Stony Brook University

Do Previous Life Experiences and Family History Moderate Gastrointestinal Symptoms, Somatic Symptoms, and Stress in Response to Transient Stressors?

A Dissertation Presented

by

Genna Hymowitz, M.A.

to

The Graduate School

in Partial fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

in

Clinical Psychology

Stony Brook University

August 2011

Stony Brook University

The Graduate School

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Abstract of the Dissertation

Do Previous Life Experiences and Family History Moderate Gastrointestinal Symptoms, Somatic Symptoms, and Stress in Response to Transient Stressors?

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2011

Irritable Bowel Syndrome (IBS) affects 10%-20% of adults living in the U.S. and accounts for approximately 25% of all visits to a gastroenterologist. Despite the high prevalence and the significant physical, psychological and financial impact of IBS, the etiology of this disorder is still largely unknown. Previous research supports an influence of genetics, family environment and physical, sexual and emotional abuse on gastrointestinal symptoms and indicates the presence of relationships among abuse, IBS and response to stressors.

The purpose of this dissertation is to evaluate gastrointestinal symptoms and stress response to a transient naturalistic stressor in individuals with both non-specific and specific risk factors for IBS. This study evaluated perceived stress levels, gastrointestinal symptoms and non-gastrointestinal somatic symptoms in 78 undergraduate students with and without a family history of childhood trauma and/or a family history of IBS before and after an examination stressor. Assessments were completed using both paper-and-pencil and Internet surveys. In contrast to expectations, the study results did not support the hypothesis that a history of

childhood trauma moderates gastrointestinal symptoms or perceived stress response to a transient stressor. Study analyses also did not show that a family history of IBS moderates gastrointestinal or perceived stress response to a transient stressor. The results of this study indicate that severity of emotional abuse is positively correlated with total gastrointestinal symptoms and gastrointestinal symptom frequency. This study further demonstrated that symptoms of IBS aggregate in families. This suggests that there is a genetic/environmental component to IBS and that individuals with a family history of IBS might have an increased risk for developing a functional gastrointestinal disorder. Additional research is needed to more thoroughly explore the relationships among genetics, family environment and development of gastrointestinal symptoms. A more comprehensive understanding of these associations will strengthen our efforts to effectively prevent and treat functional gastrointestinal disorders.

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Acknowledgements

I would like to extend my sincerest gratitude to all of the individuals without whom I would not have been able to complete this study or my graduate training.

First, I would like to thank my advisor, Dr. Arthur Stone, for his guidance and support and for inviting me to be a part of his lab. Thank you for the freedom to pursue my research interests and for giving me the tools necessary to be a successful scientist. Without your insight and encouragement this project would not have been possible. I would like to thank my committee members Drs. Joanne Davila, Turhan Canli and Kathleen Monahan for reviewing this dissertation and for sharing your expertise, your assistance and feedback during the development of this project. Your input substantially improved the quality of this study.

I also need to thank Dr. Leighann Litcher-Kelly. Thank you for sharing your RAs! Thank you also for your input and suggestions for this study design and for providing oversight for this endeavor while I was in Chicago. Thank you for being so generous with your time and advice. Your assistance has been invaluable and I am looking forward to working with you again next year. Many thanks to Christopher Marconi, Samantha Verez, Merve Mamati and Dipan Danda for their assistance with my data collection, participant recruitment and development and organization of study materials. A special thanks goes to Irina Livitz for helping to recruit and run the final wave of participants while I was away. Your organizational skills and professionalism helped to ensure that the study continued to run as efficiently as possible.

Thank you also to Dr. Dina Vivian for your unflagging support and for your help with the logistics of this study; thanks for allowing me the use of the Krasner Psychological Center offices. Thank you also to Patricia Urbelis and Dianne Pagani for your support and encouragement throughout this process and for helping to ensure study visits went smoothly.

Thank you to everyone at the Applied Behavioral Medicine Research Institute. Thank you to the W. Burghart Turner Fellowship Program for your financial support.

I would also like to thank my supervisors at the Jesse Brown VA Medical Center in Chicago, IL. Drs. Sarah Catanese, Eric Van Denburg, Susan Payvar and David Cosio. Thank you all for your encouragement and for sharing your own experiences with the dissertation process. I am indebted to you for your understanding and wise advice and for showing me that I actually did gain some applicable skills in graduate school.

I also wish to thank my parents, Barbara and Lee. Thank you for your love and support and for instilling in me the qualities necessary to achieve my goals. Last, but certainly not least I wish to thank my husband Joseph Popovich for his work as editor, personal chef, exercise partner and cheerleader. Thank you for your patience, enthusiasm and unfailing support. Thank you for moving halfway across the country for me. Thank you for sharing this adventure with me.

Introduction

Functional Gastrointestinal Disorders (FGIDs), such as Irritable Bowel Syndrome (IBS) affect approximately 15%-20% of adults living in the U.S. and account for around 50% of visits to a gastroenterologist (Locke, 1996; Gschossmann, Haag, & Holtmann, 2001). IBS is characterized by gastrointestinal distress, pain and discomfort, which can significantly inhibit daily functioning. It is also typically diagnosed in women between the ages of 25 and 54. There are a number of potential predisposing factors for IBS that are specific to this disorder. For instance, IBS appears to aggregate in families suggesting that a family history of IBS is a risk factor for diagnosis of IBS (Chitkara, Miranda, van Tilburg, Blois-Martin, & Whitehead, 2008;Hungin, Chang, Locke, Dennis, & Barghout, 2005; Saito et al., 2008). Additionally, children who have recurrent abdominal pain (RAP) also seem to be particularly at risk for developing IBS (Blanchard & Scharff, 2002). Other risk factors for a diagnosis of IBS that are not specific to IBS might include previous life stressors and abuse (Chitkara, Miranda, van Tilburg, Blois-Martin, & Whitehead, 2008; Nicholl et al., 2008). Despite the high prevalence of IBS, little is known about its etiology. Many theorists point to a biopsychosocial explanation of this disorder, which suggests that a combination of genetic predisposition, social learning, life stressors (such as sexual and physical abuse) and current stressors may lead to the development and exacerbation of IBS (Drossman,1998; See Figure 1).

Certain predisposing factors thought to play a role in the biopsychosocial mechanism of IBS development, such as a history of childhood trauma, also tend to predispose an individual to number of other illnesses and maladaptive health behaviors such as depression, anxiety, COPD, cancer, liver disease, heart disease, tobacco use and alcohol abuse (Felitti et al., 1998). This

suggests that such predisposing factors are not specific to IBS and likely do not directly cause IBS. These risk factors when combined with other risk factors more specific to an IBS diagnosis, such as a family history of IBS might lead to symptoms characteristic of IBS. One proposed mechanism for the development of IBS is that the presence of both predisposing factors specific to IBS and non-specific predisposing factors, such as traumatic life experiences, result in changes to the central nervous system, particularly the neuroendocrine system and prefrontal cortical regions of the brain and that this in turn results in changes in affect and attention, gastrointestinal motility, visceral sensitivity and gastrointestinal symptoms; the presence of predisposing factors specific for a diagnosis of IBS might exacerbate gastrointestinal specific alterations and increase the likelihood of reporting of gastrointestinal symptoms (see Figure 2). This model is consistent with research suggesting that individuals with a history of childhood abuse display increased neuroendocrine hormone levels in response to a psychosocial stressor when compared to individuals without a history of abuse (Heim, et al., 2002). Studies also indicate that, when compared to individuals without IBS, individuals with IBS show increased neuroendocrine and perceived stress reactivity in response to stressors and that stress impacts the severity of gastrointestinal symptoms (Blanchard, 2008; Elsenbruch, Lovallo, William, & Orr, 2001; Levy, Cain, Jarett, & Heitkemper, 1996; Plante, Lawson, Kinney, & Mello, 1998). Furthermore, one study evaluating gastrointestinal symptoms and bacterial flora activity in response to stressors indicated that during an exam period, levels of bacterial flora were lower and gastrointestinal symptoms were higher than during a week when individuals were not exposed to exam stress demonstrating that stressful experiences can impact gastrointestinal activity even in healthy individuals (Knowles, Nelson, & Palombo, 2008).

Lastly, at least one study showed that individuals with a diagnosis of IBS who also have a history of childhood trauma show stronger activation of prefrontal brain regions in response to pain and more self-reported sensitivity to pain than individuals diagnosed with IBS without a history of childhood trauma and individuals without IBS (Ringel et al., 2008). Taken together these studies provide preliminary support for a mechanism by which predisposing factors could lead to increased reporting of gastrointestinal symptoms.

In addition to having a higher likelihood of a history of childhood trauma and a family history of IBS, individuals with IBS are also more likely to experience a number of other somatic symptoms such as sleep disturbances, headaches, musculoskeletal pain, and urogenital pain (Riedl, 2008). Studies have demonstrated that the presence of such symptoms predicts later diagnosis of IBS (Nicholl et al., 2008). The biopsychosocial model suggests that predisposing factors such as childhood trauma and a family history of IBS are also related to other psychosocial risk factors for IBS. If this model does in fact explain the development of FGIDs we would expect that individuals exposed to predisposing factors for IBS, such as childhood trauma or a family history of IBS, would demonstrate higher gastrointestinal symptom activity and psychological reactivity in response to stressors than individuals without these predisposing factors. Studies suggest that individuals with both IBS and a history of abuse have poorer health outcomes and potentially have higher visceral sensitivity compared to individuals with IBS and without a history of abuse and individuals with a history of abuse and without IBS. As such, we might also expect that individuals with a combination of risk factors will have the highest increase in gastrointestinal symptom and psychological reactivity in response to stressors.

Thus far, most of the research supporting the biopsychosocial model for IBS focuses on either young children with risk factors for IBS, or adult patients with a diagnosis of IBS, and few

have evaluated individuals at a midpoint along the developmental continuum. This has left us with a lack of knowledge with regard to the mechanisms behind the association of predisposing factors and development of IBS.

Therefore, the purpose of the current study is to expand knowledge of FGIDs by understanding how psychosocial stressors such as history of abuse and family illness history moderate both gastrointestinal symptom and psychological response to acute psychological stress. A secondary purpose of this study is to evaluate additional risk factors specific to IBS, particularly, the presence of somatic symptoms, and whether these risk factors are more prevalent in individuals with a history of childhood trauma or a family history of IBS.

Before further exploring potential mechanisms behind IBS development it is appropriate to more thoroughly review the current research regarding IBS and psychological and physiological correlates of IBS.

Irritable Bowel Syndrome (IBS)

FGIDs account for almost half of visits to gastroenterology clinics and are particularly challenging because they are largely diagnosed by ruling out organic causes of symptoms. One of the most prevalent FGIDs is Irritable Bowel Syndrome (IBS), which affects approximately 10-22% of individuals living in the U.S., with prevalence rates ranging between 6 and 25% worldwide (Gschossmann, Haag, & Holtmann, 2001). IBS is characterized by symptoms related to abdominal discomfort including pain, tenderness, and bloating, and symptoms involving irregular bowel patterns such as, diarrhea, constipation, and urgency (Cain et al, 2006; Sach & Chang, 2002).

The symptoms of IBS can cause absenteeism from work and unemployment, and can lead to avoidance of social situations resulting in isolation (Bertram, Kurland, Lydick, Locke, &

Yawn, 2001;Silk, 2001). Patients with IBS experience greater levels of dysphoria, interference in activities, body image distress, health worries, difficulties with relationships, and lower levels of energy and overall quality of life than individuals without a diagnosis of IBS (Lee, 2008).

Not only do IBS symptoms detrimentally impact physical and psychological functioning, but this illness also has a substantial financial impact. Longstreth and colleagues (2003) evaluated the health care costs for individuals with IBS compared to individuals without IBS and found that it cost 51% more to care for an IBS patient than a non-IBS patient. The costs incurred by patients with IBS included emergency room visits, hospital stays, surgery, emergency laboratory tests, pharmacy costs, radiological services, and outpatient visits. As discussed by Longstreth et al. (2003), the high cost of care for IBS patients suggests that the current standard of care needs to be re-evaluated and that a multidisciplinary approach toward treatment would be beneficial for patients and insurance companies alike.

Biopsychosocial Model of IBS

In light of the physical, emotional, and financial impact of IBS on the lives of individuals suffering from this disorder, focus has moved towards a more thorough understanding of biological, psychological, and social factors implicated in the etiology and exacerbation of IBS with the goal of helping to develop more efficient and effective treatments for IBS.

Early research regarding the etiology of IBS focused on physiological explanations of this illness. However, as a purely biological explanation has proven to be quite elusive, over the last couple of decades attention has shifted toward a mutifactorial model that includes psychological and social variables. This biopsychosocial model of functional gastrointestinal disorders, as introduced by Drossman (1998), depicts how genetic and environmental factors present in early life can influence later psychosocial factors such as life stress, psychological

state, coping and social support, and physiological factors such as Central Nervous System (CNS) and Enteric Nervous System (ENS;the system of neurotransmitters, neurons and proteins that influence the gastrointestinal system) activity (Figure 2). According to this model, physiological and psychosocial factors influence each other and moderate functional gastrointestinal symptoms and behavioral aspects of functional gastrointestinal disorders (Levy et al., 2006).

Proponents of the biopsychosocial model propose that the changes in visceral sensitivity, suppression of gut immune activity and changes in Hypothalamic Pituitary Adrenal (HPA) axis activity seen in IBS are manifestations of alterations in neuroendocrine activity. According to a review by Mayer and colleagues (2001), sub-regions of the hypothalamus (more specifically, the paraventricular nucleus), amygdala and periaqueductal gray receive input from visceral and somatic afferents and from cortical structures. Outputs from the ventral subdivision of the anterior cingulate and medial prefrontal cortex connect to the pituitary and pontomedullary nuclei; these nuclei mediate neuroendocrine and autonomic output to the body. The HPA axis, which is implicated in the central stress response, controls the release of glucocorticoids through Corticotropin Releasing Factor (CRF), which is produced by the hypothalamus. CRF is released in response to physical and emotional stressors and results in inhibition of upper gastrointestinal (GI) tract and GI motility, secretion and transit through its influence on noradrenergic activity and its interaction with the Autonomic Nervous System (ANS; Tache & Bonaz, 2007).

Thus, this model proposes that functional disorders, including IBS, involve dysregulation of the "brain-gut axis" (Jones, Dilley, Drossman & Crowell 2006). Research also indicates that cognitive emotional and behavioral factors influence the inhibition and transmission of pain signals to the gastrointestinal system. This is consistent with studies that suggest that autonomic

system dysregulation is present in a subset of individuals with FGIDs and functional neuro-imaging studies that suggest that the pain sensitivity characteristic of IBS is most likely due to attentional and affective factors in combination with an alteration in CNS sensitivity (Berman et al., 2002; Jones, Dilley, Drossman, & Crowell, 2006).

Overall the research has supported a bidirectional relationship between the brain and the gastrointestinal system with regard to the symptoms of functional gastrointestinal disorders. The ENS communicates with the CNS in a bi-directional way, and this communication is dependent upon the stress response system, more specifically, cortisol, corticotrophin releasing factor, glucocorticoid receptors, norepinephrine, and epinephrine activity in addition to serotonin circuits in the ENS. Both the ENS and the neuroendocrine system also interact with the immune system, and the Emotional Motor system (EMS) and both systems moderate gastrointestinal activity (Mayer, Naliboff, Chang, & Coutinho, 2001). The role of the immune system in IBS is not yet fully understood, but research has suggested the presence of immune system alterations in a subset of individuals with IBS (van der Veek et al., 2005). The EMS controls emotional, behavioral, and attentional response to perceived physical and psychological stressors. This system also influences sensory responses, such as heightened sensitivity to visceral stimuli (Mayer, Naliboff, Chang & Coutinho, 2001; Musial, Hauser, Langhorst, Dobos & Enck, 2008).

Family History, Genetics and IBS

Given that the biopsychosocial model is multidisciplinary, support for this model is found in a variety of research areas, including studies of family aggregation of IBS. Kalantar et al. (2003) studied a community sample of adults and found that a family history of bowel difficulties or abdominal pain is significantly associated with a greater likelihood of having IBS. Pace (2006) followed children with Recurrent Abdominal Pain for up to 13 years and found that

individuals with IBS like symptoms at follow-up were 3 times more likely to have a sibling with IBS than participants without symptoms of IBS. Saito et al (2008) in another study of family aggregation in IBS demonstrated that individuals with IBS are three times more likely to have a parent, sibling or child with IBS than age, gender and race matched controls. Kanazawa et al. (2004) assessed 437 individuals in Japan and demonstrated that individuals who met criteria for IBS or who had consulted a physician for their IBS were significantly more likely to report that they had a parent with a history of bowel problems than community controls. Kanazawa et al. (2004) further observed that, regardless of IBS diagnosis, individuals who have a parent with bowel problems are also more likely to report more bowel problems.

Such a high aggregation of IBS in families suggests a potential genetic component to IBS; however, family environmental factors, such as modeling, reinforcement of certain illness behaviors, or a combination of both might also explain the relationship between a family history of IBS and IBS diagnosis. Levy, Whitehead, VonKorr, and Feld (2000) compared health care use and costs between one group of participants that included children and their parents who had a diagnosis of IBS and another group that included children and their parents who had not been diagnosed with IBS and found that children with parents with a diagnosis of IBS had higher healthcare costs and more healthcare visits for both gastrointestinal symptoms and non-gastrointestinal problems than children whose parents did not have a diagnosis of IBS. This study also found that parents with IBS also reported more healthcare costs and visits for gastrointestinal and non-gastrointestinal symptoms. A potential explanation of the results of this study is that children's illness behavior is a result of modeling and reinforcement of illness behavior by the parents; however, the findings of this study do not rule out the possibility of a genetic component that explains this relationship.

Genetic studies have attempted to clarify the role, if any, that genes play in IBS development. So far the results of such studies have been equivocal. At least one study has demonstrated heritability of IBS. Morris-Yates et al. (1998) evaluated Functional Bowel Disorder diagnostic status in twin pairs, and through genetic modeling found a 57.9% heritability for IBS; this study found that the best-fit model was one in which additive genetic effects was the main explanatory factor for the development of Functional Bowel Disorders. The authors of this study were not able to evaluate the contribution of shared environmental effects, but they concluded that, despite this, the strength of the association between monozygotic twins and functional bowel disorder diagnosis supports the argument for a genetic contribution to the development of IBS (Morris-Yates et al., 1998).

Other studies have suggested that there is both a genetic and an environmental component to IBS. Levy et al. (2001) in another twin study that included over 6000 twin pairs found that the likelihood that both twins had a diagnosis of IBS was significantly higher for monozygotic twin pairs than dizygotic twin pairs; however, this study also demonstrated that for dizygotic twin pairs with IBS there was a greater chance that they had a mother with IBS when compared to dizygotic twins without IBS and that having a parent with IBS more strongly predicted an IBS diagnosis than having a twin with IBS. Lembo, Zaman, Jones, and Talley (2007) in a study of 986 twin pairs using structural equation modeling (SEM) found a significantly higher proband concordance for monozygotic twins than for dizygotic twins and found that additive genetic effects accounted for 22% of the genetic variance in IBS; it should be noted that when anxiety and depression were controlled for the genetic component of IBS was not statistically significant. The authors of this study suggested that this could potentially be due to a shared pathway between IBS, anxiety and depression. They concluded that there is most

likely a genetic component to IBS but that environmental factors play an important role in the development of IBS.

Still, other studies have found that IBS development is solely due to environmental factors. Mohammed et al. (2005) in a twin study of both monozygotic and dizygotic twins found that there was no significant difference in prevalence rates between monozygotic and dizygotic twins and modeling suggested that environmental factors (both unique and shared) contribute to IBS. This study provides support for Levy et al.'s (2000) contention that it is more likely environmental factors that predict how a family history of IBS is associated with development of IBS.

In further search of an answer to the question of whether there is a genetic component to IBS investigators have begun to evaluate the association between IBS development and genetic polymorphisms. However, thus far, only a few studies have been conducted on this topic and the results are equivocal (van der Veek et al., 2005).

Although these studies do not answer the question as to whether development of IBS is due to genes or environment, they do support the notion that IBS does aggregate in families and that early life factors such as family illness history are associated with later development of IBS. It is most likely that both genetics and environment contribute to the relationship between family history of IBS and IBS and family aggregation can be conceptualized as containing both genetic and family environment components.

Abuse and IBS

In addition to early life factors such as social learning and genetics, traumatic life events, such as sexual, physical and emotional abuse, also play a role in IBS development. A study evaluating 68 men and 149 women seen at the Mayo clinic indicated that patients who reported

sexual abuse history were 2.8 times more likely to have a functional bowel disorder (Talley, Helgeson, & Zinsmeister,1992). Lechner, Vogel, Garcia-Shelton, Leichter, and Steibel (1993) evaluated women waiting for a primary care visit and found significantly more reports of gastrointestinal symptoms by individuals who had a history of abuse when compared to those without an abuse history (30.1% vs. 10.9%; $p<.001$). Felitti (1991) evaluated women with a history of abuse vs. aged matched controls and found that 64% of women with a history of abuse reported gastrointestinal symptoms compared to 39% of aged matched controls.

A history of physical, sexual or emotional abuse is also found in significantly higher numbers of patients with IBS than in patients with an "organic" gastrointestinal disorder (Inflammatory Bowel Disease). Drossman et al. (1990) evaluated 206 women referred to a gastroenterology clinic and found that 53% of individuals with a diagnosis of functional gastrointestinal illness reported a history of sexual abuse. This was significantly higher than the proportion of individuals with an organic diagnosis that reported abuse (37%). In the same study Drossman and colleagues found that 13% of women diagnosed with a functional gastrointestinal illness reported frequent physical abuse as compared to 2% of individuals diagnosed with an organic gastrointestinal illness. Ali et al. (2000) confirmed the findings of Drossman et al. (1990) in a study comparing 25 individuals with IBD to 25 individuals with IBS recruited from gastroenterology clinics.

Population based studies have also supported the relationship between IBS and abuse. A study of 919 individuals between 30 and 49 years of age demonstrated that patients who reported sexual abuse had an increased risk for IBS (Talley, Fett, Zinmeister, & Melton 1994).

Studies of children and adolescents provide further support for the role of abuse in IBS. Rimza, Berg, and Locke (1988) interviewed mothers of 72 female children and adolescents who

had experienced forced sexual activity with an adult and found that 71% of children who were abused for more than 24 months reported gastrointestinal symptoms. Felice et al. (1978), in a follow-up study of adolescent rape victims (*N*=25), recruited individuals initially seen in the emergency room with the chief complaint of rape (violent sexual assault without consent). Participants were assessed during 2 follow-up visits; 56% of these individuals had somatic complaints including abdominal pain at follow-up.

In contrast, a daily diary study evaluating history of abuse in women with IBS compared to women without IBS found a significant relationship between abuse and IBS, but did not indicate that there was a difference between gastrointestinal symptoms in women with IBS and a history of sexual or physical abuse when compared to women with IBS without a history of abuse. There was however a significant relationship between psychological distress and abuse. Individuals with IBS and a history of abuse had higher global severity index scores and a higher rating of psychological turmoil (higher levels of anger, anxiety, depression, feelings of guilt, hostility, impatience-intolerance, irritability, tearfulness and tension) than individuals with IBS but no history of sexual or physical abuse (Talley et al., 1994). Talley et al. (1998) in a later study confirmed an association between childhood abuse and IBS (*O.R.* = 2.02, 95% *CI* = 1.29-3.15); however, when age, gender, and psychological factors were controlled for childhood abuse was not associated with IBS, suggesting that this association is mediated by social and psychological factors.

Additionally, one study did not find a difference between Inflammatory Bowel Disease patients and IBS patients with regard to history of abuse, but did find that, regardless of diagnosis, those individuals who reported a history of abuse were significantly more likely to report symptoms of IBS (Talley, Fett, & Zinsmeister,1995). These findings, in addition to the

findings indicating that individuals with a history of abuse only make up a subset of IBS patients (22-53%), suggest that the association between IBS and a history abuse is most likely not a direct relationship. This is in accordance with the biopsychosocial model, which does not depict the relationship between IBS and abuse as a direct one, but instead describes the presence of factors that mediate the association between abuse history and symptoms of IBS.

It should also be noted that abuse history is not specific to IBS; abuse has been implicated in a number of other physiological and psychological illnesses including chronic pelvic pain, fibromyalgia, chronic fatigue syndrome, depression, post traumatic stress disorder, heart disease and liver disease (Felitti et al., 1998; Heim, Ehlert & Helhammer, 2000; Heim, Ehlert, Hanker, & Hellhammer, 1998). Victims of abuse are also more likely to express more psychiatric symptoms in general and more medical symptoms without a known cause (Walker et al.,1995). The lack of specificity of abuse for IBS further supports the notion that the relationship between IBS and abuse is an indirect one. However, this does not diminish the importance of further evaluating this relationship, as not only is abuse related to the presence of symptoms of IBS, it is also associated with poorer health outcomes. Drossman (1999) looked at abused and non-abused female patients at a GI referral practice and found a relationship between abuse history, poorer health status, greater pain scores and poorer daily functioning ($p<.001$). Creed et al. (2005) evaluated 257 patients with IBS and found that those that reported sexual abuse scored higher on levels of pain and reported poorer physical functioning; these findings highlight the importance of further assessing the relationship between IBS and abuse, particularly factors mediating the relationship between IBS symptoms and abuse.

Childhood Trauma vs. Trauma in Adulthood

The research on psychological, physical and emotional abuse has evaluated both abuse experienced in childhood and abuse experienced in adulthood. Thus far it is unclear as to which type of abuse, childhood abuse or abuse in adulthood, is more important to consider when evaluating IBS. One study showed no difference with regard to effects on health between individuals whose physical or sexual abuse first occurred in childhood or physical or sexual abuse that first occurred in adulthood. Another study conducted by Heim and colleagues suggested that even when controlling for adult trauma the greatest predictor of adrenal pituitary responsiveness to stressors was a history of childhood trauma (Heim et al., 2002). This research in combination with research suggesting that the experience of abuse in childhood is strongly related to abuse in adulthood indicates that a focus on childhood trauma is warranted (Coid, Petruckevitch, Feder, Chung, Richardson, & Moorey, 2001).

