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The Role of Anxiety Sensitivity in terms of Weight-related Impairment and Fatigue Severity among Adults with Obesity and Chronic Low Back Pain

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Abstract

Background: Obesity and chronic low back pain often co-occur and are associated with psychosocial and physical impairments such as weight-related impairment and fatigue. Yet, there is little understanding of psychological factors that may be associated with weight-related impairment and fatigue (a psychosocial factor) among this vulnerable population.

Methods: Thus, the current study examined the role of anxiety sensitivity as it relates to self-reported weight-related impairment and fatigue severity among persons with obesity and chronic low back pain. Participants included a nationally representative sample of adults (N = 616) with co-occurring obesity and chronic low back pain (77.3% female, M_{age} = 45.9 years, *SD* = 11.53).

Results: Results revealed that anxiety sensitivity was associated with greater levels of weight-related impairment and fatigue severity after controlling for age, sex, body mass index (BMI), pain interference, and perceived general health.

Conclusions: The findings suggest that anxiety sensitivity may be a mechanistic target for better understanding and addressing weight-related impairment and fatigue severity among individuals with obesity and chronic low back pain.

Keywords

Anxiety sensitivity; Impairment; Fatigue; Chronic Pain; Obesity

Obesity rates continue to rise in the United States (U.S.), with an estimated 42.4% of the adult population considered obese (Hales et al., 2020). Although efforts have been made to aid in the prevention and reduction of obesity, prevalence rates of obesity have moved further away from projected goals (i.e., 30.5% of individuals with obesity by 2020; United States Department of Health and Human Services, 2020). Obesity alone accounts for an

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immense amount of negative health outcomes and financial burden in the U.S. (Centers for Disease Control and Prevention, 2020). Further, obesity often contributes to and maintains other costly and burdensome health conditions such as chronic low back pain (Geurts et al., 2018; McVinnie, 2013), which increases the societal and individual impact of this condition. Indeed, obesity has been found to be associated with increased chronic low back pain prevalence (Shiri et al., 2010) and severity (Vincent et al., 2012) that leads to more treatment-seeking for chronic pain (Shiri et al., 2010). Moreover, chronic low back pain severity appears to increase as body mass index (BMI) increases (Okifuji & Hare, 2015). Not surprisingly, of the estimated 34 million individuals in the U.S living with chronic low back pain, approximately 64% of those individuals also meet criteria for overweight/obesity (Strine & Hootman, 2007).

Individuals with co-occurring obesity and chronic low back pain are at greater risk for a number of psychosocial (e.g., fatigue, social withdrawal) and physical (e.g., decline of physical function) impairments that further maintain these co-occurring conditions (Zdziarski et al., 2015). Of physical impairments, weight-related impairment (defined as impairments or limitations due to current body weight status) may be of importance to examine among this comorbid population. Extant work has suggested that individuals with obesity experience significant weight-related impairments and such impairments are further exacerbated by pain (Ball et al., 2000). For example, Ball et al., (2000) found that among individuals with obesity, the perception of being ‘too fat’ was identified as a barrier to engaging in physical activity. This is unfortunate given lack of physical activity further maintains and contributes to obesity status (Chin et al., 2016) and chronic low back pain (Alzahrani et al., 2019). Moreover, fatigue, a psychosocial impairment (Zdziarski et al., 2015), is a common symptom among individuals with obesity (Vgontzas et al., 2006), chronic low back pain (Snekkevik et al., 2014), and these co-occurring conditions (Zdziarski et al., 2015). Thus, there may be utility in examining fatigue severity among a sample with these co-occurring condition given fatigue severity lends itself to poor negative outcomes (e.g., reduced physical activity; Bonner et al., 2010; Chaput & Tremblay, 2012) which further perpetuates and exacerbate weight gain (Chin et al., 2016) and chronic low back pain (Alzahrani et al., 2019).

