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Mediators Between Job Stress and Health Quality of Life Among Adults with Irritable Bowel Syndrome

Aida M. Benitez-Rexach
Walden University

Walden University

College of Psychology and Community Services

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Aida M. Benítez-Rexach

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Review Committee
Dr. Donna Heretick, Committee Chairperson, Psychology Faculty
Dr. Silvia Bigatti, Committee Member, Psychology Faculty
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Sue Subocz, Ph.D.

Walden University
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Abstract

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MPhil, Walden University, 2019

BS, Clemson University, 1992

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Document Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Irritable bowel syndrome (IBS) is a functional gastrointestinal affliction that affects millions around the globe, impacting health-related quality of life (HRQoL). The biopsychosocial model, Folkman and Lazarus' transactional model of stress, Leventhal's common sense model of self-regulation health and illness, and Bronfenbrenner's human ecology theory are relevant to conceptualize interactions among environmental factors, biopsychosocial responses, and health-related quality of life (HRQoL). This quantitative, cross-sectional, complex correlational study sought to provide more understanding of how and whether IBS symptoms of pain, cognitive functioning, and interpersonal functioning serve as mediators between work stress and HRQoL. A total of 133 English-speaking volunteers from online IBS support groups completed an online survey containing a demographic questionnaire, the IBS-36, the Overall Anxiety Severity and Impairment Scale (OASIS), the Modified Illness Perceptions Questionnaire (M-IPQ), and the Workplace Organization Indices (WOI). Mediational analyses were performed using the Hayes Process method. While the study failed to reject the null hypothesis, it provided suggestions for further research into relationships between work stress and HRQoL among individuals who experience IBS. Studies in this area have positive social change because they provide information to individuals diagnosed with IBS, health providers, academic researchers, and employers concerning relationships of symptoms and severity of IBS to workplace stress and emotional well-being of individuals with IBS. This awareness may promote workplace interventions, such as training management on job accommodations and support for these employees.

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Dedication

To my loving husband, who has been putting up with me through the writing process, and that without his love, patience, cheerleading, his strength, and caregiving, this endeavor would have never begun. To my mother, who believed in me against all odds in moments when I have fallen down throughout my life, and to my almost second mother, Lillian Castañeda, my high school teacher, the one who taught me to love teaching and my inspiration in becoming a college professor and engage in thorough research and critical thinking.

To my friends, Dr. Diana Santiago, Dr. Vanja Bokun Popovic, and Lisa Squier, who have been my personal cheerleaders, who have been constantly challenging me to do better and comforting me with tears and laughter even if we are miles apart.

For all the rest of my friends who have supported me, and to all individuals with IBS, who deserve full social support and a better quality of life.

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I would also like to thank all Walden University professors I have met through graduate courses, particularly Dr. Monny Sklov, who helped me brave out my fear of statistics and made a dreadful subject into an exciting subject and a positive challenge that I embrace daily nowadays.

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Chapter 1: Introduction to the Study

Irritable bowel syndrome (IBS) is a common functional disorder in the intestines with a multiple range of symptoms from mild to severe (American Psychological Association, 2020). Individuals with IBS suffer from changes in bowel habits, from diarrhea to constipation or alternating both, abdominal pain, bloating, and distension. Furthermore, other symptoms include rumbling stomach or borborygmi, severe gas, low back pain, and in women, symptoms such as bladder pain, joint pain, painful sexual intercourse, and headaches are also present (Whorwell, 2017).

IBS has also been viewed by researchers as a psychophysiological disorder (PPD) because of its symptomatology. Clarke et al. (2019) explained that PPD symptoms cover three categories: functional, inconsistent, and triggered (FIT) . The functional PPD symptoms begin without a physical cause, a sensation of burning in the affected area and radiating from the affected area to other parts of the body, and when the individual suffers from stress. The inconsistent characteristic of PPD symptoms manifest a duration of hours, days, and longer, depending on the time of the day, and of varying intensity. Symptoms may occur when the individual is affected by a potential stressor though the symptoms may be minimal or nonexistent if the individual is enjoying an activity and not thinking about the condition or a stressor. Triggered PPD symptoms may begin by unrelated causes, such as smells, foods, movements, and anticipating stressful events, such as going to school, work, a medical visit, or going to a social gathering, even by imagining the triggering situation (Clarke et al., 2019). According to these FIT factors,

IBS falls under the PPD category for individuals who meet the requirements under this category.

The preoccupation among individuals with IBS is that severity of the symptoms can be excruciating enough to affect daily activities both at home and at work, affecting interpersonal relationships and their cognitive abilities during flareups. Concerns about symptoms can cause emotions of anticipation and anxiety on when will the next flareup take place and where, affecting their quality of life. In severe cases, the effect on quality of life can result in major depressive disorder and suicidal ideation (Törnblom et al., 2018; Whorwell, 2017).

In this study, I examined the relationship between workplace stress and health-related quality of life among adults suffering from IBS. Specifically, I addressed a gap in the literature and test pain severity, with cognitive functioning and interpersonal functioning as mediators between workplace stress and health-related quality of life. In this chapter, I present the background, the gaps in the literature, the problem and purpose statements, the research question and hypothesis, as well as the theoretical framework that guided this study.

Background

Individuals diagnosed with IBS suffer from a lower quality of life (QoL) through maladaptive coping, susceptibility to other GI disorders, and high functional impairment issues compared to other GI disorder patients and healthy individuals (Hausteiner-Wiehle & Henningsen, 2014; Radovanovic-Dinic et al., 2018). QoL for individuals diagnosed with IBS is associated with mood shifts, sleep disturbances, emotional suppression,

distress, and fatalistic fears due to the frequency of bowel movements and pain, affecting their daily activities and even work production (Edman et al., 2017).

Stress is a cause for concern among individuals with IBS, particularly for individuals who work . Factors influencing the impact of stressors include the workplace environment, availability of social support, and the individual's coping abilities and previous personal experience in a work environment (Monroe & Slavich, 2016) . A particular stressor within the workplace may trigger a negative response for one individual but no response for another, which means that stressor appraisals should be taken into consideration among IBS patients because personality could also become a factor. For example, the use of the Schedule of Recent Experiences questionnaire (SRE) provided a self-reported list for stress appraisal with 44-statements measuring the number of times the experiences occurred. If the number of points of the item responses were high ($N \geq 200$), the probabilities of suffering from a stress-related illness increased (Monroe & Slavich, 2016). However, such tests were considered unreliable because they could have been confounded by pre-existing conditions and other experiences.

Bengtsson et al. (2013) conducted a study to observe the differences between individuals with IBS and irritable bowel disease (IBD) in self-esteem, experiences with close relationships, general well-being, and physical symptoms, including those related to colitis. Bengtsson et al. used four questionnaires: the Rosenberg Self-Esteem Scale (RSES), the Toronto Alexithymia Scale (TAS), the Experience in Close Relationships (ECR), and the Sense of Coherence (SOC) in 74 patients with IBD with an age range of 18-82 years, and 81 patients with IBS with an age range of 21-66 years. Besides the four

questionnaires, Bengtsson et al. used also the Harvey-Bradshaw Index (HBI), which assesses the general wellbeing, abdominal pain, and intestinal complications. Moreover, Bengtsson et al. used the Simple Clinical Colitis Activity Index (SCCAI) to assess worsening conditions in participants, such as increased bowel movements during day and nighttime and amount of bowel movements, the urge to defecate, and if there was blood in their stools. Bengtsson et al. used a final assessment, the Visual Analogue Scale for IBS (VAS-IBS), to have the patients assess on a scale from 0 to 100 their concerns over physical symptoms of abdominal pain, bloating, nausea, diarrhea, constipation, flatulence, vomiting, and general quality of life.

Bengtsson et al, (2013) determined that there was a gender difference in diagnosis (more males with IBD, more females with IBS), that patients with IBS scored higher on the TAS and the SOC. Individuals diagnosed with IBS showed more relationship anxiety and had maladaptive coping skills potentially related to early childhood experiences. These stressors and maladaptive coping skills are possible influencers of quality of life in the experiences of adult IBD/IBS patients, potentially increasing stress and subsequent decrease in QoL. Two of the many possible limitations of this study were a lack of data regarding participant level of education and employment status. Berrill et al. (2013) conducted an observational study to explore the cognitive profile with IBS and IBD patients as the researchers knew that cognitive deficits occur in most chronic illnesses, yet IBS and IBD patients have rarely been studied to observe their cognitive function. Berrill et al. (2013) used the Cardiff Cognitive Battery (CBB), which consisted of seven cognitive performance tests, and results showed that neither IBS nor IBD caused clinical

cognitive deficit. However, the CBB results from the researchers showed that mood disorders triggered by these gastrointestinal disorders may affect the cognitive performance of IBS and IBD patients when performing specific tasks (Berrill et al., 2013).

Berrill et al. (2013) recruited 231 participants, where 150 were IBD patients and 40 were individuals diagnosed with IBS from the University Hospital in Llandough, Wales, and recruited 41 healthy participants as a control group from Cardiff University also. All participants submitted questionnaires with their personal profile, including demographics, medical history, and current medications. Furthermore, participants submitted a hospital anxiety and depression, 3-point Likert scale self-assessment, and the individuals diagnosed with IBS took the IBS symptom severity scale (IBS-SSS), and all participants did the CBB (Berrill et al., 2013). The test was an online neuropsychological test consisting of psychomotor speed, working memory, episodic and memory tasks, as well as an attention test, an interference test with a Stroop task, and fluid intelligence and crystallized intelligence tests. IBS and IBD patients also had to submit a fecal sample a week prior to the clinical assessments to measure fecal calprotectin (FC) levels to observe if there was any gut inflammation.

Clinical and statistical results showed that healthy participants showed lower levels of anxiety and depression than the IBS and IBD patients, but no statistically significant differences on fluid and crystallized intelligence tests. However, after reviewing the ANOVAs and ANCOVA results, IBD and individuals diagnosed with IBS showed discrepancies in covariates, such as their educational levels, where 63% of the

healthy participants, 53% of individuals diagnosed with IBS, and 38% of IBD patients attended university, and 37% of the healthy group, 47% of individuals diagnosed with IBS, and 62% of IBD patients did not attend university. Therefore, the only significance was the level of education of the participants and the onset of IBS and IBD, as more educated individuals sought medical diagnosis and supervision at the onset of the disease (Berrill et al., 2013). Furthermore, the verbal IQ from the participants showed a decrease among IBD and individuals diagnosed with IBS, depending on the mood, or state of depression or anxiety. The importance of the Berrill et al. (2013) study was the use of measures in diagnosing IBS, as the lack of checking symptoms and not obtaining the FC measurements could extend the exacerbation of symptoms and could affect the quality of life of individuals diagnosed with IBS.

Geng et al. (2018) prepared a meta-analysis to compare comorbid depression and anxiety in IBS and IBD patients to compare the severity of these GI disorders, as Geng et al. affirmed these two disorders could diminish the QOL in patients with an increased risk of suicidal behaviors and impaired personal and social functioning. Geng et al. also pointed out that IBS and IBD overlap in symptoms over their biological gut-brain interactions and psychosocial factors, and there had been few studies on depression and anxiety in IBS and IBD patients.

The methods used for the Geng et al. (2018) study were systematic reviews and meta-analysis, performing literature research in English and Chinese using the keywords *irritable bowel syndrome, colonic diseases, functional* OR *functional bowel diseases"* OR *IBS* AND *depressive* OR *depression* OR *melancholia*. Furthermore, Geng et al. used

clinician-rated and self-rated scales, such as the HADS, SDS, Beck Depression Inventory , Depression Anxiety Stress Scales and Hamilton Depression Rating Scale. The researchers excluded studies with specific populations and studies not conducted in English or Chinese. Using statistical analysis of standardized mean differences and odds ratios, results showed high entries (6,654 records) with 4,071 duplicates, and 475 articles were assessed for eligibility in studying the desired comorbidities., with 22 qualitative studies and 22 quantitative studies. The eligible papers described that those individuals diagnosed with IBS suffered more severe depression symptoms than IBD patients (n=1,244, p=0.01) and that the age was not a factor. Furthermore, Geng et al. observed that individuals diagnosed with IBS in the eligible articles suffered more from severe anxiety than IBD patients (n = 1,057, p = 0.0006). Although the prevalence of diagnosed depression showed that individuals diagnosed with IBS had higher numbers of confirmed depression (p = 0.29), the difference was not statistically significant. Geng et al.'s research clarified gaps in studying the psychological comorbidities with IBS . In addition, results indicated that although sharing some common symptoms, IBS is a functional disease that is related more to psychological distress with depression and anxiety, while IBD is an organic disease.

Individuals diagnosed with IBS suffer a verbal IQ reduction depending on the mood, state of anxiety, and level of depression (Berrill et al., 2013), and have also shown higher levels of depression and impaired visuospatial memory in the hippocampus (Kennedy et al., 2014). Evidence in recent studies in cerebellar blood oxygen level-dependent data (BOLD) in fMRIs showed that individuals diagnosed with IBS suffer

from emotional alteration of fear and anticipation in the medial, intermediate, and lateral cerebellum, and triggering the fear factor, exacerbating abdominal pain (Claassen et al., 2017). Furthermore, individuals diagnosed with IBS suffer more anxiety in interpersonal relationships and have displayed negative life events, implying they suffer from a lower quality of life than healthy individuals (Bengtsson et al., 2013).

Individuals diagnosed with IBS suffer emotional suppression and higher stress because of the social taboos of discussing their pain distress (Bowers et al., 2017). Moreover, further studies asserted that IBS displays an interaction between the disorder and psychiatric disorders, such as bipolar disorder and schizophrenia, besides generalized anxiety disorder (GAD), panic disorder, and major depressive disorder (MDD) affecting their HRQoL (Fadgyas-Stanculete et al., 2014).

Gap in Literature

Researchers have been more concerned with the gut-brain connection, and cognitive functioning in gastrointestinal disorders (GIDs) and IBD (Bengtsson et al., 2013; Berrill et al., 2013). There is a gap in literature in cognitive impairments, pain, quality of life, interpersonal functioning and IBS. Recent studies related possible frontal executive dysfunction and cognitive alterations among IBS patients (Hubbard et al., 2015; Wong et al., 2019) and another older study explained a possible connection on cognitive deterioration (Chen et al., 2016), suggesting the need for further inquiry . Furthermore, there is a gap in literature in pain symptoms affecting IBS, as studies show conflicting information on IBS on whether it is a functional, mental, or somatization disorder (Fond et al., 2014; Hausteiner-Wiehle & Henningsen, 2014; Van Oudenhove et

al., 2016). Moreover, there are gaps in the literature in job stress and the quality of life on individuals with IBS, with conflicting reports on the relationship between job stress, quality of life, and IBS, recommending further research to study if the relationships are psychosocial and demographic (Huerta et al., 2019; Weaver et al., 2018), or job burnout (Hod et al, 2020) and job dissatisfaction (Gulewitsch et al., 2013).

Problem Statement

IBS is a functional gastrointestinal disorder affecting approximately 11% of the global population (Canavan et al., 2014). IBS is indirectly related to stress, affecting the QoL of sufferers with mood and behavioral alterations (Pellissier & Bonaz, 2017) . These IBS-induced alterations are proposed to be the result of a complex two-way interaction between the brain and the gut (Lackner et al., 2014; Pellissier & Bonaz, 2017).

QoL is defined as "a state of complete physical, mental, and social wellbeing, not merely the absence of disease" (World Health Organization, 2019, p.9). Biegańska-Banaś et al. (2019) also further defined QoL as a personal, comprehensive self-assessment on one's physical health, psychological state, social interaction, autonomy, and independence, personal beliefs and convictions that provides a subjective sense of wellbeing (p. 46) . If this general state of wellbeing is affected by an imbalance of physiological, mental, social, and biological loss of homeostasis, this could affect cognitive functioning of an individual (Biegańska-Banaś et al., 2019, p. 47; U.S. Department of Health and Human Services, 2019). Cognitive functions involve mental basic cognitive processes including perception, attention, memory, and complex processes of thinking, language, and executive functions related to activity initiation, and

global functions, like attention and psychomotor speed. (Biegańska-Banaś et al., 2019, p.47). Popa et al. (2018) noted that increased job stress can affect cognitive functioning of individuals with IBS. Individuals diagnosed with IBS who work, according to the researchers, showed lower energy levels, altered physical symptoms, lower levels of self-confidence and resilience, and a lower state of mind than healthy individuals, implying that any changes in cognitive functioning is associated with pain and reduced QoL.

In studies, researchers found a relationship between work-related activities and cognitive impairment in individuals diagnosed with IBS, affecting the cognitive performance of both IBS and IBD in specific tasks (Chen et al., 2016). However, there are gaps in the IBS-cognitive functioning connection. Buono et al. (2017) pointed out in a study that individuals diagnosed with IBS with diarrhea (IBS-D) had significantly lowered work productivity and higher absenteeism, costing patients and employer productivity issues and economic losses.

Individuals diagnosed with IBS show difficulties in performing physical activities and decreased stamina, suffering from fatigue during flareups (Frändemark et al., 2016). Furthermore, IBS flareups affect social interaction by halting daily activities and close relationships, diminishing sexual relationships in the couple, and contributing to low self-esteem, all of which cause a diminished quality of life (Bengtsson et al., 2013).

Purpose of The Study

The purpose of this study was to examine the relationship between workplace stress and health-related quality of life among adults suffering from IBS. The dependent variable was *health-related quality of life* (HRQoL). The independent variable was *work*

stress (WS) as the controlling factor, with *pain* (P), *cognitive functioning* (CF), and *interpersonal functioning* (IF) as factors to examine as mediators of the prediction of HRQoL. I considered pain severity, cognitive functioning, and interpersonal functioning as mediating variables. I tested parallel mediation regression models developed by Hayes (2018) with the tool called PROCESS macro. PROCESS macro tool is a logistic regression path analysis instrument using ordinary least squares regression (OLS), and it is used to estimate direct and indirect effects in mediator models, allowing multiple mediations (Hayes, 2018). The PROCESS macro tool is used in SPSS, SAS, and R; it is easier to use than the Baron and Kenny (1986) approach because it is simpler to understand and its application allows the user to bootstrap automatically, simplifying logistic regression procedures (Hayes, 2018).

Research Question

RQ: Do pain severity, cognitive functioning, and interpersonal functioning mediate the relationship between workplace stress and health-related quality of life in individuals diagnosed with IBS?

H_0: Pain, cognitive functioning, and interpersonal functioning do not mediate the relationship between work stress and health-related quality of life.

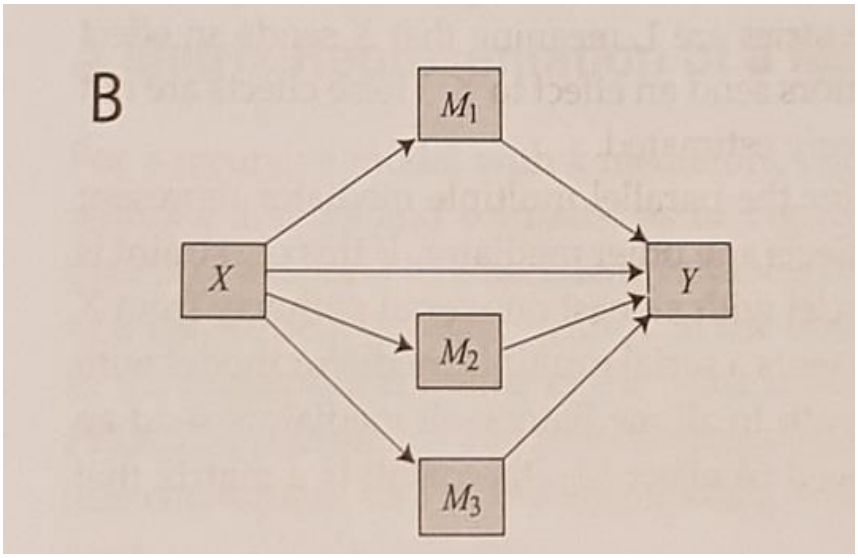
H_1: Pain, cognitive functioning, and interpersonal functioning do mediate the relationship between work stress and health-related quality of life.

The suggested hypothesis was that the levels of job stress may directly affect the health-related quality of life of individuals with IBS, and that pain, cognitive functioning, and interpersonal functioning may indirectly affect the levels of job stress in the quality

of life of individuals with IBS as intervening factors or mediators . I used a quantitative, nonexperimental, complex correlational study using the Model 4 of Hayes' mediational regression model or PROCESS (Hayes, 2018, p. 616), with three mediators, as shown in Figure 1.

Figure 1

Hayes' Parallel Mediational Regression Model Called PROCESS



Note. From "Appendix B" by A. F. Hayes, Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach (2nd ed., p. 616), 2018, Guildford Press. Copyright 2018 by Guildford Press. Reprinted with permission.

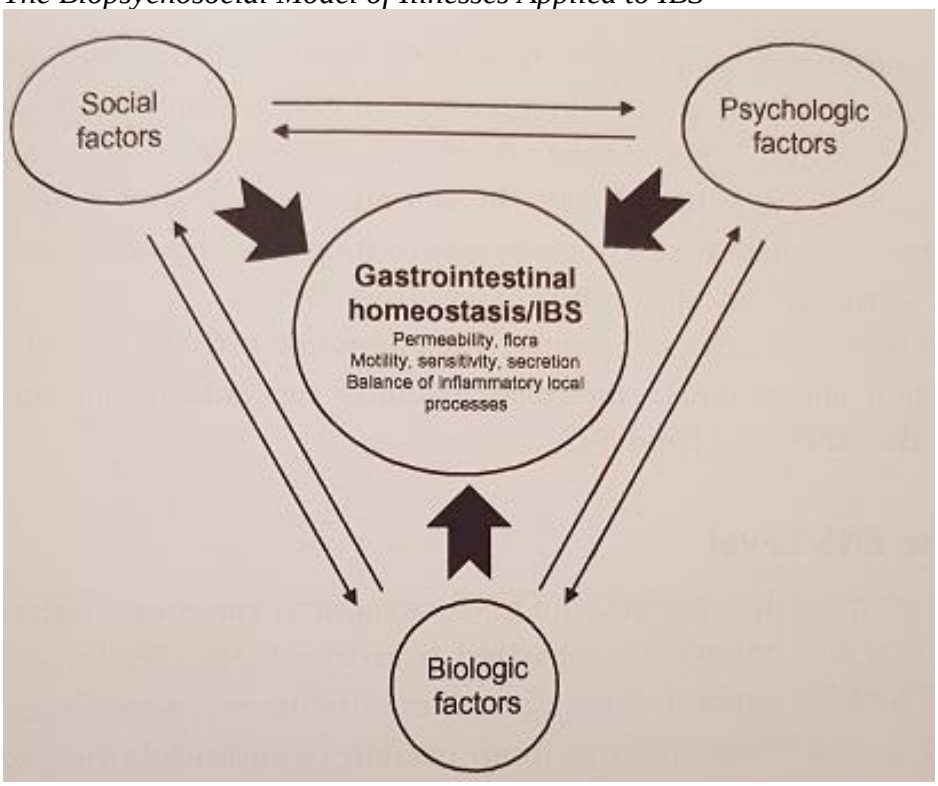
The Model 4 from Hayes' mediation regression shown on Figure 1 depicted an independent variable *X*, which was *WS* in my study, with a direct effect of a dependent variable *Y*, assigned as *HRQoL*). *P* was a bivariate mediator M_1, *C)* was the bivariate mediator M_2, and *I)* was the bivariate mediator M_3 as the factors to examine the possible indirect effect of the prediction of *Y* (*HRQoL*).