Childhood Trauma and Reactivity to Stressors

The findings regarding the role of abuse in the development of medical and psychological illnesses are consistent with the theory that abuse predisposes an individual to develop a number of psychological and biological problems through neuroendocrine alterations that include sensitization of circuits related to Corticotropin Releasing Factor activity and structural changes in the brain. Studies evaluating the stress response in individuals who have experienced childhood trauma provide evidence for this theory. Heim et al. (2000) compared women with no history of childhood abuse or psychiatric disorder, women with a diagnosis of major depression who were sexually or physically abused as children, women who were sexually or physically abused as children without current major depression, and women who had a diagnosis of major depression but were not sexually or physically abused as children with regard to levels of

adrenocorticotropin (ACTH). This study demonstrated that women with a history of childhood abuse regardless of depression diagnosis had increased ACTH.

Heim et al. (2002) evaluated a group of 49 women that included normal volunteers, depressed patients, and women with a history of early abuse and found that a history of childhood trauma predicted ACTH and cortisol response to the Trier Social Stress Test (a laboratory stressor involving presentation of a free speech and mental arithmetic to a committee) even when controlling for abuse experienced as an adult. However, the interaction between childhood trauma and adulthood trauma was the overall best predictor of maximum ACTH levels.

In addition to changes in the physiological stress response, childhood trauma is also related to changes in psychological reactivity to stressors. Glaser, van Os, Portegijs and Myin-Germeys (2006) in an investigation of childhood trauma and emotional reactivity to daily life stress evaluated 90 patients of a general practitioner's office. Approximately 1/4 of the participants experienced sexual or physical trauma before the age of 19. This ecological momentary assessment design study looked at the perceived stressfulness of daily events and activities and changes in negative affectivity and found that individuals with history of childhood trauma had a significant increase in negative affect in response to daily stressors even after controlling for number of somatic complaints and history of depression. These findings suggest a link between childhood trauma and psychological and physiological reactivity to stressors. Similar alterations in reactivity to stressors are seen in patients with IBS; this further supports the hypothesis that alterations in stress reactivity mediate the relationship between childhood trauma and IBS.

Stress and IBS

Both patients and physicians commonly associate stress with symptom exacerbation in IBS, and a number of daily diary studies provide support for this relationship. Blanchard (2008), in a 4 week prospective daily diary study using structural equation modeling, found that current stress impacts the severity of current GI symptoms including abdominal pain, abdominal tenderness, bloating, diarrhea, nausea, and constipation and that weekly stress impacts the following week's stress, which then impacts that week's symptoms. Dancey, Whitehouse, and Backhouse (1995) in a prospective daily diary study examined IBS symptoms and daily hassles in 30 women with IBS. The results showed a significant correlation between stress and symptoms in the same week. Dancey, Whitehouse, Painter and Backhouse (1995), using paper and pencil daily diaries, showed that there is a relationship between daily hassles and symptom severity in the same week, but they also demonstrated there is a relationship between symptoms in the previous week and hassles in the current week; this suggests a bidirectional relationship between daily stressors and IBS symptoms. A later daily diary study provided further support for this bidirectional relationship by demonstrating that daily hassles and symptoms on the previous 2 days and hassles on the current day predicted symptoms on the current day, and that symptoms during the previous four days significantly predicted hassles on the current day for approximately 37% of the participants in the study (Dancey, Taghavi, & Fox 1998). Another prospective daily diary study of GI symptoms and stress levels further confirmed a relationship between stress and symptoms by showing that daily hassles are associated with daily symptoms in individuals with IBS; this study also supported the hypothesis that individuals with IBS have higher mean stress levels as compared to healthy controls (Levy, Cain, Jarrett & Heitkemper 1997). Lastly, Suls, Wan, and Blanchard (1994) in a prospective daily diary study assessed 44

men and women with a diagnosis of IBS and found positive associations between stress and total symptoms and between abdominal pain and ratings of a stressful event.

Laboratory studies provide additional evidence for a connection between stress and IBS. Murray, et al. (2004) examined the perceived stress response of individuals with constipation predominant IBS to a cold pressor or dichotomous listening task. Their findings showed that IBS patients have higher baseline perceived stress levels and a heightened visceral sensitivity in response to stress as compared to healthy controls. Plante, Lawson, Kinney, and Mello (1998) examined the perceived stress response of IBS patients to a Stroop color naming task and an arithmetic stressor. Participants with IBS reported higher levels of stress during the Stroop color-naming task than participants without IBS. A second study looking at emotional stress reactivity in IBS demonstrated an increase in heart rate in response to an emotional stressor. IBS patients, when compared to controls, showed increased heart rate in response to simply knowing about the speech task without knowing the topic (Bach, Erdmannd, Schmidtmann & Monnikes, 2006). This study demonstrated an alteration in the stress response in individuals with IBS and also suggests that this alteration might be a result of stressors being perceived as more stressful by patients with IBS. Lastly, Elsenbruch, Lovallo and Orr (2001) found that IBS patients experienced a greater increase in negative affect in response to a laboratory stressor than controls. These laboratory and daily diary studies evidence a bidirectional relationship between IBS symptoms and stressors; stressors might influence symptoms, but symptoms might also increase the likelihood of experiencing something as stressful.

Studies have also shown alterations in cortisol and ACTH activity in individuals with IBS. Bohmelt et al. (2005) demonstrated blunted responses to Corticotropin Releasing Hormone (CRH) challenge in individuals with functional gastrointestinal disorders, suggesting a blunted

HPA axis response. A study by Elsenbruch, and Orr (2001) showed that following food intake individuals with IBS experience an increase in cortisol levels when compared to controls, but this finding only holds true for individuals with diarrhea predominant IBS. Levine Jarrett, Cain, and Heitkemper (1997) found higher basal norepinephrine levels in individuals with IBS. Furthermore, Fukudo, and Suzuki (1987) showed that individuals with IBS had increased norepinephrine and gastrointestinal hormone (motilin) levels and increased colonic motility in response to a laboratory stressor. These studies provide additional support for a bidirectional pathway between stress and gastrointestinal symptoms of IBS and indicate that a likely mechanism behind this relationship is alteration in the stress response system.

The current literature provides support for a relationship between childhood trauma and IBS, a relationship between IBS and changes in stress reactivity, and a relationship between childhood trauma and alterations in stress reactivity; however, few studies have evaluated childhood trauma, IBS, and stress reactivity concurrently. One of the only studies that have done so included 10 women with a diagnosis of IBS and 10 without IBS; in each of these groups half of the women reported a history of sexual and/or physical abuse. All participants underwent rectal distention during which they were asked to rate their pain. Patients who were diagnosed with IBS had similar levels of pain in response to rectal distension as participants without IBS and participants who had a history of abuse had similar levels of pain as individuals without a history abuse; however, individuals with both a diagnosis of IBS and a history of abuse rated their pain significantly higher during the rectal distension than all other groups (Ringel et al., 2008). This study also found that women with IBS and abuse reported more pain during the non-painful trial than all other women. The study used neuroimaging techniques to extend these findings and found that during rectal distension women with both IBS and a history of abuse had

greater activity in areas of the brain related to increased arousal in response to social threat and in response to unpleasant and noxious stimuli (Mid Cingulate Cortex; MCC) and areas of the brain related to attentional bias and expectancy (Posterior Cingulate Cortex ;PCC) than the other groups of participants (Ringel et al., 2008; Small et al.,2003). Additionally, participants with a history of abuse regardless of IBS diagnosis had an increase in activity in the MCC and PCC during painful rectal distention. Furthermore, higher levels of pain during rectal distention were correlated with higher levels of activity in the MCC and PCC (Ringel et al., 2008). These findings demonstrate that the presence of greater pain reports, psychosocial distress, and poorer health outcomes in individuals who have been abused may be mediated by enhanced response to aversive visceral stimuli.

Somatic Symptoms and IBS

Many patients with IBS also suffer from non-gastrointestinal somatic symptoms. Piche et al. (2007), in a study examining the prevalence of symptoms in IBS patients, found that patients with IBS also report significantly more nausea, vomiting, flatulence, urinary urgency and frequency, back pain, headache, fatigue, and poorer sleep than healthy controls. Sayuk, Elwing, Lustman, and Clouse (2007) evaluated somatic symptoms and functional diagnosis in outpatients that attended a gastroenterology clinic and demonstrated that individuals with an FGID reported more somatic symptoms, more somatization, and had a greater probability of psychiatric co-morbidity. Nicholl et al. (2007) evaluated individuals without IBS that were randomly selected from primary care offices. Participants were evaluated at baseline and at 15 months. Illness behavior, anxiety, sleep problems, and somatic symptoms independently predicted the onset of IBS.

Some suggest that a history of abuse might explain the relationship between somatic symptoms and IBS. There is support for this hypothesis. As discussed previously, the literature indicates a relationship between IBS and somatic symptoms. The literature also demonstrates that abuse is related to higher levels of somatic symptoms. A study by Walker et al (1995) indicated that women who have experienced severe abuse have a higher number of unexplained physical symptoms when compared to individuals with no abuse or with less severe abuse. Salomon, Skaife and Rhodes (2003) took these finding further and, in a sample of individuals with either IBS or Inflammatory Bowel Disease, showed that childhood sexual and adult psychological abuse uniquely predicted presence of somatic symptoms and diagnosis of IBS. This study also demonstrated a relationship between IBS diagnosis and presence of somatic symptoms and that when somatic symptoms were controlled for the relationships between IBS and childhood sexual abuse and between IBS and adult psychological abuse were no longer significant. This is indicative of the role of somatic symptoms as a mediator in the relationship between IBS and history of abuse.

Lackner, Gudleski and Blanchard (2004) contend that in addition to evaluating abuse history it is important to consider the relationships among parenting style, somatic symptoms and IBS. In a study evaluating parenting style, abdominal pain and somatization in 81 IBS patients, they found that abuse correlated with maternal and paternal rejection, but it was not associated with somatization. This study also found that parenting factors (higher levels of rejection and/or hostility among fathers) were more strongly correlated with somatization than was abuse. This highlights the importance of looking at additional risk factors such as family environment that can predict both abuse and later IBS symptoms and that it might be poor or inadequate parent child interactions that predispose individuals to poor psychological functioning; this early

adversity can then alter HPA functions and explain the stress related symptoms found in IBS (Lackner, Gudleski & Blanchard, 2004).

In contrast, Salomon, Skaife and Rhodes (2003) in their analysis of the relationships among somatization, IBS and abuse found a relationship between IBS and abuse and between abuse and somatization but did not find that parenting significantly impacted the relationship between abuse and somatization. Given the somewhat equivocal findings it is important to further explore the relationships among somatic symptoms, IBS and childhood trauma.

Current Study

In sum, the literature demonstrates a strong association between IBS and abuse and an association between IBS and a family history of IBS, but these relationships are most likely mediated by additional psychosocial factors. Most of the research involving childhood trauma or family aggregation of IBS has involved either children or adults with a diagnosis of IBS, and few studies, if any, have evaluated young adults with a history of childhood abuse or a family history of IBS that have not yet developed Irritable Bowel Syndrome. Additionally, though the research supports an influence on IBS of physical, sexual and emotional abuse, few studies have looked at physical, sexual and emotional abuse concurrently, and even fewer studies have attempted to evaluate the interaction between a non-specific predisposing factor for IBS such as a history of childhood trauma and a more specific predisposing factor such as family history of IBS. As noted previously, a high prevalence of childhood trauma is not unique to IBS patients. Childhood trauma most likely does not play an etiological role in IBS but rather influences perceptions of illness and might predispose individuals to experience psychological pain in a more physiological way. However, it is important to understand how a non-specific predisposing factor such as childhood trauma might interact with other risk factors for IBS such

as a family history of IBS and somatic symptoms to influence experience of or exacerbation of symptoms that are specific to IBS.

The current study seeks to expand our knowledge of the biopsychosocial mechanisms behind IBS symptomatology and predicts that 1) the increase in perceived stress in response to examination stress will be higher in the group of individuals who experienced childhood trauma than in those participants without a history of trauma, 2) the increase in perceived stress will be higher in the childhood trauma group than in those without a history of childhood trauma, 3) individuals with a family history of irritable bowel syndrome will have a higher increase in gastrointestinal symptoms in response to exam stress than individuals without a family history of IBS, and 4) individuals with a family history of irritable bowel syndrome will have a higher increase in perceived stress in response to an examination stressor than individuals without a family history (first degree relative with IBS) of IBS. The study also predicts that the greatest increase in perceived stress levels will occur in individuals with both a family history of IBS and a history of childhood trauma.

A secondary aim of this study is to further explore relationships among somatic symptoms, a family history of IBS, and a history of childhood trauma, and predicts that individuals with a history of childhood trauma or a family history of IBS will have higher levels of somatic symptoms. This study also predicts that individuals with a family history of IBS will have higher overall levels of perceived stress and will report more gastrointestinal symptoms than those without a family history of IBS and that individuals with a history of childhood trauma will report more gastrointestinal symptoms and will report higher perceived stress levels than those individuals without a history of childhood trauma.

To test the hypotheses for this study I used a pre-post treatment design (Figure 3). With this design, participants' gastrointestinal symptoms, levels of perceived stress, and somatic symptoms were measured at 2 time points. The first assessment took place at least two weeks before participants were exposed to naturally occurring examinations, which was conceptualized as a relatively stress-free period, and the second assessment took place within 48 hours following the first examination of the semester or during the final examination period, which was viewed as a stressful period. A total of three groups of participants were assessed. One group of participants was assessed before and after the first examination of the spring semester and one group of participants was assessed both before and after the spring semester final examination period. The third group of participants was assessed before and after the final examination period of the summer 2010 semester.

The design used in this study is a two-group pretest – posttest design; this design is commonly used to evaluate psychosocial factors. There are a number of benefits to this design. It allows for the evaluation of a single research population in a naturalistic setting, which increases the external validity of the study. Conducting assessments in groups of participants before and after different examination periods during two different semesters decreases the probability that extraneous factors, such as national or university-wide events or emergencies, caused or otherwise significantly impacted the results of the study.

There are also limitations to this design. When using this design it is difficult to dismiss the possibility of a third variable that could account for or contribute to changes seen in the dependent variable (Cook & Campbell, 1979). Results of a study using this design could also be due to factors such as maturation that might occur between the pretest and posttest assessment. When evaluating symptoms such as those seen in IBS or other illnesses any change in symptoms

between pretest and posttest could simply be due to the natural progression of an illness. However, there are convincing ways to strengthen the confidence in the results of a study using this design; one would be to use the regression equation to predict the trajectory of symptoms if there was no stressor and see if this differs from the actual data. In this study, assessment of multiple groups at different time points was used to strengthen this study design. Evaluating two groups at different time points can prevent the effect of history and reduce the likelihood that an outside event caused the change from pre-test to post test, as the probability of the same event occurring twice in the same year is low (Cook & Campbell, 1979). Another design considered for this study was a repeated measures design in which participants would be assessed at four time points: at a time point prior to the stressor, a time point immediately after the stressor, at another time point prior to a second stressor and then after a second stressor. This repeated treatment design would allow for evaluation of a transient event such as an exam stressor. However, such a design would require multiple assessments and thus be vulnerable to participant attrition and poor compliance. The use of multiple groups, with each group assessed at two different time points reduces the burden on participants and potentially increases compliance.

Methods

Participants

A total of 101 participants were recruited through the Stony Brook University Subject Pool and through advertisements posted throughout the campus of Stony Brook University. To increase the number of participants in the study sample reporting a family history of IBS, participants with a history of IBS were also recruited through the Stony Brook University Mass Testing sessions. During Mass Testing, the Family History of Irritable Bowel Syndrome Questionnaire was used to identify Introductory Psychology Students who report a family history of IBS and would like to participate in future or ongoing research studies. Inclusion criteria included current enrollment as a Stony Brook University Student, ability to write and speak English, no significant visual impairment, age within the age range of 18-25 and no current diagnosis of Irritable Bowel Syndrome. As 94% of patients with IBS have a co-morbid psychiatric diagnosis, only individuals with current psychiatric or substance abuse problems and symptoms over the previous month were excluded from this protocol (Bach et al., 2006; Whitehead, Palsson, & Jones, 2002). More than half (65%) of students in this study identified themselves as female, 44.4% of participants identified themselves as Asian, 15.3% of participants identified themselves as Black or African American and 40.3% of participants in this study identified themselves as Caucasian. With regard to ethnicity, 13% of participants identified themselves as Hispanic or Latino and 87% of participants identified themselves as neither Hispanic nor Latino.

Materials/Measures

Demographic questionnaire. Each participant completed a questionnaire that asked them to report their age sex, gender, presence of any medical illness, income, number of children, ethnicity and marital status.

Perceived stress. The Perceived Stress Scale 10-item (PSS-10) is a ten-item questionnaire that asks participants about what they were thinking and feeling over the past month (Cohen, Lamarck, & Mermelstein, 1983). Participants responded using a 5 point Likert scale ranging from 0-4 where 0 = never and 4= very often (e.g. In the last month, how often have you felt you could not control important things? ___0=never ___1=almost never ___2=sometimes ___3=fairly often ___4=very often). Positive items are reverse scored, and scores on all 10 items are added to produce a total perceived stress score. As this study assessed perceived stress in response to a transient stressor, participants were asked to rate their perceived stress over the past week. Although the original Perceived Stress Scale was developed to assess a one-month period, the use of the PSS to assess thinking and feeling over the prior week is consistent with previous research (Dishman et al., 2000; Hamad, Fernald, Karlan & Zinman, 2008).

Recent Stressful experiences. Recent life stressors that could potentially impact current perceived stress levels were evaluated using the Inventory of College Students' Recent Life Experiences scale (ICSRLE; Kohn, Lafreniere, & Gurevich, 1990;Osman, Barrios, Longnecker, & Osman,1994). This is a measure of daily hassles that are specific to a college student sample. This self-report measure consists of 49 items and asks participants to describe the extent of their experience with an item over the past month by rating each item as 1(not at all part of my life), 2 (only slightly part of my life), 3(distinctly part of my life), and 4 (very much part of my life). Cronbach's alpha was .92 for the total scale (Osman, Barrios, Longnecker, & Osman,1994).

Since this study assessed stressful events over a short period of time, (between a week when the students have no exams and a week when the students have their first exam) participants were asked about their daily hassles over the past week using the ICSRLE.

Chronic stressors. The Life Events Questionnaire (LEQ; Horowitz, Schaefer, Hiroto, Wilner, & Levin, 1977) asks participants about 12 stressful life events they may have experienced over 6 months prior to their visit. If participants have experienced any of the life events listed they were asked to check off a box corresponding to the month during which the life event occurred. An example life event on this questionnaire is: *You yourself suffered a serious illness, injury or assault*. Scores for the LEQ range from 0-12, where 0= experienced none of the life events listed and 12 = experienced all of the life events listed.

History of trauma. History of trauma was assessed with the Childhood Trauma Questionnaire (CTQ), a 28-item self-report inventory assessing five types of maltreatment (emotional, physical, and sexual abuse and emotional and physical neglect). This questionnaire has been widely used to assess a number of patient and non-patient populations and studies suggest good validity and reliability with a Cronbach's alpha of .96 and a test-retest reliability of .85 (Bernstein et al., 1994; Pavio & Cramer, 2004). This questionnaire also consists of a 3-item minimization/denial scale to evaluate potential for underreporting of traumatic events. Studies including individuals for whom corroborative reports are available indicate that this questionnaire has a good sensitivity for detecting trauma in individuals with verified histories of childhood trauma (Bernstein et al., 2002).

Family history. Family history of Irritable Bowel Syndrome was assessed using a 4-item self-report questionnaire that asks if any of the participant's first-degree relatives (mother, father, brothers or sisters) have a history of irritable bowel syndrome or bowel symptoms

consistent with a diagnosis of irritable bowel syndrome (abdominal pain accompanied by abnormal bowel frequency). This method is consistent with that used in prior family history studies (Kalantar et al., 2003; Kanazawa et al., 2004). Data was used in analysis if these individuals answered yes to either the question "Have either of your parents ever complained of recurring abdominal pain or discomfort with abnormal bowel habits such as very infrequent bowel movements or very frequent bowel movements?" or "Do your parents or siblings have a history of irritable bowel syndrome (IBS)?" As Bensen et al. (1999) suggested, family history of chronic medical illnesses can be accurately reported by probands.

Gastrointestinal symptoms. Assessment of gastrointestinal symptoms was done using the Gastro-Questionnaire (Leibbrand, Cuntz, & Hiller, 2002). This questionnaire is a 27- item self report questionnaire evaluating the frequency of a number of functional bowel symptoms as well as the subjective distress resulting from these symptoms. Participants were asked about 27 different bowel symptoms using the questions: "How often have you had this symptom?" (Response choices range from not at all to nearly always) and "How distressed were you by this?" (Response choices range from no distress to very severe distress). Validity and reliability were demonstrated to be good: overall Cronbach's alpha was .86 for frequency items and .87 for severity items, and split-half reliability, using Spearman–Brown coefficients was .77 for frequency items and .81 for severity items (Leibbrand, Cuntz & Hiller, 2002). This study uses only the symptom frequency portion of this questionnaire.

Non-gastrointestinal somatic symptoms. Somatic symptoms were assessed using the Patient health Questionnaire-15, which is comprised of 15 items and assesses the severity of 15 somatic symptoms. Each of the 15 somatic symptoms are rated from 0 = not bothered at all to 3= bothered a lot. A score of 5 is the cutoff score for low symptom severity, a score of 10 is the

cutoff score for medium symptom severity and a score of 15 is the cutoff score for high symptom severity. This scale has good internal reliability with a Cronbach's alpha of .80 (Kroenek, Spitzer, & Williams, 2002;PHQ-15).

Health and dietary habits. Health and dietary habits have been shown to vary between exam and non-exam periods, and it is important to assess and control for these changes (Noel & Cohen, 1997). As such, quantity of caffeine intake, alcohol consumption, diet and exercise over the last week were assessed using a 7- item self-report questionnaire. The items for this questionnaire are similar to one used by Dollinger and Malmquist (2009) and those used in other studies assessing substance use in a collegiate sample (Noel & Cohen, 1997). Dollinger and Malmquist (2009) demonstrated the reliability and validity of single item self-reports of behaviors in college students, such as those included in this questionnaire.

Perceived stressfulness of exams. Participants were also asked to rate the novelty, difficulty, and satisfaction with their performance on the exam as well as stressfulness, controllability, unpredictability, stress due to poor performance, extent of ego involvement, and challenge by the exam. This questionnaire was designed by the author and consists of 9 items. Participants were asked to respond to each item using a scale ranging from 0 (not at all) to 6 (extremely). This method is consistent with instruments used in previous studies assessing transient stressors (Gaab, Rohleder, Nater & Ehlert, 2005; Kirschbaum, Kudielka, Gaab, Schommer & Helhammer, 1999; Shirotsuki et al., 2009).

All questionnaires, with the exception of the CTQ, were administered using PROMIS Assessment Center an online research management tool. It took approximately 30 minutes to complete the assessment. The length of this assessment is similar to those used in other studies evaluating health and behavior in young adults, which have suggested that assessments of this

length are not overly burdensome for participants to complete. Kypri, Gallagher and Cashell-Smith (2004), in an evaluation of an internet-based survey for assessment of college students, found that the response rate for a survey that took between 13.5- 20.5 minutes to complete was 81.9%. Only 23 out of the 1564 participants in that study reported that the survey was too long, suggesting the feasibility of using assessments of a similar length. Similarly, McMorris et al. (2009) used a web survey to evaluate sexual risk behavior, substance use and social environment of adolescents between the ages of 17 and 19. For this survey, which consisted of between 158 and 274 items and took approximately 31 minutes to complete, compliance was good and less than 1% of the surveys were not fully completed, further suggesting that assessments of this length are not overly burdensome for participants. Additionally, the second web assessment could have been completed at any location where the participant had Internet access thus eliminating the need for a participant to travel to a laboratory space to complete questionnaires; this served to decrease participant burden. The questionnaires found in the web assessments are included in the Appendix.

Procedure

Participants in this study were recruited during the spring and summer semesters of the 2009-2010 academic year. They were recruited using flyers placed around Stony Brook University Campus. Potential participants signed up for study participation through the Stony Brook University Subject Pool website or by contacting the Study Coordinator. Participants with a history of IBS were also recruited through the Stony Brook University Mass Testing sessions. During mass testing, most students enrolled in the Stony Brook University Introductory Psychology course answered the Family History of Irritable Bowel Syndrome questionnaire. Individuals who reported that they had a family history of IBS or a family member with

symptoms consistent with a diagnosis of IBS and who consented to be contacted regarding future research studies were contacted by trained study personnel and asked if they would like to participate in this study. Interested participants were scheduled using the Subject Pool website. Eligibility criteria were specified on the website. Eligible participants came to a Stony Brook University Psychology department computer lab for a study visit. For the first wave of participants (participants recruited at the beginning of the spring 2010 semester) the study visit took place during the first two weeks of the spring 2010 semester. For the remaining 2 waves of participants (participants recruited during the second half of the spring 2010 semester and participants recruited during the summer 2010 semesters) the study visit took place at least 2 weeks before their Final Exam Period. During the study visit participants were administered the first web assessment (WA1), which included the Childhood Trauma Questionnaire, Family History of Irritable Bowel Syndrome Questionnaire, the demographic questionnaire, Gastro-Questionnaire, PHQ-15, PSS-10, LEQ, ICSRLE and the health behavior checklist. Informed consent was obtained through an online consent form prior to administration of WA1. A member of the study staff was available to answer any questions regarding informed consent and answered any questions about the study prior to beginning any study activities.