It is important to identify factors that may contribute to weight-related impairment and fatigue severity among adults with obesity and chronic back pain to reduce adverse consequences that these factors may have in maintaining or contributing to obesity, chronic low back pain, and their co-occurrence. Anxiety sensitivity, reflecting the fear of anxiety and arousal-related sensations (Reiss & McNally, 1985), may be one transdiagnostic vulnerability factor related to weight-related impairment and fatigue severity among individuals with obesity and chronic low back pain. Anxiety sensitivity and its association with obesity and pain have been well-documented (Hearon et al., 2014; Hearon et al., 2013; Moshier et al., 2013; Moshier et al., 2016; Ocañez et al., 2010; Otto et al., 2016). For example, extant work has found that anxiety sensitivity may interact with weight status in regards to the expression of impairment (Hearon et al., 2014). Moreover, existing models of anxiety sensitivity and pain have suggested anxiety sensitivity may increase catastrophic interpretations of pain resulting in increased avoidance of activities and other pain-related disabilities (Ocañez et al., 2010). Thus, these data highlight that anxiety sensitivity may play a pivotal role in contributing to negative outcomes such as weight-related impairment and fatigue severity among individuals with co-occurring obesity and chronic low back pain.

Broadly in line with this perspective, among individuals with a recurrent pain syndrome (i.e., irritable bowel syndrome), anxiety sensitivity was a unique predictor of fatigue even after accounting for other relevant factors such as pain catastrophizing, stress, trait anxiety, and depression (Lackner et al., 2013). Furthermore, studies have suggested that anxiety sensitivity is a contributing factor in impairment in a number of different domains (Johnson et al., 2019; Kauffman et al., 2017; Korte et al., 2013; McLeish et al., 2007; Storch et al., 2014; Vincent & Walker, 2001). For example, extant work has documented the role of anxiety sensitivity in contributing to sleep-related impairment among adults with chronic insomnia (Vincent & Walker, 2001), functional impairment among adults who smoke (Kauffman et al., 2017), epilepsy-related impairment among adults with epilepsy (Johnson et al., 2019), and obsessive-compulsive related impairment among adults with obsessive-compulsive disorder (Storch et al., 2014). Moreover, anxiety sensitivity has been found to be related to less engagement in activities (i.e., moderate intensity physical activity; Hearon et al., 2014) among individuals with obesity. However, it would be useful to examine whether anxiety sensitivity may also contribute to weight-related impairment and fatigue severity among individuals with obesity and chronic low back pain.

Theoretically, individuals with obesity and chronic low back pain may experience exacerbated condition specific symptoms due to elevated anxiety sensitivity (Asmundson et al., 2000; Smits et al., 2010). For example, an individual with obesity and chronic low back pain experiencing elevated levels of anxiety sensitivity may be more apt to interpret condition specific symptoms (e.g., pain) as catastrophic (e.g., "When I begin to feel chronic low back pain, I fear what people might think of me"). Consequently, these individuals may become afraid of engaging in activities that bring on these symptoms (e.g., avoidance of physical activity; Zvolensky & Forsyth, 2002) due to underlying fears related to social concerns (e.g., weight stigma; Phelan et al., 2015), physical concerns (e.g., fear of having a heart attack; Marchesini et al., 2003), and cognitive concerns (e.g., concerns related to psychological well-being; Chu et al., 2019). As a result, these individuals may experience greater impairments perceived as attributable to their weight status. Similarly, given that anxiety sensitivity is thought to intensify condition specific symptoms and sensations (e.g., fatigue; Asmundson et al., 2000; Smits et al., 2010), these individuals may be more apt to experience greater fatigue-related severity (Lackner et al., 2013). However, there has not been an empirical test of this preliminary working model.

The current study sought to examine anxiety sensitivity in relation to weight-related impairment and fatigue severity among individuals with obesity and chronic low back pain. We hypothesized that higher self-reported levels of anxiety sensitivity would be associated with higher self-reported weight-related impairment and fatigue severity. We expected these relations to be apparent over and above variance accounted for by clinically significant covariates including age (Thorsteinsson & Brown, 2009; Zabelina et al., 2009), sex (Thorsteinsson & Brown, 2009; Zabelina et al., 2009), BMI (Kauffman et al., 2017), pain interference (Louati & Berenbaum, 2015), and perceived general health (Bond et al., 2006).

Methods

Participants

Participants for the current study included 616 adults (77.3% female, M_{age} = 45.9 years, *SD* = 11.53) with self-reported obesity (BMI ≥ 30) and chronic low back pain. Participants were eligible to participate in the current study if they: (1) were between the ages of 18 and 64, (2) reported moderate to severe chronic low back pain, and (3) self-reported obesity status (defined as a BMI ≥ 30). Exclusion criteria for the current study included: (1) non-fluency in English and (2) inability to provide informed, voluntary, written consent.