Theoretical Framework

According to the biopsychosocial model, IBS is related to complex biological, social, and psychological factors affecting gastrointestinal homeostasis, linking stress, emotions, and brain-gut interaction (Pellissier & Bonaz, 2017). Lehman et al. (2017) explained that biological factors, like the immune system, cardiovascular system, and other interconnected systems with cells and innervations affect the health dynamics of the individual, affecting the psychological model, where neural pathways affect pain detection, sending emotional, cognitive, and attitudinal behaviors, affecting interpersonal reactions and perceived health attitudes. This complex, multifactorial biopsychosocial model was represented by Pellissier and Bonaz (2017) and it showed that IBS symptoms may be inconsistent at times and will vary depending on the individual, as shown in Figure 2 (Pellissier & Bonaz, 2017, p.331).

Figure *2*

The Biopsychosocial Model of Illnesses Applied to IBS



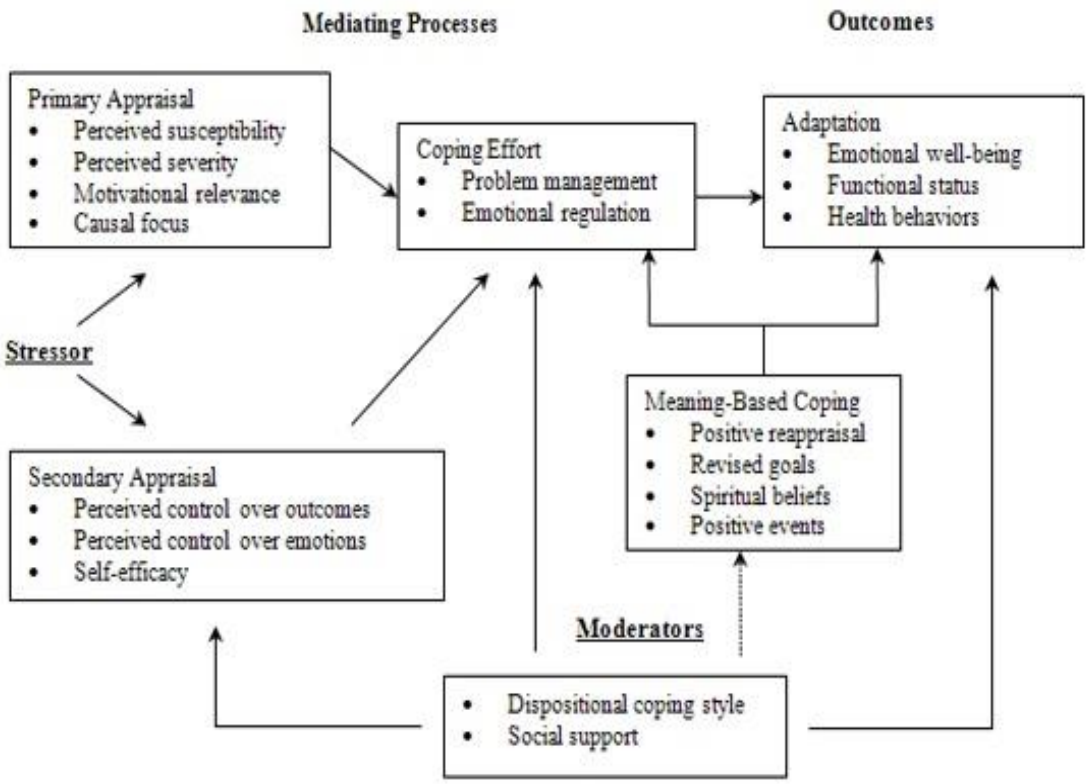
Note: From "The Place of Stress and Emotions in the Irritable Bowel Syndrome," by S. Pellissier and B. Bonaz, 2017, Vitamins and Hormones: Anxiety, Volume 103, p. 331. http://dx.doi.org/10.106/bs.vh.2016.09.005 Copyright 2017 by Elsevier. Reprinted with permission.

Folkman and Lazarus defined coping as a constant fluctuation of cognitive and behavioral attempts to manage specific external and internal factors affecting the resources of the individual as too difficult or exceeding them (Torkzadeh et al., 2019). The transactional theory of stress and coping described processes modifying stressors and aiding in controlling negative environmental and individual interactions, and the revised transactional theory attempts to facilitate positive emotions and their functions during intensely stressful events (Biggs et al., 2017). The model is depicted as a series of

moderators and mediating processes influencing the stressor to provide a series of outcomes to promote adaptation, emotional wellbeing, and positive functional outcomes in promoting health behaviors to resolve stressful events, as shown in Figure 3, and illustrated by Wethington et al, (2015).

Figure 3

Folkman and Lazarus Transactional Theory of Stress and Coping



Note. From "Stress, Coping, and Health Behavior", by E. Wethington, K. Glanz, and M. D. Schwartz, in K. Glanz, B. K. Rimer, and K. Viswanath (Eds.), *Health Behavior: Theory, Research, and Practice (5th ed.,* p. 228), 2015. Jossey-Bass. Copyright 2015 by John Wiley & Sons Inc. Reprinted with permission.

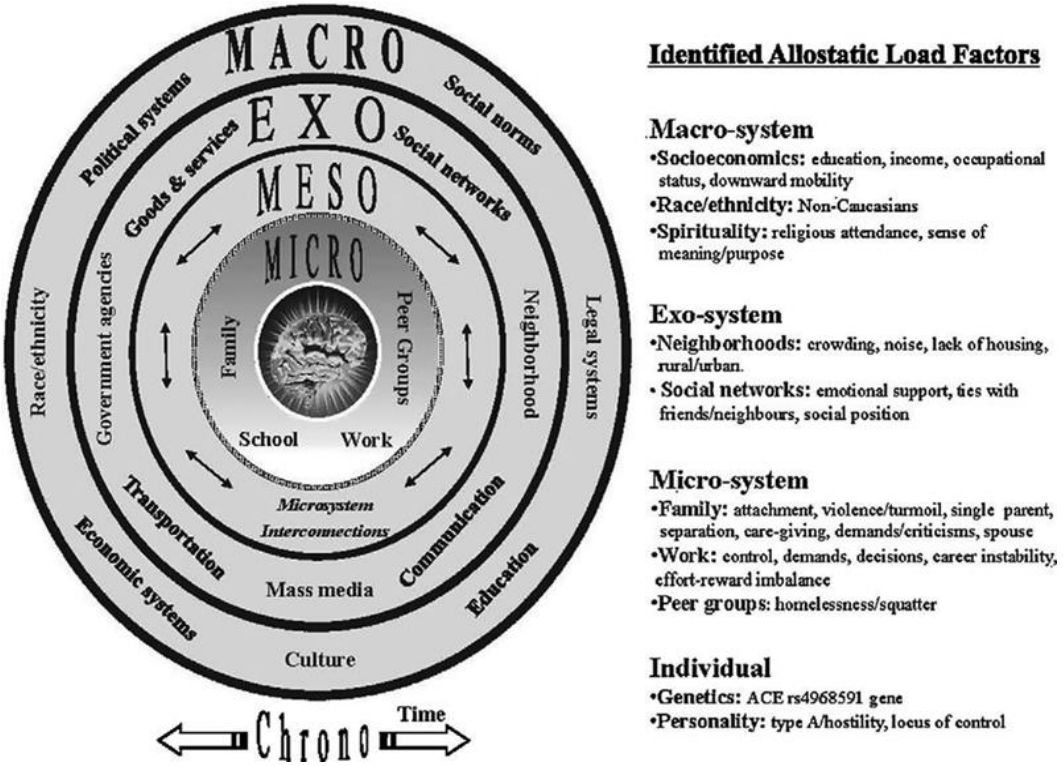
Darnall (2019) pointed out that chronic pain arises when healing has not been resolved because of undertreatment or overtreatment, causing a cycle of psychosocial dysfunctions, such as sleep, mood, and cognition disturbances and other psychological

disorders which may negatively affect the QoL within the individual, its nearby inner circle, the environment, and social circumstances, aligning with Bronfenbrenner's human ecology theory that may influence individual behavior and cognitive functioning (Cross & Cross, 2017).

Interpreting the model with IBS symptoms, the allostatic load of an individual suffering from IBS can be in any of the rings, as ring factors permeate back and forth. For example, the socioeconomic status of the individual−social mobility, income, and level of education−may affect the individual at a macrosystem level if the allostatic load fluctuates because of other factors, such as a change of income or loss of income, which in turn it could affect the spiritual aspect of the individual, triggering IBS symptoms, including pain. Furthermore, allostatic load may also be affected within the exosystem level because of fluctuations in emotional support and friendship ties because of circumstances beyond the control of the individual who suffer from IBS, and causing a loss in interpersonal relationships, and affecting further into the microsystem level, where the individual may lose control with the excessive allostatic load, as shown in Figure 4, as explained by Juster et al (2010).

Figure 4

Bronfenbrenner Human Ecology Model: Allostatic Load Factors



Note. From "Allostatic Load Biomarkers of Chronic Stress and Impact on Health and Cognition," by R-P. Juster, B.S. McEwen, and S.J. Lupien, (2010), Neuroscience & Behavioral Reviews, 35(1), p.14. https://doi.org/10.1016/j.neubiorev.2009.10.002 Copyright 2010 by Elsevier. Reprinted with permission.

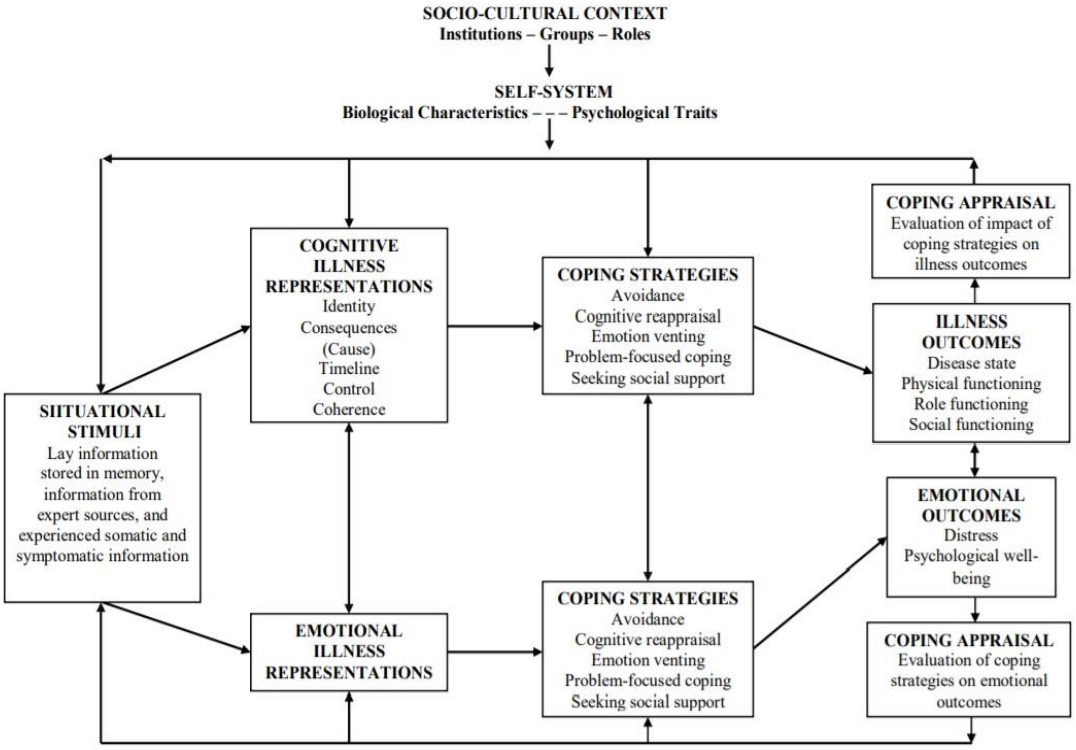
The psychological conflict of these shifts within the model implies that IBS has a psychophysiological nature, as individuals may have personal experiences throughout their lives where emotions trigger organic functions, and when these emotions recur, the brain-gut system finds a pathway to produce the organic disturbances as the frequency of the uncomfortable emotions continue (Clarke et al., 2019).

Hagger and Orbell (2003) explored the common-sense model of illness representations (CSM) developed by Leventhal et al. (1980) which provided a schema of

two main feedback loops of memory storing of symptoms and somatizing externally gathered information (Hagger & Orbell, 2003). As observed in Figure 5, the first loop sends one loop to illness cognition to coping strategies, coping appraisal, and illness outcomes, and the second loop that somatizes symptoms to represent emotional illness, emotional coping strategies, emotional appraisal to provide an emotional outcome or emotional distress (Hagger & Orbell, 2003). The CSM model has been applied to neuroepileptic patients (Hagger & Orbell, 2003), and it could be applied to individuals diagnosed with IBS, as IBS display highly symptomatic outcomes at a physical and emotional level, as explained by Hagger et al. (2017):

Figure 5

The Common-Sense Model of Illness Representations



Note. From "The Common Sense Model of Self-Regulation: Meta-Analysis and Test of a Process Model," by M. S. Hagger, S. Koch, N.L.D. Chatzisarantis, and S. Orbell 2017, Psychological Bulletin, 143(11),p. 1119. (https://doi.org/10.1016/j.neubiorev.2009.10.002). Copyright 2017 by the American Psychological Association

Definitions

The following terms and definitions for this study were used to help readers to understand the purpose of my research.

Cognitive Functioning: The multiple mental capabilities, from thinking, to reasoning, problem solving, attention, decision making and processing speed to perform in situations (Fisher et al., 2019).

Health-Related Quality of Life: It is an assessment, whether personal or professional, on the physical, mental, emotional, and social functioning on an individual related to life satisfaction and its consequences (U.S. Department of Health and Human Services, 2020).

Irritable Bowel Syndrome: A functional gastrointestinal disorder that displays frequent symptoms of abdominal pain, bloating, irregular bowel movements, difficulty in evacuation, and whose individuals experience diarrhea, constipation, or both, without any organic etiology (Gulewitsch et al., 2013). It is a common disorder that causes decreased work productivity and a low quality of life (Weaver et al., 2018).

Interpersonal Functioning: It is related to the processes of thinking and reacting emotionally to react and relate to others in daily living, or ability to empathize and have close connections with others (DSM-V, 2013; Jeung & Herpertz, 2014)

Job Stress: The type of stress made worse by work, when an individual perceives a work environment where is an imbalance between high demands of performance and the ability to cope, causing low control and support (Heikkilä et al., 2014).

Mediation: A statistical method used to evaluate an X variable as an antecedent transmit an indirect effect on an intermediate variable M, which in turn would cause a final variable Y as a result (Hayes, 2018). In this study, there were three M variables as a process.

Pain Severity: Pain is an unpleasant bodily sensation causing an unpleasant emotional experience and causing potential physical, physiological, or psychological damage, depending on the level of the sensory experience (Gorczyca et al., 2013).

Nature of the Study

The study was a quantitative complex, non-experimental correlational survey research of diagnosed IBS adult patients between the ages of 18 and 65 years of age by using multiple linear regression and the Hayes' parallel mediation model, or PROCESS, an optional feature used in the SPSS program. Participants were chosen through convenience sampling using online surveys. I used obtained information for participant demographics (See Appendix B). Four published instruments were used for examining the variables: (a) the IBS-36 for quality of life questionnaire for HRQoL variable (Groll et al., 2002); (b) the Overall Anxiety Severity Impairment Scale, also known as the OASIS (Norman et al., 2006) to examine the cognitive functioning mediating variable CF; (c) the Modified Illness Perceptions Questionnaire (Marcus et al., 2014) to examine HRQoL and pain severity P, an(d) the Workplace Organization Indices (Boreham et al., 2016) to measure stress at the workplace and outside the workplace, for both the WS variable and the IF mediating variable.

Assumptions

The assumptions for the research were that the participants in the study had volunteered to participate in the study, that they understood instructions, and they were native speakers of English and were familiarized with the wording employed in the questionnaires. Also, it was assumed that the participants who self-reported had been diagnosed with IBS and are members of this population.

Scope and Delimitations

The scope and delimitations of this research were that the study had volunteers as participants who self-reported or had been diagnosed with IBS. The age range was between 18 and 65 years of age. Also, that the participants spoke English and understood the use of Internet and had personal access to their own Internet, and that the series of questionnaires from the study were done without the help from another individual.

Limitations

There were several limitations inherent in the study. One of the limitations of this type of study was convenience sampling, which may have created the risk for sampling bias in gathering participants. However, the sampling focused on a population of individuals who are active in online groups because they are IBS patients. Another limitation was the possible return rate. Some individuals may have not done or completed the survey for a variety of reasons, such as lack of time, lack of interest, or internet connectivity issues. Lower response rate or failure to complete may also had been related to the anxiety and low interpersonal relationships associated with individuals diagnosed with IBS (see Bowers et al., 2017), as well as the anxiety occurring at the time of the surge of the COVID-19 pandemic, that may had triggered more anxiety than normal. As all participants were drawn from individuals who were active on online support or information groups, they may have not been representative of those who do not participate in such forums. Also, the costs for specific instruments, permissions, survey software use, and data storage were expensive. Finally, online security is a potential limitation. This was addressed by assigning them a random case number generated by the

survey program. Additionally, data was downloaded to an offline medium in three external hard drives and the data collected and analyses were password protected and stored at my home inside a security box with key. This security ensured the personal privacy of the participants and prevented disclosing any private information and maintained the American Psychological Association Ethical Principles of Psychologists and Code of Conduct (APA, 2010).

Significance

The results of this study may provide application of the biopsychosocial model, the Folkman and Lazarus' transactional model of stress, the Bronfenbrenner human ecology theory, and the CSM (Hagger & Orbell, 2003) to enhance understanding of relationships between workplace stress, cognitive functioning, and interpersonal functioning, and health-related quality of life for IBS patients . Results could provide information to individuals diagnosed with IBS, health providers, academic researchers, and employers concerning relationships of symptoms and severity of IBS to workplace stress and emotional well-being of individuals with IBS. Further research of the HRQoL among individuals diagnosed with IBS would help in assessing coping strategies and provide improved psychological treatments, as well as workplace policies, to provide a better understanding of individuals diagnosed with IBS, especially considering the current circumstances of the ongoing Covid-19 global pandemic, where GI symptoms are also now a part of Covid-19 (also known as SARS-CoV-2) were approximately 51% of patients tested positive from the coronavirus at the time of the study (Devkota et al., 2020, Luo et al., 2020; Pan et al., 2020; Xiao et al., 2020).

Sources of Data

Primary data came from anonymous, English-speaking, IBS-diagnosed patients who are members of online IBS support groups and living in the United States. Target groups included the ROME Foundation support groups, the Facebook IBS support group, Reddit IBS support groups, Twitter IBS support groups, and the International Foundation for Gastrointestinal Disorders (IFFGD, 2020). Participants self-reported a medical diagnosis of IBS. An online consent form was presented at the beginning of the survey, and the survey did not proceed unless the subject had agreed to participate. Participants were able to leave the study at any time without penalty. I provided the established surveys: (a) The IBS-36 questionnaire for measuring IBS QoL (Groll et al., 2002), (b) The Overall Anxiety Severity Impairment Scale (Norman et al., 2006), (c) The Modified Illness Perceptions Questionnaire (Marcus et al., 2014), and (d) The Workplace Organization Indices (WOI), a questionnaire offering extensive aspects of job satisfaction, job insecurity, workplace stress, and work-to-life interference (Boreham et al., 2016). The authors of the instruments chosen for the study had already approved their consent to use their instruments (see Appendix A).

Analytical Strategies

The projected minimum sample size was 129 participants, based on a power analysis using G*Power for a fixed factor multiple linear regression with four predictor variables, with alpha set at 0.05, effect size $f^2 = 0.15$, and power = 0.95

In preparation for the test of the full prediction/mediation model, using SPSS software (Version 27), I computed bivariate correlations between scores on measures for

all pairs of variables. Next, I performed three basic linear regressions to evaluate each of the variables individually as mediators between job stress and HRQoL. Finally, I evaluated the primary research question. Using Hayes' (2018) Process Model 4 on SPSS, I evaluated the overall model with pain, cognitive function, and interpersonal functioning as parallel mediators between work stress and health-related quality of life .

Summary

Chapter 1 provided an overview of the study. The chapter provided information about IBS, a background of the specifics that were addressed throughout the study, the problem statement, the purpose of the study, and the primary research question. Furthermore, the chapter provided a theoretical framework on the nature of the study, assumptions, and the significance of the study, which was the need for further research on the quality of life of individuals with IBS and the quest for a better understanding about the needs of the patients through this research. Chapter 2 provides an in-depth review of the literature and background related to IBS, as well as related theory and research.

Chapter 2: Review of the Literature

The purpose of this study was to examine the relationship between HRQoL among adults suffering from IBS and its effects on their mental health and cognitive functioning through a linear regression mediational analysis called Hayes' mediation and PROCESS macro. The literature review showed that studies about the organic and functional etiology of IBS, its relationship to stress and IBS, particularly stress in the workplace, QoL among individuals with IBS, comorbidities and contributing factors, and current social support research were still considered inconclusive. Although there had been hierarchical regression studies for GI disorders, these studies have done only for IBD (Kamp et al., 2019), but no further research had examined the factors identified in a hierarchical regression model to evaluate the predictors of the factors mentioned above with the QoL for individuals with IBS.

The importance of this study involved finding the gaps in the literature on job stress, cognitive functioning, pain, interpersonal relationships, and their effects on the QoL among individuals with IBS. Since there had been conflicting research between the interaction among the study variables as IBS patients, there had been a gap in literature in cognitive impairments, pain, quality of life, and interpersonal functioning and IBS, as previously stated in Chapter 1. I examined the independent variable of job stress, using mediating variables of pain, interpersonal functioning, and cognitive functioning variables through the PROCESS macro parallel mediational model, and the effects of the QoL dependent variable to examine which ones would affect the QoL outcome directly or indirectly and to what extent.