Following the study visit, participants were e-mailed the link for the second web assessment (WA2). This assessment contained all questionnaires with the exception of the demographic questionnaire, the Life Events Questionnaire, the Childhood Trauma Questionnaire and the Family History of IBS questionnaire. Participants in the first wave of the study were asked to complete the second assessment within 48 hours of completing their first introductory psychology exam of the semester and received a reminder phone call and e-mail 24 hours prior to their first introductory psychology exam of the semester. All other participants were asked to

complete the second assessment during their final exam week. Participants received a reminder phone call and e-mail 24 hours prior to the beginning of their final exam week. Completion of assessments was verified through the Assessment Center website. Participants who did not complete WA2 within 24 hours following of their exam period were contacted with an additional reminder phone call and e-mail. Data from participants who had not completed WA2 by the end of their final exam week were not included in the analyses. Figures 3, 4, 5 and 6 depict the design for this project.

Variables and Operational Definitions

History of trauma. History of trauma was assessed with the Childhood Trauma Questionnaire (CTQ). Scores on the CTQ were calculated using the scoring procedures outlined in the Childhood Trauma Questionnaire Manual (Bernstein & Fink, 1998). The item scores for each scale (Emotional Abuse; EA, Physical Abuse; PA, Sexual Abuse; SA, Emotional Neglect; EN, and Physical Neglect; PN) were summed to produce a variable representing the total score for each participant for each scale. Participants were grouped into History of Childhood Trauma and No History of Childhood Trauma groups by creating a new grouping variable labeled Trauma. Participants whose scores fell in the low to the extreme range on any of the 5 scales (participants with a score on the EA, PA, SA, EN, or PN scales at or above the cutoff score) were included in the History of Childhood Trauma group and received a score of 1 on the Trauma variable. The Guidelines for Classification of CTQ Scale Total Scores table found in Appendix B of the Childhood Trauma Questionnaire Manual was used to determine cutoff scores for each scale. The cutoff scores were as follows: Emotional Abuse ≥9, Physical Abuse ≥8, Sexual Abuse ≥6, Emotional Neglect ≥10, and, Physical Neglect ≥ 13. Participants who did not score

above the cutoff score on any of the scales received a Trauma variable score of 0 and were included in the No History of Childhood Trauma Group in study analyses.

The same method was used to recode each of the individual scale scores into a new dichotomous variable (0-1). For these new variables an individual whose score on the scale of interest was below the cutoff score received a score of 0 and an individual whose score on that scale was above the cutoff received a score of 1. This was done to enable completion of exploratory analyses evaluating the relationships among each of the types of childhood trauma, gastrointestinal symptoms and somatic symptoms.

Family history. Individuals who answered yes to either the question "Have either of your parents ever complained of recurring abdominal pain or discomfort with abnormal bowel habits such as very infrequent bowel movements or very frequent bowel movements?" or "Do your parents or siblings have a history of irritable bowel syndrome (IBS)?" were given a score of 1 on the Family History of IBS variable and individuals who answered no to both questions received a score of 0 on the Family History of IBS variable. This variable is labeled FhxIBS.

Perceived stress. Scores on all 10 items of the Perceived Stress Scale 10-item were summed to produce a total perceived stress score for each participant at each time point (Cohen & Williamson, 1988). As this is a within-participant variable that was measured during Time 1 and Time 2, each participant's total Perceived Stress Scale scores were represented by two variables (PSS1 and PSS2). A high score on the PSS represents a high level of perceived stress.

Gastrointestinal symptoms. The frequency of 27 gastrointestinal symptoms often reported by individuals with functional gastrointestinal disorders was assessed with the Gastro-questionnaire. Although the Gastro-questionnaire can be used to evaluate the presence of a number of gastrointestinal disorders, it would not be appropriate to use this scale as a diagnostic

tool for the current study analyses, because this study was focused on young adults who are at risk for, but who have not yet developed, a functional gastrointestinal disorder. Instead I used the Gastro-questionnaire to measure the presence of gastrointestinal symptoms and the frequency of these gastrointestinal symptoms. This is consistent with other studies evaluating stress and gastrointestinal symptoms. Most studies evaluating this relationship assess total number of symptoms and/or the severity of symptoms (Dancey, Taghavi, & Fox, 1998; Labus, et al., 2007; Levy, Cain, Jarrett & Heitkemper, 1997). Additionally, an aim of this study is to evaluate changes in symptoms over time and not change in diagnosis, therefore it was necessary to include a measure of symptom presence and frequency. A variable representing frequency of gastrointestinal symptoms was created. Due to the large number of gastrointestinal symptoms assessed (27), separate analysis of each symptom would greatly increase the probability of a Type I error; therefore, I chose to use a summary score for analyses.

To create the gastrointestinal symptom frequency summary scores, participants' responses to the symptom frequency portion of the Gastro-questionnaire were averaged. Thus, the gastrointestinal symptom frequency variable (GIAverageFrequency) represents the average frequency rating a participant gave each of the 27 gastrointestinal symptoms. A high score on this variable indicates that a participant experienced many symptoms very frequently. A low score on this variable indicates that most of the symptoms reported were experienced at a very low frequency. However, averaging frequency items may not be an ideal strategy because evaluating gastrointestinal symptoms using an average frequency score does not provide much information about those participants who experienced a few symptoms at a high frequency or a low frequency of many symptoms. For instance, individuals with IBS are likely to experience a high frequency of abdominal pain and discomfort as well as diarrhea or constipation but may not

experience a high frequency of vomiting or difficulty swallowing; an average frequency score might not provide us with much information for individuals with this symptom profile. With this in mind, using average frequency to evaluate change in gastrointestinal symptoms might lead to loss of valuable information regarding symptom change.

As analysis using an average frequency variable was proposed in the original study design, this variable was used in the current study analyses; however, as noted above, this is not ideal. Another way of evaluating frequency of symptoms is to determine for each participant the symptom that they reported experiencing at the highest frequency at each time point. To create this frequency variable I evaluated the maximum frequency score for each symptom for each participant's responses to the Gastro-questionnaire administered during the first web assessment; this maximum score became the score for the new variable (GIfreqmax1). This was done a second time for participant responses to WA2 to create the variable GIfreqmax2. One limitation of this method of evaluating gastrointestinal symptoms is it does not provide information regarding those individuals who experienced a large number of symptoms at a lower frequency. Therefore I created another two new variables (GItotal1 and GItotal2) to represent the total number of GI symptoms reported by each participant at each time point. To create these variables, I recoded responses to the frequency section of the Gastro-questionnaire administered during the first web assessment. Twenty-seven new dichotomous variables were created. Each of these variables represents one of the 27 gastrointestinal symptoms assessed. A score of 1 on this variable indicates that the participant reported that she experienced this symptom over the past week (provided a response of either 1, 2, or 3 to the question: During the last week, how often have you had this symptom?). Participants who did not report experiencing the symptom over the past week (answered 0= not at all to the question: During the last week, how often have

you had this symptom?) received a score of 0 on the variable. This process was repeated for responses to the Gastro-questionnaire administered during the second web assessment. The scores for all of the dichotomous symptom variables were summed for each participant for each time point creating two new summary variables for each participant for each time point. These new variables represent the number of symptoms reported by each participant at both time points. A high score on these variables indicates that the participant reported experiencing a high number of symptoms.

Non-gastrointestinal somatic symptoms. To create the somatic symptoms variables (PHQ1 and PHQ2), responses to the Patient Health Questionnaire-15, which is comprised of 15 items and assesses the severity of 15 somatic symptoms, were summed for each participant for each time point; this is consistent with the scoring procedures outlined by the authors of the PHQ (Kroenke, Spitzer, & Williams 2002). As some of the questions on the PHQ assess gastrointestinal symptoms, responses to these questions were eliminated from the summary scores. A total of 3 items, which assess stomach pain, constipation, loose bowels, or diarrhea, and nausea gas, or indigestion were eliminated from the total PHQ scores. High scores on the PHQ1 and PHQ2 variables indicate a high level of somatic symptom severity.

Recent stressful experiences. The variables ICSRLE1 and ICSRLE2 represent daily hassles reported by study participants at the 2 time points. To create these variables, scores on each of the 49 items of Inventory of College Students' Recent Life Experiences scale (ICSRLE; Kohn, Lafreniere, & Gurevich, 1990;Osman, Barrios, Longnecker, & Osman, 1994) were summed. High scores on this variable indicate that a participant experienced a high number of daily hassles and that these hassles were very much a part of their life over the past week.

Chronic stressors. The variables LEQ1 and LEQ2 represent participant responses to the

Life Events Questionnaire. Scores for these variables were calculated by summing the number of life events reported by each participant at each time point. Scores range from 0-12. A score of 0 indicates that the participant did not experience any of the life events listed, and a score of 12 indicates that the participant experienced all of the life events listed.

Health and dietary habits. Variables were created to represent the average total number of hours of sleep each night over the past week, average number of cups of caffeinated coffee or tea consumed over the past week, average number of alcoholic drinks consumed each night over the past week and average number of hours of exercise each day over the past week. These variables are labeled Sleep1, Sleep2, Caffeine1, Caffeine2, Alcohol1, Alcohol2, Exercise1 and Exercise2.

Perceived stressfulness of exams. I examined participant's ratings of the stressfulness of the examination period on a scale from 0 = not at all to 6 = extremely. This variable is labeled Stressfulness. High scores on this variable indicate a higher level of stress related to the examination period. Participants were also asked to rate exam difficulty, satisfaction with outcome, how controllable the task was, how unpredictable the task was, how challenging the exams were and how new the task was on a scale from 0 = not at all to 6 = extremely. These variables are labeled, respectively, Difficulty, Satisfaction, Controllability, Unpredictability, Challenging and Novelty.

Data Analysis Plan

The electronic data collected with PROMIS Assessment Center was downloaded to an Excel file. This file was then exported to SPSS. Data from the CTQ were double entered into an Excel file and checked for consistency; discrepancies were resolved against the hard copy of the questionnaires. All data analyses were performed in IBM SPSS 19.0 software. Missing data

analysis was conducted using SPSS 19.0 Missing Data Analysis. Missing values were imputed using the Multiple Imputation (MI) method, which assumes that the data are missing at random (MAR).

Exploratory data analysis was conducted to test for violations of study assumptions. To test for violations of normality the Shapiro-Wilk test was conducted for each of the dependent variables and the potential confounding variables. Visual analysis of histograms, Q-Q plots and box plots were used to assess for violations of study assumptions. To test for violations of the assumption of homogeneity of variance, the Levene test of homogeneity of variance was performed for all study variables. Variables that violate the assumptions of normality or homogeneity of variance were transformed using natural log transformations, base 10 logarithmic transformations, and square root transformations. The Q-Q plots, histograms and skewness and kurtosis statistics were compared for all variables and all transformed variables to evaluate which transformations produced a distribution that most closely approximated a normal curve.

To determine whether participants perceived the examination period as stressful I used a dependent *t* test with PSS as the within-participant variable. To further assess the study assumption that the examination period can be considered a stressor, I calculated the mean of participant's ratings of the stressfulness of the examination period. I also evaluated between-participant differences in ratings of stressfulness of the examination period by conducting a univariate ANOVA with exam period stressfulness (Stressfulness) as the dependent variable. The current study design has two between-participant independent variables (childhood trauma, and family history of IBS), each with two levels (history of childhood trauma/no history of childhood trauma, and family history of IBS/no family history of IBS), and one within-

participant independent variable (Time 1/Time 2). The primary analyses for this project were pre-post examination period comparisons of gastrointestinal and perceived stress levels between the independent variable groups. I conducted separate two-way repeated measures Analysis of Variance (ANOVA) for perceived stress, average gastrointestinal symptom frequency, maximum gastrointestinal symptom frequency, and gastrointestinal symptoms total. I predicted significant divergent interactions (when data are graphed the lines will not be parallel, but do not cross) between childhood trauma and the presence of a transient stressor (examination period) for reports of gastrointestinal symptoms (gastrointestinal symptom frequency, gastrointestinal symptom total and maximum gastrointestinal symptom frequency); this would indicate that when an individual has a history of childhood trauma they also have greater increases in gastrointestinal symptoms in response to the examination stressor than those individuals without a history of childhood trauma. I also predicted significant divergent interactions (when data are graphed the lines will not be parallel, but do not cross) between childhood trauma and time (pre-examination/examination period) for reports of perceived stress. This would also indicate that the mean perceived stress level for individuals with a history of childhood trauma will increase more than the mean perceived stress levels of individuals without a history of childhood trauma between the pre-examination (Time 1) and the examination periods (Time 2). Divergent interactions were also predicted for family history of IBS and stressor (Time 1/ Time 2) with regard to gastrointestinal symptom levels and perceived stress levels.

Previous research suggests that sleep, life events, daily hassles, caffeine intake, exercise, alcoholic beverage consumption, gender, ethnicity and race are potentially confounding variables. To determine the potential influence of these variables on gastrointestinal symptoms and perceived stress levels and whether these variables should be added as covariates in the

study analyses, I evaluated differences between all groups with regard to sleep, life events, daily hassles, caffeine intake, exercise, and alcoholic beverage consumption at Time 1 using univariate ANOVAs with each potential confounding variable tested separately as a dependent variable and Trauma and FhxIBS as independent variables. I then evaluated within-participant and between-participant effects related to demographic variables (gender, ethnicity, race), sleep, exercise, alcohol consumption, daily hassles and life events. I then re-ran the primary study analyses and included the confounding variables for which I found significant between group differences (differences among individuals with a family history of IBS and no history of childhood trauma, individuals with a family history of IBS and a history of childhood trauma, individuals without a family history of IBS and with a history of childhood trauma and those with neither a family history of IBS nor history of childhood trauma) or that were found to be significantly related to an outcome variable when included in the repeated measures ANOVA.

As mentioned previously, participants for this study were recruited during 3 separate time points. Participants were recruited during the first 2 weeks of the spring 2010 semester, during the second half of the spring (2010) semester and during the summer of 2010. To assess for potential differences among participant waves, preliminary ANOVAs were conducted with semester (beginning of spring semester, second half of spring semester and summer semester) as a between-participant variable. If significant within or between-participant effects were not found with regard to semester, the variable Semester was not included in further analyses. To further evaluate the percentage of the variance associated with the wave during which a participant participated in this study I used a linear mixed model to find the intraclass correlation coefficients (ICC) for each dependent variable (PSS, GIfreqmax, GI average symptom

frequency, GI total and PHQ). The ICC was calculated using the formula Between Groups Variance Component/ Total Variance x 100.

Results

Compliance and Design Fidelity

A participant was considered compliant if they completed both Web Assessment 1 and Web Assessment 2. Overall compliance of study participants was 90%, that is, 90 of 100 participants completed both assessments. Of the individuals who completed both Web Assessments 1 and 2, 78 participants reported that they had 1 exam or fewer during Time 1. For all subsequent analyses, data from individuals who did not complete the second web assessment and data from those participants that reported that they had 2 exams or more during Time 1 were excluded from analyses. As illustrated by *Figure* 7, 78 participants were included in the final analysis.

Data Distributions and Transformations

The Shapiro-Wilk test was significant (indicating a violation of normality) for GI average symptom frequency at Time 1 and Time 2, total GI symptoms at Time 1 and Time 2, ICSRLE at Time 1 and Time 2, LEQ at Time 1 and Time 2 and caffeine intake. The assumption of normality was not violated by PSS1, PSS2, PHQ1 or PHQ2.

As the Shapiro-Wilk test is sensitive to even slight deviations from normality, skewness and kurtosis statistics and Q-Q plots were also used to evaluate multivariate normality and indicated that most variables were positively skewed; however, skewness and kurtosis were within the acceptable range for most variables (between -2 and +2). Measures of kurtosis for GI average symptom frequency, number of alcoholic drinks, exercise, caffeine intake, history of childhood physical abuse and history of childhood sexual abuse were higher than +2 indicating a significant deviation from normal and the need for data transformation. Additionally, measures of skewness indicated a large positive skew for the variables GIAverageFrequency1, GIAverageFrequency2, Alcohol1, Alcohol2, Exercie1, Exercise2, Caffeine1, and Caffeine2, childhood physical abuse

and childhood sexual abuse. Visual analysis of histograms, Q-Q plots and box plots suggested that most variables were positively skewed and had unimodal distributions.

Although most variables fell within the acceptable range with regard to skewness and kurtosis, visual analysis of Q-Q plots and histograms suggested the need for transformation of some variables prior to data analysis. To test for violations of the assumption of homogeneity of variance, the Levene test of homogeneity of variance was performed for all study variables. This test was significant for GIfreqmax2, PHQ1, LEQ2, Alcohol1, Alcohol2, Caffeine1, Caffeine2, childhood emotional abuse, and childhood physical abuse. A significant finding for this test suggests the need for transformation of variables prior to carrying out study analyses. A natural log transformation, base 10 logarithmic transformation and square root transformations were used to transform the variables GIAverageFrequency, LEQ, ICSRLE, and PHQ. The Q-Q plots, histograms and skewness and kurtosis statistics were compared for all variables and all transformed variables to evaluate which transformations produced a distribution that most closely approximated a normal curve. A logarithmic transformation resulted in a distribution that most closely approximated a normal curve for the following variables: GIAverageFrequency, Caffeine, Alcohol, Exercise, emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Square root transformations resulted in distributions that most closely approximated a normal curve for the following variables: GIfreqmax, PHQ and LEQ.

Missing data analysis indicated that of all of the items that were supposed to be completed by all participants <1% (.72%) of values were missing, 30.77% of participants (24/78 participants) had missing values and 19.65% of the study variables had a missing value. To determine whether data were missing at random (MAR), I reviewed the Missing Value Patterns

Chart, which displays patterns of missingness that correspond to groups of cases with the same pattern of missing and complete data. I also reviewed a chart displaying the 10 most common missing value patterns. None of the 10 most common patterns of missing values included cases with missing values on any of the main outcome variables (PSS, GIAverageFrequency, GItotal, GIfreqmax, or PHQ). The patterns of missing values suggest that the values are likely MAR and likely due to accidental omission. Missing values were imputed using the Multiple Imputation (MI) method, which assumes that the data are missing at random (MAR). MI procedures seek to restore the error variance lost during other regression-based methods of imputation, so that it most accurately approximates actual data. MI procedures are generally carried out in three steps: 1) imputation of data multiple times 2) analysis of each imputed data set and 3) combination of the results of these analyses. This method is outlined in Rubin (1987). The strengths of this method include its use of all of the available information in the non-missing data and its robustness to violations of normality; even with highly non-normal data and/or a small sample size this procedure is effective (Schaefer and Graham, 2002). To date there are no standardized rules for pooling results of an ANOVA, therefore data from all 5 imputations will be reported. The significance levels of all five imputations will be evaluated. A result will only be considered statistically significant if $p < .05$ for all 5 imputations. If $p < .05$ for 3 or 4 of the 5 imputations, then the result will be considered marginally significant.

A brief description of each variable and pooled means, medians, SEs and minimum and maximum values for Time 1 and Time 2 are presented in Table 1. Means SEs, and ns for PSS for individuals with a family history of IBS and no history of childhood trauma, individuals with a family history of IBS and a history of childhood trauma, individuals with a history of childhood trauma and no family history of IBS and individuals with neither a family history of

IBS nor history of childhood trauma at Time 1 and Time 2 are presented in Table 2. Means, SEs, and ns for GIAveragefrequency, GItotal and GIfreqmax for individuals with a family history of IBS and no history of childhood trauma, individuals with a family history of IBS and a history of childhood trauma, individuals with a history of childhood trauma and no family history of IBS and individuals with neither a family history of IBS nor history of childhood trauma at Time 1 and Time 2 are presented in Table 3. As displayed in Table 3, the number of individuals with a family history of IBS and no history of childhood trauma is very small (n = 4). The number of individuals who reported a family history of IBS and a history of trauma is also small (n = 12). This suggests that the power to detect group differences related to family history of IBS is low. Analyses evaluating differences among all four groups (individuals with a family history of IBS, individuals with a family history of IBS and a history of childhood trauma, individuals with a history of childhood trauma and no family history of IBS and individuals with neither a family history of IBS nor a history of childhood trauma) should be interpreted with caution; even if there are differences among groups it is likely that the study results will not be statistically significant.

As noted previously the primary hypotheses for this study were tested using 2 way repeated measures ANOVAs. For all study analyses Mauchy's Test of Sphericity indicated violation of the sphericity assumption; however, results of all analyses indicated that the Greenhouse-Geisser corrected and Huynh Feldt corrected F-statistics were identical to the F-statistics generated when sphericity was assumed. As the data set used for the study analyses is a multiple imputation data set, for variables with missing values data from all 5 imputations will be presented.

Due to the violation of the assumption of sphericity as indicated by Mauchy's Test of Sphericity, the potential for correlation of error and the presence of unbalanced groups, the main study analyses were also run using a mixed model. The use of a linear mixed model has a number of advantages over the GLM. A mixed model allows for violation of the assumption of sphericity and it is better at handling unbalanced designs. This model also allows for handling of hierarchical data (e.g. when participants are nested within the time period during which they participated in a study).

Preliminary Analyses to Confirm Stressor Effects

One major assumption of this study design was that the exam period could be considered a transient stressor. If this were the case we would expect an increase in perceived stress levels between Time 1 and Time 2. We would also expect that participants would rate the examination period as stressful. To test this assumption I first examined the means of PSS1 and PSS2. There was an increase in PSS from Time 1 to Time 2 (PSS1, *M*(*SE*) = 18.81(.74); PSS2, *M* (*SE*) = 19.38 (.81)); however, when evaluated by a paired t-test this difference was not statistically significant, t (77) = -.89, p = .37. This suggests that the examination period might not have been an adequate stressor.

To further assess the study assumption that the examination period can be considered a stressor, I examined participant's ratings of the stressfulness of the examination period (Time 2) on a scale from 0 = not at all to 6 = extremely. The mean rating of the stressfulness of the examination was 3.75 (*SE* = .19); this indicates that, on average, participants found this examination period somewhat stressful.

Means and SEs with regard to ratings of exam difficulty, satisfaction with outcome, how controllable the task was, how unpredictable the task was, how challenging the exams were and

how new the task was are reported in Table 4. Students rated the exams as somewhat challenging; however, they considered them somewhat controllable and not very difficult. The experience was not very novel, and overall, students were somewhat satisfied with the outcome of the exam period.

To determine whether there were differences among groups in how stressful students perceived the exam period to be I conducted a 2 (Family History of IBS/No Family History of IBS x 2 (Trauma/No Trauma) ANOVA with stressfulness of the exam (rating of stressfulness of examination period on a 0-6 scale, where 0= not at all stressful) as the dependent variable. There was no statistically significant difference among groups with regard to ratings of exam period stressfulness. It then conducted 6 separate ANOVAs for difficulty of examination period, satisfaction with outcome, controllability, unpredictability, challenge and novelty. No statistically significant differences among study groups were found with regard to exam period difficulty, satisfaction with outcome, controllability, unpredictability, challenge or novelty. The results of these ANOVAs are found in tables 5-11.

As reported above, the difference in perceived stress between Time 1 and Time 2 was not statistically significant. Therefore, analyses were conducted to evaluate the primary study hypotheses in a subgroup of participants who experienced an increase in perceived stress. To determine the subgroup of participants that experienced an increase in perceived stress between Time 1 and Time 2, I created a new variable that represented the change in perceived stress by subtracting for each participant the values for the variables PSS 2 from the value of PSS1. Means, SEs, ns, minimum and maximum values for ratings of the examination period for individuals who experienced an increase in PSS between Time 1 and Time 2 are presented in Table 12. Means, SEs, ns, minimums and maximums for all study variables for individuals who

experienced an increase in PSS are included in Table 13. Means SEs, and ns for PSS at Time 1 and Time 2 for individuals with a family history of IBS and no history of childhood trauma, individuals with a family history of IBS and a history of childhood trauma, individuals with a history of childhood trauma and no family history of IBS and individuals with neither a family history of IBS nor a history of childhood trauma are presented in Table 14. Means, SEs, and ns at Time 1 and Time 2 for GIAverageFrequency, GItotal and GIfreqmax for individuals with a family history of IBS and no history of childhood trauma, individuals with a family history of IBS and a history of childhood trauma, individuals with a history of childhood trauma and no family history of IBS and individuals with neither a family history of IBS nor a history of childhood trauma that experienced an increase in PSS between Time 1 and Time 2 are presented in Table 15. Not surprisingly, when only data from participants who experienced an increase in PSS were analyzed using a paired t-test, the difference between PSS1 and PSS2 was statistically significant, t (43) = -11.53, p<.001. However, as displayed in tables 14 and 15, when data from individuals that did not experience an increase in PSS between Time 1 and Time 2 were excluded the number of individuals remaining that reported a family history of IBS but no history of childhood trauma was exceptionally low ($n = 2$). The number of individuals with a family history of IBS and a history of childhood trauma is also very low ($n=5$). This suggests that study analyses that involve either the group of individuals that reported a family history of IBS and a history of childhood trauma or the group of individuals with a family history of IBS and no history childhood trauma are likely not able to detect differences among groups.

The weak effect of the transient stressor chosen for this study suggests that the planned repeated measures ANOVAs are not able to detect differences in among study groups with regard to response to the stressor. Therefore, in addition to the planned study analyses with the

full number of participants in each cell, hypotheses 1-4 were also tested by conducting repeated measures ANOVAs that only included data from individuals that experienced an increase in perceived stress in response to the transient stressor. Only including individuals that experienced an increase in perceived stress between Time 1 and Time 2 reduces the number of participants who did not experience a family history of childhood trauma but reported a family history of IBS to 2. An *n* of 2 is not sufficient to be analyzed effectively. Therefore, Hypothesis 5, which predicts differences among all four groups was only tested using the full *N*.

