-8-27
13. Friedberg F, Williams DA, Collinge W. Lifestyle-oriented non-pharmacological treatments for fibromyalgia: a clinical overview and applications with home-based technologies. *J Pain Res*. 2012;5:425–435. doi:10.2147/JPR.S35199
14. Nicassio PM, Schuman C, Radojevic V, Weisman MH. Helplessness as a mediator of health status in fibromyalgia. *Cognitive Ther Res*. 1999;23 (2):181–196. doi:10.1023/a:1018731312503
15. Nicassio PM, Radojevic V, Schoenfeld-Smith K, Dwyer K. The contribution of family cohesion and the pain-coping process to depressive symptoms in fibromyalgia. *Ann Behav Med*. 1995;17(4):349–356. doi:10.1007/bf02888600
16. Reich JW, Johnson LM, Zautra AJ, Davis MC. Uncertainty of illness relationships with mental health and coping processes in fibromyalgia patients. *J Behav Med*. 2006;29:307–316. doi:10.1007/s10865-006-9054-7

17. Palomino RA, Nicassio PM, Greenberg MA, Medina EP. Helplessness and loss as mediators between pain and depressive symptoms in fibromyalgia. *Pain*. 2007;129(1–2):185–194. doi:10.1016/j.pain.2006.12.026
18. Walker EA, Keegan D, Gardner G, Sullivan M, Katon WJ, Bernstein D. Psychosocial factors in fibromyalgia compared with rheumatoid arthritis. *Psychosomatic Med*. 1997;59(6):565–571. doi:10.1097/00006842-199711000-00002
19. Wolfe F, Michaud K, Li T, Katz RS. Chronic conditions and health problems in rheumatic diseases: comparisons with rheumatoid arthritis, noninflammatory rheumatic disorders, systemic lupus erythematosus, and fibromyalgia. *J Rheumatol*. 2010;37(2):305–315. doi:10.3899/jrheum.090781
20. Reibel MD, Hutti MH. The role of helplessness in the appraisal of illness uncertainty in women with fibromyalgia. *Nurs Sci Q*. 2020;33(4):346–352. doi:10.1177/0894318420943151
21. Pereira MG, Baia V, Machado JC. Coping and quality of life in patients with skin tumors in the follow-up stage: the mediating role of Body Image and psychological morbidity. *J Psychosoc Oncol*. 2016;34(5):400–412. doi:10.1080/07347332.2016.1196807
22. Moyano S, Scolnik M, Vergara F, et al. Evaluation of learned helplessness, perceived self-efficacy, and functional capacity in patients with fibromyalgia and rheumatoid arthritis. *J Clin Rheumatol*. 2019;25(2):65–68. doi:10.1097/rhu.0000000000000769
23. Tesio V, Di Tella M, Ghiggia A, et al. Alexithymia and depression affect quality of life in patients with chronic pain: a study on 205 patients with fibromyalgia. *Frontiers in Psychology*. 2018;9(422). doi:10.3389/fpsyg.2018.00442
24. Wolfe F, Smythe HA, Yunus MB, et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. Report of the multicenter criteria committee. *Arthritis Rheum*. 1990;33(2):160–172. doi:10.1002/art.1780330203
25. Andrade A, Vilarino GT, Sieczkowska SM, Coimbra DR, Bevilacqua GG, Steffens RD. The relationship between sleep quality and fibromyalgia symptoms. *J Health Psychol*. 2020;25(9):1176–1186. doi:10.1177/1359105317751615
26. Theadom A, Cropley M, Humphrey K-L. Exploring the role of sleep and coping in quality of life in fibromyalgia. *J Psychosom Res*. 2007;62(2):145–151. doi:10.1016/j.jpsychores.2006.09.013
27. Naughton F, Ashworth P, Skevington SM. Does sleep quality predict pain-related disability in chronic pain patients? The mediating roles of depression and pain severity. *Pain*. 2007;127(3):243–252. doi:10.1016/j.pain.2006.08.019
28. Miró E, Martínez MP, Sánchez AI, Prados G, Medina A. When is pain related to emotional distress and daily functioning in fibromyalgia syndrome? The mediating roles of self-efficacy and sleep quality. *Br J Health Psychol*. 2011;16(4):799–814. doi:10.1111/j.2044-8287.2011.02016.x
29. Nicassio PM, Ormseth SR, Kay M, et al. The contribution of pain and depression to self-reported sleep disturbance in patients with rheumatoid arthritis. *Pain*. 2012;153(1):107–112. doi:10.1016/j.pain.2011.09.024
30. Kaplan RM, Schmidt SM, Cronan TA. Quality of well being in patients with fibromyalgia. *J Rheumatol*. 2000;27(3):785–789.
31. Choy EHS. The role of sleep in pain and fibromyalgia. *Nat Rev Rheumatol*. 2015;11(9):513–520. doi:10.1038/nrrheum.2015.56
32. Ethical principles of psychologists and code of conduct. American Psychological Association; 2017. Available from: https://www.apa.org/ethics/code. Accessed July 26, 2023.
33. Nicassio PM, Wallston KA, Callahan LF, Herbert M, Pincus T. The measurement of helplessness in rheumatoid arthritis. The development of the arthritis helplessness index. *J Rheumatol*. 1985;12(3):462–467.