This literature review provided all the research to date on IBS etiology, diagnosis, the types of tests for its diagnosis, pharmacological treatments, psychological approaches for individuals with IBS, social support and online social groups and the gaps in the literature observed. Support from the literature review came from the following Walden University databases: EBSCO host, ProQuest, PsycINFO, SAGE database for references, PsyTests, books, peer-reviewed and open-access journals within the past 5 years, save for a few exceptions, such as seminar works on specific theories. The keywords used to search through the databases were *irritable bowel syndrome and quality of life, irritable bowel syndrome and mood disorders, irritable bowel syndrome and depression, irritable bowel syndrome and chronic pain, irritable bowel syndrome and interpersonal relationships, IBS and uncertainty, IBS and stress, IBS and cognitive impairment, IBS and job performance,* and *IBS treatments*. Except for background sources related to theories, publication dates were limited to articles from 2008 to 2022.

IBS as a Functional Disorder

The Rome Foundation (2016), the organization that classifies and assesses functional gastrointestinal disorders (FGIDs), updated their fourth edition and it is the current source for DGBI (Drossman, 2016). This update described four types of IBS: IBS-C for constipation, IBS-D for diarrhea, IBS-M for mixed, or combined diarrhea and constipation, and IBS-U for unclassified origin. Further, the Rome Foundation defined IBS as an FGID related to motility disturbance, visceral hypersensibility, altered mucosal and immune function, changes in gut microbiota, and in CNS processing, involving multiple pathological processes (Drossman, 2016) . Moreover, the ROME IV update

eliminated the use of the word abdominal discomfort because of its ambiguity, and added bloating, distention, and an average of presence of abdominal pain at least 1 day per week during at least 3 months (Mearin et al., 2016) . IBS is considered the most common lower FGID showing a specific symptom ROME IV criteria (Mearin et al., 2016). However, identification of IBS for clinical trials can be challenging due to the overlap of IBS symptoms with other GI and non-GI conditions (Burgell & Ye, 2020). Farmer and Ruffle (2019) affirmed that more than 40% of IBS cases come from clinic referrals and are treated and diagnosed in primary care units.

Etiology of IBS

Organic Etiology

El-Salhy et al. (2014) suggested that IBS is an organic disorder because of an abnormality in the microvilli of GI endocrine cells of IBS patients. Padhy et al. (2015) provided a summary of pathophysiologic mechanisms to IBS as a disorder of organic origin: (a) abnormal motility, (b) visceral hypersensitivity, (c) infection, (d) inflammation, (e) bacterial overgrowth, (f) serotonin levels, and (g) the brain-gut axis interaction (p. 569).

According to El-Salhy et al. (2014), abnormal motility is an organic symptom with abdominal pain caused by clustered small intestine contractions that end in either delayed motility, or constipation, or diarrhea, which is the accelerated intestinal passage of stools. This dysmotility radiates in the colon during or after a meal. Visceral hypersensitivity is a pathophysiological mechanism where esophageal distension with

pain is present with apparent neural pathway sensitization coming from the GI area (Padhy et al., 2015).

As Padhy et al. (2015) described, another organic symptom for this disorder is infection. Individuals with IBS tend to suffer from acute infective gastroenteritis, as well as other acquired external disorders like *Salmonella*, *Shigella*, and *Campylobacter*. Bacterial toxicity accumulates in acute flareups, with elevation of white blood cells, followed by IBS symptoms after the GI infection. Furthermore, over time, there is an increase in mast cells that aid in the colon mucosa, followed by development of chronic neuronal degeneration, which may be a potential trigger for IBS. Moreover, Padhy et al. pointed out that the relationship between an excess in bacterial growth and excessive fermentation and gas formation is supported by observations that the use of an antibiotic therapy ameliorates the symptoms.

Serotonin (5-hydroxytryptamine of 5-HT) is important to GI function and is implicated in the modulating mood, sleep, and other behaviors (Breedlove & Watson, 2018; Padhy et al., 2015). Irregularities in 5-HT reuptake receptors, such as polymorphisms in serotonin transporters and impaired serotonin secretion, would trigger IBS-C , yet an increased 5-HT secretion or overstimulation are found among IBS-D patients, overstimulating secretomotor neurons (Padhy et al., 2015). Therefore, this literature shows that there is an imbalance in the brain-gut-axis (BGA).

If the IBS pathophysiology is multifactorial, factors like the autonomic nervous system (ANS), hypothalamus-pituitary-adrenal axis (HPA-axis), and stress alterations in the GI system may trigger visceral hypersensitivity and contribute to exacerbating

gastroenteritis. Further, Farmer and Ruffle (2019) noted that other factors, such as changes in the central nervous system (CNS), personality traits, and genetic and environmental factors may trigger IBS.

Brain-Gut-Axis

The BGA provides for bidirectional intercommunication, mostly between the CNS and the enteric nervous system (ENS) and is considered by researchers as the second brain in the body (Padhy et al., 2015; Sayuk, 2020) . However, it should be considered more as it is an intricate network with more than two systems. The ENS contains millions of neurons in the bowel region walls responding to bowel functions communicating with the CNS. Other systems that are involved include responses to the emotional arousal network (EAN), sympathetic nervous system (SNS), emotional triggers within the limbic system, medial prefrontal cortex, amygdala, and the hypothalamus (Padhy et al., 2015). The ENS affects the coordination of gut musculature and vascular contractions, and the ANS causes neuroimmune disruptions within the brain-gut microbiota axis (BGM), triggering abdominal symptoms and psychological symptoms, which, in turn, underlie this intricate network of major GI disorders, including IBS (Sayuk, 2020).

Functional Etiology

As noted earlier, the ROME IV defined IBS as a functional bowel disorder where recurrent abdominal pain is related to defecation or disordered bowel habits of constipation, diarrhea, or a combination of both and with bloating and distension symptoms (Mearin et al., 2016). However, researchers are only recently concurring that

IBS should be considered a functional brain-gut interaction disorder (Balmus et al., 2020).

As an FGID, IBS is known for increased motor reactivity, enhanced visceral hypersensibility, altered immune and mucosal function related to bacterial dysbiosis or impaired microbiota, and the altered CNS-ENS regulation reflects exposure to psychosocial and sociocultural factors (Drossman, 2016). Furthermore, the symptoms depend on the affected body location and symptom duration. Individuals with IBS who develop an organic postinfection experience altered bacterial flora and mucosal dysfunction.

Gut Microbiota

A normal quantity of microbes, or approximately 100 trillion microbes generally inhabit the GI tract as part of the gut microbiota and it is part of a complex, symbiotic ecological system (Suen & De Cruz, 2020). This microsystem protects the GI system from harmful bacteria to maintain homeostasis when it ferments undigested food and transforms them to vitamins and minerals suitable to the human body. However, changes in the microbiota may break the homeostatic state, leading to autoimmune diseases and IBS (Suen, & De Cruz, 2020).

Furthermore, the human gut also has a mycobiome. Research studies suggested that colonies of gut fungi are associated with GI disorders, from epithelium from the oral pathway to the genitourinary tract, as well as colorectal cancer (CRC; Gu et al., 2019). As a chronic and recurrent disorder, IBS is a challenging somatosensory disorder, as the dysbiosis can alter the microbe counts with mycobiome, and the main problem in

diagnosing and controlling IBS is the low level of inflammation and the aberrant reactions of the IBS immune responses (Gu et al., 2019).

If the homeostasis of the intestinal microbiome or microbiota is disrupted through factors like diet and other environmental factors, this may trigger IBS symptoms, which in turn will affect a spectrum of disorders, such as metabolic syndrome, diabetes, psychological disorders, neurological disorders, inflammation, and cancer (Distrutti et al., 2016). Evidence of a relationship between gut microbiota and IBS in research has been inconclusive because of the complexity of diagnosing IBS and its comorbidities, yet studies showed there is an indirect relationship between IBS and the types or microbiota alterations (Kennedy et al., 2014).

Diagnosing IBS

The main problem in diagnosing IBS is in classifying symptoms, as they may mimic or overlap with other GI Symptoms. Mearin et al (2016) described an IBS diagnosis depending on an onset of symptoms at least 6 months prior to the diagnosis and that the symptomatology may be present during the last 3 months of the symptom onset. The Rome criteria for IBS include recurring abdominal related to defecation, frequency, and form appearance in stool pain at least once a week during the last 3 months as the onset of symptoms. IBS symptoms are broad, and it depends on the Rome IV classification criteria to diagnose the syndrome (Drossman, 2016). The symptoms were abdominal pains at least one day per week related to defecation or change in frequency of stool and its stool form and appearance (Farmer & Ruffle, 2019). Potential individuals with IBS are required to undergo specific blood screening tests like full blood count,

sedimentation rate, fecal calprotectin measurements, and C-reactive protein concentration to observe if there is any type of inflammation. Balmus et al. (2020) categorized IBS as a functional gastrointestinal impairment with multiple clinical manifestations, such as frequent changes in bowel conducts, stool alternations, inflammation and infection being defined mainly through stool consistency variations like constipation, diarrhea, or alternating both with or without intestinal inflammation or infection, abdominal pain and cramping with symptom amelioration after defecating and without a diagnosed cause.

Blood and Cortisol Tests

Blood and cortisol tests are used to diagnose IBS. Because IBS is highly related to stress, tests like corticotropin-releasing factor (CRF) and serial serum adrenocorticotropic hormone (ACTH) stimulation test to observe cortisol levels are used to obtain results on cortisol levels (Park et al., 2017).

Stool Test

Another means of diagnosing IBS is through a stool test, where the patient provides a fresh stool sample for laboratory testing. Laboratory technicians perform tests to check for *E. coli*, *Salmonella*, *Shigella*, *Campylobacter*, parasites, including ova and cysts, and *Giardia lamblia* to first rule out any specific infection (London Gastroenterology Centre, 2018).

At the time of this current study, presence of COVID-19 in stool tests were also observed in 53.42% of patients diagnosed with the SARS-CoV-2, with positive results for 1 to 12 days after the patients have been diagnosed with the disease (Xiao et al., 2020). Furthermore, Xiao et al. (2020) noted that fecal-oral transmission of the virus is very high

among patients prior to and after infection. Although this study is not specific to patients with IBS, it should be noted that IBS patients or individuals must undergo stool tests for a possible IBS diagnosis, especially since IBS may occur after any GI related or affecting infection. This is especially relevant since *Campylobacter jejuni* has been present in some post-COVID-19 cases (Berumen et al., 2020)

IBS stool testing requires the presence of calprotectin with a high white blood cell count to then determine if the inflammation symptoms are IBS or any other bowel disorder inflammation (London Gastroenterology Centre, 2018). Kennedy, Cryan, et al. (2014) enumerated a list of gut microbiome BGA disorders compared to healthy subjects and their fecal microbiome.

Biopsychosocial Elements of IBS

Stress

Stress is a bodily threat to homeostasis, and IBS is a GI response to stress. These GI responses includes changes in ENS caused by nutritional imbalances, hormonal changes, psychological distress, and lifestyle regarding physical activity affecting intestinal motility and causing chronic pain with flareups, depression, and anxiety symptoms affecting the BGA and diminishing the QoL (Matthews, 2016; Werlang et al., 2019). As the EAN interprets unpleasant gut sensations, it signals the SNS to decide if these sensations are considered normal or threatening, which further signals the PNS, which regulates energy conservation, heart rate, breathing rate, GI activity, and sphincter muscle relaxation (Sayuk, 2020). The SNS-GI interaction during stress triggers colon

function, causing urges to defecate or urinate and experiencing abdominal pain (Sayuk, 2020).

Past gaps in academic research on stress and IBS were based on the lack of developing a further understanding of the fields of psychology and gastroenterology. Labanski et al. (2020) suggested that instead of viewing FGID including IBS as a stress standpoint, conventional research had been focused on them from a gastroenterological perspective. The researchers concluded that current research in neurogastroenterology explained that the release of neurotransmitters involved in stress, emotions, and visceral pain overlap for IBD, functional dyspepsia (FD) and IBS.

According to Labanski et al. (2020), FGIDs, including IBS, trigger psychological stress responses with acute episodes of anxiety, levels of cortisol, hyperventilation, elevated blood pressure and heart rate, and heightened sensorimotor functions. Moreover, individuals with IBS in particular have a pronounced tendency to catastrophize behaviors when affected by visceral pain, altering the amygdala, prefrontal cortex, and hippocampal brain regions (Li & Hu, 2016).

The COVID-19 pandemic has threatened the health and economy in individuals worldwide, and it is common for individuals with chronic conditions to suffer disproportionately higher than regular individuals, including perceived stress, and decreasing their overall HRQoL (Umucu & Lee, 2020). Higher levels of anxiety, depression, distress, and functional limitations for individuals with physical disabilities are observed during pandemics, and this current pandemic is not an exception. Umucu and Lee (2020) affirmed that stress and coping measures among individuals during the

current pandemic are self-distraction, acceptance, seeking spiritual help, venting emotions, distracting individuals suffering from disabling conditions, and suffering from moderate stress, anxiety, and depression.

Stress in the Workplace

Stress in the workplace is the most prevalent triggering factor of IBS. Research with a pressure management indicator (PMI) questionnaire, salivary cortisol, and cytokine blood samples in 76 participants were used to measure stress between IBS patients against a health control (Popa et al., 2018) . Results showed IBS patients scored lower figures in job satisfaction, state of mind, resilience, confidence level, energy level, physical symptoms, and physical wellbeing. Furthermore, the researchers observed that although results did not show any differences in cortisol levels, there was a significant result in cytokines, showing IBS participants high levels of inflammation, revealing that IBS symptoms are related to job stress, which in turn showed that the environment, particularly the work environment, plays a role in the disorder (Popa, Leucuta, & Dumitrascu, 2018) . Moreover, the researchers attributed IBS to physical and emotional responses to the work environment, causing anxiety, depression, and FGIDs.

In a study by Elhosseiny et al., (2019) IBS medical and engineering students had the highest levels of IBS because of the long duration of studies, the number of examinations, and internship practices, suffering constant stress, anxiety, and depression, with a 31.8% of the medical student community with IBS in Saudi Arabia, and a 22.9% prevalence on both medical and engineering students in an Egyptian university (p. 2).

Excessive stress and worry may cause unexpected goal blockages, causing repetitive negative thinking (RNT) can affect the emotional process, influencing cognitive decisions negatively and affecting attention negatively (Lewis et al., 2020). Translating the implications of IBS and stress in the workplace, extended rumination, worry, and RNT could trigger IBS symptoms, as negative affect causes emotional exhaustion, diminishing QoL. Measures should be taken to ameliorate the IBS triggering factors, such as finding a solution for job presenteeism to reduce health problems, as excessive work overloads cause prolonged stress, exhaustion, anxiety, and depression, and productivity loss, or job burnout (Ferreira et al., 2019).

At the time of the COVID-19 pandemic, job stress appeared to have more impact. If IBS/IBD patients lose their jobs, fear for their jobs, feel stressed by working from home, or feel overworked, they can lose their sense of empowerment and experience fear of losing their homes. This stress related to COVID-19 may trigger IBS/IBD symptoms. They may also feel compelled to disregard symptoms that could indicate infection with COVID-19, which could potentially be fatal. Boals and Banks (2020) affirmed that individuals currently appear to be suffering from mind wandering during the current pandemic which can increase stress levels and decrease job performance in the workplace. This also can adversely affect IBS/IBD symptoms.

Quality of Life Among Individuals with IBS

Individuals with IBS generally report a diminished physical and mental QoL (Michalsen et al., 2015; Zhu et al., 2015). Its symptoms cause social life restrictions, high cost of illness remedies and its comorbidities, yet their range and impact on IBS are still

under study (Elhosseiny et al., 2019; Padhy et al., 2015). Michalsen et al. (2015) suggested that IBS treatment should focus directly on a QoL palliative instead of ameliorating IBS symptoms because the etiology remains unknown.

Vandvik and Farup (2015) conducted a cohort study with 104 participants lasting 6 to 9 months with 26 Norwegian general practitioners to assess participants' symptoms and a six-month-follow-up study. The measurements used in the study were a series of surveys: a) the short form health-related quality of life (SF-12); b) the physical component score (PCS); c) the mental component score (MCS); d) the subjective health complaint inventory (SHC) to analyze the number of organic diseases and comorbidities; e) the Hopkins Symptom Check List-10 to assess anxiety and depression; f) the Whiteley Index (WI) to assess health anxiety, and g) the Eysenck Personality Questionnaire (EPQ) to assess neuroticism (Michalsen, Vandvik, & Farup, 2015).

One-way ANOVA, Pearson and Spearman correlation tests, and regression analyses demonstrated reduced physical and mental QoL, with a PCS mean score of 38.4 (on 0-100 scale) and an MCS mean of 45.0 (0-100 scale) with subjective complaints, organic diseases and affective disorders as main independent predictors (Michalsen, Vandvik, & Farup, 2015). Furthermore, results the study showed comorbidity is the strongest predictor of reduced overall QoL in individuals with IBS and somatization is also common among the participants; yet the limitations were that the Michalsen, Vandvik and Farup study (2015) was under the Rome II rules, and further study is required to update to the Rome IV criteria.

The costs on IBS treatments are high, and unnecessary surgeries, such as hysterectomies and appendectomies, had been done because of the difficulty in the diagnosis and the overlapping symptoms, causing a poor QoL at a physical and emotional level (Elhosseiny et al., 2019).

Anxiety and Depression

Individuals with IBS tend to show GI-related anxiety and depression, relating these mental disorders with QoL impairment (Tončić & Tkalčić, 2017). The anxiety caused by abdominal pain severity affects their illness perception, as IBS tends to be non-fatal. The GI symptoms triggers feelings of worry, uncontrollable thoughts and images, extra self-vigilance, and self-consciousness, altering the mindset of the IBS patient, catastrophizing events and being hypervigilant over their symptoms (Tončić & Tkalčić, 2017).

Furthermore, IBS and FD symptoms tend to overlap, reporting symptoms of fibromyalgia, chronic fatigue syndrome, chronic pelvic pain, overactive bladder, and other gastrogenitourinary symptoms (Labanski et al., 2020).

Emotional abuse experiences are also an indirect factor contributing to IBS symptoms and QoL. Kanuri et al. (2016) performed a study on 272 IBS patients and 246 non-FGID patients using the Rome criteria for IBS with the early life stressor questionnaire (ELSQ), the short form of the health-related quality of life questionnaire (SF-36), and the PHQ-15 questionnaire on non-medical-related somatic symptoms, as well as a qualified physician to evaluate psychiatric diagnoses (pp.1509-1510) . The average population age was 49.4 years; and symptom severity for IBS were significantly

higher than the non-FGID ($p < 0.001$); discomfort and frequency were significantly higher ($p < 0.001$), and the IBS symptoms of pain constipation, bloating, and diarrhea, where significantly higher in IBS than the non-FGIDs ($p < 0.001$). Furthermore, prevalence of abuse, including physical, emotional, and sexual abuse were significantly higher than non-FGIDs ($p < 0.0001$), and that females had higher abuse experiences than males in the study ($p < 0.001$) (Kanuri et al., 2016, p. 1511). The researchers informed that all results from degree of depression and anxiety and health-related QoL scores were significantly higher ($p \leq 0.001$) for IBS patients who experienced abuse over participants who did not suffer abuse, and the scores for GI symptom frequency and severity for IBS patients with abuse were significantly higher than the non-abused ($p \leq 0.04$), and 49% of the IBS patients experienced multiple forms of abuse, with significant increases in IBS severity ($F= 2.73$, $p < 0.05$) and a significant decrease in health-related QoL for any one type of abuse ($F= 3.24$, $p < 0.05$), and significantly poorer health-related QoL for IBS patients who experienced two or more types of abuse ($p < 0.001$) (Kanuri et al., 2016, p. 1512). Therefore, early life experiences directly affect mood disorders, and in turn IBS symptoms.

During the peak of the pandemic, the anticipatory anxiety and the thoughts of catching Covid-19, the anticipatory awaiting for results or caregiving for a family member after recuperating from the virus, being socially isolated during the quarantine, or losing a loved one caused major fear and anxiety (Porcelli, 2020; Steele, 2020). Fear of the unknown fate of this pandemic poses a serious threat and a sense of impotence, a sense of catastrophe and hopelessness for many normal individuals, and is implied that

symptoms that are normal for IBS individuals may be exacerbated under the current circumstances, causing other clinical manifestations, such as hypochondria, cyberchondria, illness denial, and disease fear, among others during the extent of the pandemic (Porcelli, 2020).

Quality of Interpersonal Relationships

A strong social network is necessary to maintain a stress barrier, and lack of long-term interpersonal relationships trigger stress (Lu, 2014). This social insufficiency predominates among individuals with IBS. Tončić and Tkalčić (2017) pointed out that psychosocial factors, such as hypersensitivity vigilance, is predominant among IBS patients, and early life experiences affect the QoL, as well as IBS symptoms and severity (Kanuri et al., 2016). It is possible that earlier traumatic experiences triggering IBS, the anticipating anxiety of the next IBS flareup, and the social taboos of expressing their symptoms affect interpersonal relationships (Bowers, et al., 2017).

Results from a study by Ballou et al. (2019) showed that more than 50% of individuals with IBS-D tend to avert making plans and travel plans, avoid leaving the house and rule out going to places where bathrooms are limited or absent. Furthermore, the study also pointed out that individuals with IBS-C had more feelings of self-consciousness, avoided sexual relationships, had difficulty concentrating, and that individuals with IBS claimed their symptoms affected their work productivity an average of eight days per month with 1.5 days of job or school absenteeism.

Cognitive Impairment and IBS

Evidence of cognitive impairment among IBS patients comes from research studies where brain regions are affected, such as decreases the prefrontal cortex thickness, grey density, and lack of attention when anticipating noxious visceral pain during stress reactions to IBS flareups or the anticipation pain anxiety (Sayuk, 2020). GI infections, such as gastroenteritis, has been associated with brain dysfunction, systemic enteric inflammation, and a dysbiosis of the gut microbiota, affecting individuals with IBS with anxiety, depression, mood changes, and cognition (Szigethy, 2019). Recent studies have revealed that repeated episodes of gastroenteritis during early childhood significantly displayed symptoms of mental disorders, such as anxiety, depression, and ADHD in adolescence, evidencing a connection between the gut microbiota and cognitive impairment (Szigethy, 2019).

Kennedy et al. (2014) conducted a study to verify if there is a CNS dysfunction in IBS patients and if the tests showed any association between cognitive impairment and IBS. The cross-sectional study was done with 39 patients, 18 patients with Crohn's Disease (CD), and 40 healthy participants. Participants were tested with four assessments from the Cambridge Neuropsychological Test Automated Battery (CANTAB) and a Stroop test of executive function to observe the HPA-axis function and cortisol awakening response (CAR). The participants also submitted their HADS and the Patient Health Questionnaire (PHQ) and were taken for a medical examination, where physicians took a blood sample from the participants to observe their blood count, renal function, liver enzymes and electrolytes.