In sum, all study hypotheses were tested first with the planned repeated measures ANOVAs. This initial test of each hypothesis included all participants (*N= 78*). The primary and secondary study hypotheses (Hypotheses 1-5 and Secondary Hypotheses 1-6) were then tested using Linear Mixed Model Analyses to account for violations of the assumption of sphericity and the unbalanced cells of the study. Due to the weak effect of the transient stressor, I also tested hypotheses 1-4 using 2 x 2 repeated measures ANOVAs that included only participants who experienced an increase in perceived stress from Time 1 to Time 2. I ran all planned study analyses, linear mixed model analyses and repeated measures ANOVAs first without including covariates and then with covariates.

Test of Hypothesis 1

This hypothesis states that the mean increase in perceived stress in response to examination stress will be higher in the group of individuals who experienced childhood trauma than in those participants without a history of trauma.

To test this hypothesis I conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with perceived stress (PSS1/PSS2) as the within participant dependent variable. The Time by Trauma interaction was not statistically

significant. Results of the repeated measures ANOVA are displayed in Table 16. Figure 8 depicts the mean change in perceived stress levels for individuals with a history of childhood trauma and individuals without a history of childhood trauma. This analysis included both participants that experienced an increase in perceived stress between Time 1 and Time 2 and participants that did not experience an increase in perceived stress.

When the variable PSS was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect and Trauma and FhxIBS as fixed effects, the Time by Trauma interaction was not statistically significant. The estimate of the Time by Trauma interaction was not statistically significant, $ß = -.33$, $t\ (148) = -.06$, $p = .95$.
This analysis included both participants that experienced an increase in perceived stress between Time 1 and Time 2 and participants that did not experience an increase in perceived stress. Results of Type III tests of fixed effects are displayed in Table 17.

When the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with perceived stress (PSS1/PSS2) as the within-participant dependent variable was re-run only including individuals who reported an increase in PSS between Time 1 and Time 2, the Time by Trauma interaction was again not statistically significant. Results of this repeated measures ANOVA are displayed in Table 18.

I then tested potentially confounding variables by conducting 2 way ANOVAs to evaluate baseline between-participant differences with regard to Sleep, Exercise, Alcohol, Caffeine, ICSRLE and LEQ. I also conducted 2 way repeated measures ANOVAs to evaluate within-participant and between-participant differences with regard to potentially confounding variables. Lastly, I conducted repeated measures ANOVAs to evaluate between and within-participant differences with regard to gender, ethnicity, race and point in the year during which

participants completed the evaluation. Correlations among the main study outcome variables and potentially confounding variables are found in Table 19.

During Time 1 individuals who reported a history of childhood trauma reported more hours of sleep per night than individuals without a history of childhood trauma, F (1,74) = 5.51, p <.05. There was a significant between-participant interaction between family history of IBS and trauma with regard to hours of sleep at baseline, F (1,74) = 4.75, p <.05. The results of the ANOVA with Sleep1 entered as the dependent variable are found in Table 20. A repeated measures ANOVA with Sleep as the dependent within-participant variable indicated a significant influence of Time on hours of sleep, F (1,74) = 6.95, p <.05. The within-participant by between-participant interactions of Time by Trauma and Time by FhxIBS were also statistically significant. The results of the repeated measures ANOVA are found in Table 21.

There were no between-participant main effects or interactions for Caffeine1. The results of this ANOVA are reported in Table 22. When a repeated measures ANOVA was conducted with Caffeine as the within-participant dependent variable, there was a significant within-participant main effect noted for Time. The results of this analysis are found in Table 23. There was also a significant difference in life events reported at Time 1 between individuals with a family history of IBS and individuals without a family history of IBS, F (1,74) =6.32, p <.05.

The results of this ANOVA are displayed in Table 24. A repeated measures ANOVA with LEQ as the within-participant dependent variable indicated that individuals with a history of trauma reported a higher level of life events than individuals without a history of trauma, F(1,74) = 4.58, p< .05. The change in LEQ between Time1 and Time2 was also statistically significant, F(1,74) = 5.14, p<.05. Table 25 displays the results of this repeated measures ANOVA.

There was a significant difference between individuals with a history of trauma and individuals without a history of trauma with regard to reports of ICSRLE at time 1, F (1,74) =4.51, p<.05. The results of this ANOVA are reported in Table 26. There were no significant within-participant or between-participant differences or interactions when ICSRLE was entered into a repeated measures ANOVA as the within-participant dependent variable and Trauma and FhxIBS were entered as independent variables. The results of this repeated measures ANOVA are found in Table 27.

No significant between-participant or within-participant effects or interactions were found with regard to Alcohol or Exercise. Results of an ANOVA with Alcohol1 as the dependent variable are reported in Table 28. Results of the ANOVA with Alcohol as the within-participant dependent variable are reported in Table 29. Results of the ANOVA with Exercise1 as the dependent variable are reported in Table 30. The results of the repeated measures ANOVA with Exercise as the within-participant dependent variable are reported in Table 31.

There were no significant differences between male and female participants with regard to PSS. There were no significant differences between individuals who reported that they were of Hispanic or Latino origin and those individuals who did not report that they were of Hispanic or Latino origin with regard to PSS. There were no differences in PSS with regard to race. Results of these analyses are displayed in Tables 32-34. There were no significant differences in PSS related to Semester (beginning of spring semester, second half of spring semester and summer semester). Results of the repeated measures ANOVA with PSS entered as the within-participant dependent variable and Semester entered as a factor are reported in Table 35.

Given the significant between and within-participant effects and interactions found with regard to Sleep, ICSRLE, Caffeine and LEQ, I also ran the analyses testing Hypothesis 1 with

the inclusion of these variables as covariates. I conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with perceived stress (PSS1/PSS2) as the within-participant dependent variable and Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 as covariates. This analysis included both participants that experienced an increase in perceived stress between Time 1 and Time 2 and participants that did not experience an increase in perceived stress. The Time by Trauma interaction was not statistically significant. Results of the repeated measures ANOVA are displayed in Table 36.

When the variable PSS was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, Trauma and FhxIBS as fixed effects and Sleep, LEQ, ICSRLE, and Caffeine as covariates, the Time by Trauma interaction was not statistically significant**.** This analysis included both participants that experienced an increase in perceived stress between Time 1 and Time 2 and participants that did not experience an increase in perceived stress. Results of Type III tests of fixed effects for this analysis are displayed in Table 37. The estimate of the Time by Trauma interaction was not statistically significant, $ß = 2.61$, $t(144) = .66$, $p = .51$.

A 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within-participant dependent variable was conducted with only participants that reported an increase in PSS between Time 1 and Time 2. Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 were included as covariates. The Time by Trauma interaction was not statistically significant. Results of the repeated measures ANOVA are displayed in Table 38.

In sum, the results of tests of Hypothesis 1 were not statistically significant. This hypothesis was initially tested by conducting the planned 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with perceived stress (PSS1/PSS2) as the within participant dependent variable. This hypothesis was then tested using linear mixed model analyses and a 2 x 2 repeated measures ANOVA that only included data from participants that reported an increase in PSS between Time 1 and Time 2. These three analyses were then re-run with the inclusion of covariates and confounding variables. The Time by Trauma interaction effect was not statistically significant when this effect was tested using a 2 x 2 repeated measures ANOVA without covariates, when tested using linear mixed model analyses, or when tested using a 2 x 2 repeated measures ANOVA that only included data from participants that reported an increase in PSS between Time 1 and Time 2. When the initial tests of the Time by Trauma interaction effect were run with the inclusion of covariates the results were again not statistically significant.

Test of Hypothesis 2

This hypothesis states that the mean increase in perceived stress will be higher for individuals with a family history of IBS compared to individuals without a family history of IBS.

To test this hypothesis I again looked at the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with perceived stress as the within-participant dependent variable (see Table 16). There was no statistically significant difference between individuals without a family history of IBS and individuals with a family history of IBS with regard to change in perceived stress between Time 1 and Time 2. Figure 9 depicts the means of the PSS change scores between individuals with a family history of IBS and individuals without a family history of IBS.

I also reviewed the 2x2 repeated measures ANOVA that included PSS as the dependent variable and included only individuals reporting a change in PSS between Time 1 and Time 2. The Time by FhxIBS interaction was not significant (see Table 17).

The linear mixed model that included PSS as the dependent variable, Time as a repeated measure and a fixed effect, and Trauma and FhxIBS as fixed effects indicated that the Time by FhxIBS interaction was not statistically significant (see Table 17). The estimate of Time by FhxIBS was also not statistically significant, *ß* = -.93, *t* (148) = -.30, *p* = .76.

Given the significant relationships noted between Sleep, Caffeine, ICSRLE, and LEQ and the main study variables and the between and within-participant effects noted for Sleep, Caffeine, ICSRLE and LEQ, to further evaluate Hypothesis 2 I also reviewed the results of the 2 x2 repeated measures analyses and the linear mixed model analyses that included PSS as the dependent variable and Sleep, Caffeine, ICSRLE and LEQ as covariates. I then reviewed the 2x2 repeated measures ANOVA that included PSS as the dependent variable and Sleep, Caffeine, ICSRLE and LEQ as covariates and included only individuals reporting a change in PSS between Time 1 and Time 2.

The within-participant by between-participant interaction between Time and FhxIBS was not statistically significant (see Table 36). When tested using a linear mixed model, the Time by FhxIBS fixed effect was not significant (see Table 37). The estimate of the Time by FhxIBS fixed effect was not statistically significant, *ß* = .31, *t* (144) = .14, *p* = .89. When only participants who reported an increase in PSS between Time 1 and Time 2 were evaluated, the Time x FhxIBS interaction was not significant (see Table 38).

In sum, the results of tests of Hypothesis 2 were not statistically significant. This hypothesis was initially tested by reviewing the planned 2 (family history of IBS/no family

history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within-participant dependent variable. The linear mixed model analyses and the 2 x 2 repeated measures ANOVA that only included data from participants that reported an increase in PSS between Time 1 and Time 2 were then reviewed. Lastly, I reviewed the results of the three analyses that were run with the inclusion of covariates and confounding variables. The Time by FhxIBS interaction effect was not statistically significant when this effect was tested using a 2 x 2 repeated measures ANOVA without covariates, when tested using linear mixed model analyses, or when tested using a 2 x 2 repeated measures ANOVA that only included data from participants that reported an increase in PSS between Time 1 and Time 2. When the initial tests of the Time by FhxIBS interaction effect were run with the inclusion of covariates the results were again not statistically significant.

Test of Hypothesis 3

This hypothesis states that individuals with a family history of IBS will report a higher change in gastrointestinal symptoms in response to exam stress than individuals without a family history of IBS.

To test this hypothesis I first conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIAverageFrequency as the within participant dependent variable, which included both participants that did not report an increase in perceived stress between Time 1 and Time 2 and participants that reported an increase in perceived stress between Time 1 and Time 2. The within by between-participant interaction of family history of IBS by Time was not significant for GIAverageFrequency. The results of this repeated measures ANOVA are found in Table 39. Figure 10 is a bar graph of the mean change in GIAverageFrequency for individuals with a family history of IBS and

individuals without a family history of IBS. I then conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GItotal as the within participant dependent variable. The interaction between Time and family history of IBS was not significant. The results of this repeated measures ANOVA are displayed in Table 40. The mean change in GItotal for individuals with a family history of IBS and individuals without a family history of IBS is displayed in Figure 11. I also conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIfreqmax as the dependent within-participant variable. The Time by FhxIBS interaction was not significant. The results of this repeated measures ANOVA are displayed in Table 41. The mean change in GIfreqmax for individuals with a family history of IBS and individuals without a family history of IBS is displayed in Figure 12. Table 3 provides the means, standard errors and ns for GIfreqmax, GItotal and GIAverageFrequency.

When the variable GIAverageFrequency was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, and Trauma and FhxIBS as fixed factors, the Time by FhxIBS interaction was not statistically significant. Results of Type III tests of fixed effects are found in Table 42. The estimate of the Time by FhxIBS interaction was not statistically significant for GIAverageFrequency, $ß$ = .00, t (148) = -.04, p = .97.

When the variable GItotal was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, and Trauma and FhxIBS as fixed factors, the Time by FhxIBS interaction was not statistically significant. Table 43 displays results of Type III tests of fixed effects for this analysis. The estimate of the Time by FhxIBS was not statistically significant**,** $ß$ = -09, t (148) = -.04, p = .97.

When the variable GIfreqmax was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, and Trauma and FhxIBS as fixed factors, the Time by FhxIBS interaction was not statistically significant. The results of the tests of fixed effects for this analysis are found in Table 44. The estimate of the Time by FhxIBS effect was not statistically significant, $ß = .11$, $t\ (148) = .76$, $p = .44$.

The 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA for GIAverageFrequency, GItotal and GIfreqmax were re-run including only individuals who experienced an increase in PSS between Time 1 and Time 2. The Time by FhxIBS interaction was not significant for GIAverageFrequency. The results of this analysis are found in Table 45. The Time by FhxIBS interaction was marginally significant for GItotal ($p = .05$). The results of this analysis are displayed in Table 46. The Time by FhxIBS interaction was not statistically significant for GIfreqmax. The results of this analysis are displayed in Table 47.

As noted previously, significant between-participant and within-participant effects were found for Sleep, Caffeine, LEQ and ICSRLE indicating the need to include these variables as covariates in study analyses. To assess for additional confounding factors I evaluated between and within-participant differences with regard to gender, ethnicity, race and point in the year during which participants completed the study for GIAverageFrequency, GItotal and GIfreqmax. There were no significant differences between male and female participants with regard to GIAverageFrequency, GItotal, or GIfreqmax (see Tables 48, 49 and 50). There were no significant differences between individuals who reported that they were of Hispanic or Latino origin and those individuals who did not report that they were of Hispanic or Latino origin with regard to GIAverageFrequency, GItotal or GIfreqmax (see Tables 51, 52 and 53). There were no differences with regard to GItotal or GIfreqmax among racial groups (see Tables 54 and 55). A

significant interaction was noted between Time and Race for GIAverageFrequency (see Table 56). There were no statistically significant between participant effects found for Semester with regard to GIAverageFrequency or GItotal. The results of these ANOVAs are found in Tables 57 and 58. There was a statistically significant Time by Semester interaction for GIfreqmax. The results of the ANOVA are found in Table 59.

I then conducted all tests of Hypotheses 3 and included Sleep, ICSRLE, LEQ and Caffeine as covariates. Given the significant interaction between Time and Race for GIAverageFrequency, Race was included as a grouping variable in analyses related to GIAverageFrequency. As the Time x Semester interaction was statistically significant for GIfreqmax, Semester was included as a grouping variable when conducting analyses related to GIfreqmax.

I next conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIAverageFrequency as the within-participant dependent variable (GIAverageFrequency1/GIAverageFrequency2), Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 added into the model as covariates and Race included as a grouping variable. The Time by FhxIBS interaction was not significant. The results of this analysis are found in Table 60. I then conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GItotal as the within-participant dependent variable (GItotal1/GItotal2) and Sleep1, Sleep2, Leq1, Leq2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 added into the model as covariates. The Time by FhxIBS interaction was not significant. The results of this analysis are displayed in Table 61. A 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIfreqmax as the within-participant dependent variable

(GIfreqmax1/GIfreqmax2), Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 added into the model as covariates and Semester added as a grouping variable resulted in a statistically significant Time by FhxIBS interaction. Figure 13 illustrates this interaction with a line graph. The results of this analysis are displayed in Table 62.

When the variable GIAverageFrequency was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, Trauma, FhxIBS and Race as fixed factors and Sleep, LEQ, ICSRLE, and Caffeine as covariates, the Time by FhxIBS interaction was not statistically significant. Results of Type III tests of fixed effects for this analysis are found in Table 63. The estimate of the Time by FhxIBS interaction was not statistically significant for GIAverageFrequency, $ß = .00$, $t\ (130) = .01$, $p = 1.00$.

When the variable GItotal was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, Trauma and FhxIBS as fixed factors and Sleep, LEQ, ICSRLE and Caffeine as covariates, the Time by FhxIBS interaction was not statistically significant. Table 64 displays results of tests of Type III fixed effects for this analysis. The estimate of the Time by FhxIBS was not statistically significant for GItotal, $ß = .35$, $t\ (144) = .18$, $p = .86$.

When the variable GIfreqmax was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, Trauma, FhxIBS and Semester as fixed factors, and Sleep, LEQ, ICSRLE, and Caffeine entered as covariates, the Time by FhxIBS interaction was not statistically significant. The results of the tests of fixed effects for this analysis are found in Table 65. The estimate of the Time by FhxIBS was not statistically significant for GIfreqmax, $ß = .11$, $t\ (142) = .85$, $p = .40$.

Lastly, I conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIAverageFrequency as the within participant dependent variable, Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 added into the model as covariates and Race as a grouping variable and only included data from individuals that experienced an increase in perceived stress between Time 1 and Time 2. The Time by FhxIBS interaction was not significant. The results of this analysis are found in Table 66. I then conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GItotal as the within-participant dependent variable and Sleep1, Sleep2, Leq1, Leq2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 added into the model as covariates and only included data from participants that reported an increase in PSS between Time 1 and Time 2. The Time by FhxIBS interaction was not significant. The results of this analysis are displayed in Table 67. I also conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIfreqmax as the within-participant dependent variable, Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 added into the model as covariates and Semester added as a grouping variable and only included data from participants that reported an increase in PSS between Time 1 and Time 2. The Time by FhxIBS interaction was not statistically significant. The results of this analysis are displayed in Table 68.

In sum, to test Hypothesis 3 I initially conducted the planned 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIAverageFrequency as the within participant dependent variable. I also conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GItotal as the within participant dependent variable. I then conducted a 2 (family history of

IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIfreqmax as the within participant dependent variable. Hypothesis 3 was also tested using linear mixed model analyses and by running the 2 x 2 ANOVAs including only data from participants that reported an increase in perceived stress between Time 1 and Time 2. For each dependent variable (GIAverageFrequency, GItotal and GIfreqmax) all three analyses (2x2 ANOVA, linear mixed model and 2x2 ANOVA with only individuals that reported an increase in PSS) were re-run with the inclusion of covariates and confounding variables. No statistically significant Time by FhxIBS effects were found for GItotal or GIAverageFrequency. When the Time by FhxIBS interaction for GIfreqmax was tested using a 2 x 2 repeated measures ANOVA that did not include covariates, when tested using linear mixed model analyses with and without covariates, or when tested using a 2 x 2 repeated measures ANOVA that only included data from participants that reported an increase in PSS between Time 1 and Time 2, this effect was not statistically significant. However, when tested using a 2 x 2 repeated measures ANOVA that included Sleep, Caffeine, LEQ and ICSRLE as covariates and Semester as a factor, the Time by FhxIBS interaction effect was statistically significant for GIfreqmax.

Test of Hypothesis 4

This hypothesis stated that individuals with a history of childhood trauma will have a higher change in gastrointestinal symptoms in response to an examination stressor than individuals without a family history of childhood trauma.

To test this hypothesis I reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVAs for GIAverageFrequency, GItotal and GIfreqmax and the results of the linear mixed model analyses for GIAverageFrequency, GItotal and GIfreqmax. I then reviewed the results of the 2x2 repeated

measures ANOVAs for GIAverageFrequency, GItotal and GIfreqmax that only included individuals that reported a change in PSS between Time 1 and Time 2. The within by between-participant interaction of Time by Trauma was not statistically significant for GIAverageFrequency (see Table 39). Figure 14 is a graph of the mean change in GIAverageFrequency for individuals with and without a history of trauma. The interaction between Time and Trauma was not statistically significant for GItotal (see Table 40). Figure 15 depicts the mean change in GItotal between Time 1 and Time 2 for individuals with a history of childhood trauma and individuals without a history of childhood trauma. The interaction between Time and Trauma was statistically significant for GIfreqmax. The results of the repeated measures ANOVA are displayed in Table 41. Figure 16 is a graph of the mean change in GIfreqmax for individuals with a history of childhood trauma and individuals without a history of childhood trauma.

The Time by Trauma interaction was not statistically significant for linear mixed model Type III tests of fixed effects for GIAverageFrequency, GItotal or GIfreqmax (see Tables 42,43,44). The estimate of the Time by Trauma interaction was not statistically significant for GIAverageFrequency, $ß = .00$, $t\ (148) = .01$, $p = 1.00$. The estimate of the Time by Trauma effect was not statistically significant for GItotal, $ß = -1.42$, $t\ (148) = -.35$, $p = .73$. The estimate of the Time by Trauma fixed effect was not statistically significant for GIfreqmax, $ß = .48$, $t\ (148) = 1.88$, $p = .06$.

The 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVAs for GIAverageFrequency, GItotal and GIfreqmax that included only individuals who experienced an increase in PSS between Time 1 and Time 2 indicated that the Time by Trauma interaction was not significant for GIAverageFrequency or for GItotal (see

Tables 45 and 46). The Time by Trauma interaction was significant for GIfreqmax (see Table 47).

I then reviewed the results of the previously conducted 2 x 2 repeated measures ANOVAs for GIfreqmax, GIAverageFrequency and GItotal that included Sleep, Caffeine, ICSRLE and LEQ as covariates. I also reviewed the results of the tests of the linear mixed models for GIfreqmax, GIAverageFrequency and GItotal that included Sleep, Caffeine, ICSRLE and LEQ as covariates and the 2x2 repeated measures ANOVAs that included only individuals that experienced an increase in PSS between Time 1 and Time 2 and that included Sleep, Caffeine, ICSRLE and LEQ as covariates. As noted previously, Race was included as a grouping variable when testing hypotheses related to GIAverageFrequency and Semester was included as a grouping variable when conducting analyses related to GIfreqmax. The repeated measures ANOVAs that included individuals who did not experience an increase in PSS between Time 1 and Time 2 indicated that the Time x Trauma interaction was not significant for GIAverageFrequency or for GItotal (see Tables 60 and 61). The Time by Trauma interaction was statistically significant for GIfreqmax (see Table 62). Figure 17 illustrates this interaction with a line graph**.**

The results of the linear mixed model tests of fixed effects indicated that the Time by Trauma interaction was not statistically significant for GIAverageFrequency (see Table 63). The estimate of the Time by Trauma interaction for GIAverageFrequency was not statistically significant, $ß = .03$, $t\ (130) =. 27$, $p =.79$. The Time by Trauma interaction was not statistically significant for the Type III tests of fixed effects for GItotal (see Table 64). The estimate of the Time by Trauma interaction was not statistically significant, $ß = -.22$, $t\ (144) = -.06$, $p =.95$. The Time by Trauma fixed effect was statistically significant for GIfreqmax (see Table 65). The

estimate of the Time by Trauma interaction was statistically significant, ß = .59, *t* (142) = 2.43, *p* <.05.

The 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVAs that controlled for confounding variables and only included individuals that reported an increase in PSS indicated that the Time by Trauma interaction was not significant for GIAverageFrequency or GItotal (see Table 66 and 67). The Time by Trauma interaction effect remained statistically significant for GIfreqmax (see Table 68).

In sum, to test Hypothesis 4 I reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIAverageFrequency as the within participant dependent variable, the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GItotal as the within participant dependent variable and the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIfreqmax as the within participant dependent variable. Hypothesis 4 was also tested by reviewing the results of the linear mixed model analyses for GIAverageFrequency, GItotal and GIfreqmax and the 2 x 2 ANOVAs including only data from participants that reported an increase in perceived stress between Time 1 and Time 2 for GIAverageFrequency, GItotal and GIfreqmax. Lastly, I reviewed the results of the 2x2 ANOVAs, the linear mixed model analyses and the 2x2 ANOVAs that included only data from individuals that reported an increase in PSS that were run with the inclusion of covariates and confounding variables. When covariates were not included in the study analyses the Time by Trauma interaction was not significant for GIAverageFrequency or GItotal when this effect was tested using 2x2 repeated measures ANOVAs including individuals that did not experience an increase in PSS between Time 1 and

Time 2, when this effect was tested using linear mixed models or when this effect was tested with 2x2 repeated measures ANOVAs that only included individuals that reported an increase in PSS between Time 1 and Time 2. When covariates and confounding variables were included in study analyses the Time by Trauma interaction was again not significant for GIAverageFrequency or GItotal. The Time by Trauma Interaction effect was statistically significant for GIfreqmax when tested using a 2x2 repeated measures ANOVA that included individuals who did not experience an increase in PSS between Time 1 and Time 2 and when tested with a 2x2 repeated measures ANOVA that only included individuals that experienced an increase in PSS between Time 1 and Time 2. When covariates were included in study analyses, the Time by Trauma interaction was significant for GIfreqmax when this effect was tested with 2x2 repeated measures ANOVAs including individuals that did not experience an increase in PSS between Time 1 and Time 2, when this effect was tested using linear mixed models and when this effect was tested with 2x2 repeated measures ANOVAs that only included individuals that reported an increase in PSS between Time 1 and Time 2.

Tests of Hypothesis 5

This hypothesis stated that the greatest increase in perceived stress levels will occur in individuals with both a family history of IBS and a history of childhood trauma.

To test this hypothesis I first reviewed the results of the previously conducted 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within participant dependent variable. There was no statistically significant within by between-participant interaction among Time, Trauma and FhxIBS for PSS (See Table 16). Figure 18 is a bar graph of Time by Trauma for individuals with and without a family history of IBS.

I then reviewed the results of the linear mixed model analyses that included the variable PSS as the dependent variable, Time as a repeated measure and a fixed effect and Trauma and FhxIBS as fixed factors. The Time by Trauma by FhxIBS interaction was not statistically significant. Results of the Type III tests of fixed effects for this analysis are found in Table 17. The estimate of the Time by Trauma by FhxIBS interaction term was not statistically significant for Time 1, *ß* = -5.38 *t* (148) =-1.26, *p* = .21, or for Time 2, *ß* = -6.11, *t* (148) =-1.43, *p* = .15.