34. Brady TJ. Measures of self-efficacy, helplessness, mastery, and control: the arthritis helplessness index (ahi)/rheumatology attitudes index (RAI), arthritis self-efficacy scale (ASES), children's arthritis self-efficacy scale (CASE), generalized self-efficacy scale (GSES), Mastery Scale, multi-dimensional health locus of Control Scale (MHLC), parent's arthritis self-efficacy scale (PASE), rheumatoid arthritis self-efficacy scale (RASE), and self-efficacy scale (SES). *Arthritis Care Res*. 2003;49(S5):S147–S164. doi:10.1002/art.11413
35. Stein MJ, Wallston KA, Nicassio PM. Factor structure of the arthritis helplessness index. *J Rheumatol*. 1988;15(3):427–432.
36. Radloff LS. The CES-D scale. *Appl Psychol Meas*. 1977;1(3):385–401. doi:10.1177/014662167700100306
37. Turk DC, Okifuji A. Detecting depression in chronic pain patients: adequacy of self-reports. *Behav Res Ther*. 1994;32(1):9–16. doi:10.1016/0005-7967(94)90078-7
38. Smarr KL, Keefer AL. Measures of depression and depressive symptoms: beck depression inventory-II (BDI-II), Center for Epidemiologic Studies Depression Scale (CES-D), Geriatric Depression Scale (GDS), Hospital Anxiety and Depression Scale (Hads), and patient health Questionnaire-9. *Arthritis Care Res*. 2011;63(S11):S454–S466. doi:10.1002/acr.20556
39. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and Research. *Psychiatry Res*. 1989;28(2):193–213. doi:10.1016/0165-1781(89)90047-4
40. Buysse DJ, Hall ML, Strollo PJ, et al. Relationships between the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and clinical/polysomnographic measures in a community sample. *J Clin Sleep Med*. 2008;4(6):563–571. doi:10.5664/jcsm.27351
41. Carpenter JS, Andrykowski MA. Psychometric Evaluation of the Pittsburgh Sleep Quality Index. *J Psychosom Res*. 1998;45(1):5–13. doi:10.1016/s0022-3999(97)00298-5
42. Eryilmaz MM, Ozdemir C, Yurtman F, Cilli A, Karaman T. Quality of sleep and quality of life in renal transplantation patients. *Transplant Proc*. 2005;37(5):2072–2076. doi:10.1016/j.transproceed.2005.03.084
43. Kaplan RM, Bush JW, Berry CC. Health status: types of validity and the index of well-being. *Health Serv Res*. 1976;11(4):478–507.
44. Coons SJ, Rao S, Keininger DL, Hays RD. A comparative review of generic quality-of-life instruments. *PharmacoEconomics*. 2000;17(1):13–35. doi:10.2165/00019053-200017010-00002
45. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: a regression-based approach. American Psychological Association; 2013. Available from: https://psycnet.apa.org/record/2013-21121-000. Accessed July 26, 2023.
46. Smith TW, Christensen AJ, Peck JR, Ward JR. Cognitive distortion, helplessness, and depressed mood in rheumatoid arthritis: a four-year longitudinal analysis. *Health Psychol*. 1994;13(3):213–217. doi:10.1037/0278-6133.13.3.213
47. Van Alboom M, De Ruddere L, Kindt S, et al. Well-being and perceived stigma in individuals with rheumatoid arthritis and fibromyalgia: a daily diary study. *Clin J Pain*. 2021;37(5):349–358. doi:10.1097/ajp.0000000000000929
48. Galvez-Sánchez CM, Montoro CI, Duschek S, Reyes DEl Paso GA. Depression and trait-anxiety mediate the influence of clinical pain on health-related quality of life in fibromyalgia. *J Affective Disorders*. 2020;265:486–495. doi:10.1016/j.jad.2020.01.129
49. Ozcetin A, Ataoglu S, Kocer E, et al. Effects of depression and anxiety on quality of life of patients with rheumatoid arthritis, knee osteoarthritis and fibromyalgia syndrome. *West Indian Med J*. 2007;56(2):122–129. doi:10.1590/s0043-31442007000200004

50. Arnold LM, Crofford LJ, Mease PJ, et al. Patient perspectives on the impact of fibromyalgia. *Patient Educ Couns*. 2008;73(1):114–120. doi:10.1016/j.pec.2008.06.005
51. Okifuji A, Turk DC, Sherman JJ. Evaluation of the relationship between depression and fibromyalgia syndrome: why aren't all patients depressed? *J Rheumatol*. 2000;27(1):212–219.
52. Lobentanz IS, Asenbaum S, Vass K, et al. Factors influencing quality of life in multiple sclerosis patients: disability, depressive mood, fatigue and sleep quality. *Acta Neurol Scand*. 2004;110(1):6–13. doi:10.1111/j.1600-0404.2004.00257.x
53. Eilertsen G, Ormstad H, Kirkevold M, Mengshoel AM, Söderberg S, Olsson M. Similarities and differences in the experience of fatigue among people living with fibromyalgia, multiple sclerosis, ankylosing spondylitis and stroke. *J Clin Nurs*. 2015;24(13–14):2023–2034. doi:10.1111/jocn.12774
54. Bao Y-P, Han Y, Ma J, et al. Cooccurrence and bidirectional prediction of sleep disturbances and depression in older adults: meta-analysis and systematic review. *Neurosci Biobehav Rev*. 2017;75:257–273. doi:10.1016/j.neubiorev.2017.01.032