Kennedy et al. (2014) found that IBS patients scored significantly higher on the PHQ depression scale and the HADS than the healthy controls, and that IBS patients showed significant impaired visuospatial memory. Cortisol levels were lower in individuals with IBS and among patients with CD, when compared to healthy participants. Kennedy et al. (2014) attempted to test the hypothesis that there is a relationship between IBS and cognitive impairment, and results did show a slight visuospatial memory functioning deficit, particularly in the hippocampus, which are related the HPA-axis, and that lower cortisol levels showed cognitive dysfunction. Furthermore, Kennedy et al. (2014) suggested that IBS may be related to cognitive alterations in the amygdala affecting emotions and mediated by the hippocampus, and the anxiety and depression disorders affect cognition, showing a pathophysiological mechanism. The researchers found limitations in the study, as the IBS patients were from all types of IBS, and these studies should have been done separately to further investigate the phenomenon.

Rey et al. (2009) attempted to evaluate rational and experiential intelligence in IBS patients, pointing out that although intelligence is difficult to define, IBS patients suffer from coping difficulties due to possible personality traits and neuroticism, and the researchers pointed out that previous studies showed that IBS patients showed lower IQ scores. According to Rey et al., IBS sufferers had issues with rational intelligence, or coping with environmental factors affecting bowel symptoms, and possible issues with experimental intelligence, which are closely connected to emotions. The case control study involved 50 IBS-diagnosed patients (called consulters), 50 participants with IBS

symptoms but not diagnosed (non-consulters), and 100 healthy participants recruited at a primary care health facility in Madrid, Spain and gastroenterologist offices in the area. The participants submitted a clinical questionnaire, and consulters and nonconsulters took the Functional bowel disease severity index (FBDSI), the WAIS-III in Spanish, the CTI test on cognitive experiential theory to assess emotional and behavioral coping, personal superstitious thinking, esoteric thinking, categorical thinking and naïve optimism, but the CTI results were invalidated for two subjects who participated. The participants also took the NEO personality inventory (NEO-PI) in Spanish, based on the big five theory, the MMPI-2 in Spanish to observe multiphasic personality detection, the state-trait anxiety inventory (STAI) to assess anxiety, and the social readjustment rating scale (SRRS) in Spanish to observe the participants' significant life events.

Rey et al. (2009) found that the IBS participants showed lower scores in global constructive thinking, higher neuroticism scores, and reported more stressful events than the control group. IBS consulters also showed lower total and verbal IQ and constructive thinking than nonconsulters. Altogether, IBS participants did not show lower rational intelligence, but showed lower experiential intelligence, showing that stress has a role in constructive thinking, precipitating or worsening symptoms because of neuroticism and emotional distress. Again, these results were not based on individuals who were diagnosed per the ROME IV criteria.

In another study, researchers suggested that there is a relationship between gut microbiota dysbiosis and neuropsychiatric disorders. Cenit, et al. (2017) pointed out that variations in the gut microbiota structure are related to depression, autism and

Parkinson's disease. However, it is not yet clear if the gut microbiota alterations are the cause or if the related neuropsychiatric disorders are indirectly related to mental health, yet it does affect patients' behavior. Therefore, further studies would help in finding that since IBS is related to stress and gut microbiota alterations, there could also be related to cognitive impairment.

Neurological disorders may mimic some IBS symptoms. adding higher neuroticism because of the COVID-19. In a meta-analysis research, Rogers et al. (2020) pointed out that individuals taken to hospitals for SARS and MERS showed symptoms of confusion, depressed mood, insomnia, anxiety, irritability, memory impairment, sleep disorders, and fatigue. Furthermore, the prevalence of post-traumatic stress disorder (PTSD) was 32.2%, with depression and anxiety prevalence of 14.9% and 14.8% respectively (p. 611). However, 33% of the patients who recovered from COVID-19 showed symptoms of dysexecutive functioning (Rogers et al., 2020).

Boals and Banks (2020) addressed cognitive functioning during the current COVID-19 pandemic. Increased anxiety and mind wandering (MW) have become mediators between stress and cognitive functioning, causing limited executive functioning resources (working memory capacity), causing a major deterrent on work performance in the workplace, poor driving abilities, poor daily routine tasks, and academic performance of students. Concerns of self-worry and concerns for their loved ones, and job loss have resulted in lack of focus and attention on cognitive abilities. and self-pity. Furthermore, although working for home has become an efficient way to many but the social distancing has affected individuals, and the extra time individuals are

having while working for home have also inevitably affected the levels of stress (Boals & Banks, 2020).

Comorbidities

Chronic Pain

Pain is a strong factor in IBS, as there is abdominal pain, before and after defecation, as well as anticipatory pain before and after a meal, or even when thinking about a food that has caused the patient pain in the past (Mohebbi et al., 2019). Furthermore, chronic pain is also present among IBS patients when they sense feelings of an incomplete fecal discharge, and there is pelvic pain related to possible urolithiasis because of the oxalate absorption in the intestinal wall (Helvaci et al., 2019). Chronic IBS pain can also affect QoL, as the patient refrains from daily activities and interpersonal relationships because of the pain (Adams & Turk, 2019). This is pivotal in the connection of the poor QoL, interpersonal relationships, anxiety, and depression among individuals with IBS because it is related to central sensitivity syndromes (CSS), or nociceptive neurons display perceived sensitivity to stimuli in the CNS (Adams & Turk, 2019). Therefore, IBS is related to multiple factors, both organic and functional.

At the time of this study, possible organic illness symptoms, like COVID-19 GI symptoms have affected IBS indirectly. In a study by Luo et al. (2020) of 1141 confirmed COVID-19 cases, researchers have recently detected a GI symptomatology of 16% (183 patients), and that males slightly complained of these symptoms more than females. The researchers affirmed that 37% of the COVID-19 patients suffered from abdominal pain before the onset of COVID-19, and 25% presented symptoms of diarrhea, concluding that

gastrointestinal symptoms were initial symptoms of COVID-19 even without fever or respiratory manifestations (Luo et al., 2020). Furthermore, current studies have shown that patients admitted in hospitals with COVID-19 with GI symptoms were taken to intensive care units (ICUs) faster because of the severity of the condition, as GI symptoms imply that the virus may begin propagating, causing abnormal liver function, and severe hemorrhagic colitis (Ma et al., 2020).

Other Possible Organic Illnesses Indirectly Related to IBS

It is important to know that atrial fibrillation (AF) has been shown to be associated with disordered gut microbiota. A study by Zuo et al. (2019) demonstrated that patients with bacterial dysbiosis showed progressive AF, atrial fibrosis, and indirectly causing risks of stroke and heart failure. The researchers stated that every AF episode induces electrical and structural remodeling, causing irreversible atrial fibrosis and requiring ablation therapies. However, this relationship is not well understood and requires further investigation, as gut microbiota is involved in hypertension, obesity, coronary atherosclerotic heart disease, and diabetes mellitus as alterations in metabolic patterns progress (Zuo et al., 2019). Stool samples from AF patients showed microbial and metabolite fluctuations in the gut microbiota conducive to cardiac problems, as stearic acid used in simple sugar and corn syrup, and lysophosphatidylcholine, a fatty acid, is a potential inducer of cardiac cell death and intracellular lipid accumulation which is related to cardiovascular disease (Zuo et al., 2019). Therefore, just as there is an indirect correlation between gut microbiota changes, GID and cardiovascular diseases,

there is a possibility of an indirect correlation between IBS and the risk of cardiovascular diseases, such as AF.

Researchers have also suggested a link between food allergies, asthma gastroesophageal reflux disease (GERD), FD and IBS, as wheat proteins may cause intestinal alterations because of food intolerances or sensitivities (Talley, 2019). Individuals without proper diagnosis or supervision may self-prescribe a food elimination diet which does not control IBS symptoms or its possible causes (Talley, 2019). Furthermore, Talley (2019) reported a gap in the literature and research on reliable diagnostic tests to determine food-induced allergies, immune deficiencies, and IBS.

Helvaci et al. (2019) conducted a study to observe if there was a relationship between IBS, chronic gastritis (CG), depression, haemorrhoids, smoking habit, and urolithiasis. The study with 647 IBS patients compared to 340 healthy control participants showed that there is a highly significant relationship between these comorbidities, with a $p < 0.001$ for all statistical tests (Helvaci et al., 2019, p. 31). The interesting discovery is that females tend to suffer IBS more than males, as results showed that a high number of IBS patients suffer from urolithiasis, suggesting that the oxalates in the system is generally absorbed through the intestinal wall, triggering urolithiasis in both males and females (Helvaci et al., 2019).

Mohebbi et al (2019) suggested in a semi-structured interview study of an Iranian sample of IBS participants that headaches, sleep problems, sexual problems, halitosis, body weakness and arthritis are also related to IBS symptoms.

Treatments for IBS

Farmer and Ruffle (2019) suggested a positive patient-doctor relationship to deal with IBS patients, as patients may suffer negative attitudes which may exacerbate the symptoms instead of helping them control the disorder. They also suggested a low FODMAP diet led by a nutritionist and pharmacotherapy depending on the IBS type as the human body needs nutrients, both macronutrients, such as carbohydrates, proteins, and fats, and micronutrients, or vitamins and minerals, to control the gut microbiota (Suen, & De Cruz, 2020).

Serotonergic Treatments

Physicians have been using selective serotonin reuptake inhibitors (SSRIs) to increase the levels of serotonin and control and alleviate depression (Mayo Clinic, 2019). Researchers have shown a low efficacy of SSRIs in treating IBS symptoms, as in seven trials with comparative studies using 356 patients using SSRIs (176) against placebo therapy treatment (180) 80 out of 176 patients who took the SSRIs did not show any significant improvement (43.3%), while 121 patients of 180 with placebo treatment (67.2%) showed no significant improvement (Ford et al., 2019). However, although recent studies have informed that SSRIs can improve global IBS symptoms and reduces pain, it may cause dry mouth and constipation, which could affect patients with IBS-C (Burgell & Ye, 2020).

Tricyclic antidepressants (TCAs) are also used to treat IBS symptoms and particularly for IBS patients with epigastric pain syndrome or functional dyspepsia, but SSRIs are used instead of TCAs in case of comorbid depression (Burgell & Ye, 2020).

However, there is not enough evidence to help in improving somatic symptoms and may cause constipation; nevertheless, TCAs inhibits smooth muscle activity in the GI tract (Carruthers & Stern, 2020).

Cognitive Behavioral Therapy

CBT is type of psychotherapy centering on the emotions, behaviors, and thoughts of individuals, how their negative behaviors work in order to emphasize behaviors to control the patients' aspects and change their negative behaviors into positive ones, accepting that thoughts and behaviors as an IBS patient may oscillate. CBT for the IBS patient is a therapy that attempts to identify the source of the symptoms if they are not of organic nature, and the therapist attempts to focus in modifying the thoughts and behaviors of the IBS patient. Research has shown that CBT is highly effective in improving the QoL of IBS patients, improving their mental health, centering on the thoughts-feelings-emotions-behavior cycle, as one aspect affects another (Patterson, 2019). CBT sessions should be eight treatments lasting 45 to 60 minutes once a week and could be extended, depending on the need and the severity of the IBS patient to help coping with the symptoms (Henrich et al., 2015).

CBT is the type of IBS therapy with the most significant results, improving daily functioning and better than MBSR because providing diverse, uncommon scenarios with your IBS condition encourages the patient to face the problem, finding solutions and practicing routines notwithstanding the physical symptoms (Laird et al., 2016a)

Mindfulness-Based Stress Reduction (MBSR) Therapy

IBS is an increased gastrointestinal response to stress (Micozzi, 2015). Researchers have shown that MBSR improves your Quality of Life as an IBS patient, but so far it has only been tested for IBS, IBD, and functional somatic syndromes (Pandit & Ballou, 2020). MBSR is a type of therapy based on meditation to improve the cognitive appraisal of the IBS patient, improve symptom severity, and improve their QoL.

MBSR is a complementary, nonjudgmental alternative medicine used in behavioral medicine. It helps the IBS patient to be aware of their stress, accept the unpleasant moods, sensations, and pains from the IBS symptoms involving meditation, yoga guided focus on the body parts to reduce physical tension and autonomic arousal of symptoms (Pandit & Ballou, 2020). This treatment should be used whenever the IBS patient begins sensing that a flareup is about to occur.

Studies have shown that MSBR has been clinically effective in managing chronic pain stress management, improving sleep and digestion, improving your immune system and the ability to concentrate, as it changes your relationship with stress and pain. (Laird et al., 2016b). However, MBSR requires weekly 2.5 hour sessions, plus 45 minutes of self-practice six days per week and an eight-hour retreat, which requires commitment and discipline (Pandit & Ballou, 2020).

Hypnotherapy

Hypnotherapy is performed by a trained mental health professional, where the patient is guided to a state of focus and concentration (Riehl, 2020, p.216). Through the use of verbal repetition, the therapist guides the patient through mental images in an

attempt to calm the individual, and researchers suggested it is effective because of the BGA connection to regulate unpleasant sensations which conventional medical therapy cannot work, and it is effective for IBS, FD, and depression (Ford et al., 2019; Riehl, 2020).

Natural Remedies

Researchers discovered recently that IBS is a multifactorial disorder with pathogenic mechanisms and supporting the concept that the gut microbiota is affected in individuals with IBS (Distrutti et al., 2016). The suggested use of probiotics is considered helpful in treating IBS symptoms, as trials with IBS patients with *Lactobacillu*s, *Bifidobacterium*, and *Streptococcus Thermophilus* probiotics reported benefits in improving bloating, pain, and flatulence (Distrutti et al., 2016). However, more research is necessary to ensure if the use of other probiotics, such as *l. casei*, is helpful in ameliorating gut hypersensitivity, as well as the use of prebiotics, or non-movable substrates to metabolize specific bacteria to protect the gut microbiota from harmful bacteria and nourish the gut with healthy bacteria, benefitting patients with disorders, such as allergies, metabolic disorders, and FGIDs like IBD (Distrutti et al., 2016).

Grundmann, Yoon, Mason, and Smith (2018) did a cross-sectional correlational design to investigate patients affected by GI disorders and if the use of fiber, STW 5, peppermint oil, and probiotics improve the QoL . The study was a self-reported survey on the use of GI supplements, GI symptom severity, and health problems like GERD (44.4%), depression (33.8%), anxiety disorders (31.7%), and IBS (29.8% (p. 226). The health care provider for the study suggested special diets (44.0%), vitamins (37.5%), and

herbal supplements (21.7%) for the participants who self-reported their symptoms. Survey results before the recommended treatment showed that participants self-reported a 5.9 GI symptom severity from a 7-point Likert scale (1= none to 7= unbearable). The GI symptoms with high scores were feeling of fullness after a meal, bloating, abdominal pain after a meal, loss of appetite, and stool and constipation with severe GI pain scores with an $r2 = 0.8682$, $F= 46.12$, $df^1 = 1$, $df^2 = 7$, $p < 0.001$ (Grundmann, Yoon, Mason, & Smith, 2018, p. 227). After the 5-month suggested treatment, post survey results showed on a 9-point Likert scale (1 = worst, 9 = best) that there was an improvement according to GIDs, but the best result was a result of 8 (p. 227).

Furthermore, the researchers observed that participants used the following suggestions through the survey responses: 1) fiber treatment for bloating, IBS and other GIDs; 2) STW 5 treatment for participants with IBS, bloating, and indigestion; 3) peppermint oil preparations and probiotics for upset stomach, nausea, bloating, and indigestion, but few preferred the use of supplements for Crohn's disease, dyspepsia, and IBD. However, the overall effectiveness for the suggested GID remedies fluctuated, as 50.7% of the participants with a positive result used STW 5, 30.8% affirmed effectivity with probiotics, 18.8% for peppermint oil, but no effectivity with using fiber (Grundmann, Yoon, Mason, & Smith, 2018, p. 228). Moreover, results also showed that the use of STW5 helped in alleviating pain after a meal, peppermint oil for nausea, yet probiotics showed no improvement in pain severity, and fiber use showed the least improvement in pain severity, and no worsening conditions were reported. The use of

STW 5 was not investigated for potential benefits for IBS but it helped in ameliorating dyspepsia and indigestion, which is an IBS symptom.

The Grundmann, Yoon, Mason, & Smith study (2018) concluded there is a correlation between the GID patient's symptoms and patient perceptions on GIDs, implying that they seek additional pharmacological remedies to ameliorate GI symptoms, and that their symptoms are related to social, personal, and professional limitations (p. 230).

The importance of this study were the limitations encountered by the researchers, as they relied on online social networks and the level of attrition was high and self-diagnosis surveys may be misleading, as the participants may not have an official diagnosis from a physician.

FODMAP

The human body needs nutrients, both macronutrients, such as carbohydrates, proteins, and fats, and micronutrients, which are vitamins and minerals (Suen, & De Cruz, 2020) . A diet low in fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) is suitable to improve QoL of individuals with IBS. In a study conducted by Yepes, Múnera, and Martelo (2018), 50 IBS patients volunteered to follow the FODMAP diet, and measured their symptoms with the Irritable Bowel Syndrome Quality of Life questionnaire (IBS-QoL) questionnaire in the Spanish language. Results showed a significantly high reduction of all IBS symptoms among the participants ($p < 0.001$) but the general QoL was not measured and there was a limitation in the study, as there was absence of a control group (Yepez, Múnera & Martelo, 2018).

Altobelli et al. (2017) developed a meta-analysis about the FODMAP diet, and results showed that a low FODMAP diet contributes to diminished symptoms of bloating and abdominal pain, but no difference in stool consistency, as well as it is unknown if the diet helps IBS patients in the long term, requiring future inquiry.

Social Support

Social support is a means where social interactions benefit the individual in coping with psychological symptoms and managing their illness (Kamp et al., 2019). According to Mikocka-Walus et al. (2020) there is minimal research on the role of social support for chronic GI conditions. Meetup, an Internet group where individuals meet and gather locally, has a total of 626 members under the irritable bowel syndrome topic, divided into local groups in the United States and Canada (Meetup.com, 2020).

In a pilot study by Björkman et al. (2019), it was suggested that person centered care (PCC) with different expert professionals to meet individuals with IBS for research, diagnosis, medical treatment, patient education and nutritional recommendations, hypnotherapy and individual support would be useful for managing IBS. However, the studies were hypothetical because PCC has been effective for long-term chronic disorders, such as coronary diseases. Björkman et al . (2019) proposed a PCC with realistic goals for individuals with IBS to develop vicarious experience with peer support groups, labeled as PS-IBS. Results from the pilot study with 17 participants showed that the IBS patients in the study had low expectations but developed a supportive relationship with the professionals involved in the PCC, aiding the participants to work with symptom management, trial and error coping strategies. However, participants

considered tedious some self-care wellbeing activities, such as exercise, relaxation, and using written information with diaries, which in turn would trigger anxiety. Furthermore, PCC pilot study was too small to be considered as appropriate primary care psychosocial interventions and the IBS management used for social support required a team of professionals, which in most cases would be costly to maintain (Björkman et al., 2019)

Roohafza et al . (2017) emphasized inadequacy of social supports for IBS individuals causes altered immunologic system functions, causing more stress among individuals with IBS in terms of interpersonal relationships, home life, sexual life, work and education preoccupations, and health concerns. Results from the Roohafza et al. study (2017) showed that individuals with IBS had significantly higher stress levels, less social support, less coping strategies, and triggering depression . Furthermore, social support for individuals with IBS lack of an approach to alter their stress appraisal, and that family, friends, and their surrounding social group should be informed and educated to find potential stressors for IBS and cooperate in fostering social support.

Other evidence on social support came from Kamp et al. (2019). The researchers provided a systematic review on social support and psychological symptoms, but the study was done for IBD and ulcerative colitis (UC), not for IBS, which has more psychological symptoms than IBD and UC.

Online Social Networks

IBS forum groups on the internet had been almost inactive until recently, with Facebook and Twitter groups being the most active. However, most online social networks do not offer professional psychological support. For example, the majority of

the Facebook and Twitter members are IBS patients sharing their IBS experiences, asking questions about their symptoms, and the project administrators are moderating conversations to allow IBS individuals to express their concerns based on scientific evidence but without psychological support. Yang et al. (2018), affirmed there was a lack of solid, social interaction to offer peer support, as the research was based on a study about the *ibsgroup.org* (2016), developed for longitudinal online study on IBS. Yang et al. (2018) informed that the specific online group had become inactive since 2018; however, there are three new participants and one returning participant since 2020 (ibsgroup.org, 2016).

The IBS Support at Facebook and Twitter, the private and official group, has the most daily activity, with 64,740 members and 14 moderators for Facebook and 21,000 members for Twitter, including a licensed dietician, and a research fellow professor specialized in FODMAP (Facebook.com, 2020). However, this online support does not provide any psychological support for IBS QoL, only providing scientific advice and information. Another IBS online help and support group is Inspire (2020), which had six community leaders since 2009 and a low level of activity since 2016. Only one participant joined on February 24, 2020, to ask about IBS symptoms, and only Team Inspire, or the community leader representative, responded to the participant with scientific information, but not with psychological support. Therefore, the Inspire online support group has a low level of activity. However, the *supportgroups.com* for IBS has been active since 2015, with 37891 members, and the most recent activity was on February 21, 2020, with 10 participants in discussions (SupportGroups, 2015).

Technology based on eHealth has become available through teleconsulting with Skype, Zoom, and computerized psychotherapy, and 92.6% of GI patients seek emotional support online, making eHealth increasingly important (McCombie & Knowles, 2020). IBS eHealth interventions have become active, particularly in improving IBS symptoms in individuals who suffer from IBS and anxiety, and newer IBS-focused applications to monitor IBS symptoms are available for individuals with IBS, such as Cara Care (2020), where individuals can track their food, mood, and stool tracking diary for android phones, and Zemedy (2020).

Zemedy IBS Management Application

A new IBS management Android phone application called Zemedy® had currently been tested for IBS patients as a guidance to IBS self-management (Bold Health, 2020). The application was in its *Beta* version, and it provides a daily tutorial, a virtual psychologist with hypnotherapy sessions, visual imagery, mindfulness meditation, and mainly CBT to reduce flareups as a self-paced 10-week module program. The application also had self-diagnosis for IBS yet suggested registered individuals to seek medical treatment to a personal physician to officially diagnose the disorder, as well as a daily diary entry for the IBS patient to control their own information (Bold Health, 2020) . Individuals with IBS are suggested to download the application and register for free to use the program and confirm the registration by e-mail and use it as an interactive tool.