The 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with perceived stress (PSS1/PSS2) as the within participant dependent variable and Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 entered as covariates did not indicate a statistically significant within by between- participant interaction among Time, Trauma and FhxIBS (See Table 36).

The Time by Trauma by FhxIBS interaction was statistically significant for PSS when tested using a linear mixed model that controlled for Sleep, ICSRLE, LEQ and Caffeine. Results of the Type III tests of fixed effects for this analysis are found in Table 38. The estimate of the Time by Trauma by FhxIBS interaction term was statistically significant for Time 1, *ß* = -7.09, *t* (144) =-2.28, *p* = <.05 but not for Time 2, *ß* = -4.075006*t* (144) =-1.33, *p* = .19.

In sum, to test Hypothesis 5 I reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within-participant dependent variable. Hypothesis 5 was also tested by reviewing the results of the linear mixed model analyses for PSS. Lastly, I reviewed the results of the 2x2 ANOVA and the linear mixed model analyses that were run with the inclusion of covariates. The Time by Trauma by FhxIBS interaction was not statistically significant for PSS when this effect was tested using a 2x2 repeated measures ANOVA including individuals that did not experience an

increase in PSS between Time 1 and Time 2 or when this effect was tested using linear mixed models. When covariates were included in study analyses the Time by Trauma by FhxIBS interaction was again not significant for PSS when this effect was tested with 2x2 repeated measures ANOVAs including individuals that did not experience an increase in PSS between Time 1 and Time 2. The Time by Trauma by FhxIBS fixed effect was significant for PSS when this effect was tested using linear mixed model analyses.

Test of Secondary Hypothesis 1

This hypothesis stated that individuals with a history of childhood trauma will have higher levels of gastrointestinal symptoms than individuals without a history of childhood trauma.

To test this hypothesis I reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVAs for GIAverageFrequency, GItotal and GIfreqmax. The main effect of Trauma was not statistically significant for GIAverageFrequency, GItotal or GIfreqmax (see Tables 39, 40 and 41).

I then reviewed the linear mixed model Analyses for GIAverageFrequency, GItotal and GIfreqmax. The fixed effect of Trauma was not statistically significant for GIAverageFrequency, GItotal or GIfreqmax. The results of the Type III tests of fixed effects for these analyses are found in Tables 42, 43, and 44. The estimate of the main effect of Trauma was not statistically significant for GIAverageFrequency, $ß = -.03$, $t\ (148) = -.39$, $p = .70$, GItotal, $ß = -.50$, $t\ (148) = -.18$, $p = .86$ or GIfreqmax, $ß = -.24$, $t\ (148) = -1.31$, $p = .19$.

I also reviewed the results of the tests of the main effect for Trauma that included covariates and confounding variables. The 2 x 2 repeated measures ANOVA for GIAverageFrequency that included Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 as covariates and Race as an independent variable indicated that the

main effect for trauma was not statistically significant (see Table 60). The 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GI symptom total (GItotal1/GItotal 2) as the within-participant dependent variable and Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 entered as covariates did not result in a significant main effect for Trauma (see Table 61). The 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIfreqmax (GIfreqmax1/GIfreqmax2) as the within-participant dependent variable, Sleep1, Sleep2, Leq1, Leq2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 entered as covariates and Semester as a grouping variable did not indicate a statistically significant main effect for Trauma (see Table 62).

When GIAverageFrequency was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, Sleep, LEQ, Caffeine and ICSRLE as covariates and Trauma, FhxIBS and Race as fixed factors, the fixed effect of Trauma was not statistically significant. The results of the Type III tests of fixed effects for this analysis are found in Table 63. The estimate of the main effect of Trauma was not statistically significant, *ß* = -.02, *t* (142*)* = -.35, *p* =.73.

When the variable GItotal was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, Trauma and FhxIBS as fixed factors and Sleep, LEQ, Caffeine and ICSRLE as covariates, the fixed effect of Trauma was not statistically significant. The results of the Type III tests of fixed effects for this model are found in Table 64. The estimate of the main effect of Trauma was not statistically significant, *ß* = .18, *t* (144) = .07, *p* = .94.

When the variable GIfreqmax was entered into a linear mixed model as the dependent variable, Time as a repeated measure and a fixed effect, Trauma, FhxIBS and Semester as fixed factors, and Sleep, LEQ, Caffeine and ICSRLE as covariates the fixed effect of Trauma was not statistically significant. The Type III tests of fixed effects for this analysis are found in Table 65. The estimate of the main effect of Trauma was not statistically significant, $ß = -.31$, $t\ (142) = -1.80$, $p = .07$.

In sum, the results of tests of Secondary Hypothesis 1 were not statistically significant. When the main effect of Trauma for GIAverageFrequency, GItotal and GIfreqmax was tested using 2x 2 repeated measures ANOVAs with and without covariates and linear mixed model analyses with and without covariates, the results were not statistically significant.

Test of Secondary Hypothesis 2

This hypothesis states that individuals with a family history of IBS will have higher levels of gastrointestinal symptoms.

To test this hypothesis I first reviewed the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with average frequency of gastrointestinal symptoms (GI average frequency 1/GI average frequency 2) as the within-participant dependent variable. There was a significant between-participant main effect for FhxIBS. Individuals with a family history of IBS reported a significantly higher average frequency of gastrointestinal symptoms when compared to individuals without a family history of IBS. Results for all 5 imputations are displayed in Table 39.

I then reviewed the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GItotal (GItotal1/GItotal 2) as the within-participant

dependent variable. The main effect for FhxIBS was statistically significant. Results for all 5 imputations are displayed in Table 40.

I then conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIfreqmax as the within-participant dependent variable (GIfreqmax 1/GIfreqmax 2). The difference between individuals with a family history of IBS and individuals without a family history of IBS was statistically significant. Results for all 5 imputations are displayed in Table 41.

When GIAverageFrequency was added into a linear mixed model as a dependent variable, Trauma and FhxIBS were entered as fixed effects and Time was entered as a repeated measure and a fixed effect, the fixed effect estimate for FhxIBS was statistically significant. The results of tests of Type III fixed effects for this analysis are found in Table 42. The estimate of the main effect of FhxIBS was statistically significant, $ß = -.11$, $t\ (148) = -2.51$, $p < .05$. When GItotal was added into a linear mixed model as a dependent variable, Trauma and FhxIBS were entered as fixed effects and Time was entered as a repeated measure and a fixed effect, the fixed effect estimate for FhxIBS was statistically significant. The results of tests of Type III fixed effects for this analysis are found in Table 43. The estimate of the main effect of FhxIBS was statistically significant, $ß = -4.02$, $t\ (148) = -2.48$, $p<.05$. When GIfreqmax was included in a linear mixed model as a dependent variable, FhxIBS and Trauma were entered into the model as fixed factors and Time was entered as a repeated measure and a fixed factor the fixed effect of FhxIBS was statistically significant. The results of the tests of Type III fixed effects for this analysis are found in Table 44. The estimate of the fixed effect of FhxIBS was not statistically significant, $ß = -.17$, $t\ (148) = -1.66$, $p = .10$.

I also reviewed the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVAs for GIAverageFrequency, GItotal and GIfreqmax that included Sleep1, Sleep2, Caffeine1, Caffeine2, LEQ1, LEQ2, ICSRLE1, and ICSRLE2 as covariates and also included confounding variables. There was a significant between-participant main effect of FhxIBS for GIAverageFrequency. Individuals with a family history of IBS reported a significantly higher average frequency of gastrointestinal symptoms when compared to individuals without a family history of IBS. Results for all 5 imputations are displayed in Table 60. There was also a statistically significant between-participants main effect of FhxIBS for GItotal. Results for all 5 imputations are displayed in Table 61.

The 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with GIfreqmax as the within participant dependent variable (GIfreqmax 1/GIfreqmax 2) that included Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 as covariates and Semester as a grouping variable did not indicate a statistically significant difference between individuals with a family history of IBS and individuals without a family history of IBS with regard to GIfreqmax. Results for all 5 imputations are displayed in Table 62.

I then reviewed results of the fixed effects linear mixed model analyses for GIAverageFrequency, GItotal and GIfreqmax. When GIAverageFrequency was added into a linear mixed model as a dependent variable, Race, Trauma and FhxIBS were entered as fixed effects, Time was entered as a repeated measure and a fixed effect, and Caffeine, Sleep, LEQ and ICSRLE were entered as covariates the fixed effect estimate for FhxIBS was statistically significant. The results of tests of Type III fixed effects for this analysis are found in Table 63**.** The estimate of the main effect of FhxIBS was statistically significant, $ß = -.11$, $t\ (142) = -2.67$, p

<.01. When GItotal was added into a linear mixed model as a dependent variable, Trauma and FhxIBS were entered as fixed effects, Time was entered as a repeated measure and a fixed effect, and Caffeine, Sleep, LEQ and ICSRLE were entered as covariates the fixed effect estimate for FhxIBS was statistically significant. The results of tests of Type III fixed effects for this analysis are found in Table 64. The estimate of the main effect of FhxIBS was statistically significant, *ß* = -4.00, *t* (144) = -2.85, *p*<.01. When GIfreqmax was included in a linear mixed model as a dependent variable, FhxIBS, Trauma and Semester were entered into the model as fixed factors, Time was entered as a repeated measure and a fixed factor, and Caffeine, Sleep, LEQ and ICSRLE were entered as covariates the fixed effect of FhxIBS was statistically significant. The results of the tests of Type III fixed effects for this analysis are found in Table 65. The estimate of the fixed effect of FhxIBS was statistically significant, *ß* = -.21, *t* (142) = -2.17, *p* <.05.

In sum, results of the 2 x 2 repeated measures ANOVAs and the linear mixed model Analyses for GIAverageFrequency, GItotal and GIfreqmax indicated a significant main effect for FhxIBS. When the 2 x 2 repeated measures ANOVAs and the linear mixed model analyses were re-run with the inclusion of covariates and confounding variables the main effect of FhxIBS was statistically significant for GItotal and GIAverageFrequency. The linear mixed model analysis for GIfreqmax that included covariates and confounding variables indicated a statistically significant main effect for FhxIBS, but this effect was not significant for GIfreqmax when analyzed using a 2 x 2 repeated measures ANOVA that included covariates and confounding variables.

Test of Secondary Hypothesis 3

This hypothesis stated that individuals with a history of childhood trauma will have higher levels of non-gastrointestinal somatic symptoms.

To test this hypothesis I conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PHQ as the within-participant dependent variable (PHQ1/PHQ2). The between-participant main effect for Trauma was not significant. The results of this ANOVA are presented in Table 69. When PHQ was included in a linear mixed model as a dependent variable, FhxIBS and Trauma were entered into the model as fixed factors and Time was entered as a repeated measure and a fixed factor the fixed effect of Trauma was not significant. The results of the tests of Type III tests of fixed effects for this analysis are found in Table 70. The estimate of the main effect for Trauma was not statistically significant, ß = -.61, t (148) = -1.47, p =.14.

To test for potentially confounding variables, I evaluated the within-participant and between-participant effects for PHQ with regard to Gender, Ethnicity, Race and Semester with repeated measures ANOVAs that included PHQ as the dependent within-participant variable. There were no significant differences between male and female participants with regard to PHQ (see Table 72). There were no significant differences between individuals who reported that they were of Hispanic or Latino origin and those individuals who did not report that they were of Hispanic or Latino origin with regard to PHQ (see Table 73). There were no differences in PHQ with regard to race (see Table 74). There were no significant differences in PHQ related to Semester (beginning of spring semester, second half of spring semester and summer semester). Results of the repeated measures ANOVA with PHQ entered as the within-participant dependent variable and Semester entered as a factor are reported in Table 75.

I then conducted a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PHQ as the within-participant dependent variable (PHQ1/PHQ2) that included Sleep, ICSRLE, LEQ and Caffeine as covariates. The between-

participant main effect for Trauma was again not significant (see Table 76). When PHQ was included in a linear mixed model as a dependent variable, FhxIBS and Trauma were entered into the model as fixed factors, Time was entered as a repeated measure and a fixed factor and Sleep, ICSRLE, LEQ and Caffeine were entered as covariates the fixed effect of Trauma was not significant. The results of the tests of Type III tests of fixed effects are found in Table 77. The estimate of the main effect for trauma was not statistically significant, $ß = -.54$, $t\ (144) = -1.49$, $p = .14$.

In sum, Secondary Hypothesis 3 was initially tested by conducting a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PHQ as the within-participant dependent variable (PHQ1/PHQ2). This hypothesis was then tested using linear mixed model analysis with PHQ as the dependent variable. Both the 2x 2 ANOVA and the linear mixed model analyses were then re-run with the inclusion of covariates. The results of all four analyses did not indicate a statistically significant main effect for Trauma.

Test of Secondary Hypothesis 4

This hypothesis stated that individuals with a family history of IBS will have higher levels of non-gastrointestinal somatic symptoms.

To test this hypothesis I reviewed the previously conducted 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PHQ as the within-participant dependent variable (PHQ1/PHQ2). The results of this ANOVA are presented in Table 69. There was no significant between-participant main effect for FhxIBS. The linear mixed model Type III tests of fixed effects indicated that the fixed effect of FhxIBS was not statistically significant. The tests of Type III fixed effects for this analysis are found in Table 70.

The estimate of the main effect for FhxIBS was statistically significant, *ß* = -.47, *t* (148) =-2.00, *p*<.05.

I also reviewed the previously conducted 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PHQ as the within-participant dependent variable (PHQ1/PHQ2) and Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 added into the model as covariates. The results of this ANOVA are presented in Table 75. There was no significant between-participant main effect for FhxIBS. When a linear mixed model was used to test this hypothesis the fixed effect of FhxIBS was not statistically significant. The tests of Type III fixed effects for this analysis are found in Table 76. The estimate of the main effect for FhxIBS was statistically significant, *ß* = -.46, *t(*144*)* =-2.28, *p*<.05.

In sum, Secondary Hypothesis 4 was initially tested by conducting a 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PHQ as the within-participant dependent variable (PHQ1/PHQ2). This hypothesis was then tested using linear mixed model analysis with PHQ as the dependent variable. Both the 2x 2 ANOVA and the linear mixed model analyses were then re-run with the inclusion of covariates. The results of all four of these analyses did not indicate a statistically significant main effect for FhxIBS.

Test of Secondary Hypothesis 5

This hypothesis stated that individuals with a history of childhood trauma will have higher levels of perceived stress than individuals without a history of childhood trauma.

To test this hypothesis I reviewed the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within participant dependent

variable (PSS1/PSS2). There was no significant between-participant main effect for Trauma. Results of this ANOVA are presented in Table 16.

I also reviewed the results of the linear mixed model analysis with FhxIBS, Trauma and Time entered as fixed factors and Time entered as a repeated measure. The fixed effect of Trauma was not statistically significant. The results of tests of Type III fixed effects for this analysis are found in Table 17. The estimate of the main effect of Trauma was not statistically significant, $ß = 2.17$, $t\ (148) = .56$, $p = .58$.

I then reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within participant dependent variable (PSS1/PSS2). Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 were added into the model as covariates. There was no significant between-participant main effect for Trauma. Results of this ANOVA are presented in Table 36.

Lastly, I reviewed the results of the linear mixed model analysis with FhxIBS, Trauma and Time (pre-examination period/examination period) entered as fixed factors, Time entered as a repeated measure, Caffeine, Sleep, ICSRLE and LEQ as covariates and PSS as the dependent variable. The fixed effect of Trauma was marginally significant. The results of tests of Type III fixed effects for this analysis are found in Table 37. The estimate of the main effect of Trauma was not statistically significant, $ß = 3.66$, $t\ (144) = 1.31$, $p = .19$.

In sum, to test Secondary Hypothesis 5 I reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within-participant dependent variable. I also tested Secondary Hypothesis 5 by reviewing the results of the linear mixed model analyses for PSS. Lastly, I reviewed the results of the 2x2

ANOVA and the linear mixed model analyses that were run with the inclusion of covariates. These analyses did not indicate a statistically significant main effect of Trauma for PSS.

Test of Secondary Hypothesis 6

This hypothesis stated that individuals with a family history of IBS will have higher levels of perceived stress than individuals without a family history of IBS.

To test this hypothesis I again reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within participant dependent variable. There was no significant between-participant main effect for FhxIBS. The results of this analysis are presented in Table 16.

I also reviewed the results of the linear mixed model analyses. For this analysis FhxIBS and Trauma were entered as fixed factors, Time was entered as a repeated measure and a fixed effect, and PSS was entered as the dependent variable. The fixed effect of FhxIBS was marginally significant. Results of tests of Type III fixed effects for this analysis are found in Table 17. The estimate of the main effect of FhxIBS was not statistically significant, $ß$ =.56, t (148) = .25, p =.80.

I then reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within participant dependent variable (PSS1/PSS2) and Sleep1, Sleep2, LEQ1, LEQ2, ICSRLE1, ICSRLE2, Caffeine1 and Caffeine2 added into the model as covariates. There was no significant between-participant main effect for FhxIBS. The results of this analysis are presented in Table 36.

Lastly, I reviewed the results of the linear mixed model analyses that included covariates. For this analysis FhxIBS and Trauma were entered as fixed factors, Time was entered as a repeated measure and a fixed effect, Caffeine, Sleep, ICSRLE and LEQ were included as

covariates and PSS as the dependent variable. The fixed effect of FhxIBS was not statistically significant. Results of tests of Type III fixed effects for this analysis are found in Table 37. The estimate of the main effect of FhxIBS was not statistically significant, *ß* =.78, *t* (144) = .49, *p* =.62.

In sum, to test Secondary Hypothesis 6 I reviewed the results of the 2 (family history of IBS/no family history of IBS) x 2 (trauma/no trauma) repeated measures ANOVA with PSS as the within-participant dependent variable. I also tested Secondary Hypothesis 6 by reviewing the results of the linear mixed model analyses for PSS. Lastly, I reviewed the results of the 2x2 ANOVA and the linear mixed model analyses that were run with the inclusion of covariates. These analyses did not indicate a statistically significant main effect of FhxIBS for PSS.

Exploratory Analyses

Exploratory analyses were conducted to evaluate the relationships between different types of trauma (emotional abuse, physical abuse, sexual abuse, emotional neglect and physical neglect) and gastrointestinal symptoms and non-gastrointestinal somatic symptoms in response to the examination stressor. To evaluate the relationships among types of trauma and non-gastrointestinal somatic symptoms I calculated bivariate correlations among EA, PA, SA, EN, PN, GIAverageFrequency, GItotal, GIfreqmax and PHQ. EA was significantly correlated with PSS1, PSS2, GIAverageFrequency1, GIAverageFrequency2, GItotal1, and GIfreqmax2. PA, SA, EN, and PN were not significantly correlated with gastrointestinal symptom or somatic symptom variables. Correlations between EA, PA, SA, EN, PN and GIAverageFrequency, GItotal, GIfreqmax and PHQ are reported in Table 77.

Discussion

Approximately 10%-20% of adults suffer from Irritable Bowel Syndrome (Locke, 1996; Gschossmann, Haag, & Holtmann, 2001; Katsinelos, et al., 2009; Kubo et al., 2011). Despite the relatively high prevalence of IBS and the significant physical, psychological and financial impact of IBS (Longstreth et al., 2003), the etiology of this disorder is still unclear. Drossman and colleagues (1995) in a review of the literature evaluating abuse and IBS posited that individuals who experience abuse are likely to experience psychological distress and this distress amplifies GI symptoms in individuals who are already susceptible to the development of gastrointestinal illness. This suggests that individuals who present with early life factors such as genetic and/or family environment risk factors specific to the development of gastrointestinal illness are more likely to develop gastrointestinal symptoms following abuse. Drossman and colleagues (1994) propose a number of possible mechanisms for the relationships among susceptibility to gastrointestinal illness, psychological disturbances and the development of gastrointestinal symptoms.

One proposed mechanism is that psychological distress can produce exaggerated intestinal motility and abdominal discomfort through changes in the central nervous system and/or through autonomic pathways and that this occurs to a greater degree in individuals who are already susceptible to experiencing a bowel disorder. In support of this mechanism, research has indicated that IBS is heritable and that both genetics and family environment likely play a role in the development of IBS. Studies also indicate that, when compared to individuals without IBS, individuals with IBS show increased alterations in response to stressors and that stress impacts gastrointestinal symptoms (Blanchard, 2008; Elsenbruch, Lovallo, William, & Orr, 2001; Levy, Cain, Jarett, & Heitkemper, 1996; Plante, Lawson, Kinney, & Mello, 1998). Other studies suggest that individuals with IBS are also more likely than individuals without IBS to

have a history of childhood trauma, that individuals with a history of trauma are more likely to be diagnosed with IBS and that a history of trauma influences reporting of gastrointestinal symptoms (Drossman et al., 1995; Felitti, 1991;Lechner, Vogel, Garcia-Shelton, Leichter & Steibel 1993;Talley, Helgeson & Zinsmeister, 1992). Studies have further demonstrated that individuals with a history of childhood abuse display increased reactivity to a psychosocial stressor (Heim, et al., 2002) and that individuals with both IBS and a history of abuse have poorer health outcomes and increased responsivity to stressors when compared to individuals with only one of these risk factors or neither or these risk factors (Ringel, 2008).

In sum, the current research supports an influence of genetics, family environment and physical, sexual and emotional abuse on gastrointestinal symptoms and indicates the presence of relationships among abuse, IBS and response to stressors. Thus far, many studies evaluating IBS and risk factors for IBS focus on either children who have risk factors for IBS or adults who have been diagnosed with IBS, but there is a lack of research evaluating reactivity to stress in young adults who have risk factors for IBS but have not yet developed IBS. Understanding the relationships among stress, gastrointestinal symptoms and non-specific and specific risk factors for IBS can help us better understand whether the relationship between early life factors and development of gastrointestinal symptoms is moderated by the presence of less specific predisposing factors such as history of childhood trauma. The purpose of the current study was to expand our understanding of how a non-specific predisposing factor such as childhood trauma interacts with risk factors for IBS such as a family history of IBS and somatic symptoms to influence experience or amplification of gastrointestinal symptoms.

More specifically, the aim of this study was to evaluate gastrointestinal symptom and perceived stress response to a transient stressor in young adults with both non-specific (history of

childhood trauma) and specific (family history of IBS) risk factors for Irritable Bowel Syndrome. This study hypothesized: 1) The mean change in perceived stress between Time 1 and Time 2 would be higher in the group of individuals who experienced childhood trauma than in those participants without a history of childhood trauma, 2) The mean change in perceived stress between Time 1 and Time 2 would be higher for individuals with a family history of IBS compared to individuals without a family history of IBS, 3) Individuals with a family history of IBS would report a greater change in gastrointestinal symptoms in response to exam stress than individuals without a family history of IBS, 4) Individuals with a history of childhood trauma would have a greater change in gastrointestinal symptoms in response to an examination stressor than individuals without a history of childhood trauma and 5) The greatest increase in perceived stress levels would occur in individuals with both a family history of IBS and a history of childhood trauma.

Secondary aims of this study were to evaluate between group differences in overall levels of gastrointestinal symptoms, non-gastrointestinal somatic symptoms and perceived stress in individuals with and without specific (family history of IBS) and non-specific (history of childhood trauma) risk factors for IBS. Secondary hypotheses of this study included: 1) Individuals with a history of childhood trauma would have higher levels of gastrointestinal symptoms than individuals without a history of childhood trauma, 2) Individuals with a family history of IBS would have higher levels of gastrointestinal symptoms than individuals without a family history of IBS, 3) Individuals with a history of childhood trauma would have higher levels of non-gastrointestinal symptoms than individuals without a history of childhood trauma, 4) Individuals with a family history of IBS would have higher levels of non-gastrointestinal symptoms than individuals without a family history of IBS, 5) Individuals with a history of

childhood trauma would have higher levels of perceived stress than individuals without a history of childhood trauma and 6) Individuals with a family history of IBS would have higher levels of perceived stress than individuals without a family history of IBS. This study also sought to conduct exploratory analyses to further evaluate the relationships among emotional abuse, physical abuse, sexual abuse, emotional neglect and physical neglect and gastrointestinal symptoms and non-gastrointestinal somatic symptoms.

Overall, the current study did not provide support for the primary study hypotheses. Before discussing specific tests of hypotheses, I will comment on several issues that arose during the conduct of the study and in the analysis of the results. These factors could have contributed to the patterns of null results, so it is important that they be discussed in depth.

One factor contributing to the null findings of the current study is the fact that the cells analyzed in the study analyses are unbalanced and some cells had very few respondents. There were significantly fewer individuals with a family history of IBS than individuals without a family history of IBS. The relatively low number of participants who reported a family history of IBS (n =12) and the very low number of participants with a family history of IBS who did not also report a history of childhood trauma (n= 4) significantly limits the power of this study's analyses, particularly those analyses comparing means among all four groups of participants in this study (individuals with a family history of IBS and without a history of childhood trauma, individuals with a family history of IBS and a history of childhood trauma, individuals without a family history of IBS and with a history of childhood trauma and individuals with neither a family history of IBS nor a history of childhood trauma). Based upon the rates of individuals diagnosed with IBS in the general population (10-20%), I expected that the proportion of individuals reporting a family history of IBS would be lower when compared to individuals

without a family history of IBS. However, between 13-50% of individuals with functional gastrointestinal disorders also report a history of abuse, as such, I expected that, at most, half of the individuals who reported a family history of IBS would also report a history of abuse. I was surprised to find that such a high proportion (75%) of individuals with a family history of IBS also reported a history of childhood trauma. Below I will discuss a number of possible explanations for this surprisingly disproportionate distribution of participants.