Most of the sample self-identified as White (80.2%). The remainder of the sample identified as follows: 11.9% African American/Black, 1.8% Asian/Pacific Islander, 1.3% Native American/American Indian, 2.9% multiracial, 1.3% other, and 0.6% preferred to not respond. Of the sample, 8.1% self-identified as Latinx. The average BMI of the current sample was 37.05 (*SD* = 6.30), which is slightly lower compared to rates among individuals with obesity seeking weight-loss treatment (*M* = 41.10, *SD* = 5.90; Pearl et al., 2017). In the current sample, 48.2% fell within the ‘Class 1’ category of obesity (defined as a BMI of 30 to < 35), 27.6% fell within the ‘Class 2’ category of obesity (defined as a BMI of 35 to < 40), and 24.2% fell within the ‘Class 3’ category of obesity (defined as a BMI of ≥ 40). Average pain interference evidenced in the current sample was 43.75 (*SD* = 26.13). Over half of the sample (52.4%) in the current study endorsed clinically significant fatigue (defined as a score of ≥ 5 on the Fatigue Severity Scale; Krupp et al., 1989).

Measures

Demographics.—A Demographic Questionnaire was utilized to collect information on age, sex, race, and ethnicity. The variables age and sex were used as covariates in the current study.

Body Mass Index.—Self-reported height and weight was collected from the participants. BMI was then calculated [weight (pounds)]/[height (inches)^2 × 703] for each participant per World Health Organization recommendations (World Health Organization, 2000).

Chronic Low Back Pain.—To determine eligibility, a 3-item questionnaire related to chronic low back pain was developed by the research team. Items included: (1) “*Do you have chronic pain?*” (2) “*Where is your primary pain?*” and (3) “*What severity is the pain?*” Participants who endorsed moderate to severe chronic pain in the low back region were included in this study.

Perceived General Health.—Perceived general health was measured using a 12-Item Short-Form Health Survey (SF-12; Ware et al., 1996). The SF-12 consists of two summary measures (physical component summary and mental component summary) as well as eight health concepts subscales (physical functioning, role limitations due to physical health problems, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health). In the current study, the 1-item general health subscale (“*In general, would you say your health is…”* and 1-item bodily pain subscale

("*During the past 4 weeks, how much did pain interfere with your normal work [including both work outside the home and housework]?*") were used as covariates with higher scores indicative of higher perceived general health and lower pain interference (*possible range for both subscales 0 – 100*). The SF-12 has demonstrated sound psychometric properties in past work (Gandhi et al., 2001; Ware et al., 1996).

Anxiety Sensitivity.—Anxiety sensitivity was measured using the Short Scale Anxiety Sensitivity Index (SSASI; Zvolensky et al., 2018a). The SSASI is a short version (5-item) of the 18-item Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007) intended to measure the fear of anxiety and arousal-related sensations. Participants were asked to rate on a 5-point Likert-type scale from 0 (*very little*) to 4 (*very much*) the extent to which they are concerned about the possible consequences of anxiety-related symptoms and sensations. The SASSI has sound psychometric properties (Zvolensky et al., 2018a). The SASSI total score (*possible range 0* - 20) was utilized as a predictor variable in the current sample and demonstrated good internal consistency (α = .88).

Fatigue Severity.—Fatigue severity was measured with the 9-item Fatigue Severity Scale (FSS; Krupp et al., 1989). Participants were asked to rate on a 7-point Likert-type scale the degree to which they experience symptoms and impairment related to fatigue (e.g., "*My fatigue prevents sustained physical functioning*") on a scale from 1 (*strongly disagree*) to 7 *(strongly agree*). Items were then averaged to create a total score (*possible range 1 −7)*. The FSS demonstrated excellent internal consistent (α = .93), consistent with past work (Krupp et al., 1989).

Weight-related Impairment.—Weight-related impairment was measured with a 1-item scale in which respondents were asked to "*Please indicate the degree to which you are impaired/limited by your body weight*" on a scale from 0 (*not impaired/limited*) to 10 (*completely impaired/limited*).