Theoretical Frameworks for Functional Disorders

Biopsychosocial Model

Engel (1977) proposed a health and illness model to solve the jumbled schema of mental, environmental, and social factors affecting medical issues on establishing feasible goals for individuals suffering from mental and health disorders. The biopsychosocial model (BSM) suggests that a state of distress or disease in individuals depends on somatized behaviors through mental thoughts, emotions, and environmental factors (Engel, 1992). In other words, disorders such as IBS should not only be defined and treated for this biological physiopathology, but also with regard to psychological factors, such as thoughts, emotions, behaviors, as well as environmental, economic, or social factors. The importance of the BSM is that a patient suffering from a specific disease is observed and treated as an individual with a unique lifestyle and not just as a disease with a deviation from conventional symptoms, and that the personal attention to the patient involves prevention for an improved QoL (Lehman, David, & Gruber, 2017).

IBS is considered a type of psychophysiological disorder (PPD) in individuals where diagnostic tests reveal there are no cause for this symptomatology. Clarke and Schubiner (2019) claimed that IBS should be considered a PPD because the symptoms are classified into three categories: 1) functional, 2) inconsistent, and 3) triggered symptoms. Functional symptoms are considered inconsistent of structural anomalies, such as stress without physical grounds, and the spreading of symptoms to different areas of the body. A PPD is considered inconsistent when the patient's symptoms change from one location in the body intermittently, depending on the intensity, the time of the day,

and the duration, shifting on sporadic symptoms and flareups, and depending on the amount of stress. PPD-triggered symptoms signify that stimuli provokes brain activation but do not cause the physical symptoms; stress anticipation activities or any sensitive situation may provoke brain stimulation, but it is not caused by the activities alone (Clarke & Schubiner, 2019). Therefore, a PPD is considered from the vantage points of how the mind, emotions, and organic functions of the individual respond to changes in the surroundings.

Common Sense Model

The common sense model of self-regulation of health and illness (CSM) by Leventhal (Leventhal, Brissette, & Leventhal, 2003) considers how a person processes an illness threat. It views the individual as an active problem solver, and capable of pursuing common sense behaviors to achieve the goal of physical and mental wellbeing. When disease threatens the body, the human mind should be capable of self-regulating in a test, operate, test, and exit (TOTE) manner to regulate the body and remove harmful obstacles.

According to the CSM, IBS should be labeled as a functional somatic syndrome (FSS) because the symptoms are severe enough to interfere in daily activities and affect the quality of life (QoL; Leventhal et al., 2003). IBS symptoms interfere in such a manner that individuals who suffer from it may be unable to self-regulate, disrupting the TOTE mechanism. Instead, they enter into a spiral of symptom exacerbations and negative overlapping behaviors, such as limiting social interactions, while failing to exit the TOTE mechanism and, thus, experiencing impairments in mental health.

Lazarus and Folkman's Stress Model

Lazarus and Folkman (1984) described stress as related to inevitable strain with situations that require appraisal and coping. Appraisal is the rapid, automatic, and cognitive part of the reaction to situational distress where the individual reflects to interpret the situation. Coping involves strategies to handle the situation through ongoing cognitive reevaluations, as well as emotional and behavioral choices (Lazarus & Folkman, 1984). The Lazarus and Folkman stress model (LFSM) categorizes coping strategies to stress into two groups: 1) emotion focused, or the attempt to regulate the situation through relaxation, meditation, or avoiding the cognitive components of the situation, or, less effectively, focusing only on their own emotional responses rather than ways to address the situation, and 2) problem-focused, or seeking information and a plan of action to solve the stressful event. Individuals with chronic illnesses attempt to deal with both types of coping (Kristofferzon, Engström, & Nilsson, 2018), but individuals with functional somatic and psychophysiogical disorders like IBS may have difficulties with the phases because of the tendency to exacerbate the emotional distress through catastrophizing events because they cannot find an organic cause for the distress to do a plan of action.

Bronfenbrenner's Ecological Model

The ecological systems theory (EST) proposed by Bronfenbrenner (1979) suggests that human development is a nested set not only of psychological elements, but also cultural, social, economic and political, interacting to develop or thwart human development. Shelton (2019) compared Bronfenbrenner's EST to overlapping rings. The

macrosystem is on top, describes the external environmental development of laws and societal beliefs; the exosystem is where external local community, school, and communications interact (Bronfenbrenner, 1979; Shelton, 2019). The mesosystem describes the experiences within the neighborhood context, work, and schools, and the microsystem is the immediate family, home, school and neighborhood relationships linking the individual in the center. All these levels interweave and interflow depending on the nature and nurturing the individual, adding a chronosystem line to delineate past, present, and future experiences and changes over time (Shelton, 2019).

Lehman, David, and Gruber (2017) proposed a psychosocial model, developing a dynamic psychosocial model (DPM), expanding Bronfenbrenner's EST and Engel's BSM models, where human health is a result of a feedback of biological, psychological, interpersonal and macrosystem ideas interacting through time and historical context. The researchers suggested that while Engel's BSM boosted the current practice in psychosomatic medicine, Bronfenbrenner's EST promoted the nurturing of social environments for developing a state of wellbeing, and further organizing the complexities of human behavior, including trauma and pain, and encouraged further research in interpersonal social support for health. This is crucial for individuals with IBS, as patients tend to socially withdraw, affecting interpersonal relationships (Bowers, Wroe, & Pincus, 2017).

Gaps in the Literature

As noted in this review, theoretical frameworks had a partial answer to the causes and solutions to IBS, but there is still not enough information on individuals with IBS and

their QoL, the extent of the effects on IBS in the workplace, the quality of their interpersonal relationships, the extent of cognitive impairment during flareups, and the effectiveness of social support to improve their QoL. The review of literature provided some research during the most recent five years, and most individuals with IBS feel they are being stigmatized, negatively labeled as individuals with psychological disorders, and that discussing their concerns over their symptoms and flareups are considered a taboo subject (The Lancet, 2018).

Since the pandemic, research has been currently being conducted on GI symptoms with COVID-19 (Devkota et al., 2020). Individuals with IBS may confuse COVID-19 symptoms with symptoms related to IBS-IBD. Researchers are still studying to determine how these symptoms from COVID-19 and IBS/IBD might differ and how this confusion impacts the stress experienced by IBS/IBD patients.

The focus of my study was on biopsychosocial predictors of quality of life among individuals with IBS. As a continuation to the research from the previous authors in IBS research, the study attempted to fill the gaps in examining the relationship between health related QoL (HRQoL) among adult individuals with IBS. HRQoL for among adult individuals with IBS was the dependent variable on this quantitative study, the study attempted to observe through linear regression and through Hayes' (2018) parallel mediation if pain (P), cognitive functioning (CF) , and interpersonal functioning (IF) mediated the relationship between work stress (WS) and health-related quality of life (HRQoL).

Summary

Chapter 2 presented a review of literature on IBS, including symptoms, causes, effects, treatments, theoretical models, and gaps in the literature regarding predictors of experiences among individuals with IBS. The literature suggested that most results were still considered inconclusive, as IBS has been viewed as a GI disorder from a gastroenterological point of view, where it should also be viewed from a biopsychophysiological point of view, as symptoms overlap with IBD and individuals with IBS require unique personal treatment and psychosocial support to improve their QoL. Furthermore, QoL issues among individuals with IBS had not been properly addressed from the IBS patients' point of view, and more research is needed to find answers. Therefore, the research questions identified by the end of this chapter were the base for the justification of this study. Chapter 3 describes the research design and methods used for addressing the research questions for this study.

Chapter 3: Research Method

The theoretical frameworks discussed in Chapter 2 had a partial answer to the causes and solutions to IBS. However, there are still not enough studies to demonstrate the effects of IBS severity and their QoL, the extent of the effects on IBS in the workplace, the QoL of interpersonal relationships among IBS patients, the extent of cognitive impairment during IBS flareups, and the effectiveness of social support to improve their QoL. The most recent study showed that job burnout was related to IBS (see Hod et al., 2020), but the research authors claimed that the relationship between job stress and IBS had not been studied in depth. Furthermore, the review of literature provided research from 2014 to 2022, and most individuals with IBS feel they are being stigmatized, negatively labeled as individuals with psychological disorders, and that discussing their concerns over their symptoms and flareups are considered a taboo subject (The Lancet, 2018). Therefore, the purpose of this quantitative study was to examine if the selected mediators of pain severity, cognitive functioning, and interpersonal functioning were adequate factors to predict the relationship between workplace stress and health-related quality of life among adults suffering from IBS.The overall research question for this study was “Do pain, cognitive functioning, and interpersonal functioning mediate the relationship between workplace stress and health-related quality of life in individuals diagnosed with IBS?”

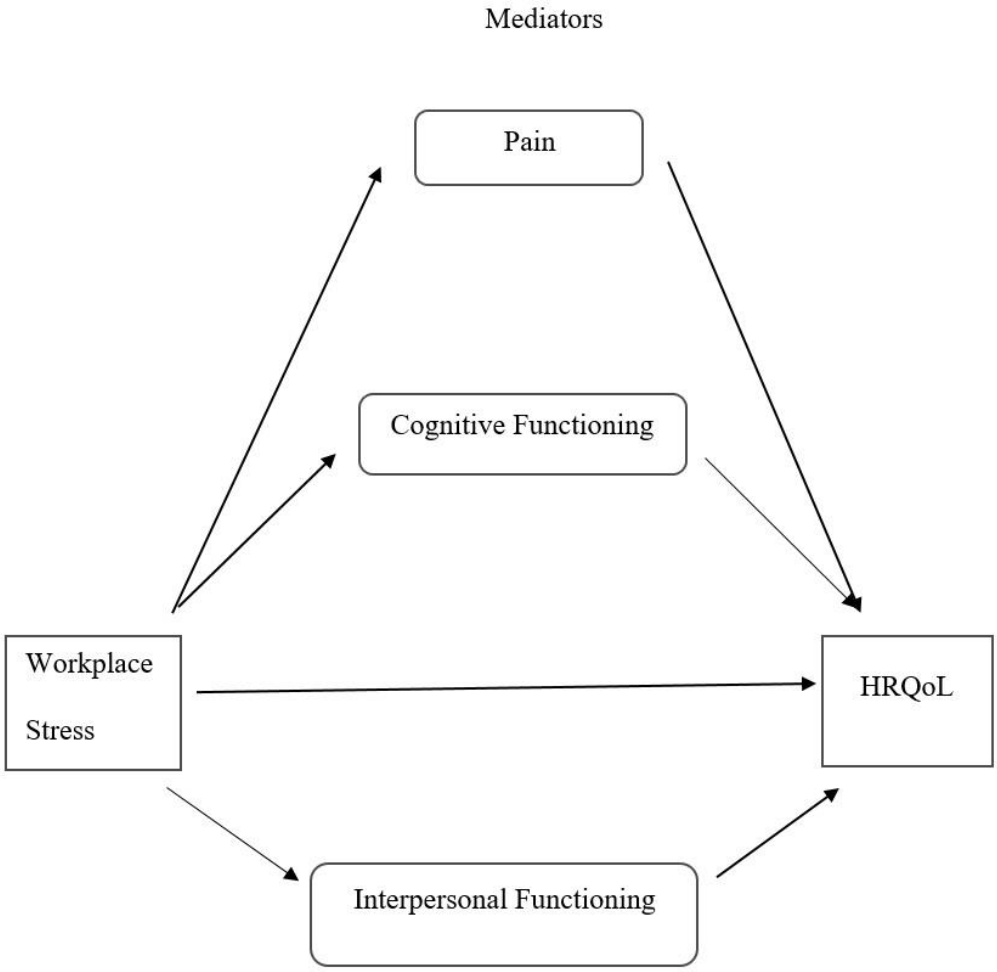
Research Design

This study was a quantitative, cross-sectional, complex correlational study to examine predictors, including mediators, of HRQoL. I used the Hayes’ parallel multiple

mediator model to assess the relationships. The dependent variable was (HRQoL. The independent variable was WS as the controlling factor, with P, CF, and IF as factors to examine as mediators of the prediction of HRQoL, as observed in Figure 6:

Figure 6

Propose Mediation Model for IBS and HRQoL Applying Hayes' Model 4



Note: Applying Hayes' Model 4 from "Appendix B" by A. F. Hayes, Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach (2nd ed., p. 616), 2018, Guildford Press. Copyright 2018 by Guildford Press. Reprinted with permission.

Methodology

Population

The global prevalence of IBS has fluctuated, from an 11.2% of the population (Endo et al., 2015) to a 13.6% based on the Rome-III criteria, to 5.0% based on the Rome-IV criteria after a recent global study both online and household survey total (Sperber et al., 2021). The targeted population for inclusion criteria for my study were diagnosed IBS patients and self-diagnosed IBS patients aged 18 years of age to 65 years of age and who participated through the following social media sites: the Facebook IBS Support (official) site, which has a population of 65,494 members, the IBS support group from supportgroups.com, with a population of 37,925 members, the ROME Foundation Facebook group, with a population of 528 followers, the Rome Gastropsychogastroenterology group from Twitter (@RomeGastroPsych), with 1,231 followers, the Reddit IBS Research with 7,500 followers, and the IFFGD (2020).

Sample and Sampling

I used convenience sampling. My minimum planned sample size was 129 participants. This projection was based on a power analysis using G*Power for a fixed factor multiple linear regression with four predictor variables, effect size $f^2 = 0.15$, with an α error probability of $p \leq 0.05$, a power (1-β error probability) = 0.95, with a maximum number of tested predictors of 4 and a critical $F = 2.444$. I actually sought to increase the number of participants to 155 as a 50% increase to ensure that all the data was usable and avoid any invalidated results because of incomplete questionnaires from

the participants but I managed to obtain 133 participants after screening participants who did the survey.

Recruitment Procedures

Recruitment announcements were posted through IBS social media groups on Facebook, SupportGroups.com, and any other social media support groups related to IBS through a consent form. The announcement had a detailed explanation of the purpose of the study with a link to the Survey Monkey site, which was the site for the demographic survey, consents, instrument materials and questionnaires where they were posted. The first page of the survey site had the informed consent form, which also included criteria for participation (self-diagnosed IBS patients or officially diagnosed IBS patients, 18 to 65 years of age who could fully understand and respond in English language). The final line of the consent form had two choices for the participant: (a) to agree to participate in the study (participant were forwarded to the first page of the survey materials after agreeing) and (b) to choose not to participate (participant was forwarded to a "Thank You" acknowledgement where they exited the survey site). Before agreeing to the survey, the consent form participants had the rights to request information before deciding and they could not enter the survey unless they agreed to participate. Participants who requested more information received contact information, and an email to me for the inquiry.

Data Collection

Once the participant consented to participate, the participant entered the online survey. This username number, randomly generated by the SurveyMonkey, ensured their

anonymity. The participant could pause the survey and take a break as needed due to their health condition but not close the survey until they finished it. Further, the survey was active from July 7 to October 19, 2021, and all the data was stored in a personal external hard drive kept on my premises to ensure confidentiality and time accuracy . The survey program remained active for 60 days to ensure there were enough participants to have an appropriate sample size.

After agreeing and confirming the willingness to do the survey, the participants began with the qualifying and demographic questionnaire (See Appendix B), and then onward to the questionnaires: (a) The IBS-36 questionnaire (to analyze IBS and HRQoL), (b) the OASIS (to analyze the level of anxiety, pain, and cognitive impairment), (c) the MIPQ for analyze the participants' perceptions of their IBS, and (d) the WOI to analyze work stress and interpersonal relationships. The survey had an expected time limit between 30 to 45 minutes and could leave their computer window open to pause and break if they had an IBS flareup . Every page with questions had different encouragement quotes to boost their morale as they continued answering the questions and with a polite warning quote if they had not answered all the questions per page. A debriefing form was added to inform the participants about the study (See Appendix H)

Instrumentation

Demographic Questions

There were six questions consisting of qualifying questions such as age and diagnosis (must be between 18 to 65 years old and have a diagnosis of IBS to participate) and gender, education level, and economic level (See Appendix B).

The IBS-36 Questionnaire

The IBS-36 questionnaire for measuring IBS QoL (Groll et al., 2002) consisted of 36 questions with a 7-point Likert Scale from 0 = *never* to 6 = *always* and a *nonapplicable* option (See Appendix C). The total of ratings was employed for scoring. The highest possible score of the IBS-36 instrument was 216 to represent the lowest QoL and 0 for the highest QoL appearing as a negative correlation, as the higher the individual scored in the questionnaire, the individual would show a lower quality of life. Question 18 had a reverse score, where the 0 score will be scored as a 6 in Groll et al (2002). There were no cutoffs for scoring, as I was informed by the test authors (S. Vanner, personal communication, October 6, 2020) . The IBS-36 questions were designed to ask patients to consider the QoL impact on their IBS symptoms, and the types of questions were related to physical pain, IBS symptoms, emotional wellbeing, cognitive impairment, anxiety, physical and social needs, and nutrition issues, among others, summarizing the QoL of IBS as a specific condition.

The IBS-36 internal reliability is very high, with a Cronbach's alpha of $\alpha = 0.95$ and a high rest-retest reliability of $r = 0.92$ (Groll et al., 2002), and it was used to evaluate efficacy in addressing clinical psychological interventions in assessing the QoL of IBS patients. The IBS-36 has been compared to other IBS instruments for criterion validity and both the internal reliability and the validity are high (Groll et al., 2002).

Overall Anxiety Severity and Impairment Scale (OASIS)

The OASIS was a brief, five-item questionnaire to measure anxiety-related severity and impairment for multiple anxiety disorders, capturing: (a) the frequency of

anxious feelings of the participant; (b) the level of severity of anxious feelings of the participants; (c) frequency of avoidance impairment; (d) ability impairment at work, school, or home because of anxiety; and (e) interference with social life and relationships (Norman et al., 2006; see Appendix D). The purpose of using this instrument in the current study was to measure CF and IF. Validity for detecting anxiety disorders for the OASIS had been considered fair, where a cutoff score of nine points out of a possible 20 points of the scale would have suggested that the individual had a chance of having an anxiety disorder (Ito et al., 2015). The scores guidance for the OASIS were shown on

Table 1

Guidance Scoring for OASIS

Score	Anxiety Severity
0-5	Mild or none
6-10	Moderate
11-15	Severe
16-20	Extreme

Note: From "Norman, S. B., Cissell, S. H., Means-Christensen, A. J., & Stein, M. B. (2006). Development and validation of an overall anxiety severity and impairment scale (OASIS). *Depression and Anxiety, 23*, 245-249. doi: 10.1002/da.20182". Copyright 2006 from the U. S. National Library of Medicine. Numbers reprinted with permission from the author.

Participants checked one option per item. Item 1 questioned the times the participant had anxiety feelings during the past week, and there were five options from 0 = *no anxiety* to 4 = *constant anxiety*. Item 2 inquired about anxiety severity, and had five options to answer, from 0 = *little or no anxiety and hardly perceptible,* to 4 = *extreme, describing physical symptoms as intolerable and impossible to relax*. Item 3 referred to

the frequency of avoidance and fear of doing activities or situations because of anxiety during the past week and the five options were from 0 = *None, or not avoiding places, situations, activities, or things because of fear,* to 4 = *all the time, or full avoidance*. Item 4 inquired about anxiety causing impairment for daily work, school, and home during the past week, with the five options from 0 = *None, or no interference,* to 4 = *extreme,* where anxiety impaired in the ability to do tasks at home, work, or school. Item 5 enquired about the social life and relationships of the participants to assess how often the patient's anxiety had interfered with their social life and relationships. The five options for this item began with 0 = *no effect* in relationships, to 4 = *extreme,* where the anxiety of the individual had affected social activities, from suffering to even ending relationships, and the score is from 0 to 20 (Norman et al., 2006).

The OASIS instrument is reliable, with a Cronbach's alpha of $\alpha = 0.80$, which is considered internally reliable. Although the study was used for patients with psychosis, the instrument is suitable for patients with anxiety, depression, and has a strong positive relationship with neuroticism (Norman et al., 2006). These personality traits play important roles in affecting inflammatory functions contributing to IBS and chronic pain.

Modified Illness Perceptions Questionnaire

The MIPQ (Marcus et al., 2014b; see Appendix E) is the modification of the Illness Perceptions Questionnaire (IPQ) designed by Weinman et al. (1996) and based on the CSM model by Leventhal et al. (2003) . The MIPQ has a moderate convergent validity with outcome predictors of cure control and illness timeline, correlating with

symptom severity and perceptions of cure outcomes among participants who took the test when it was developed (Marcus et al., 2014b).

Marcus et al. (2014b) developed the MIPQ to predict behavioral response after a CBT treatment through testing and retesting patients with psychosis, and IBS data from previous research showed that there is an interaction between psychiatric disorders and IBS (Fadgyas-Stanculete et al., 2014). The MIPQ questionnaire (Marcus et al., 2014a) is comprised of 14 items answered by using a 5-point Likert scale, where 1 = *strongly disagree* to 5 = *strongly agree*. The item statements in this questionnaire measured participants' expectations of their illness, in this case IBS, if the participants considered their condition would change, and the level of the illness outcome.

The total score of the MIPQ was 70 points, developed into four subscales: (a) a cure/control perceptions section for Questions 1, 2, 3, 6, 13, 14 with a total score of 35 points; (b) Questions 8, 9, 10 to assess illness duration perception for a total of 15 points, where Question 8 had a reversed score; (c) two questions (11, 12) to assess personality perception, or if the individual considers the illness was self-caused for a total of 10 points; and (d) a final two questions (5 and 7), with a reversed scoring, to assess the individual's state of mind, or hopelessness and fatalism illness perception, for another total of 10 points which was a statistically a reversed score (Marcus et al., 2014b).

The MIPQ scale was internally consistent with an acceptability of Cronbach's alpha of $\alpha = 0.70$ with interitem correlations of 0.3 and higher, and with three reversed scores for items 5, 7, and 8, and with an internal reliability for item 12 ($r = 0.1$, $p = 0.5$, n

= 15 for “state of mind”), and item 13 (r = 0.4, p = 0.01, n = 15 for “personality”) for test-retest reliability (Marcus et al., 2014a).

Workplace Organization Indices (WOI)

QoL can be based on economic resources, and a sense of self-worth through social relationships, respect from others, and the capacity of being employed and productive to maintain the wellbeing of an individual (Boreham, Povey, & Tomaszewski, 2016a). The Workplace Organization Indices test (Boreham et al., 2016b; see Appendix G) was developed to measure workplace satisfaction, working flexibility, job insecurity, workload pressure, work stress, and work-to-life interference. The authors argued that the measurement included health, family relationships, personal security, work, and leisure to determine the level of social capacity to access to personal resources and relationships, as well as material resources and their level of confidence in having individuals feel integrated in their society.