One aspect of the study design that potentially contributed to the small number of participants who reported a family history of IBS was the use of probands to evaluate history of IBS in first-degree relatives. Although there is some support from prior studies that suggest probands provide an accurate report of history of chronic medical illness in their relatives (Bensen et al. 1999), gastrointestinal disorders and gastrointestinal symptoms might be less openly discussed even in immediate families than symptoms of other chronic illnesses. As a result, participants in this study might have underreported the presence of family members with a history of IBS; this would be consistent with the findings of a pilot study indicating that individuals are likely to underestimate the frequency of IBS in their relatives (Saito, Petersen, Lock et al., 2008). However, although the number of participants in this study who endorsed a family history of IBS was low compared to the number of individuals without a family history of IBS and/or a history of childhood trauma, 20% of the participants in this study reported that they have at least one family member that had been diagnosed with IBS or who has symptoms suggesting a diagnosis IBS; this is consistent with reports that between 10 and 20% of individuals in the general population have been diagnosed with IBS. I attempted to increase the number of participants in this study who reported a family history of IBS by contacting

individuals who reported that they were interested in participating in research and indicated that they had a family history of IBS, but this procedure had limited success.

A second factor that contributed to the different numbers of participants in each cell of the primary study analyses is the relatively large number of study participants that endorsed a history of childhood trauma. The Adverse Childhood Experiences (ACE) study, a large scale study evaluating the relationship between health factors and adverse childhood experiences in 17,337 adults, found that over half (52%) of study participants experienced at least 1 adverse experience in childhood. In contrast, in the current study 69% of participants endorsed a history of childhood trauma. This was higher than expected based on the findings of the ACE study, particularly since the ACE study evaluated exposure to violent treatment of mother or stepmother, mental illness, and substance abuse and criminal behavior in the household in addition to the 5 types of trauma evaluated in the current study. Additionally, although studies suggest that up to half of individuals with a functional bowel disorder report a history of sexual abuse and that individuals with a history of abuse are more likely to report gastrointestinal symptoms (Drossman, 1990; Felitti, 1991), little is known about the rates of abuse in individuals with a family history of IBS. The current study found that, of the participants included in the study, 75% of the participants who endorsed a family history of IBS also reported a history of abuse; again this was higher than expected.

A second factor contributing to the null findings of the current study is that there was no strong indication that the transient stressor was perceived as significantly stressful. Although study participants reported that the exam period was somewhat stressful (approximately a 4.0 on a scale where 0 = not at all stressful and-6= extremely stressful), there was no significant difference between perceived stress levels at Time 1 and perceived stress levels at Time 2. This

again was surprising as a number of studies evaluating a transient examination stressor found that this type of stressor increased psychological distress in a sample of undergraduate students (Knowles et al., 2008;Murphy, Denis, Ward & James, 2010; Weekes, et al. 2006).

One possible explanation for the weak effect of the transient stressor is that participants were asked to rate their perceived stress levels using a global measure of stress (PSS-10) and were not asked directly about acute stress levels. A recent study indicated that when students were asked whether they felt "more stressed than normal this week" they reported increased levels of stress during an examination period when compared to a non-examination period. However, the responses of these students to a general measure of perceived stress (PSS-10) did not indicate an increase in perceived stress between the non-examination period and the examination period (Murphy et al., 2010). It is therefore possible that if a measure of acute perceived stress such as the one used by Murphy et al. (2010) were included in this study I would have detected an increase in perceived stress between the pre-examination period and the examination period.

A second explanation is that the “low stress” period chosen for this study was too stressful. At this university the timing of examinations and other major assignments might result in a relatively small difference in levels of perceived stress experienced between examination and pre-examination periods.

Third, it is possible that students were assessed at a time point that was too close to the examination period. Although previous studies have indicated that an examination period is an effective transient stressor, there is little research investigating the ideal time period between the pre-examination and the examination periods. Students were not allowed to participate in this study during the two weeks prior to the examination period. However, it is possible that a longer

period between the pre-examination period and the examination period would have resulted in a stronger stressor effect.

A fourth explanation is that 14 of the 78 participants completed the second web assessment following the first exam of the semester whereas the remaining participants completed the second web assessment during their final exam period. This occurred because there was a change in the design of the study that was implemented to account for a slow rate of participant recruitment and changes in participant recruitment guidelines that were made after recruitment for this study began. The original design for this study was that participants would complete web assessment 1 and the Childhood Trauma Questionnaire two weeks prior to the first exam of the semester and then complete a second web assessment within 24-48 hours following the first exam of the semester. The initial study design was revised to allow students to participate in this study during any week they did not have an exam and at least two weeks prior to their final exam week. Students were allowed to complete the second web assessment during their final exam week. It is possible that study participants experienced the final examination period as stressful but did not find the first examination of the semester to be as stressful, or that participants found the first examination of the semester as stressful but did not find the final examination particularly stressful. To account for this design change and to evaluate any potential differences between individuals who participated in this study before this design change occurred, I conducted repeated measures ANOVAs to determine if there were differences in outcome variables related to time of study participation (first part of spring semester, second part of spring semester or summer semester). These analyses indicated that there were no differences among participants who participated in the study during the first part of spring semester, during the second part of spring semester, and participants who participated in the study during the

summer semester with regard to perceived stress, non-gastrointestinal somatic symptoms, average gastrointestinal symptoms or total gastrointestinal symptoms. However, analyses indicated that there were differences among participants who participated in the study during first part of spring semester, during the second part of spring semester and participants who participated in the study during summer semester with regard to the maximum frequency of gastrointestinal symptoms reported over time. To adjust for these between-participant differences I included Semester as a factor when conducting analyses of maximum gastrointestinal frequency that included covariates.

Fifth, participants completed the first web assessment at different time points throughout the spring and summer 2010 semesters. Students were evaluated at least 2 weeks before their final exam period; however, the time period during which participants completed the first assessment ranged from the first week of the semester to 2 weeks before the final exam period. The difference between the time participants filled out the first web assessment and the time participants completed WA2 varied for each participant. The unequal time period between the pre-exam period and the examination period and the potential variability added by using two different transient stressors (first examination of the semester and final examination period) could have contributed to some of the variability in the research findings.

To account for the presence of unbalanced groups, the main study analyses were also run using a mixed model. The use of a linear mixed model is better at handling unbalanced designs when compared to the GLM and allows for violations of the assumption of sphericity. To account for the lack of difference in reports of perceived stress between Time 1 and Time 2, in addition to the planned analyses the primary hypothesis were also tested including data only from participants who experienced an increase in perceived stress between Time 1 and Time 2.

However, only including data from participants that experienced an increase in perceived stress further limited the power of the study analyses, particularly for those hypotheses evaluating participants with a family history of IBS.

I now turn to a discussion of the results for each hypothesis.

Hypothesis 1

This hypothesis states that the mean increase in perceived stress in response to examination stress will be higher in the group of individuals who experienced childhood trauma than in those participants without a history of childhood trauma.

This hypothesis was not supported. The mean increase in perceived stress in response to the transient academic stressor was not significantly different between individuals with a history of childhood trauma and individuals without a history of childhood trauma. There are several possible reasons for these null findings. First, this study evaluated response to a stressor using self-report measures. Previous studies that found an increased response to a stressor in individuals with a history of childhood trauma evaluated physiological stress reactivity and did not evaluate subjective reports of the stress experience (Heim et.al., 2002). The discrepancy between the current findings and those of Heim and colleagues (2002) might indicate that individuals with a history of trauma are not aware of their physiological reactivity to a stressor. These individuals might not report a stressor as stressful; however, they still might respond physically to this stressor.

Second, as mentioned above, the stressor paradigm employed in this study may not have been effective in generating perceived stress responses. This would reduce the possibility of finding group differences. Analyses suggest that individuals who participated in this study did not experience a significant change in perceived stress between the pre-examination period and

the examination period. However, when only individuals that reported an increase in perceived stress levels between Time 1 and Time 2 were included in the analysis there was no difference in change in perceived stress between individuals with a history of childhood trauma and individuals without a history of childhood trauma. This supports the finding that there was no difference in perceived stress reactivity between individuals with a history of childhood trauma and individuals without a history of childhood trauma. However, the power to detect differences with this analysis was extremely low when data from individuals who did not experience an increase in perceived stress was excluded from the analyses, which again reduced the possibility of finding group differences.

A third possibility is that individuals with a history of childhood trauma and individuals without a history of childhood trauma differ in their emotional reactivity to a stressor (e.g. increase in negative affect or decrease in positive affect) but they might not differ with regard to perceived stress reactivity. This would be consistent with the findings by Glaser, van OS, Portegijs and Myin-Germeys (2006) demonstrating an increase in negative affect but not perceived stress in response to daily stressors.

A fourth factor contributing to the null findings of the current study is the type of stressor studied. The perceived stress reactivity might differ with different types of stressors. For example, there might be a difference between these two groups when the stressor of interest is a social evaluative stressor (e.g. job interview or interpersonal conflict), a notion that is also supported by Heim (2002).

A fifth potential explanation is that perceived stress reactivity is better evaluated using momentary assessments rather than relying on retrospective reports of perceived stress. However, an ecological momentary assessment design study of response to daily hassle stressors

in individuals who experienced physical trauma before the age of 19 found that individuals with a history of physical trauma had a significant increase in negative affect in response to daily stressors but did not report an increase in perceived stress to daily stressors (Glaser, van Os, Portegijs & Myin-Germeys, 2006).

Sixth, it is possible that the difference in reactivity to a transient stressor is related to the type of childhood trauma experienced and/or the severity of that trauma. The primary analyses for this study did not differentiate among types of trauma or severity of trauma. Individuals who reported sexual abuse, physical abuse, physical neglect, emotional abuse and emotional neglect were included in the history of childhood trauma group, regardless of ratings of severity of abuse.

Seventh, this study focused on history of childhood trauma and did not assess presence of trauma after the age of 18. Some studies suggest that the experience of abuse in childhood is closely related to abuse in adulthood (Coid, Petruckevitch, Feder, Chung, Richardson, & Moorey, 2001); however, other studies suggest that even when controlling for adulthood trauma, a history of childhood trauma significantly predicts responsiveness to stressors (Heim, 2002).

Hypothesis 2

This hypothesis states that the mean increase in perceived stress will be higher for individuals with a family history of IBS compared to individuals without a history of IBS.

This hypothesis was not supported. This result was surprising, as a number of studies suggest a relationship between reactivity to a stressor and IBS (Bach, Erdmannd, Schmidtmann & Monnikes, 2006; Bohmelt et al. 2005; Elsenbruch, & Orr, 2001, Fukudo, & Suzuki 1987). There are many possible explanations for the discrepancy between the current findings and those of previous laboratory studies. First, the current study evaluated perceived stress reactivity to a

stressor rather than a physiological response to a stressor. However, at least one laboratory study failed to find a significant difference between patients with IBS and patients without IBS with regard to physiological reactivity to a laboratory stressor (Payne, Blanchard, Holdt & Schwartz, 1992).

A second possibility is the following: increased reactivity to stressors could develop following development of IBS and would not be present prior to development of IBS. The current study evaluated individuals who are susceptible to the development of gastrointestinal illness but who have not been diagnosed with IBS. Third, the type of stressor evaluated in this study, a transient academic stressor, does not produce the same increase in perceived stress as would a laboratory stressor. Previous studies that have found a difference between individuals with IBS and individuals without IBS used a laboratory stressor to evaluate this relationship (Heim, 2002). Fourth, individuals might not experience a change in perceived stress in response to a stressor but might differ with regard to overall perceived stress levels. Studies evaluating the relationship between perceived stress response to a laboratory stressor and IBS diagnosis support this hypothesis (Murray, et al., 2004; Plante, Lawson, Kinney, & Mello, 1998; Elsenbruch, Lovallo, Orr, 2001).

A fifth possibility for the null findings of the current study is that the transient stressor chosen in this study was not stressful enough, or the students that participated in this study simply do not find exams very stressful. However, when only individuals who experienced an increase in perceived stress reactivity between Time 1 and Time 2 were included in the study analyses the difference in perceived stress levels between Time 1 and Time 2 was not different between individuals with a family history of IBS and individuals without a family history of IBS. This provides support for the conclusion that there might not be a difference in perceived stress

reactivity in individuals with a family history of IBS and individuals without a family history of IBS. However, as noted previously, only including data from participants who experienced an increase in perceived stress from Time 1 to Time 2 significantly decreased the power to detect group differences. In sum, previous studies support the argument that individuals with IBS might have an increased physiological reactivity to a stressor; however, so far there is little support for the hypothesis that there is a difference between individuals with IBS and individuals without IBS with regard to perceived stress reactivity.

Hypothesis 3

This hypothesis states that individuals with a family history of IBS will report a higher change in gastrointestinal symptoms in response to exam stress than individuals without a family history of IBS.

This hypothesis was not supported. The change in gastrointestinal symptoms in response to exam stress was not significantly different between individuals with a family history of IBS and individuals without a family history of IBS when this effect was tested with a 2 x 2 ANOVA. When sleep, caffeine consumption, life events and daily hassles were added into the model as covariates and time of study participation (first part of spring semester, second half of spring semester, or summer semester) was added as a grouping variable, the within-participant by between participant interaction between time (pre examination period/examination period) and family history of IBS was statistically significant for maximum frequency of gastrointestinal symptoms. The discrepancy between this result and those found when covariates were not included might be due to the fact that the addition of covariates reduces the within-group variability against which the effects of the stressor were compared allowing for a greater chance of finding between-participant differences. The Time by maximum frequency of GI symptoms

interaction was again not statistically significant when this effect was tested using a linear mixed model. One explanation for the discrepancy between the findings of this analysis and the results of the repeated measures ANCOVA is that in cases when the assumption of sphericity is violated ANOVAs tend to inflate the F-statistic indicating that when the sphericity assumption is violated it is more likely that the null hypothesis will be falsely rejected. Linear mixed models allow for the violation of the assumption of sphericity. In the current study the assumption of sphericity was violated; this suggests that the linear mixed model analyses might be the more accurate test of the statistical significance for the current study.

The Time by total GI symptoms interaction was marginally significant when tests of this interaction only included individuals with an increase in PSS. Potentially, with a larger number of participants and a resulting increase in power, this effect could be tested more effectively.

One possibility for the null findings of these analyses is that the type of stressor chosen for this particular study, a transient academic stressor, did not produce the same reactivity to stress as would a daily hassle stressor. Previous studies suggesting a relationship between gastrointestinal symptoms and stress in individuals diagnosed with IBS did not use a transient academic stressor (Blanchard, 2008; Dancey, Whitehouse & Backhouse, 1995; Dancey, Whitehouse, Painter & Backhouse, 1995; Levy, Cain, Jarrett & Heitkemper 1997; Suls, Wan, and Blanchard, 1994).

A second possibility for the null findings of the current study is that the current stressor was too weak. Although previous studies indicate that an examination period is generally perceived as stressful and is related to higher levels of gastrointestinal symptoms (Knowles, Nelson & Palombo, 2008), the exam period at this particular university might not be perceived as stressful or the students in this study might have been assessed at a point that was too close to

their examination period (participants could complete the first assessment up to two weeks prior to the examination period). However, when the study analyses only included individuals who experienced an increase in perceived stress levels between Time 1 and Time 2 the difference in change in gastrointestinal symptoms between individuals with a family history of IBS and individuals without a family history of IBS was again not statistically significant.

Hypothesis 4

This hypothesis states that individuals with a history of childhood trauma will have a greater change in gastrointestinal symptoms in response to an examination stressor than individuals without a history of childhood trauma.

This hypothesis was not supported. The current study did find not find a difference in change in total symptoms or change in average GI symptom frequency in response to a transient stressor between individuals with a history of childhood trauma and individuals without a history of childhood trauma. The interaction between Time and history of childhood trauma was statistically significant for maximum frequency of GI symptoms and remained statistically significant after controlling for sleep, caffeine intake, daily hassles, life events and time during which the participants participated in the study, when this relationship was evaluated using a linear mixed model analysis and when only participants who experienced an increase in perceived stress between Time 1 and Time 2 were included in the study analyses. The results indicate that individuals who do not report a history of childhood trauma have a greater *decrease* in the maximum GI symptom frequency reported between the pre-examination period and the examination period. Individuals who have a history of childhood trauma experience a slight increase in maximum GI symptom frequency reported; however, individuals without a history of trauma experience a decrease in maximum frequency of GI symptoms between the pre-

examination period and the examination period. In contrast to the current findings, at least one previous study suggested that healthy individuals report higher levels of gastrointestinal symptoms during an examination period when compared to a week without exams (Knowles, Palombo, 2008). The discrepancy between these findings and those of the current study might be attributed to the fact that individuals in the current study did not experience the exam period as stressful. However, as mentioned previously, when only individuals that experienced an increase in perceived stress levels were included in this study the results still indicated that individuals without a history of childhood trauma experienced a larger decrease in maximum frequency of GI symptoms than individuals with a history of childhood trauma.

A second possible explanation is that the relationship between childhood trauma and maximum gastrointestinal symptom frequency is influenced by family history of IBS; the significant Time by family history of IBS by history of childhood trauma interaction provides support for this explanation.

A third possible explanation for the study findings is that individuals without a history of childhood trauma experienced higher levels of other types of stressors (e.g. daily hassle stressors and life events) before the examination period, and as a result the examination period was a period of comparatively lower stress. There is some support for this as the mean number of life events experienced by individuals without a history of childhood trauma decreased from 2.4 during the pre-examination period to 1.38 during the examination period. Also, individuals without a history of childhood trauma reported a lower frequency of daily hassles during the examination period (82.28) when compared to the period of time before the examination period (85.42).

Fourth, previous research demonstrated that individuals with a history of abuse report a higher level of gastrointestinal symptoms than individuals without a history of abuse (Rimza, Berg, & Locke, 1988;Felice et al., 1978;Lechner, Vogel, Garcia-Shelton, Leichter, & Steibel 1993; Felitti, 1991). In contrast to these previous studies, the current study evaluated the difference in change in gastrointestinal symptoms in response to a stressor between individuals who experienced childhood trauma and individuals without a history of childhood trauma.

The results of the current study suggests that there is a difference in change in maximum frequency of gastrointestinal symptoms reported in response to an examination stressor, but in contrast to expectations individuals without a family history of childhood trauma experienced a decrease in maximum frequency of GI symptoms reported.

Hypothesis 5

This hypothesis states that the greatest increase in perceived stress levels will occur in individuals with both a family history of irritable bowel syndrome and a history of childhood trauma.

This hypothesis was not supported. There was no statistically significant within-participant by between-participant interaction among Time, history of childhood trauma and family history of IBS for perceived stress when tested using linear mixed models or 2 x 2 ANOVAs without covariates; however, when covariates were included this relationship was significant when tested with linear mixed model analyses. These results are somewhat consistent with a previous study that did not find a significant interaction between IBS and history of trauma with regard to responsivity to a stressor (Videlock et al., 2009). However, there were design differences between the current study and that of Videlock and colleagues (2009). Videlock et al. (2009) did not assess all 5 areas of trauma that were assessed in the current study

and instead assessed exposure to crime, general trauma and disaster, and physical and sexual abuse. Additionally, the current study evaluated response to a transient naturalistic academic stressor whereas Videlock et al. (2009) evaluated a physical visceral stressor. Videlock et al (2009) also evaluated HPA axis responsivity using physiological assessment (cortisol levels) whereas the current study used subjective reports of stress as a measure of stress reactivity.

The current findings are inconsistent with the findings of another study that evaluated response to a rectal distension and found that individuals with both a diagnosis of IBS and a history of abuse rated their pain significantly higher during rectal distension than individuals with IBS without history of abuse and individuals with a history of abuse and without a diagnosis of IBS (Ringel et al., 2008). One possibility for the discrepancy between the findings of the current study and those of previous studies is that the current study did not use physiological measures to evaluate stress response. Instead, this study relied on self-reported perceptions of stress levels. As mentioned previously, it is possible that individuals with IBS might experience altered physical responsivity to stressors without reporting a change in stress levels.

A second possible explanation is that the transient stressor used in the current study was too weak and did not have an effect on perceived stress levels regardless of group membership. However, when only data from individuals that experienced an increase in perceived stress between Time 1 and Time 2 were included in study analyses the Time by history of trauma by family history of IBS relationship was still not statistically significant. Third, it is possible that a history of childhood trauma might only influence physiological reactivity to a stressor and might not impact perception of a stressor. Fourth, differences in stress reactivity between individuals with and without trauma and with and without a diagnosis of IBS might be most adequately evaluated when the stressor is not an academic stressor. Instead, individuals with IBS or who are

at risk for IBS might be most responsive to either a physical or a social evaluative stressor. Sixth, the current study, in contrast with the research of Ringel et al. (2008) and Videlock et al. (2009) did not evaluate individuals with a diagnosis of IBS, instead this study evaluated individuals who reported specific risk factors for IBS (family history of IBS). Individuals with a family history of IBS but who have not yet developed IBS might simply not be more responsive than individuals without a family history of IBS regardless of whether or not they have a history of childhood trauma.

Secondary Hypothesis 1

This hypothesis states that individuals with a history of childhood trauma will have higher levels of gastrointestinal symptoms than individuals without a history of childhood trauma.

This hypothesis was not supported. This study did not find a statistically significant difference in reports of total gastrointestinal symptoms, average frequency of gastrointestinal symptoms or maximum frequency of gastrointestinal symptoms between individuals with a history of childhood trauma and individuals without a history of childhood trauma. This is not consistent with previous studies suggesting that individuals with a history of abuse report a higher level of gastrointestinal symptoms than individuals without a history of abuse (Felice et al. 1978;Felitti, 1991; Lechner, Vogel, Garcia-Shelton, Leichter, and Steibel, 1993; Rimza, Berg, and Locke, 1988). One possibility for the discrepancy between the findings of the current study and those of previous studies is the current study inventoried reports of emotional neglect, emotional abuse and physical neglect in addition to sexual abuse and physical abuse. Second, the current study did not account for severity of gastrointestinal symptoms. Perhaps there are differences between groups with regard to severity of symptoms but not with regard to frequency of symptoms or number of symptoms experienced.

Secondary Hypothesis 2

This hypothesis states that individuals with a family history of IBS will have higher levels of gastrointestinal symptoms.

This hypothesis was supported. Analyses suggested that individuals with a family history of IBS have a higher average GI symptom frequency; this relationship remained statistically significant even when hours of sleep, caffeine consumption, life events and daily hassles were entered into the analyses as covariates and when this relationship was analyzed using a linear mixed model. The study analyses also indicated that individuals with a family history of IBS had a higher number of GI symptoms than individuals without a family history of IBS. This relationship remained significant when hours of sleep, life events, caffeine and daily hassles were added into the model as covariates and when this relationship was tested using a linear mixed model. The study results further indicated that individuals with a family history of IBS reported a higher maximum frequency of GI symptoms than individuals without a family history of IBS. When hours of sleep, life events, daily hassles and caffeine consumption were added into the model as covariates and time of study participation (first part of spring semester, second part of spring semester or summer semester) was added as a grouping variable this relationship was no longer significant; however, this relationship was also assessed using a linear mixed model and this relationship was again statistically significant. The results of the current study are consistent with reports that IBS aggregates in families and that individuals with a family history of IBS are at risk for later development of IBS (Kanazawa et al., 2004; Kalantar et al., 2003;Pace, 2006; Saito, et al 2008; Levy, Whitehead, VonKorr, & Feld,2000). The results of the current study are also consistent with studies evaluating the heritability of IBS, which suggest that there is a genetic contribution to the development of IBS (Morris-Yates, et al., 1998; Levy et

al., 2001; Lembo, Zaman, Jones & Talley 2007). These findings extend those of previous studies. Much of the previous literature evaluated gastrointestinal symptoms in relatives of individuals with a diagnosis of IBS, whereas the current study evaluated IBS diagnosis or symptoms in relatives of individuals who do not have a diagnosis of IBS.

Secondary Hypothesis 3

This hypothesis states that individuals with a history of childhood trauma will have higher levels of non-gastrointestinal symptoms.

This hypothesis was not supported. The between-participant main effect for trauma was not significant. There was no significant difference found between individuals with a history of childhood trauma and individuals without a history of childhood trauma with regard to non-gastrointestinal somatic symptoms. Although previous studies suggested that the presence of somatic symptoms might mediate the relationship between childhood trauma and irritable bowel syndrome (Salomon, Skaife & Rhodes, 2003), the current findings do not support this relationship. However, other studies have also failed to find a relationship between history of abuse and reports of somatic symptoms (Lackner, Gudleski & Blanchard 2004). One possibility for the null findings of the current study is that factors other than abuse, such as parental rejection and hostility, might be more closely related to somatic symptoms than abuse. At least one study provides support for this hypothesis (Lackner, Gudleski & Blanchard, 2004).

Secondary Hypothesis 4

This hypothesis states that individuals with a family history of IBS will have higher levels of non-gastrointestinal symptoms.

This hypothesis was not supported. A repeated measures ANOVA with PHQ (non-gastrointestinal somatic symptoms) as the within-participant variable did not indicate that

individuals with a family history of IBS had higher levels of non-GI somatic symptoms than individuals without a history of IBS. When a linear mixed model was used to test this hypothesis the estimate of the fixed effect for family history of IBS was again not statistically significant.

The results of this study are not consistent with previous studies that suggest that patients with IBS also report more back pain, headache, fatigue and poorer sleep than healthy controls and that individuals with a functional gastrointestinal disorder reported more somatic symptoms than individuals without a functional GI disorder (Piche et al., 2007; Sayuk, Elwing, Lustman, & Clouse, 2007). The current findings are also inconsistent with those of one study that indicated that somatic symptoms predicted the onset of IBS (Nicholl et al. 2007). The current results do not provide support for the model that suggests that higher levels of somatic symptoms are found in individuals with a family history of IBS. One potential explanation for this null finding is that this study focused on non-gastrointestinal somatic symptoms; whereas previous studies included gastrointestinal symptoms when evaluating the relationship between IBS and somatic symptoms.

Secondary Hypothesis 5

This hypothesis states that individuals with a history of childhood trauma will have higher levels of perceived stress than individuals without a history of childhood trauma.