Procedure

Participants for the current study were recruited from the United States (U.S.) through a reliable and valid online survey management system (Qualtrics). This approach has been successfully implemented in past work (Zvolensky et al., 2018b). Individuals with a Qualtrics Panels account who endorsed moderate to severe chronic low back pain were sent a survey advertisement to participate in the current study. Interested participant were then screened for initial eligibility criteria. Eligible participants were then redirected to complete the online anonymous Qualtrics survey. Informed consent was obtained from all participants prior to participating in the study. Participants who completed the survey were compensated by preference to receive various forms of compensations (e.g., gift cards, reward miles, reward points, etc.). The study protocol was approved by the Institutional Review Board where the study took place.

Analytic Strategy

Analysis were conducted in SPSS version 25.0. A sample of 700 adults with obesity (BMI ≥ 30) and reported current chronic low back pain completed the survey and were selected for the current study. Data were then checked for inappropriate or carless responding (n= 23), abnormally fast response times (i.e., defined as less than one-half the median soft launch time; n = 36), and the presence of multivariate outliers (n = 25). Thus, the final sample consisted of 616 adults with obesity and reported current chronic low back pain.

Sample descriptive statistics and zero-order correlations were examined among study variables. Next, two separate 2-step hierarchical regressions were conducted to examine the association between anxiety sensitivity on two continuous criterion variables: (1) weight-related impairment and (2) fatigue severity. Step 1 in all models included five theoretically driven study covariates: (1) age (Thorsteinsson & Brown, 2009; Zabelina et al., 2009), (2) sex (Thorsteinsson & Brown, 2009; Zabelina et al., 2009), (3) BMI (Kauffman et al., 2017), (4) pain interference (Louati & Berenbaum, 2015), and (5) perceived general health (Bond et al., 2006). Step 2 in all models included the addition of anxiety sensitivity. To evaluate model fit for each of the steps, the F statistic and increase in variance accounted for (change in R^2) was utilized. In order to examine the effect size for each of the individual predictors, squared semi-partial correlations (sr^2) was used (interpreted as .01 = small, .09 = moderate, and .25 = large; Cohen, 1988).

Results

Descriptive Statistics

Zero-order correlations among all study variables are presented in Table 1. Anxiety sensitivity was positively correlated with BMI (r = .09, p = .027), weight-related impairment (r = .26, p < .001), and fatigue severity (r = .48, p < .001). Anxiety sensitivity was negatively correlated with age (r = −.24, p < .001), pain interference (r = −.33, p < .001), and perceived general health (r = −.21, p < .001).

Hierarchical Regression Analysis

In predicting weight-related impairment, step 1 of the model with covariates only was significant (R^2 = .21, F(5, 610) = 32.67, p < .001). Examining individual predictors, BMI, pain interference, and perceived general health were statistically significant predictors. When anxiety sensitivity was added in step 2 of the model, the model remained statistically significant (R^2 = .23, F(6, 609) = 30.53, p < .001). The addition of anxiety sensitivity accounted for a statistically significant increase in variance (ΔR^2 = .02, F(1, 609) = 15.86, p < .001); anxiety sensitivity was a statistically significant predictor with small effects (sr^2 = .02; see Table 2).

In terms of fatigue severity, step 1 of the model with covariates only was statistically significant (R^2 = .25, F(5, 610) = 41.15, p < .001); age, sex, pain interference, and perceived general health were significant predictors. Step 2 of the model with the addition of anxiety sensitivity was statistically significant (R^2 = .35, F(6, 609) = 54.21, p < .001) and accounted for a significant increase in variance (ΔR^2 = .10, F(1, 609) = 89.65, p < .001). Anxiety sensitivity was a statistically significant predictor of fatigue severity with moderate effects (sr^2 = .10; see Table 2).