The WOI was a questionnaire with 23 items that could be self-administered. There were six areas of inquiry: (a) participative management (five statements consisting on satisfaction with management relations and trust in the workplace), (b) flexible work hours (four statements consisting on levels of agreement of disagreement on their hour flexibility or lack of it), (c) employment insecurity (four statements consisting of possible threats on personal and family job loss), (d) workload pressure (three statements consisting on job overload, interference, and performance), (e) work stress (three statements consisting on stress and health, job stress demands, and job-related anxiety

symptoms), and (f) work-to-life interference (five statements consisting on interpersonal relationships at home, lack of relaxation, and exhaustion).

The participative management, flexible work hours, and employment insecurity categories were measured on a five-point scale from 1 = *strongly disagree* to 5 = *strongly agree*. The workload pressure, work stress, and work-to-life interference categories were measured on a five-point scale from 1 = *never* to 5 = *all of the time*. Boreham et al. (2016a) reported Cronbach's alpha for all subscales of $\alpha \geq 0.85$ except for the flexible work hours ($\alpha = 0.51$) and employment insecurity ($\alpha = 0.60$).

Planned Data Analysis

Data Cleaning and Screening

The data from the survey was transferred from the survey site to an SPSS (version 27) data file. Any participant who did not meet eligibility requirements (under 18 years of age and not over 65 years of age) were excluded from the analysis . I used the Explore function to identify surveys with missing items. Depending on the percentage and pattern of missing responses, I decided whether to omit the case or to employ a method for data imputation to replace the missing value.

Internal Reliabilities of Survey Items

I examined the internal reliability among items on each of the quantitative measures for the predictors and the criterion variable. Cronbach's alpha values of .70 or higher were considered acceptable for the sample in the study, as the items are internally consistent. Results of scores for any instruments whose internal reliabilities did not reach this level or, if too high (Taber, 2018), were interpreted with caution in further analyses.

Scoring Questionnaires

I computed the total scores for the scales (and subscales, if relevant) for the OASIS questionnaire per section, the MIPQ per section, and the WOI, and IBS-36 scores. Once the scores were computed, the data were cleaned and screened.

Outliers

I checked for outliers in distributions of the various computed scores. Where necessary, I trimmed outliers that appeared to be spurious (e.g., due to random responding). I used the Winsorize process to modify any remaining outliers so that the influence of those outliers remained while the extreme amount of influence was reduced so as not to skew the results of the analysis (Salkind, 2010).

Reporting Demographic Data

I employed crosstabs and descriptive statistics to describe the sample demographics, such as gender, age, and level of education to observe frequencies with means and standard deviations for any demographics that are continuous data (σ).

Testing of Primary Research Hypothesis

I used the Hayes PROCESS Model 4 Parallel Multiple Mediator analysis (SPSS v.27) to evaluate the model with three mediators . This special application of the Hayes PROCESS Model 4 is called the BMATRIX (Hayes, 2018).

Results of the analysis provided the following information: (a) the overall proportion of variance in health QOL scores accounted for by all predictors; b) simple bivariate regressions to verify the paths of the predictors, and c) executed the model 4 parallel mediator PROCESS macro in the SPSS.

The research question was:

RQ_1: Do pain, cognitive functioning, and interpersonal functioning mediate the relationship between work stress and health-related quality of life?

H_0: Pain, cognitive functioning, and interpersonal functioning do not mediate the relationship between work stress and health-related quality of life.

H_a: Pain, cognitive functioning, and interpersonal functioning do mediate the relationship between work stress and health-related quality of life.

Other Preparatory Analyses

In preparation for the mediational analyses, I computed the bivariate correlations between all pairs of variables. These computations provided initial estimations of the basic relationship between job stress and health quality of life, as well as between job stress and each of the proposed mediators, and between each of the proposed mediators and health quality of life.

Using the Hayes PROCESS Model 4 analysis for simple mediation, I conducted linear regression analyses to evaluate the individual models for each of the proposed mediators between job stress and health quality of life, without consideration of the partial correlations among all of the predictors .

Threats to Validity

External Validity

External validity is the degree to which the results of a study can be applied to other settings (Warner, 2013). Because the participants were self-selecting volunteers

from a convenience sampling from Facebook Twitter, and social media IBS support groups, results may have not been generalized to the full population of individuals who experienced IBS or would self-report to be diagnosed with IBS.

Internal Validity

Internal validity is the degree to which the study actually reflects a connection between the variables and the outcome (Warner, 2013). A threat to internal validity in the study would have been the self-reported surveys, as the participants in the study had self-diagnosed with IBS, as the announcement and consent form were for participants who had been diagnosed with IBS and who self-reported their condition. Other GIDs may coexist as confounding variables with IBS but between the qualifying demographic questions and the IBS-36 instrument would have made them have a very low internal validity risk. The internal reliability of the IBS-36 is very high, with a Cronbach's alpha of $\alpha = 0.95$ and a high rest-retest reliability of $r = 0.92$ (Groll et al., 2002) . One of the confounding variables could be psychological disorders (e.g., depressive disorders, PTSD) because it can mimic anxiety or influence the perceptions of the illness. However, the OASIS scale was internally consistent with a reliability of $\alpha = 0.80$ (Norman et al., 2006) and the M-IPQ with an acceptability of $\alpha = 0.70$ with interitem correlations of 0.3 and higher and with three reversed scores for items 5, 7, and 8, and with an internal reliability for item 12 ($r = 0.1$, $p = 0.5$, $n = 15$ for "state of mind"), and item 13 ($r = 0.4$, $p = 0.01$, $n = 15$ for "personality") for test-retest reliability (Marcus et al., 2014a). The combination of the OASIS and the M-IPQ should have reduced the threat to internal validity. The nature of the surveys may have caused anxiety and fatigue in the

participants because of the participants' condition, allowing the participants to pause the survey and continue later may have reduced the anxiety and fatigue.

At the time of the proposed study, there was an ongoing global pandemic, and it was peaking with lockdowns worldwide. The COVID-19 natural disaster had affected the ability to work due to social isolation, quarantining, sudden changes from the work environment to a switch to an online environment or no work at all. Thus, work stress may have been higher than what would have been observed prior to the effects of COVID-19. This may have raised the levels and/or variability of responses among respondents, as well as the nature of the relationships between and among the variables in question, at this point in time, compared with those observed in more normal work environments.

Ethical Procedures

The study was developed to minimize the risk of harm to any of the participants . All participants had to sign the informed consent in order to begin the online survey and had the right to discontinue to study at any point if they feel uncomfortable for whatever reason and may have contacted the researcher or Walden University with any questions should any concerns arose, and that any concerns and questions would have been treated and answered with respect. There were not any disclosure of personal information of the participants and the study had no intention of causing stress to the participants, and there was not any type of solicitation or any intrusion of privacy. All answers were strictly confidential to the researcher, the dissertation chair and committee members, and the data

was confidential and secured throughout the study, following all stipulations from the APA Code of Ethics (American Psychological Association, 2017).

Summary

This study was focused on exploring if job stress, cognitive functioning, pain, and interpersonal functioning mediated the health related quality of life of adults with IBS . The research questions followed the steps and criteria on the Hayes' mediation model using the PROCESS method. Participants were recruited on social media, such as Facebook, Twitter, and Reddit, as well as IBS related organizations, such as the ROME Foundation and the IFFGD. Participants were asked to take part in one online demographic survey and four questionnaires, and ethical procedures were secured for all participants.

Chapter 4: Results

The assumed relationship between job stress and IBS has not been studied in depth; however, there is ongoing demand for more recent research (The Rome Foundation, 2022). Popa et al. (2018) provided a limited overview of occupational stress and the psychosocial work environment, where job demands, expectations, and low social support may trigger anxiety and DGBI. DGBIs include IBS and other functional GI disorders involving visceral hypersensitivity and motility disturbances in different parts of the GI tract and without any underlying pathophysiology (Sperber et al., 2021; Stanculete et al., 2021).

The purpose of this quantitative study was to investigate pain severity or personal perception of pain severity, cognitive functioning, and interpersonal functioning as possible mediators between workplace stress and health-related quality of life among adults suffering from IBS. The overall research question for this study was "Do pain, cognitive functioning, and interpersonal functioning mediate the relationship between workplace stress and health-related quality of life in individuals diagnosed with IBS?"

This chapter begins with an overview of the methods used for sampling and gathering data from a total of 133 participants recruited from different IBS support groups within social media. The analyses included describing the demographics of the sample, as well as procedures to prepare the data for quantitative analyses to test the research question. Steps for quantitative analyses included cleaning and screening the data, including assessments of the data in relation to the assumptions of the proposed

statistical analyses, and then performing bivariate and multilinear regression analyses (including the Hayes PROCESS method) to evaluate proposed mediators.

Research Design

The study was a quantitative, cross-sectional, complex correlational study to examine predictors, as well as mediators/moderators, of health-related quality of life via the Hayes' parallel multiple mediator model to assess the relationships . The study was conducted from July to October of 2021 through an online survey developed through SurveyMonkey. The survey consisted of 87 questions, including a participant consent form to decide if the participant would qualify for the study . If they qualified, the survey continued with the following items that were presented in this order:

1) Seven questions of participant's demographics (Appendix B),
2) IBS-36 instrument of 36 questions (Appendix D) to assess the HRQoL of the participants (dependent variable).
3) Five questions from the OASIS instrument to assess the level of CF of the participants (mediator M1).
4) Questions 1 through 5 from the WOI to evaluate WS (independent variable).
5) Fourteen questions from the M-IPQ survey to assess the second mediating factor (M2) for P
6) Subsection 6 of the WOI to operationalize level of IF as the third mediating factor (M3) for the Hayes' Model of the study (Chapter 3, p. 69, figure 6).

Population

The global prevalence of IBS had been estimated to be as high as 11.2% of the population (Endo et al., 2015) using the previous Rome III criteria. However, a more recent global study using internet surveys and the Rome IV criteria for IBS displayed a world prevalence of 3.6 to 4.0%, which was lower than the 9.8 to 10.5% results based on the Rome III criteria (Sperber et al., 2021). The difference between criteria is that the Rome IV criteria uses abdominal pain at least 1 day a week for 3 months and 6 months prior to the IBS diagnosis, while the Rome III includes abdominal pain and discomfort without the official IBS diagnosis, allowing more inclusive criteria instead of the specific Rome IV criteria (Drossman, 2016). However, results for each study throughout the years remain inconclusive, as the figures vary per country and per year of study (Canavan et al., 2014; Endo et al., 2015; Sperber et al., 2021).

The targeted population for inclusion criteria for this study included both formally diagnosed IBS patients and self-diagnosed IBS patients aged 18 years of age to 65 years of age . The choice to limit the maximum age to 65 years for this study was because of concern of possible confounding with other comorbidities, which would require further studies beyond GI consultation (see Canavan et al., 2014).

The participants were recruited through the following social media sites: the Facebook IBS Support (official) site, with a population of 65,494 members, the IBS support group from supportgroups.com, with a population of 37,925 members, the ROME Foundation Facebook group, with a population of 528 followers, the Rome Gastropsychogastroenterology group from Twitter (@RomeGastroPsych), with 1,231

followers, the IFFGD (2020) and the Reddit IBS Research page (Reddit, 2019), with 7,500 subscribers.

Sampling

Convenience sampling was used to recruit participants through IBS social media sites that permitted recruitment information to be posted (Appendix A). Beginning on July 7, 2021, the informed consent form, demographic questionnaire, and other survey items were available on SurveyMonkey.

There were 185 participants who submitted information on the online survey, but only 133 qualified as usable cases for the study after data cleaning and screening. The 133 met the planned minimum sample size of 129 participants needed for adequate statistical power, as determined through G*Power analysis for a fixed factor multiple linear regression with four predictor variables: estimates were based on a planned effect size $f^2 = 0.15$, with an α error probability of $p \leq 0.05$, a power (1-β error probability) = 0.95, with a maximum number of tested predictors of four, and a critical $F = 2.444$. The total of 129 participants was less than the expected projection of 155 participants in order to provide a 50% increase to ensure that there would be enough data to avoid any invalidated results because of incomplete questionnaires from the participants, As will be discussed later, there were issues of missing data. Lee and Shi (2021) affirmed that missing data could occur because respondents may fear their anonymity, slow reading when responding to a long questionnaire, or even due to equipment malfunctions (p. 466). Although my study provided anonymity for participants and no personal identifying

information (e.g., name) was required, the occurrences of missing data could have been related to the length of the survey (87 survey questions in total).

Unfortunately, it was not until all the data were collected that I also became aware of other clerical errors in the survey items that resulted in some missing data. By error in the demographics section (Appendix B) on yearly household income, a fifth option of $100,000 - $149,999 range was omitted from the list of response options. For Items 13 to 23 in the WOI instrument's work stress and work-to-life interference (Subsections 5 and 6), there was a variation from the measure's response choices: whereas the responses should have read from 1= Never to 5=All of the Time, I entered responses to those items as 1=Strongly Disagree to 5= Strongly Agree.

Recruitment Procedures

Recruitment announcements were posted through IBS social media groups on Facebook IBS support groups, such as the Rome foundation IBS support group, Twitter, SupportGroups.com, IFFGD, Reddit, and any social media support groups related to IBS through the announcement (Appendix A). The announcement had an explanation of the purpose of the study with a link to the SurveyMonkey site, where the survey materials and questionnaires were posted. The informed consent form included the criteria for participation (self-diagnosed IBS patients or officially diagnosed IBS patients, or suspected IBS, 18 to 65 years of age, and could understand and respond in English). Before agreeing to the survey, the consent form explained that participants had the right to request further information before deciding and that they could not enter the survey unless they agreed to the consent form. The final line of the consent had the three choices

for the participant: (a) to agree to participate in the study (participant was forwarded to the first page of the survey materials), (b) to choose not to participate (participant was forwarded to a “Thank You” acknowledgement), (c) to contact me via email if they wanted further information before deciding . Only one respondent requested more information and decided not to participate in a survey for a for-profit university.

Instrumentation

There were six questions consisting of qualifying questions such as age and diagnosis (must be between 18 to 65 years old and have a diagnosis of IBS to participate) and gender, education level, and economic level (See Appendix C).

The instruments used for this study were explained in Chapter 3 and were the following:

1- The IBS-36 questionnaire for measuring IBS QoL (Groll et al., 2002) consisted of 36 questions with a 7-point Likert Scale from 0 = *never* to 6 = *always* and a *non-applicable* option. This survey was designed to ask patients to consider the QoL impact on their IBS symptoms, and the questions were related to physical pain, IBS symptoms, emotional wellbeing, cognitive impairment, anxiety, physical and social needs, and nutrition issues, among others, summarizing the QoL of IBS as a specific condition.

2- OASIS to measure anxiety-related severity and impairment for multiple anxiety disorders, particularly with questions related to ability impairment at work, school, or home because of anxiety, and interference with social life and relationships (Norman et al., 2006).

3- MIPQ (Marcus et al., 2014b) which was the modification of the IPQ designed by Weinman et al. (1996) and based on the CSM model by Leventhal et al. (2003) .

4- The Workplace Organization Indices test (Boreham et al., 2016b), a survey developed to measure workplace satisfaction, working flexibility, job insecurity, workload pressure, work stress, and work-to-life interference.

Data Collection

Once the participant consented to participate, the individual entered the online survey and was automatically assigned a participant number. The survey was set up so that if a pause was necessary, the participants had to keep their computer open and take the necessary break due to their health condition but could not close the survey until they finished it.

In order to have an appropriate sample size, data collection continued to October of 2021. Participants began the official survey with the demographic questionnaire (See Appendix B), and then proceeded to the following: (a) The IBS-36 instrument of 36 questions to obtain results for HRQoL, the dependent variable *Y*; (b) the OASIS instrument of 5 questions to analyze the level of anxiety and cognitive impairment or *M1* mediator, (c) the M-IPQ instrument of 14 questions to analyze the participants' perceptions of their IBS pain or *M2* mediator, and (d) the WOI instrument of 23 questions divided into two subsections: (a) subsections 1 through 5 (19 questions) to obtain the results of the *X* or independent variable or WS, and (b) subsection 6 (5 questions) to analyze interpersonal relationships or *M3* mediator. The survey should have taken

between 30 to 45 minutes in case the participants had to pause and break because of an IBS flare up, but the average time was 19 minutes. Every page break had different encouragement quotes to boost their morale to continue answering the questions, and a debriefing form was provided to inform the participants about the study (See Appendix H).

Cleaning and Screening Data

Prior to conducting tests of the research hypotheses, data were cleaned and screened to evaluate statistical assumptions as appropriate to the study. All analyses were conducted using SPSS 27.0. Results is presented and discussed in the following pages: a summary of demographics of participants, information on cleaning and screening the data, including evaluation of data in relation to assumptions of the planned statistical tests. Descriptive statistics for each variable are presented, followed by steps for the multilinear regression analyses to test the research hypotheses: mode, chi-square tests for independence, bivariate correlations for each variable, and Hayes' Model 4 for mediation and moderation for the 79 questions out of 87 original survey questions. As a reminder, sections of the WOI survey were eliminated due to clerical errors on items in the survey; however, subsections without these errors were used for the variables.

Demographic Data

Characteristics of my sample are summarized in Table 2. There was an erratum on the yearly household income, as the $100,000 - $149,999 category option was skipped due to clerical error and there were two missing responses.

Table 2

Sociodemographic Descriptions of Participants (N = 133)

Variables	Column Head	*N*	%
Age	18-26	23	17.3
	27-35	38	28.6
	36-44	39	39.3
	45-54	16	12
	55-65	16	12
	Missing	1	0.8
Gender	Male	47	35.3
	Female	85	63.9
	Other	1	0.8
Civil Status	Single	53	39.8
	Married or Domestic Partnership	69	51.9
	Divorced	9	6.8
	Widowed	1	0.8
	I prefer not to answer this question	1	0.8
Ethnicity	Asian	11	8.3
	Black/African	8	6.0
	Caucasian	88	66.2
	Hispanic/Latino	17	12.8
	Native American	1	0.8
	Pacific Islander	5	3.8
	Prefer Not to Answer	3	2.3
Education Level	Less Than High School	3	2.3
	High School Diploma	19	14.3
	Some College Education	20	15.0
	Bachelor's Degree	45	33.8
	Master's Degree	35	26.3
	Professional Doctorate	5	3.8
	Ph.D.	5	3.8

Variables	Column Head	*N*	%
	Missing System	1	0.8
Current Employment Status	Full-Time Employment	76	57.1
	Part-Time Employment	11	8.3
	Unemployed/Looking for Work	13	9.8
	Unemployed/Not Looking for Work	6	4.5
	Student	12	9.0
	Retired	6	4.5
	Other	9	6.8
Yearly Income Household in USD	$0-$24,999	37	27.8
	$25,000-$49,000	17	12.8
	$50,000-74,999	23	17.3
	75,000-$99,999	25	18.8
	$150,000 or more	29	21.8
	Missing System	2	1.5
IBS Diagnosis	Yes, Medical IBS Diagnosis with Specific Tests	40	30.1
	Yes, Medically Diagnosed Through Symptom Testing	61	45.9
	Not Sure, but I do have IBS Symptoms	32	24.1

Note: The Yearly Household Income items did not include the option for $100,000 - $149,999 due to clerical error.

Testing Assumptions Prior to Testing the Research Hypothesis

Mertler and Vannatta (2002) provided a series of assumptions prior to performing a data analysis, and the steps are provided as part of the results.

Missing Data

The MI method was used as a valid and popular method for handling missing data (Jakobsen et al., 2017) . Lee and Shi (2021) pointed out that the use of MI is used when survey responses are incomplete because of possible fears of anonymity issues, equipment malfunctions, or when participants may consider that a survey is too long (p.466-467). Although the survey was safe and anonymous, IBS patients may feel insecure because of sudden bowel movements and pausing their computer to go to the nearest restroom, whether at home or work, as observed in previous studies where IBS negatively affects the QoL of participants and applying previous literature review on work stress and IBS (see Popa et al., 2018) . These reasons may have been a factor in having missing data, yet the MI solved the issue by the use of the standard imputations used through the SPSS® Version 27, which was a maximum of five, and all of the imputations displayed a closer to the expected data, allowing for a more complete data analysis and closer to a goodness-to-fit model with objective criteria (see Lee & Shi, 2021).

Internal Reliability of the Measures

Prior to preliminary results, Groll et al. (2002) affirmed that the IBS-36 internal reliability is very high, with a Cronbach's alpha of $\alpha = 0.95$. Results from this study showed that the IBS-36 internal reliability had a Cronbach's alpha of $\alpha = 0.96$, which was considered high and representative of the study by Groll et al. (2002), and with a mean score of 125.43 in the scale. The IBS-36 instrument was used to predict Y or the dependent variable.

The OASIS instrument was used to assess the level of cognitive functioning or cognitive impairment and was determined as the first mediator, or *CIM1* . *Prior to the study,* information from the previous chapter and the information provided by Norman et al. (2006), asserted that the OASIS instrument had an internal reliability with a Cronbach's alpha of $\alpha = 0.80$. Results from the study showed that the OASIS had a Cronbach's alpha of $\alpha = 0.90$, and a mean of 9.33 and a standard deviation of S.D. = 5.363 in the scale, which showed that participants expressed a level of moderate anxiety.

The WOI instrument used for the study has a Cronbach's alpha for all subscales of $\alpha \geq 0.85$ except for the flexible work hours ($\alpha = 0.51$) and employment insecurity ($\alpha = 0.60$) subscales (Boreham, Povey, & Tomaszewski, 2016a). Data from my study showed the following Cronbach's alpha results (See **table 3**).

The M-IPQ scale was used to evaluate pain as the third mediator, or *PainM3* . Marcus et al. (2014b) stated that the instrument had a Cronbach's alpha of $\alpha = 0.70$, which is considered acceptable in regular internal consistency results. Data from the research study resulted in a Cronbach's alpha of $\alpha = 0.685$ and a Cronbach's alpha based on standardized items of $\alpha = 0.687$, which could be considered as acceptable (Ursachi et al., 2015), and with a mean of 40.792 and a S.D. = 6.999.