This hypothesis was not supported. When this hypothesis was tested using a repeated measures ANOVA the results did not suggest a significant difference in levels of perceived stress between individuals with a history of childhood trauma and individuals without a history of childhood trauma; however, when this hypothesis was tested using a linear mixed model that included covariates the interaction between Time and history of childhood trauma was marginally significant. The discrepancy in findings between the repeated-measures ANOVA and the mixed model analyses that included controls indicates that these findings have to be

interpreted with caution. However, overall these findings are not consistent with previous studies indicating a relationship between stress and a history of trauma (Heim et al., 2000).

Secondary Hypothesis 6

This hypothesis states that individuals with a family history of IBS will have higher levels of perceived stress than individuals without a family history of IBS.

This hypothesis was not supported. Study analyses did not indicate a statistically significant difference in levels of perceived stress between individuals with a family history of IBS and individuals without a family history of IBS. This finding is not consistent with previous studies that suggest that individuals with IBS have a higher level of perceived stress than individuals without a diagnosis of IBS (Levy, Cain, Jarrett & Heitkemper 1997; Murray, et al., 2004; Plante, Lawson, Kinney, & Mello, 1998).

Exploratory Analyses

Exploratory analyses were conducted to evaluate the relationships among types of trauma (emotional abuse, physical abuse, sexual abuse, emotional neglect and physical neglect) and gastrointestinal symptoms and non-gastrointestinal somatic symptoms. Correlational analyses suggest that there is a significant relationship between emotional abuse and gastrointestinal symptoms. Emotional abuse was correlated with average frequency of gastrointestinal symptoms, maximum frequency of gastrointestinal symptoms and mean number of gastrointestinal symptoms. However, the correlation between emotional abuse and non-gastrointestinal somatic symptoms was not statistically significant. Physical abuse, sexual abuse, emotional neglect and physical neglect were not correlated with either gastrointestinal symptoms or non-gastrointestinal somatic symptoms. Although these analyses were exploratory, these

findings suggest that as the severity of emotional abuse increases the number and frequency of gastrointestinal symptoms also increases.

Strengths and Limitations

There are a number of limitations to the current study, many of which have been discussed above. First, the current study evaluated response to a transient academic stressor; however, as discussed previously, differences in stress reactivity between individuals with and without trauma and with and without a diagnosis of IBS might be most adequately evaluated when the stressor is either a physical or a social evaluative stressor. Second, the use of retrospective self-report measures of stress, gastrointestinal symptoms and childhood trauma is also a limitation of this study. Such retrospective self-reports are subject to memory biases. Third, participants in this study were recruited from a limited population (students enrolled in classes at Stony Brook University), potentially limiting the generalizability of the study findings.

There are also a number of strengths to this study. The multiple group pretest – posttest design increases the external validity of the study and requires a smaller sample size to achieve adequate power. Conducting assessments before and after a transient event allows for evaluation of within- and between-participant hypotheses. Also, assessment of individuals during different time points during the spring and summer semester helped reduce the probability that extraneous factors, such as national or university-wide events or emergencies, significantly influenced the results of the study. Additionally, this study evaluated 5 types of trauma compared to other studies that only evaluated the presence of sexual abuse or physical abuse. This allowed for greater generalizability of study findings.

The use of web-based assessments was another strength of this study. Since the second assessment could be completed online, participants were able to complete this assessment

wherever it was most convenient for them; this resulted in decreased participant burden. The use of a web based assessment with time-stamping capabilities also allowed the author to ensure that only data from participants who completed the evaluation during the time period allotted (either within 48 hours of the first exam of the semester or during the final examination period) were included in study analyses. Furthermore, the use of a web-assessment decreased the likelihood of human error increasing variability in the study data, as occurs when data is entered by hand into analysis software.

An additional strength of this study is its use of a naturalistic stressor. The use of such a stressor increases the ecological validity of the study. However, as mentioned above, the severity of the stressor is likely to have detracted from the testing of hypotheses. Lastly, the evaluation of both specific and non-specific risk factors for IBS allowed for further exploration of the accuracy of a model of IBS that suggests that it is a combination of predisposing factors and precipitating factors that contribute to altered stress reactivity and then later development of irritable bowel syndrome.

Future Directions

The results of this study suggest a number of areas for future research, which I will discuss below. One, more studies are needed to evaluate additional family environmental and genetic factors that contribute to the aggregation of IBS in families. Second, as demonstrated by the current study, a large number of individuals who have a family history of IBS also have a history of childhood trauma. This suggests that perhaps it is a shared environmental factor that puts an individual at risk for both IBS and abuse. Additional research is needed to further evaluate this hypothesis. Third, prospective studies are needed to evaluate the percentage of

individuals with both specific genetic/environmental risk factors for IBS and non-specific risk factors for IBS who later develop IBS or other functional gastrointestinal motility disorders.

Fourth, as the analyses evaluating types of trauma and gastrointestinal symptoms were exploratory, it is necessary to further evaluate these relationships in additional studies before any firm conclusions can be made. Fifth, future studies should also evaluate the relationships among exposure to stressors, severity of trauma, severity of gastrointestinal symptoms and distress related to gastrointestinal symptoms.

Sixth, to ensure a greater difference between the "low stress" and "high stress" periods, future studies should recruit individuals during a time period when they do not have any examinations such as during summer or winter break. Seventh, to evaluate the hypothesis that individuals might physically react to a stressor without subjectively reporting an increase in stress levels, future studies might benefit from the incorporation of physiological measures of reactivity to a stressor such as cortisol, heart rate, gastrointestinal motility, hormones related to gastrointestinal motility and bacterial flora. The use of physiological measures in study designs evaluating response to transient stressors might also allow for a more effective manipulation check.

Eighth, as mentioned previously, at least one study evaluating the relationship between reactivity to stressors and IBS indicated that perhaps individuals with IBS exhibit emotional but not perceived stress reactivity to a stressor. This suggests that perhaps future studies should focus on differences in emotional reactivity to stressors rather than perceived stress reactivity. Ninth, it is also possible that individuals with a family history of IBS do not have an increased perceived stress reactivity to stressor but instead experience changes in thoughts and emotions

related specifically to gastrointestinal symptoms (e.g. gastrointestinal specific anxiety). Additional studies would be needed to evaluate this hypothesis.

Tenth, the statistically significant relationships between history of childhood trauma and baseline levels of daily hassles suggests the importance of evaluating the relationship between history of childhood trauma and daily hassles in future studies. It might also be important for additional studies to consider whether individuals with a history of trauma or a family history of IBS might be more reactive when they have a combination of stressors occurring simultaneously (e.g. when they have a high number of daily hassles and they also are in the middle of a final exam period).

Lastly, as the current study is one of the few studies thus far to evaluate stress reactivity in individuals at risk for development of IBS, it would be important to explore this relationship further in studies that evaluate subjective stress reactivity, emotional reactivity, and physiological reactivity to stressful events in such individuals.

Conclusions

The current study aimed to extend the findings of previous studies by evaluating gastrointestinal symptom and stress response to a transient naturalistic stressor in individuals with both non-specific and specific risk factors for IBS. The study results did not support the hypothesis that alterations in response to stress mediate the relationship between risk factors for IBS and the development of gastrointestinal symptoms. The study analyses also did not suggest that a history of childhood trauma moderates the relationship between genetic/environmental risk factors of IBS and alterations in response to stressors. Given the low power of the study, the weak effect of the transient stressor and the disproportionate cell sizes the lack of findings in the current study need to be interpreted with caution.

The study demonstrated that there is a significant and positive association between severity of emotional abuse and gastrointestinal symptoms. This suggests that type of trauma and severity of trauma might play a role in the exacerbation of gastrointestinal symptoms. However, as mentioned previously, this finding was the result of an exploratory analysis and should be interpreted cautiously.

Additionally, this study provided support for the hypotheses that symptoms of IBS aggregate in families and that there is a genetic/environmental component to IBS. This finding extends those of previous studies as this is one of the only studies, if not the only study, evaluating gastrointestinal symptoms in individuals with a family history of IBS. A more thorough understanding of the relationships among genetics, family environment and development of gastrointestinal symptoms will help us to more effectively prevent and treat functional gastrointestinal disorders.

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Appendix A

Figure 1. Biopsychosocial Model of IBS

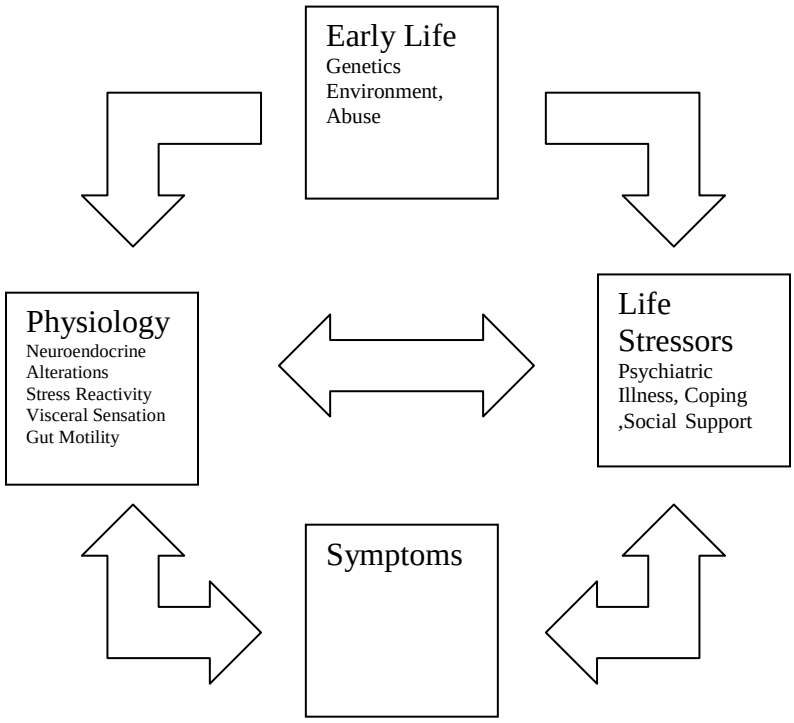


Figure 2. Model of Physiological Alterations Resulting from the Combination of Non-Specific and Specific Predisposing Factors for IBS

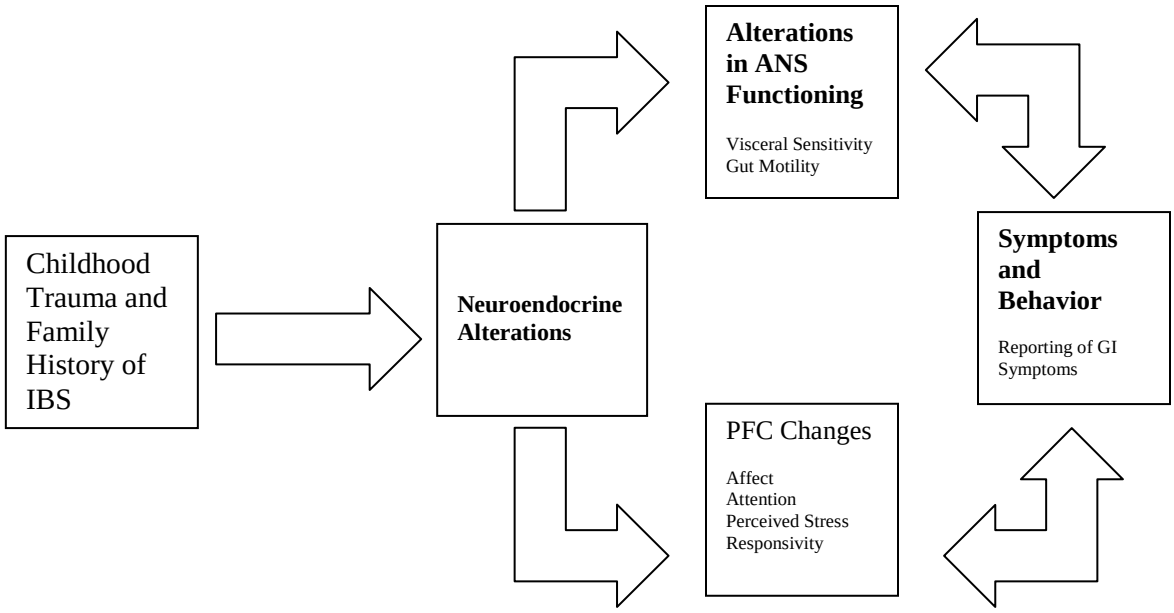


Figure 3. Study Design: Web Assessment (WA) Completion

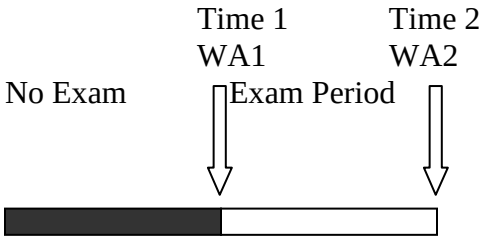


Figure 4. Period during which the first wave of participants completed Web Assessment 2 (WA2)

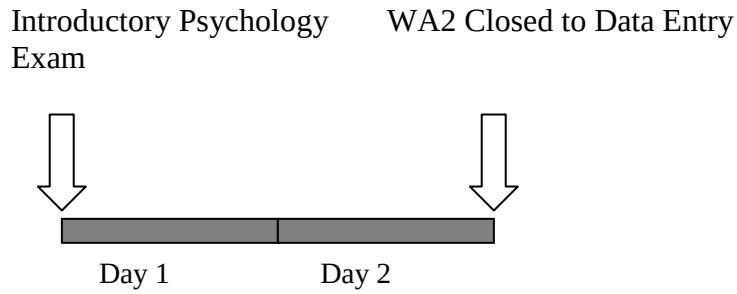


Figure 5. Period during which the second and third waves of participants completed Web Assessment 2

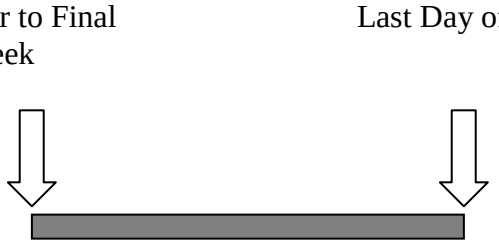


Figure 6. Study Variables

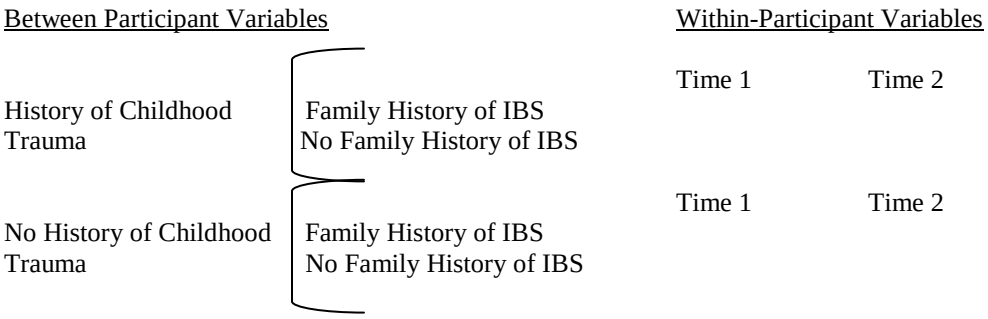


Figure 7. CONSORT Flow Diagram

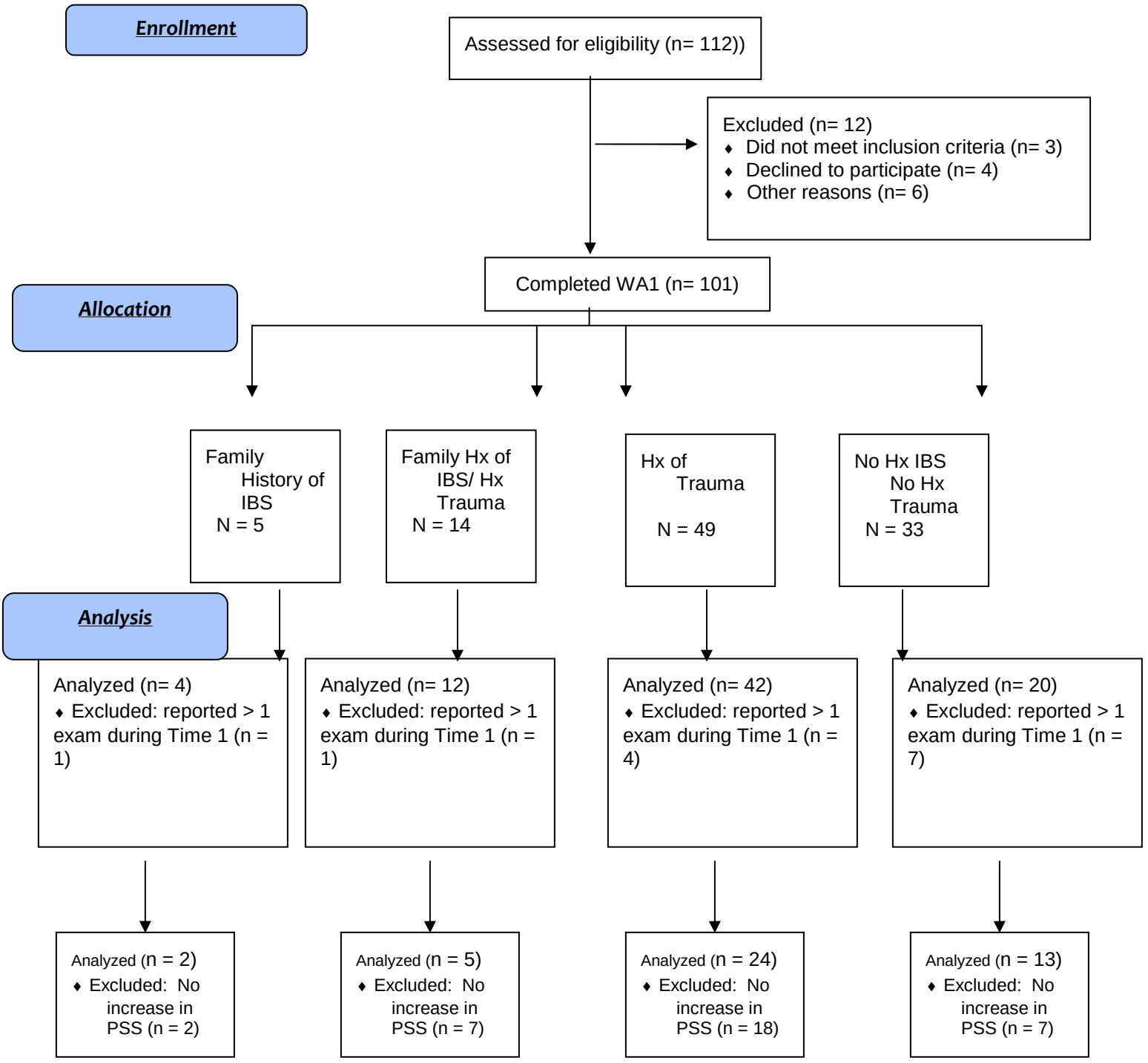


Figure 8. Mean Change in PSS Between Time 1 and Time 2 for Individuals with and without a History of Childhood Trauma

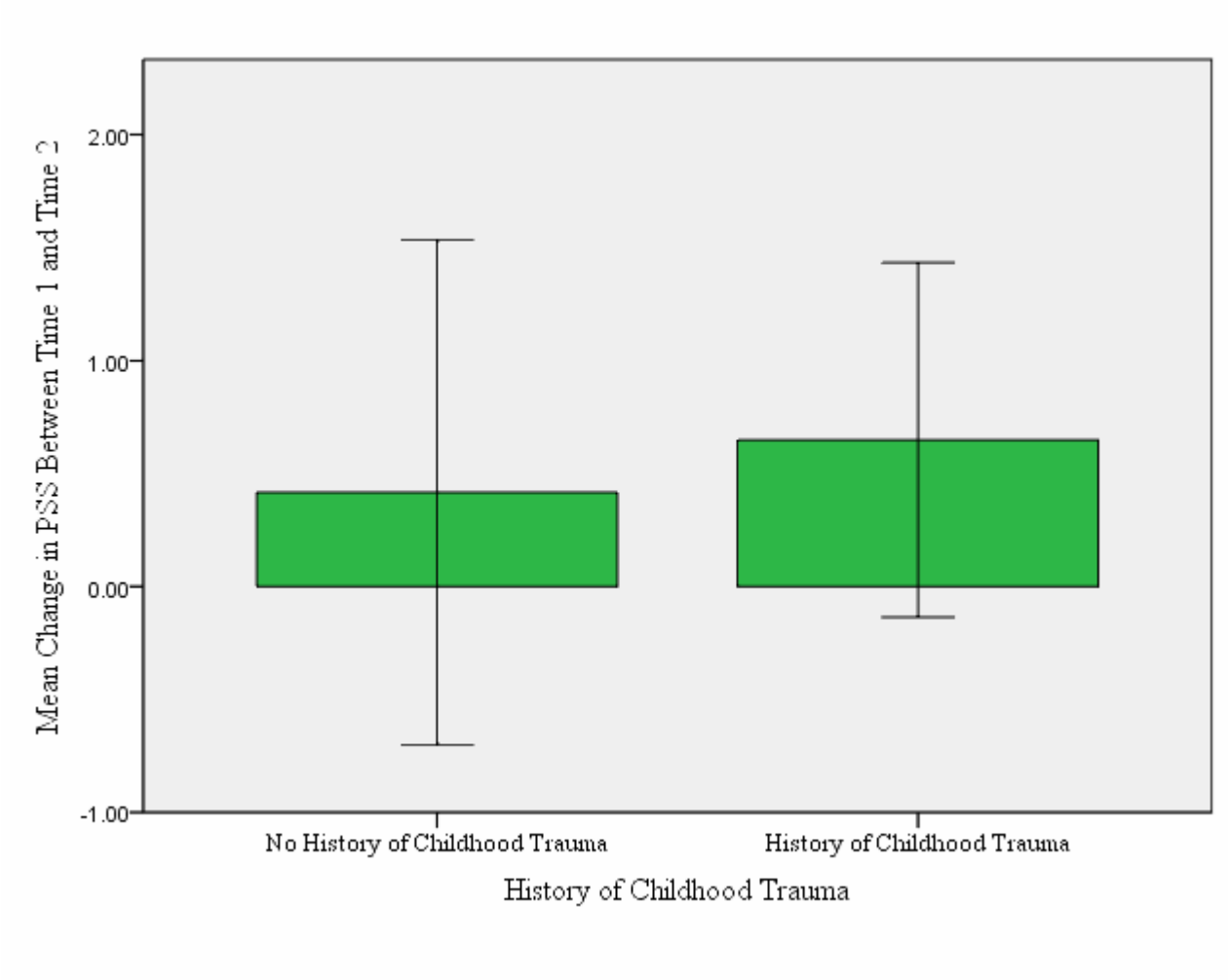


Figure 9. Mean Change in PSS Between Time 1 and Time 2 for Individuals with and without Family History of IBS

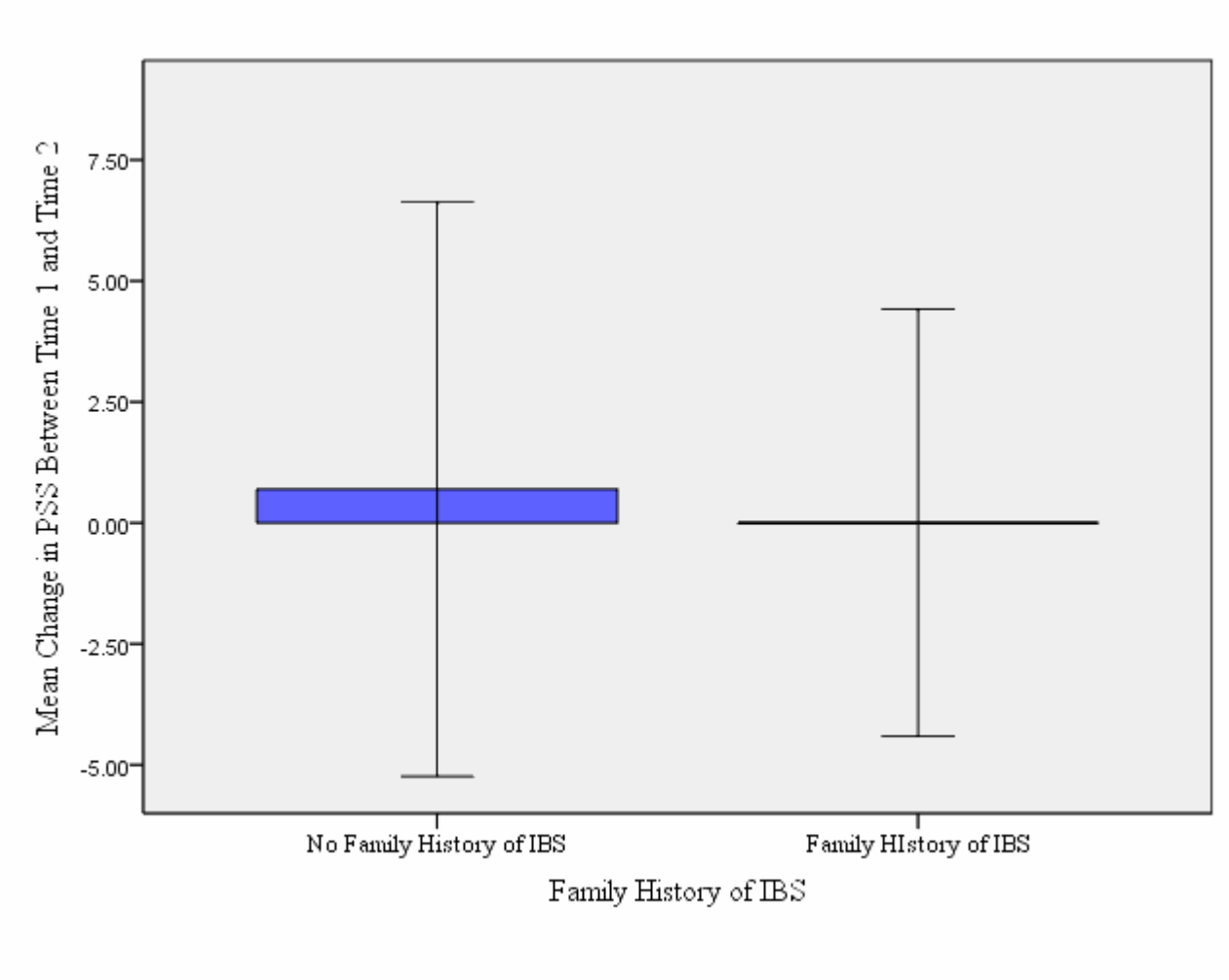


Figure 10. Mean Change in GIAverageFrequency Between Time 1 and Time 2 for Individuals with and without a Family History of IBS