Discussion

The present study examined the association of anxiety sensitivity with weight-related impairment and fatigue severity among individuals with obesity and chronic low back pain. As hypothesized, among individuals with obesity and chronic low back pain, higher levels of anxiety sensitivity were associated with increased levels of weight-related impairment and fatigue severity. These findings were evident after accounting for theoretically relevant and statistically significant covariates, including age, sex, BMI, pain interference, and perceived general health, and are consistent with past work that has found anxiety sensitivity to be related to greater levels of fatigue (Lackner et al., 2013) and impairment across multiple domains (e.g., functional, sleep; Kauffman et al., 2017; Korte et al., 2013; McLeish et al., 2007; Storch et al., 2014; Vincent & Walker, 2001) and extends these findings among a sample of individuals with co-occurring obesity and chronic low back pain. The observed effect sizes in the current sample were small (2% of unique variance in weight-related impairment) to moderate (10% of unique variance in fatigue severity). This is in comparison to other work which has documented psychological variables (e.g., anxiety sensitivity, anxiety) to have moderate effects on impairment (Johnson et al., 2019; Vincent & Walker, 2001) and large effects on fatigue (Oh & Seo, 2011). However, the current study is the first to provide effect size estimates among a sample of individuals with co-occurring obesity and chronic low back pain.

Although not a primary study aim, it is important to comment on the degree of anxiety sensitivity observed in the current sample. Specifically, the average anxiety sensitivity levels in the current study ($M = 8.24$, $SD = 5.91$) were comparable to normative scores for individuals seeking mental health outpatient services at a university-affiliated behavioral health clinic ($M = 8.14$, $SD = 5.13$; Zvolensky et al., 2018a) and slightly higher than normative scores for individuals presenting at a community health center for medical treatment ($M = 5.57$, $SD = 5.41$; Zvolensky et al., 2018a). These data are important, as they showcase the generally elevated levels of anxiety sensitivity among this comorbid population. As such, these data suggest that individuals with co-occurring obesity and chronic low back pain are a particularly ‘at-risk’ group due to the potential negative consequence associated with generally elevated anxiety sensitivity.

The present investigation may have important clinical implications. Specifically, it may be beneficial to incorporate anxiety sensitivity within existing screening protocols for individuals presenting with co-occurring obesity and chronic low back pain experiencing weight-related impairments and/or severe fatigue. Such an approach will allow for earlier detection of potential concerns that can then be more adequately addressed through appropriate referrals. Moreover, if the observed findings are replicated and extending using longitudinal methodology, clinicians may benefit from directly targeting anxiety sensitivity. In particular, exercise-based interventions may be particularly useful for individuals with obesity and chronic low back pain as exercise can have direct effects on anxiety sensitivity reduction (Broman-Fulks et al., 2004; Broman-Fulks & Storey, 2008; Smits et al., 2008), weight-related concerns (Ross, 2013), and chronic low back pain (Alzahrani et al., 2019).

The current study has several limitations worth mentioning. First, the data were collected at one time-point. Thus, the directionality of effects cannot be determined. Moreover, it is unclear whether participants' chronic low back pain or obesity condition occurred first. Future research may benefit from a greater understanding of the time course and patterning between obesity and chronic low back pain to gain a more comprehensive historical account of their developmental interplay. Second, the current sample consisted of primarily white females. Although the study utilized a national sample, future efforts are needed to include a more racially/ethnically diverse group with a larger proportion of males. Third, all measures were collected via self-report, including height and weight. Therefore, this method of collection may impose some limitations including underestimation of objective weight status (Bowring et al., 2012) and the possibility of shared method variance. Future work should include objective measures of height and weight, among other multi-method assessment approaches, to test the observed relations. Finally, some of the constructs utilized were assessed using a single item. Future studies should employ multi-item measures of these constructs to better capture these concepts and provide estimates of internal consistency.

Overall, the current study provides initial empirical support for the role of anxiety sensitivity in relation to weight-related impairment and fatigue severity among a population of individuals with co-occurring obesity and chronic low back pain. Moreover, the underlying conditions present (i.e., obesity and chronic low back pain) may be particularly pertinent in driving the relations observed in the current study between anxiety sensitivity with weight-related impairment and fatigue severity. The findings suggest that anxiety sensitivity may be a mechanistic target for better understanding and addressing weight-related impairment and fatigue severity among individuals with obesity and chronic low back pain.

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Table 1.