Table 3

Reliability Results for WOI

Subscale	Cronbach's Alpha (α)	Cronbach's Alpha Based on Standardized Items	*N* of items	Mean	*SD*
Participative Management	0.832	0.833	5	16.632	3.995
Flexible Work Hours	0.710	0.716	4	13.789	3.616
Employment Insecurity	0.696	0.700	3	7.233	2.705
Workload Pressure	0.895	0.896	3	8.647	3.312
Work Stress	0.658	0.728	3	10.053	3.722
Work-To-Life Interference	0.917	0.917	5	14.323	5.319

Note. Based on a population of *N*=133 participants in the survey

Outliers

Outliers are a priority in checking assumptions testing, as they may distort the data analysis and results (Mertler et al., 2021). Prior to the data screening, there were only 5 outliers throughout the surveys when testing each survey instrument group for outliers by using box plots and scatterplots with regression. I then double-checked the data responses per item and the responses saved on the data set (the participant's responses and the data input), as the results were typed manually. Two outliers were typo errors and were corrected, and the remaining three were extreme outliers, which are

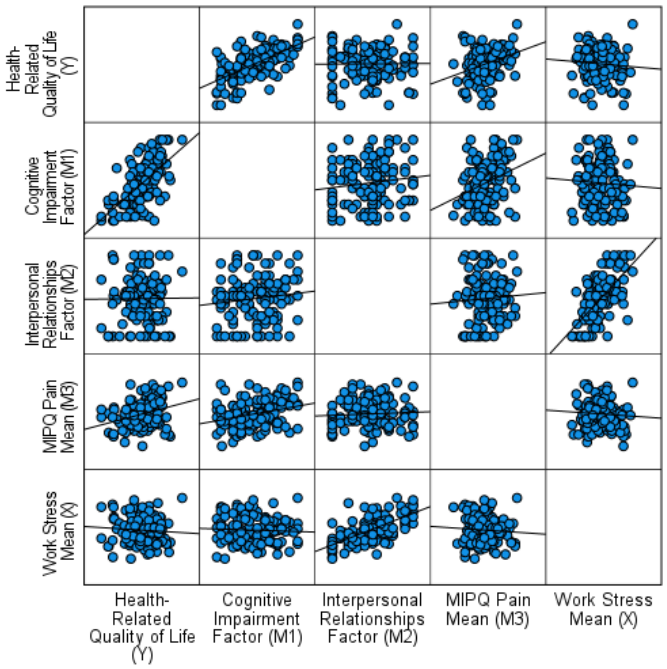
considered normal when using smaller data sets . The final outliers were corrected by using the Interquartile Range Method (IQR), where the extreme value is replaced with the next value above/below the median value that also fell within the acceptable interquartile range.

Normality

Normality is an important aspect of data analysis in testing assumptions, especially with smaller samples, such as with this study. Normality involves measures of central tendency to avoid extremes and continues with calculations to test the hypothesis (Mishra et al., 2019) . Normality is used to observe if the variables for the research are normally distributed and not violating any assumption (Mertler et al., 2021). Results from the instruments used for the research after defining the variables in Figure 7 showed linearity, yet with heterogeneity, as positive and negative Q-Q plots require further experimentation through the Hayes' Process because the assumptions began to show that the Null Hypothesis should be rejected.

Figure 7

Scatter-Dot Matrix Results of Variable to Observe Normality



Note: Although a few Q_Q plots showed negative linearity and heterogeneity, it still showed linearity, thus further research is continued to test the variables through the Hayes' Process of Mediation.

Table 4 showed descriptive statistics for the variables to test assumptions of skewness and kurtosis . Positive skewness was observed in all variables except for the HRQoL variable (S = -0.466), and negative kurtosis was observed except for the HRQoL variable (K = 0.068). Assumptions of normality were not violated, as no skewness or kurtosis values were greater than 1.0 or – 1.0 (Hair et al., 2022).

Table 4

Descriptive Statistics for Normality

	Minimum	Maximum	Mean	*SD*	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	S. E.	Statistic	Std. Error
HRQoL (Y)	.00	7.00	3.5676	1.33079	-.466	.210	.068	.417
Cognitive Impairment (CIM1)	.00	4.00	1.8669	1.07248	.084	.210	-.877	.417
Interpersonal Functioning/ Relationships Factor (IFM2)	1.00	5.00	2.8647	1.06388	.020	.210	-.417	.417
MIPQ Pain (PainM3)	1.71	4.07	2.9089	.48528	.211	.210	-.294	.417
Work Stress (WStress) (X)	1.83	4.08	2.8868	.47825	.237	.210	-.373	.417
Valid N (listwise)	133							

Note. Assumptions of normality were not violated as none of the Skewness or Kurtosis values were greater than +1.0 or -1.0 . The lowest negative value was the CIM1 variable for a Kurtosis value with -.877, and a positive Skewness for the WStress (X) variable value of 0.237

Testing the Primary Research Hypothesis

The model used to test the research hypothesis was Model 4 of the Hayes' Process Macro, as shown in Figure 6 of chapter 3 (Hayes, 2018 ; p. 69) . The research question and hypotheses were:

RQ: Do pain, cognitive functioning, and interpersonal functioning mediate the relationship between work stress and health-related quality of life? The null and alternative hypotheses were:

H_0: Pain, cognitive functioning, and interpersonal functioning do not mediate the relationship between work stress and health-related quality of life.

H_a: Pain, cognitive functioning, and interpersonal functioning do mediate the relationship between work stress and health-related quality of life.

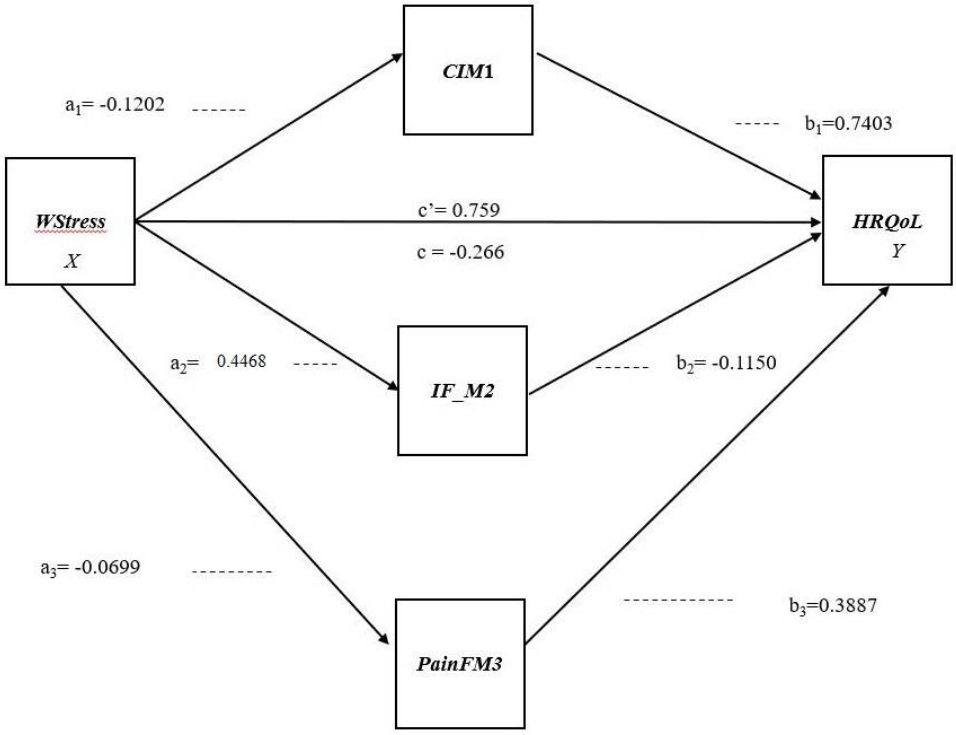
Results

Overall, the three mediators (cognitive impairment, interpersonal relationships, and pain) did not mediate the relationship between work stress (WS) and HRQoL, as each path showed significant and nonsignificant results, according to each mediation test.

To investigate the research question [RQ] mentioned above, a complex mediation analysis was performed using Hayes Process Model 4 for multiple parallel mediation. The outcome/dependent variable for the analysis (Y) was defined by HRQoL scores. The mediator variables for the analysis were cognitive impairment (CI;[M1], interpersonal functioning[IF;[M2], and pain (PainFM3 or pain factor mean; [M3] scores). The predictor variable, X, was the work stress mean (WStressM). Details of the full Hayes Process Output may be found in Appendix H, and a diagram in Figure 8.

Figure 8

Statistical Diagram with the Mediation Variables and Paths



Note: The statistical diagram appeared different from the theoretical diagram only because the Hayes PROCESS Model 4 does the built-in syntax model in alphabetical order of the mediating variables.

The step 1 for path a_1, from *WStressM* (*X*) to cognitive impairment *CIM1* was a negative, statistically nonsignificant relationship, with a coefficient of a_1= -0.1202, R^2 = 0.0029, s.e.$^{(1)}$ = 0.1956, F(1,131) = 0.377, *t*(132)= -0.6146, and p = 0.539, making the path statistically nonsignificant to the cognitive impairment mediator M_1.

The step 2 path to a_2 showed a significant, positive relationship with *WStressM* or *X* and *Interpersonal Functioning* (*IF_M2*) variable, with a coefficient of a_2= 0.4468, R^2 = 0.4230, F(1,131) = 96.0372, *t*(131)= 9.7999, s.e. = 0.1476, and p<.001, showing that

interpersonal functioning did not have a mediating relationship with work stress X. This was observed in Figure 8, in the IF_M2 outcome .

The pain mediator (PainFM3) in step 3 showed a nonsignificant a_3 path from work stress, as the path showed a negative coefficient of a_3 = -0 .0699, R^2 = 0.0047, F(1,131) = 0.6246, t(131) = -0.7903, s.e. =0 .0844, and p = 0.438. These results are indicators that a_3 was a nonsignificant predicting path to work stress and possible mediation path, as was observed in Figure 8 in the PainFM3 variable outcome.

Step 4 in Figure 8 displayed the HRQoL outcome in relation to the b paths for each mediator . The b_1 path from M_1 CIM1 to HRQoL was statistically significant, as b_1 =0.7403, F(4,132) = 22.6904, s.e. = 0.0894, t(132) = 8.2810, and p <0.001 . This result showed that CIM1 is a significant predictor of HRQoL or Y. The b_2 path, or IF_M2 as a predictor of HRQoL was statistically nonsignificant predictor of Y, as b_2 = -0.1150, F(4,132) = 22.6904, s.e. = 0.1143, and p =0.3164. The b_3 path, or the PainFM3 mediator is a close call of a significant predictor of HRQoL, and the path from Pain to HRQoL is b_3 = 0.3887, F(4,132) = 22.6904, t(132) = 1.9908, s.e. = 0.1952, and p= 0.0486. This path is a significant predictor of Y.

Finally, the X→Y Total effect outcome or *c* was nonsignificant, with a negative coefficient of c = -.2066, s.e. = 0.2425, F(1, 131) = 0.7259, t(131) = -0.8520, and p = 0.3958. Therefore, there was a nonsignificant relationship between work stress and HRQoL according to the model, and the c' showed a path of p = 0.7645, displaying a nonsignificant path. However, there was an indirect effect between X and Y through the PainFM3 mediator, which showed a near zero effect (-0.0272) .

Therefore, results showed that the study failed to reject the H_0, and that further research is necessary to test the current H_a or find other possible alternative hypotheses is necessary to ensure that if the typo errors committed within the data, as well as the multiple imputation and errors when doing the input in the survey may have also affected the results.

Summary

Results showed that H_0 was not rejected because of a combination of significant and nonsignificant path results of tests for mediation within the Hayes model The paths to these two mediators displayed partial or no mediation, while the Work stress X and the IF_M2 mediator showed nonstatistical significance, possibly mediating partially the path from WStress $X \rightarrow M_2 \rightarrow Y$. Further consideration of the results will be discussed in Chapter 5.

Chapter 5: Discussion, Conclusions, and Recommendations

In this study I aimed to examine the relationship between workplace stress and HRQoL, that is, a state of complete physical, mental, and social wellbeing, not merely the absence of disease (see WHO, 2019) among adults suffering from IBS. Cognitive functioning, interpersonal relationships, and pain were examined as mediators between workplace stress and HRQoL. Chapters 1 and 2 introduced the study of IBS as a disorder that affects the HRQoL of individuals through numerous factors, such as maladaptive coping of symptoms when GI pain flares up, whether at work or home (see Edman et al., 2017). Pain and stress have effects on cognitive functioning and contribute to disruption of interpersonal relationships at work (Monroe & Slavich, 2016; Popa et al, 2018). Other research shows that IBS has more symptoms of depression than any other GI disorder (Ballou et al., 2017; Geng et al., 2018). Unfortunately, there is a specific gap in the literature regarding job stress and the quality of life among individuals with IBS, with conflicting reports on the relationship between job stress, quality of life, and IBS. Recommendations remain for further research to study if relationships are related to psychosocial and demographic factors (Huerta et al., 2019; Weaver et al., 2018) or job burnout (Hod et al, 2020).

My study attempted to respond to this gap in the literature by examining possible mediating variables between work stress and HRQoL. Mediators included cognitive impairment, interpersonal relationships, and pain. I operationally defined these factors using the IBS-36, the OASIS, the M-IPQ, and the WOI. After a nonexperimental,

quantitative study with 133 participants, the results of the study failed to reject the null hypothesis. Thus, further research is needed to respond to this gap in literature.

Latest Literature Research Since the Study Began

A follow-up review of the literature since my initial literature review disclosed that psychosomatic factors may have a role in IBS severity, but this alone has not served as a predictor of IBS severity among individuals (see Porcelli et al., 2020) . Such findings suggest that individuals who suffer from IBS show a higher level of psychosocial distress, alexithymia, poor psychosocial functioning (feelings of helplessness, hopelessness, and giving up), and allostatic overload (inability to cope with stressors), but no somatic symptom disorder (SSD; Porcelli et al., 2020, pp.58-59) . These results mean that assessing IBS, its severity, and whether it is a medical and/or a psychological condition with biomedical implications is more complex than expected.

Debate over Functional IBS or DBGI

There is a debate on whether IBS is a FGID or if it is considered a DGBI. Drossman et al. (2021) explained that GI disorders were classified as FGID back in 1990 when the first Rome Classification System was developed to classify GIDs when they discovered that these disorders shared disturbed sensory-motor and brain gut function. Sperber et al. (2021) confirmed that IBS is a DGBI because it adversely affects the HRQoL of individuals who suffer this condition. Currently, DGBIs are assessed and classified according to 27 algorithms to test patients with yes-no answers to follow symptoms (Drossman et al., 2021).

IBS as a Disability for Patients Who Need Federal Aid and Social Needs

In general, IBS is not automatically considered a disability by the Social Security Administration (Social Security Administration, 2022) . However, individuals with IBS may qualify for disability, depending on the IBS severity and how IBS affects the QoL and work-related QoL of the IBS patient. According to Trull (2022), the Centers of Disease Control and Prevention (2020) stated that a disability affects the QoL of an individual in carrying out normal life activities and socially interacting. Furthermore, if the disease or disorder affects other health-related aspects, such as nutrition deficiencies, fatigue, depression, or other mental-related disorders in a way to affect daily activities, it should qualify as a disability. However, meeting criteria, supported by evidence and medical documentation, are necessary to obtain disability and special disability needs and privileges.

Discussing Models and Applying to the Study

Chapter 2 discussed four models on which to base my study of work stress, cognitive functioning, interpersonal functioning, and pain: the Bronfenbrenner human ecology model, Leventhal's common sense model of illness representations, Lazarus and Folkman transactional model of stress and coping, and the biopsychosocial model of illnesses applying to IBS. Findings from my study only showed significant paths from work stress to interpersonal functioning and from cognitive impairment to HRQoL. There was a marginally significant path from pain to HRQoL. I would suggest further inquiry to develop a superordinate theory of work stress and HRQoL that integrates all these theoretical models for mediational processes.

Research Questions and Brief Findings

The research question was whether pain, cognitive functioning, and interpersonal functioning mediate the relationship between work stress and HRQoL. The null hypothesis was that pain, cognitive functioning, and interpersonal functioning did not mediate the relationship between work stress and health-related quality of life. The alternative hypothesis was that pain, cognitive functioning, and interpersonal functioning did mediate the relationship between work stress and health-related quality of life.

The study failed to reject the null hypothesis, as some mediating paths did mediate, and some did not mediate. Altogether, the three variables did not mediate the overall relationship between work stress and health-related quality of life. Results reflected the paradigms presented from a Model 4 Hayes' PROCESS analysis, which treated the paths in their own processing order alphabetically, as presented in Chapter 4, Figure 8 (i.e., CIM, IF_M, and PainM variables).

Implications for Social Change

IBS is a DGBI disorder that needs to be further studied and reassessed constantly due to its complexity: the acronym seems simple, but the complexity of the multiple organs, hormones, and systems is enormous (Malagelada, 2020). Since the first FGID classification system to the newest classification and algorithms to assess symptoms of IBS as an DGBI, there has been a long evolution and newest discoveries and medicines to treat IBS, but there is a need to make changes in society to help patients and the community in controlling the disorder.

Trull (2022) pointed out that the need for further push for IBS as a disability also requires the need to protect IBS patients by providing accommodations both at home, if the patient is disabled and cannot work, or at work, where employers must provide accommodations. These work accommodations for employees who suffer from IBS may include accessibility to restrooms, the right to have frequent breaks in case of an urgent discomfort and need to defecate, and provision of an optimal work environment with the least stressors possible.

Recommendations

Continued research is needed because IBS appears to be an extremely complex syndrome with many possible causative and correlated factors. Appreciation of the complexity should be reflected in the following.

The Need for Further Training

Physicians must treat patients with care, as IBS is a complex disorder that requires a targeted approach in considering both physiologic mechanisms and psychologic factors that are affecting a patient's symptoms, if the patient is coping and their coping behavior (Cash, 2021). Gastroenterologists should be trained and require psychogastrologists to interact in helping patients improve their quality of life. It is evident that patients want clinicians to listen, provide hope, make a correct diagnosis, improve their symptoms, and help the patient and others to educate the importance of dealing and coping with IBS.

Furthermore, since the beginning of the Covid-19, research has become necessary in exploring the relationship between DGBI symptoms and this multisystem disease, as Covid-19 is predominantly a respiratory disease (Ma et al., 2022), but it affects the GI

system (Golla et al., 2022). The most recent studies have shown that long-term DGBIs, predominantly IBS, and considering that IBS patients suffer from a lower HRQoL and a higher tendency of suffering from psychological disorders like depression (Ballou et al., 2017), the distress factor may exacerbate the immune reaction to the lungs. Ma et al. (2022) pointed out that respiratory diseases, which affects the lungs, are accompanied by a dysbiosis in the gut microbiota, causing inflammation and affecting the immune system, and that researchers are studying the role of gut microbiota and COVID-19, finding opportunistic harmful bacteria (p. 5). Therefore, further research is required to provide solutions to aid patients with immunocompromised systems, such as IBS patients, who may be prone to diseases like COVID-19 and seek a better HRQoL with microbiota-related treatments like probiotics with proper nutrition to maintain homeostasis.

Further Research in Microbiota

Microbiota is defined as microorganisms within a microbiome or system, where some may be helpful and others harmful (Harponen, 2021). Dysbiosis is an imbalance in the gut microbiota related to disease, and IBS is considered as such, playing a fundamental role this imbalance, linking the disorder with chronic fatigue, anxiety, anxiety, and depression (Wang et al., 2020). A meta-analysis by Wang et al. (2020) affirmed that a deficiency of *Lactobacillus*, *Bifidobacterium*, both beneficial bacteria or probiotics, and a high amount of *Enterobacter* and *E. coli* are found in IBS patients, altering gut microbiota, and adversely affecting proinflammatory cytokines.

Marazziti et al. (2021) suggested that the use of microbiota treatments should be labeled as *psychobiotics* because central nervous system (CNS) interactions with an

imbalanced microbiota affects individuals with mood disorders, major depressive disorder (MDD), obsessive-compulsive disorder (OCD), and bipolar disorder (BD) (p. 5). Hillstad et al. (2022) have recently developed a model to explain the importance of gut homeostasis, called the Microbiota-Gut-Brain axis (MGB) involving the Vagus nerve as the modulator (p. 414). Under favorable, normal conditions or homeostasis, Vagus nerve endings send signals to the Enteric Nervous System (ENS) to generate the regular muscular, neuro-hormonal, and secretory signals to begin regular digestion in the gut. Patients with IBS have an altered gut microbiota, causing the IBS symptoms, but the issue relies on what would be a healthy gut microbiota, as each human being is an individual and will require an intestinal gut microbiota analysis (Hillstad et al., 2022). Therefore, the use of prebiotics and probiotics as therapy are a potentially beneficial to the stomach and intestines in promoting a balance in the microbiota, yet it requires further inquiry to observe therapies to improve the gut microbiota and thus provide a better HRQoL of patients with IBS.

Nutrition and IBS

Because of adverse effects of various foods, there is a need for continued research and training on nutritional factors in IBS. For example, butyrate are necessary to maintain colon integrity and are found in onions, leeks, asparagus, and Jerusalem artichokes. These anti-inflammatory foods improve the immune system in the gut. Other foods, however, such as asparagus, may need to be monitored, limited, avoided temporarily, or reintroduced to see if the gut is tolerating this food or if it is contributing to a flare up as this butyrate vegetables are part of the list of foods avoided with the Low FODMAP Diet

(LFD) and physicians are recommending butyrate to maintain gut homeostasis (The Ruscio Institute for Functional Medicine, 2022). Further research is necessary to make the FODMAP diet with probiotics, as Ankersen et al. (2021) affirmed that a clinical trial with LFD and microbiota treatment, reduced IBS symptoms as a long-term nutritional management, yet treatments should be monitored to observe which probiotics are effective for each IBS patient. Therefore, each IBS treatment with probiotics must be personalized, and will require constant monitorization as a long-term, trial and error treatment, as the nutritional expert must try different types of probiotics to balance the microbiota and reduce IBS symptoms (Ankersen et al., 2021; Ghaffari et al., 2022).

Food intolerance is also a possible factor linked to IBS. Lactose, egg, or wheat intolerance may trigger IBS symptoms and negatively affect HRQoL (Jansson-Knodell et al., 2022). Food intolerance is related to increased psychological symptoms like anxiety and depression among IBS patients, as the most recent study pointed out 84% of IBS patients informed that trigger foods after a meal would begin GI symptoms that would produce an IBS flare up episode, which in turn bring about psychological symptoms, and strongest food trigger is lactose intolerance (Jansson-Knodell et al., 2022, p. 2123). Sucrose intolerance is another possible IBS trigger among food intolerances, as it produces bloating, gas, and cramping, resulting in functional diarrhea, IBS-D, abdominal distention, and pain (Frissora et al., 2022). Therefore, further research and testing must be included in IBS treatments with enzyme replacements to control carbohydrate malabsorption since sugar is avoided in LFD and sugar replacements like sucrose can possibly trigger IBS.