Descriptive Statistics and Bivariate Correlations between Study Variables (N = 616)

Variable	Mean/n (SD/%)	1	2	3	4	5	6	7	8
1. Age	45.88 (11.53)	_							
2. Sex	476 (77.3%)	−.06	_						
3. BMI	37.05 (6.30)	−.09*	.12**	_					
4. Pain Interference	43.75 (26.13)	−.12**	.01	−.13**	_				
5. Perceived General Health	38.31 (21.18)	−.12**	−.05	−.18***	.37***	_			
6. Anxiety Sensitivity	8.24 (5.91)	−.24***	.04	.09*	−.33***	−.21***	_		
7. Weight-related Impairment	4.55 (2.77)	.08	−.04	.24***	−.41***	−.26***	.26***	_	
8. Fatigue Severity	4.86 (1.48)	−.08*	.16***	.12**	−.43***	−.30***	.48***	.25***	_

Note.

** $p < .001$,

* $p < .05$.

Sex: % listed as females (Coded: 0 = male and 1 = female); BMI = Body Mass Index; Pain Interference = 12-item Short-Form Health Survey-Bodily Pain Subscale (Ware et al., 1996); Perceived General Health = 12-item Short-Form Health Survey-General Health Subscale (Ware et al., 1996); Anxiety Sensitivity = Short Scale Anxiety Sensitivity Index (Zvolensky et al., 2018a); Fatigue Severity = Fatigue Severity Scale (Krupp et al., 1989).

Table 2.

Hierarchical Regression Results

		Weight-related Impairment							
Model		***b***	***SE***	***β***	***t***	***p***	***CI (l)***	***CI (u)***	***sr*²**
1	Age	0.01	0.01	0.04	1.03	.302	−0.01	0.03	.00
	Sex	−0.40	0.24	−0.06	−1.67	.095	−0.87	0.07	.00
	BMI	0.08	0.02	0.18	4.94	< .001	0.05	0.11	.03
	Pain Interference	−0.04	0.00	−0.34	−8.72	< .001	−0.04	−0.03	.10
	Perceived General Health	−0.01	0.01	−0.10	−2.47	.014	−0.02	0.00	.01
2	Age	0.02	0.01	0.08	2.20	.028	0.00	0.04	.01
	Sex	−0.42	0.24	−0.06	−1.78	.076	−0.89	0.04	.00
	BMI	0.08	0.02	0.18	5.02	< .001	0.05	0.11	.03
	Pain Interference	−0.03	0.00	−0.29	−7.19	< .001	−0.04	−0.02	.07
	Perceived General Health	−0.01	0.01	−0.08	−1.95	.051	−0.02	0.00	.00
	Anxiety Sensitivity	0.07	0.02	0.16	3.98	< .001	0.04	0.11	.02
		Fatigue Severity							
Model		***b***	***SE***	***β***	***t***	***p***	***CI (l)***	***CI (u)***	***sr*²**
1	Age	−0.02	0.00	−0.14	−3.79	< .001	−0.03	−0.01	.02
	Sex	0.50	0.12	0.14	3.97	< .001	0.25	0.74	.02
	BMI	0.00	0.01	0.01	0.38	.702	−0.01	0.02	.00
	Pain Interference	−0.02	0.00	−0.39	−10.17	< .001	−0.03	−0.02	.13
	Perceived General Health	−0.01	0.00	−0.17	−4.35	< .001	−0.02	−0.01	.02
2	Age	0.00	0.00	−0.04	−1.00	.316	−0.01	0.00	.00
	Sex	0.47	0.12	0.13	4.05	< .001	0.24	0.70	.02
	BMI	0.00	0.01	0.02	0.46	.649	−0.01	0.02	.00
	Pain Interference	−0.02	0.00	−0.28	−7.47	< .001	−0.02	−0.01	.06
	Perceived General Health	−0.01	0.00	−0.12	−3.36	.001	−0.01	0.00	.01
	Anxiety Sensitivity	0.09	0.01	0.35	9.47	< .001	0.07	0.10	.10

N for analyses is 616 cases Sex: Coded: 0 = male and 1 = female; BMI = Body Mass Index; Pain Interference = 12-item Short-Form Health Survey-Bodily Pain Subscale (Ware et al., 1996); Perceived General Health = 12-item Short-Form Health Survey-General Health Subscale (Ware et al., 1996); Anxiety Sensitivity = Short Scale Anxiety Sensitivity Index (Zvolensky et al., 2018a); Fatigue Severity = Fatigue Severity Scale (Krupp et al., 1989).