Continued Research on Medical Treatments for IBS

Continued research is needed to identify safe and efficacious medical treatments. Some of the standard medical treatments for IBS may be contraindicated, making symptoms worse for some individuals with comorbidities. For example, Alosetron is an IBS-D drug used prescribed for female individuals with severe cases, and although a study by Lacy et al. (2018) had claimed that this medicine was considered safe, the research showed that 44.3% of the participants showed treatment emergent adverse events (TEAEs) and another 22.9% suffered from a drug-related adverse events. However, the researchers claimed that the medicine was well-tolerated (Lacy et al., 2018, pp 8-9). Furthermore, the limitations of the Alosetron study did not have a control group to compare its safety and effectiveness among IBS-D participants who had taken Alosetron for the study, and the participants who were taking Alosetron were also taking other medications to control IBS symptoms. Moreover, the use of this drug should not be prescribed for children and should be used with caution among the elderly because of the drug interactions and adverse effects (Mayo Clinic, 2022) . Individuals who have a history of blood clotting, such as thrombophlebitis, show a tendency to suffer from bouts with severe constipation, diverticulitis, liver problems, and/or ischemic colitis. Patients who take fluvoxamine, an SSRI antidepressant used to treat obsessive-compulsive disorder (OCD) and social anxiety disorder (SAD) should not be taking this drug because of interaction with Alosetron: Alosetron is a serotonin blocker for IBS (Mayo Clinic, 2022).

Another line of treatment for IBS that merits ongoing exploration and formal research is Complementary Alternative Medicines (CAM). In general, CAM has gained popularity among patients with chronic diseases, including IBS (Sudhakar et al., 2022). In fact, the World Health Organization (WHO, 2022) has encouraged further research and application of CAM so that procedures can be evaluated and employed within national health systems . In China, for example, acupuncture is currently being studied for treating IBS according to a recent meta-analysis (Li et al., 2022). However, the results are still inconclusive, requiring further research as a possible alternative to alleviate IBS symptoms.

Conclusion

The current study provided an updated literature review on IBS/IBD characteristics, frequencies, and critical issues regarding underlying processes, treatments, and outcomes. The research gap that was addressed in this study was related to psychosocial variables that may play a role in quality of life among those who experience IBS/IBD. Specifically, the research question was: *RQ*: Do pain, cognitive functioning, and interpersonal functioning mediate the relationship between work stress and health-related quality of life?

The null and alternative hypotheses were:

H_0: Pain, cognitive functioning, and interpersonal functioning do not mediate the relationship between work stress and health-related quality of life.

H_a: Pain, cognitive functioning, and interpersonal functioning do mediate the relationship between work stress and health-related quality of life.

In general, the null hypothesis was not rejected.

Research in this area has critical social significance. There continues to be a need to develop and evaluate various models related to possible causes/correlates of IBS/IBD, as well as various methods for diagnosis and treatment of IBS/IBD. Information that helps to elucidate varieties of combinations of contributing factors, as well as individual variations in symptom patterns and needs, will help to inform health care providers of options for effective treatment and support for the growing number of individuals who face this challenge .

Footnotes

[1]The initials “s.e.” are the standardized effects of the Hayes’ PROCESS data analysis that are used for mediation-only models when using the application to compare other correlations across paths (Hayes, 2018).

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Appendix A: Announcement for Online Social Groups

Dear IBS Online Social Group Member**,**

If you are between the ages of 18 years to 65 years, you are an English-language speaker living in the United States, and you have medically been diagnosed as an irritable bowel syndrome (IBS), you are invited to voluntarily participate in an IBS study on stress and health-related quality of life. This research is being conducted by Aida Benitez-Rexach, Master of Philosophy in Psychology student at Walden University, under the Supervision of Dr. M. Hanania and Dr. D. Heretick of Walden University.

Survey Link**:**

https://www.surveymonkey.com/ (Official Survey Monkey address will be entered)

Appendix B: Demographics

Please fill out the following information for the study:

Age:

☐ 18 – 26

☐ 27 – 35

☐ 36 – 44

☐ 45 – 54

☐ 55 – 65

Gender:

☐ Male

☐ Female

☐ Other

I identify myself as:

☐ Asian

☐ Black / African

☐ Caucasian

☐ Hispanic/Latino

☐ Native American

☐ Pacific Islander

☐ I prefer not to answer

Highest Level of Education:

☐ Less than High School Diploma

☐ High School Diploma

☐ Some college education

☐ Bachelor's degree

☐ Master's degree

☐ Professional doctorate (DDS., MD., JD, etc.) Please specify: _____

☐ Ph.D.

Current employment status:

☐ Full time employment

☐ Part time employment

☐ Unemployed / Looking for work

☐ Unemployed / Not looking for work

☐ Student

☐ Retired

☐ Other, please specify: _____

Household Income

☐ $0 - $24,999

☐ $25,000 - $49,999

☐ $50,000 - $74,999

☐ $75,000 - $99,999

☐ $100,000 - $149,999

☐ $150,000 or more

Do you have IBS?

☐ Yes, I have been medically diagnosed with IBS through IBS specific tests

☐ Yes, I have been medically diagnosed with IBS through symptom testing

☐ I am not sure, but I do have IBS symptoms.

Appendix C: IBS-36 Questionnaire

IBS-36 Questionnaire

Please check the number that explains how you have been IN THE PAST TWO MONTHS. Please say "In the Past two months" ahead of each question as you think about the answer. If the question does not apply to you, please mark not applicable.

Example: /----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

IN THE PAST TWO MONTHS

Have you been afraid to eat out because of food causing bowel symptoms?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Have you felt angry as a result of your bowel problem?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Did you need to go suddenly when you had a bowel movement?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Did your bowel symptoms interfere with your relationship with your children and/or partner?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Did you avoid foods that you like because you were afraid that they might cause bowel symptoms?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

/----------/----------/----------/----------/----------/----------/ Not applicable

Did your bowel symptoms interfere with being able to do well at work/school/usual daily activities?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Have you felt fearful or discouraged as a result of your bowel problem?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did you feel that your family/friends thought your symptoms were not real?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

How often, while participating in leisure or sport activities did you have to stop because of your bowel symptoms?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Have you felt worried or anxious about never feeling any better?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did you miss work/school/usual daily activities because of your bowel problem?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did your bowel symptoms interfere with being able to concentrate?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

/----------/----------/----------/----------/----------/----------/ Not applicable
Never Always

Have you felt alone or isolated from your family because of bowel symptoms?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Were you embarrassed because of your bowel symptoms?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Were you troubled by pain your abdomen?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Were you afraid that your bowel symptoms are getting worse?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Were you troubled by bowel movements that were hard/difficult to pass?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did you check your diet from the previous day trying to find foods that might cause bowel symptoms?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did you avoid traveling due to worry about bowel symptoms?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

/----------/----------/----------/----------/----------/----------/ Not applicable
Never Always

Did your bowel symptoms shorten the length of time you could work every day?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did your bowel symptoms keep you from sleeping soundly during the night?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Were you troubled by loose bowel movements?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did your bowel condition interfere with having sexual relations?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Has being bloated troubled you?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did your bowel symptoms interfere with your enjoyment of leisure or sport activities?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Was passing large amount of gas a problem?
/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

/----------/----------/----------/----------/----------/----------/ Not applicable

Were you concerned that your symptoms may be due to cancer?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Have you had to delay or cancel going out socially because of your bowel problem?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Were you tired in the morning because of your bowel symptoms?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Did your bowel symptoms interfere with your desire to have sexual relations with your partner?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Has feeling that you need to go to the bathroom even though your bowels are empty troubled you?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

Did your feel that your doctor/health professionals did not believe that your bowel symptoms are real?

/----------/----------/----------/----------/----------/----------/ Not applicable

0 1 2 3 4 5 6

Never Always

How often do you immediately need to find where washrooms are when you are in a new place?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Did you avoid planning activities ahead of time because you were unsure of how your bowel symptoms would be?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Has accidental soiling of your underwear troubled you?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

Were you late for or did you delay work/school/usual daily activities because of your vowel symptoms?

/----------/----------/----------/----------/----------/----------/ Not applicable
0 1 2 3 4 5 6

Never Always

From: Groll, D., Vanner, S. J., Depew, W. T., DaCosta, L. R., Simon, J. B., Groll, A., Roblin, N., & Paterson, W. G. (2002). The IBS-36: A new quality of life measure for irritable bowel syndrome. The *American Journal of Gastroenterology, 97*(4), 962-971. doi: 10.1111/j.1572-0241.2002.05616x Test provided and approved by co-author Dr. Stephen J. Vanner.

Appendix D: The Overall Anxiety and Severity and Impairment Scale (OASIS)

The following items ask about anxiety and fear . These symptoms may include panic attacks, situational anxieties, worries, flashbacks hypervigilance of startle . Include all of your anxiety symptoms when answering these questions . For each item, check the number for the answer that best describes your experience over the past week .

1. In the past week, how often have you felt anxious?

0 = *No* anxiety in the past week.

1 = *Infrequent* anxiety . Felt anxious a few times .

2 = *Occasional anxiety* . Felt anxious as much of the time as not . It was hard to relax.

3 = *Frequent* anxiety . Felt anxious most of the time . It was very difficult to relax.

4 = *Constant* anxiety . Felt anxious all of the time and never really relaxed .

2. In the past week, when you have felt anxious, how intense or severe was your anxiety?

0 = *Little or None*: Anxiety was absent or barely noticeable.

1 = *Mild*: Anxiety was at a low level . It was possible to relax when I tried . Physical symptoms were only slightly uncomfortable.

2 = *Moderate*: Anxiety was distressing at times . It was hard to relax or concentrate, but I could do it if I tried. Physical symptoms were uncomfortable.

3 = *Severe*: Anxiety was intense much of the time . It was very difficult to relax or focus on anything else. Physical symptoms were extremely uncomfortable.

4 = *Extreme*: Anxiety was overwhelming. It was impossible to relax at all. Physical symptoms were unbearable .

3. In the past week, how often did you avoid situations, places, objects, or activities because of anxiety or fear?

0 = *None*: I do not avoid places, situations, activities, or things because of fear.

1 = *Infrequent*: I avoid something once in a while, but will usually face the situation or confront the object . My lifestyle is not affected.

2 = *Occasional*: I have some fear of certain situations, places, or objects, but it is still manageable . My lifestyle has only changed in minor ways . I always or almost always avoid the things I fear when I'm alone, but can handle them if someone comes with me.

3 = *Frequent*: I have considerable fear and really try to avoid the things that frighten me . I have made significant changes in my life style to avoid the object, situation, activity, or place.

4 = *All the Time*: Avoiding objects, situations, activities, or places has taken over my life . My lifestyle has been extensively affected and I no longer do things that I used to enjoy.

4. In the past week, how much did your anxiety interfere with your ability to do the things you needed to do at work, at school, or at home?

0 = None: No interference at work/home/school from anxiety

1 = Mild: My anxiety has caused some interference at work/home/school . Things are more difficult, but everything that needs to be done is still getting done.

2 = *Moderate*: My anxiety definitely interferes with tasks . Most things are still getting done, but few things are being done as well as in the past .

3 = Severe: My anxiety has really changed my ability to get things done . Some tasks are still being done, but many things are not . My performance has definitely suffered.

4 = Extreme: My anxiety has become incapacitating . I am unable to complete tasks and have had to leave school, have quit or been fired from my job, or have been unable to complete tasks at home and have faced consequences like bill collectors, eviction, etc.

5. In the past week, how much has anxiety interfered with your social life and relationships?

0 = *None*: My anxiety doesn't affect my relationships.

1 = *Mild*: My anxiety slightly interferes with my relationships . Some of my friendships and other relationships have suffered, but, overall, my social life is still fulfilling

2 = *Moderate*: I have experienced some interference with my social life, but I still have a few close relationships . I don't spend as much time with others as in the past, but I still socialize sometimes.

3 = *Severe*: My friendships and other relationships have suffered a lot because of anxiety . I do not enjoy social activities . I socialize very little.

4 = *Extreme*: My anxiety has completely disrupted my social activities . All of my relationships have suffered or ended . My family life is extremely strained.

From: Norman, S. B., Cissell, S. H., Means-Christensen, A. J., & Stein, M. B. (2006). Development and validation of an overall anxiety severity and impairment scale (OASIS). *Depression and Anxiety, 23*, 245-249. doi: 10.1002/da.20182 and with the permission of the author, Dr. Sonya Norman

Appendix E: The Modified Illness Perceptions Questionnaire (M-IPQ)

The purpose of the following 14 items below are to test your perceptions about your illness or condition. Please mark the answer for each item that best describes your condition.

1. My problems can improve.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

2. There is a lot which I can do to improve my problems.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

3. What I do can determine whether my current problems/illness get better or worse.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

4. My current problems/illness will improve in time.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

5. There is very little that can be done to improve my current problems. (R)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

6. Talking therapy will be effective in improving my current problems/illness.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

7. Recovery from my current problems is largely dependent on fate or chance. (R)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

8. My current problems/illness will last a short time. (R)

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

9. My current problems/illness are likely to be permanent rather than temporary.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

10. My current problems/illness will last for a long time.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

11. My state of mind played a major part in causing my current problems/illness.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

12. Something about my personality played a role in causing my current problems/illness.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

13. Changing the way I think or the way I do things can improve my problems.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

14. Looking at things differently can be helpful.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

Appendix F: The Workplace Organization Indices (WOI)

Workplace Organization Indices

For each item, please choose the answer that is appropriate about your life at your workplace

Participative Management

1) I am generally satisfied with my relationship with my immediate manager or supervisor.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

2) Management is generally interested in my suggestions for how we can work better.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

3) Management generally keeps me informed about things that will affect me and my job.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

4) I cannot influence my immediate supervisor’s decisions/actions that affect me.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

5) I do not feel that I can trust the management in this organization.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

Flexible Work Hours

6) I have no flexibility about my hours of work.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

7) I am able to take a day off on full pay to attend to personal matters.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

8) I am able to take a day off at my own expense to attend to personal matters.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

9) If I need to start work late or leave early occasionally, it is generally OK to do so.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

Employment Insecurity

10) The security of my job depends on regularly working extra hours.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

11) My employer regularly puts off people if business declines.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

12) Some family members in my household are likely to lose their jobs in the next 1 month (i.e. get retrenched/fired/not have a contract renewed).

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

Workload Pressure

13) I feel that I cannot possibly finish my daily workload in a normal work day.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

14) I believe the amount of work I have to do interferes with how well it gets done.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

15) I feel I have too heavy a workload.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

Work Stress

16) Problems associated with my job tend to directly affect my health.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

17) The demands of my job leave me feeling stressed.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

18) Problems associated with my job have kept me awake at night.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

Work-to-life Interference

19) After work, I come home too tired to do things I had planned to do.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

20) My job keeps me from spending the amount of time I would like to spend with my family.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

21) The amount of time my job takes up makes it difficult to fulfill family responsibilities.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

22) I have so much work to do in my job that it takes time away from my personal

interests.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

23) My family/friends dislike how I am preoccupied with my work while I am with them.

Never	Rarely	Sometimes	Often	All of the Time
○	○	○	○	○

From “Workplace Organization Indices” by P. Boreham, J. Povey, and W. Tomaszewski (2016). *PsycTests*, p.2 (doi: https://dx.doi.org/10.1037/t49440-000). Copyright 2016 by The American Psychological Association

Appendix G: Hayes PROCESS Model 4 for the Mediation Study

Model: 4
Y: HRQoL
X: WStressM
M1: CIM1
M2: IF_M2
M3: PainFM3
Sample size: 133

OUTCOME VARIABLE

CIM1

Model Summary

R	R-sq	MSE	F	df1	df2	p
.0536	.0029	1.1557	.3777	1.0000	131.000	.5399

Model

	coeff	se	t	p	LLCI	ULCI
constant	2.2140	.5724	3.8677	.0002	1.0816	3.3465
WStressM	-.1202	.1956	-.6146	.5399	-.5073	.2668

Standardized coefficients:

	coeff
WStressM	-.0536

OUTCOME VARIABLE

IF_M2

Model Summary

R	R-sq	MSE	F	df1	df2	p
.6504	.4230	.6581	96.0372	1.0000	131.000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	-1.3120	.4320	-3.0374	.0092	-2.1666	-.4575
WStressM	1.4468	.1476	9.7999	.0000	1.1549	1.7389

Standardized coefficients:

	coeff
WStressM	.6504

OUTCOME VARIABLE

PainFM3

Model Summary

R	R-sq	MSE	F	df1	df2	p
0689	.0047	.2362	.6246	1.0000	131.000	.4308

Model

	coeff	se	t	p	LLCI	ULCI
constant	3.1106	.2588	12.0205	.0000	2.5987	3.6226
WStressM	-.0699	.0884	-.7903	.4308	-.2449	.1051

Standardized coefficients:

	coeff
WStressM	-.0689

OUTCOME VARIABLE

HRQoL

Model Summary

R	R-sq	MSE	F	df1	df2	p
.6441	.4149	1.0686	22.6904	4.0000	128.000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	1.1651	.8324	1.3997	.1640	-.4819	2.8121
WStressM	.0759	.2529	.3002	.7645	-.4245	.5764
CIM1	.7403	.0894	8.2810	.0000	.5634	.9172
IF_M2	-.1150	.1143	1.0059	.3164	-.3411	.1112

	HRQoL					
PainFM3	.3887	.1952	1.9908	.0486	.0024	.7749

Standardized coefficients

	coeff
WStressM	.0273
CIM1	.5966
IF_M2	-.0919
PainFM3	.1417

********** TOTAL EFFECT MODEL **********
OUTCOME VARIABLE:
HRQoL

Model Summary

R	R-sq	MSE	F	df1	df2	p
.0742	.0055	1.7747	.7259	1.0000	131.0000	.3958

Model

	coeff	se	t	p	LLCI	ULCI
constant	4.1640	.7094	5.8699	.0000	2.7606	5.5673
WStressM	-.2066	.2425	-.8520	.3958	-.6862	.2731

Standardized coefficients

	coeff
WStressM	-.0742

********** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **********

Total effect of X on Y

Effect	se	t	p	LLCI	ULCI	c_cs
-.2066	.2425	-.8520	.3958	-.6862	.2731	-.0742

Direct effect of X on Y

Effect	se	t	p	LLCI	ULCI	c'_cs
.0759	.2529	.3002	.7645	-.4245	.5764	.0273

Indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
TOTAL	-.2825	.2415	-.7317	.2205
CIM1	-.0890	.1530	-.3762	.2264
IF_M2	-.1663	.1701	-.4942	.1748
PainFM3	-.0272	.0489	-.1408	.0611

Completely standardized indirect effect(s) of X on Y:

	Effect	BootSE	BootLLCI	BootULCI
TOTAL	-.1015	.0877	-.2694	.0782
CIM1	-.0320	.0545	-.1356	.0797
IF_M2	-.0598	.0617	-.1815	.0620
PainFM3	-.0098	.0178	-.0516	-.0516

********** ANALYSIS NOTES AND ERRORS **********

Level of confidence for all confidence intervals in output:

95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:

5000

------ END MATRIX -----

Appendix H: Debriefing Form

Debriefing Form

I would like to thank you for participating in this study on job stress, pain, cognitive functioning, interpersonal relationships, and quality of life in irritable bowel syndrome.

You have completed four separate questionnaires that assessed the following: a specific questionnaire for irritable bowel syndrome, overall anxiety severity and impairment, illness perceptions about your condition, and a work organization survey. The purpose of the study is to investigate the relationships between job stress, pain, cognitive functioning, interpersonal functioning and health-related quality of life in adults with IBS . While you were taking the survey, each page was showing you an encouraging quote to continue and boost your morale.

Your participation will help me test the five following hypotheses: (1) The degree of influence workplace stress, pain, cognitive function, and interpersonal functioning influence health-related quality of life in individuals with IBS (2) If there is a significant relationship between work stress and pain, (3) If there is a significant relationship between work stress and cognitive functioning in individuals with IBS, (4) If there is a significant relationship between work stress and interpersonal functioning in individuals with IBS, and (5) If pain, cognitive function, and interpersonal functioning intervene between work stress and health-related quality of life.

Taking into account all the factors being under the study, your participation may have helped improve the understanding of IBS as a condition and its relationship to the

quality of life in IBS patients to seek further patient education to ameliorate the impact of the condition and improve their quality of life. Should you feel the need to find emotional support or counseling following your participation in this study, you may contact the United Way Helpline 211. This free Helpline will help you locate counseling/support services within your area. Please dial on your telephone 211 for these United Way Helpline services. Also, you may reach the Crisis textline 741741 on mobile phones or Facebook message in the United States and Canada for free Crisis counseling at https://www.crisistextline.org/

For results of this study or if you have any further questions about the study, please feel free to contact me at: aida.benitez-rexach@waldenu.edu

Sincerely,

Aida M. Benitez-Rexach, Graduate Student

*The Surveys used for the research study were the following in the following order:
1 . **IBS-36.** From Groll, D., Vanner, S. J., Depew, W. T., DaCosta, L. R., Simon, J. B., Groll, A., Roblin, N., & Paterson, W. G. (2002). The IBS-36: A new quality of life measure for irritable bowel syndrome. The American Journal of Gastroenterology, 97(4), 962-971. doi: 10.1111/j.1572-0241.2002.05616x and Test provided by permission of co-author Dr. Stephen J. Vanner.

2. **OASIS.** From Norman, S. B., Cissell, S. H., Means-Christensen, A. J., & Stein, M. B. (2006). Development and validation of an overall anxiety severity and impairment scale (OASIS). Depression and Anxiety, 23, 245-249. doi: 10.1002/da.20182 and with the permission of the author, Dr. Sonya Norman.

3. **MIP-Q.** From “A pilot validation of a modified Illness Perceptions Questionnaire designed to predict response to cognitive therapy for psychosis,” by E. Marcus, P. Garety, J. Weinman, R. Emsley, G. Dunn, P. Bebbington, D. Freeman, E. Kuipers, D. Fowler, A. Hardy, H. Waller, H., and S. Jolley, 2014, Journal of Behavior Therapy and Experimental Psychiatry, 45(4), p. 462 (doi: 10.1016/j.jbtep.2014.06.003). CC BY- https://creativecommons.org/licenses/by/4.0/

4. **Workplace Organization Indices (WOI)** From “Workplace Organization Indices” by P. Boreham, J. Povey, and W. Tomaszewski (2016). PsycTests, p.2 (doi: https://dx.doi.org/10.1037/t49440-000). Copyright 2016 by The American Psychological Association

APPENDIX J: Consent from Authors to Use the Research Instruments

Questionnaire Approvals Requiring Consent from Authors

IBS-36 QUESTIONNAIRE:

Dear Aida, thank you for your interest in our IBS-36 instrument. You are certainly free to use the instrument . I will see if I can find the instrument questionnaire in the midst of COVID-19 .

Regards, Stephen

Stephen J. Vanner MD, MSc, FRCPC

Professor, Depts. of Medicine and Molecular and Biological Science Director, Gastrointestinal Diseases Research Unit (GIDRU) Queen's University Kingston General Hospital

OVERALL ANXIETY SEVERITY IMPAIRMENT SCALE:

Yes, please feel free to use the OASIS.

Sonya Norman

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