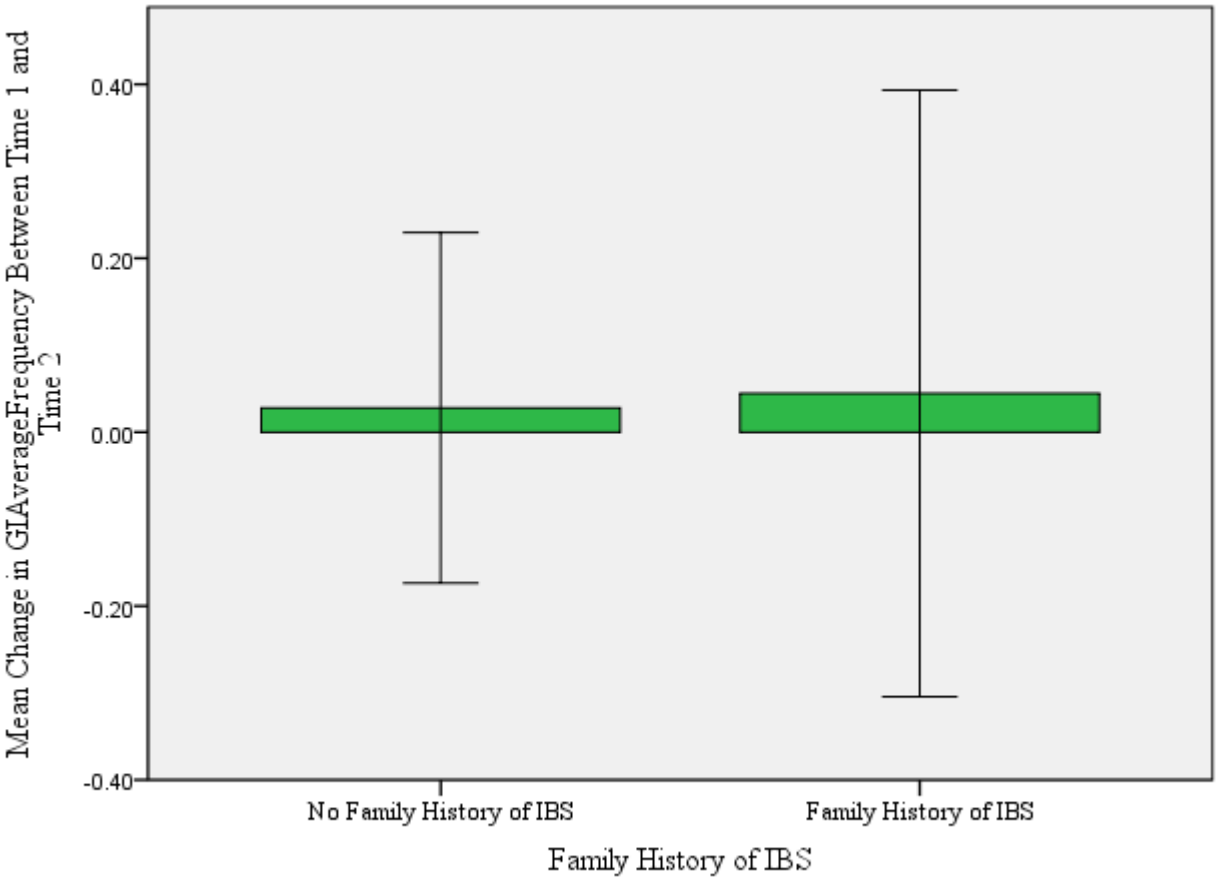


Figure 11. Mean Change in GItotal Between Time 1 and Time 2 for Individuals with and without a Family History of IBS

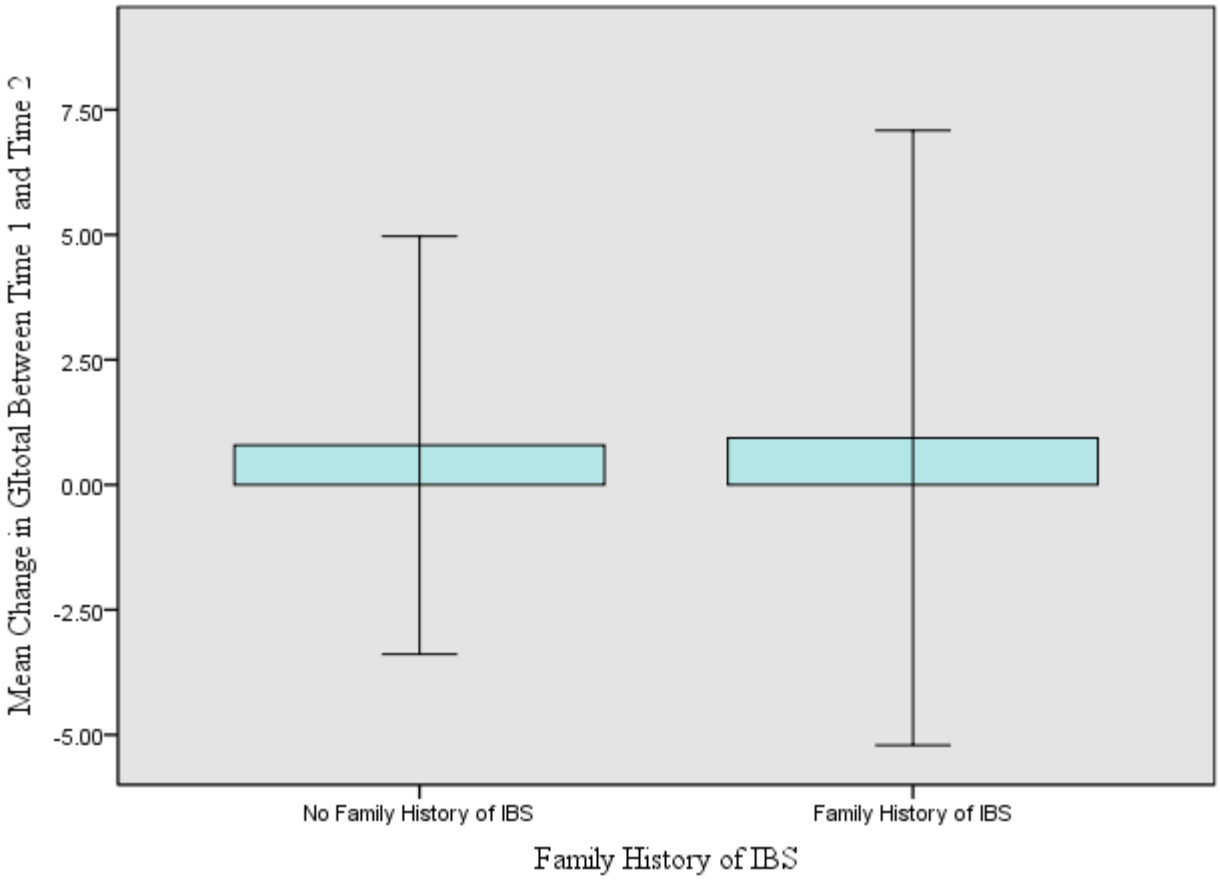


Figure 12. Mean Change in GIfreqmax Between Time 1 and Time 2 for Individuals with and without a Family History of IBS

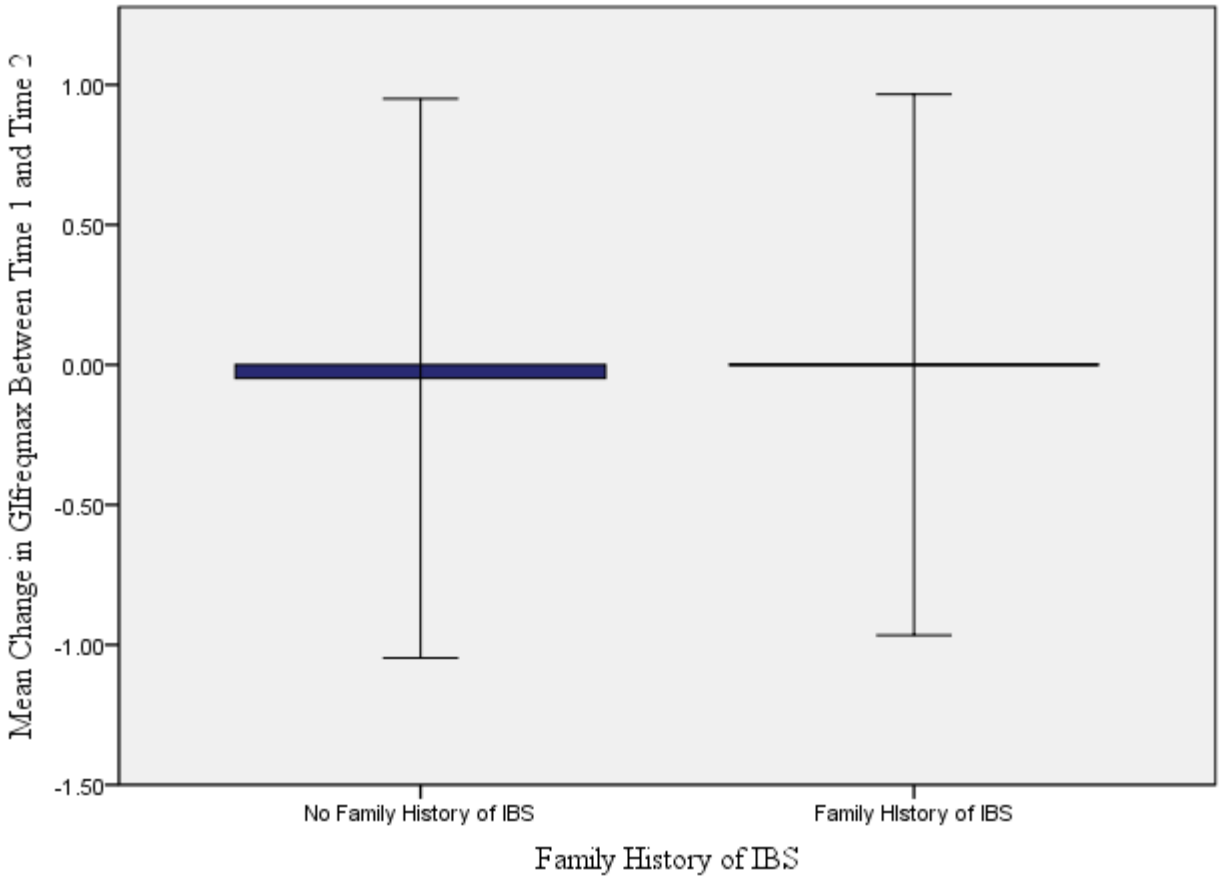


Figure 13. Means of GIfreqmax at Time 1 and Time 2 for Individuals with a Family History of IBS and Individuals without a Family History of IBS

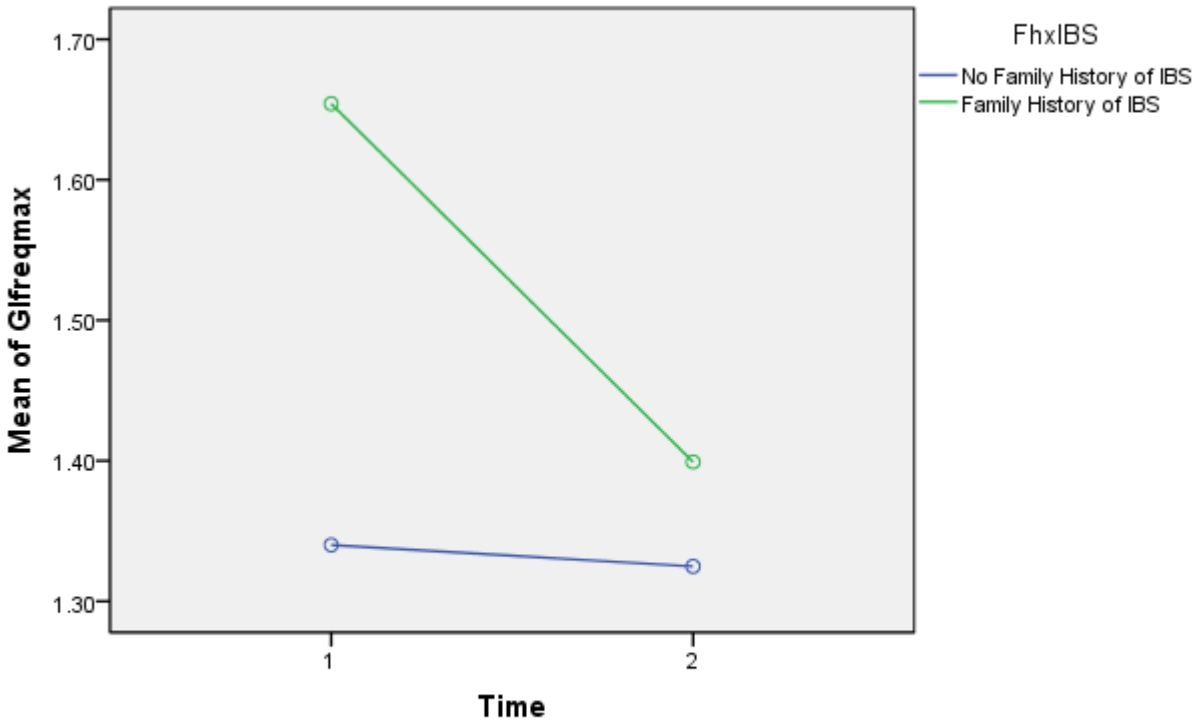


Figure 14. Mean Change in GIAverageFrequency for Individuals with and without a History of Childhood Trauma

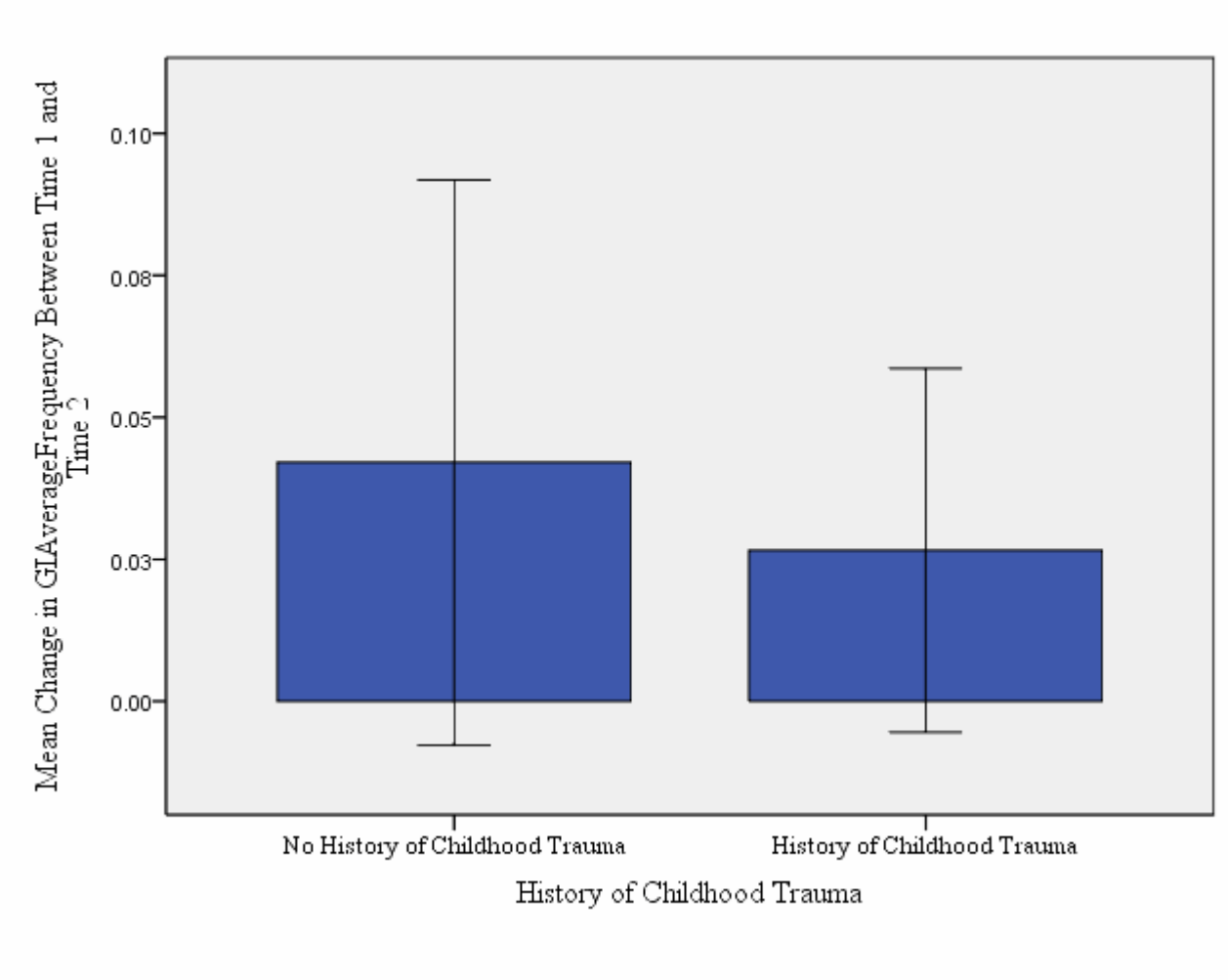


Figure15. Mean Change in GItotal for Individuals with and without a History of Childhood Trauma

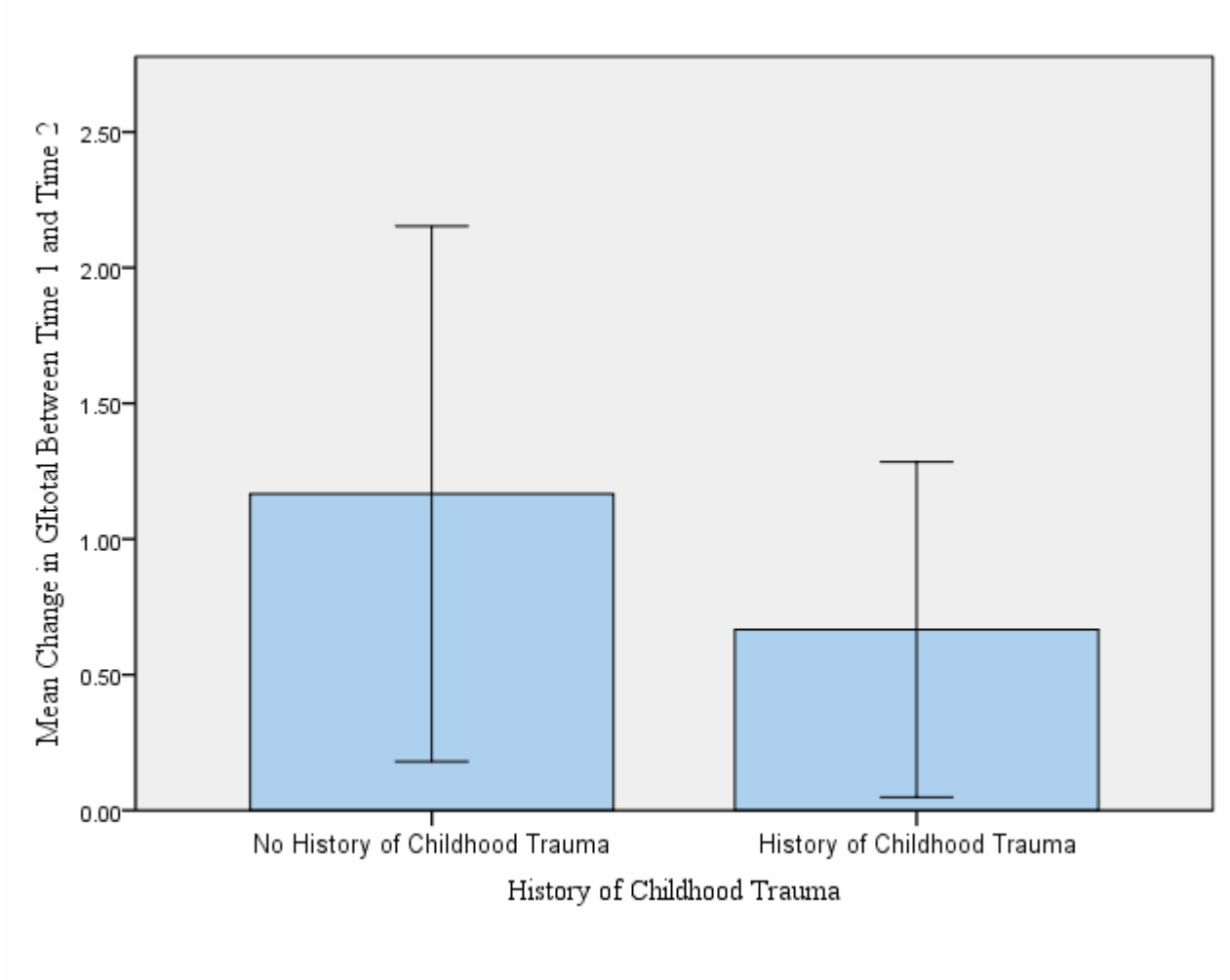


Figure 16. Mean Change in GIfreqmax for Individuals with and without a History of Childhood Trauma

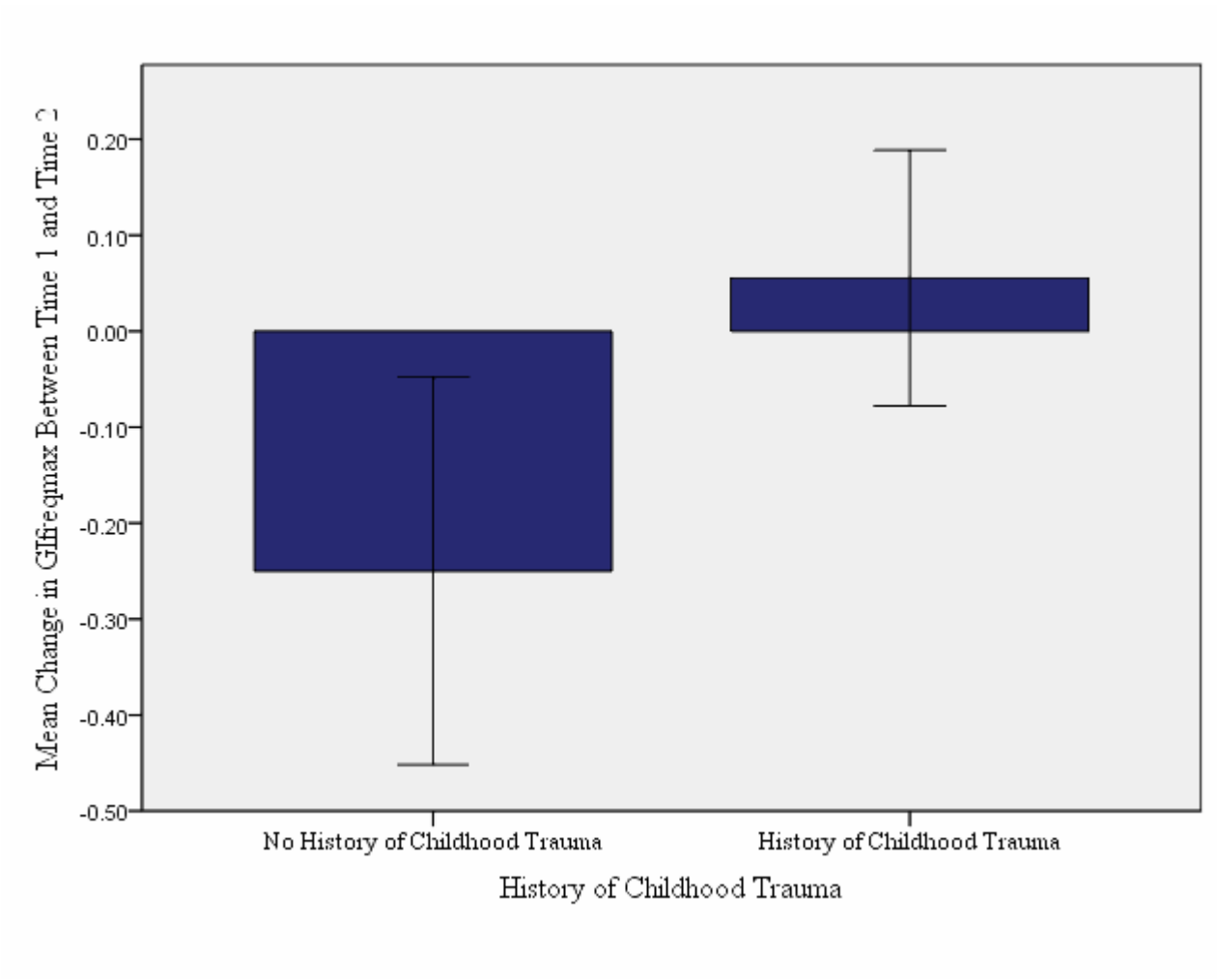
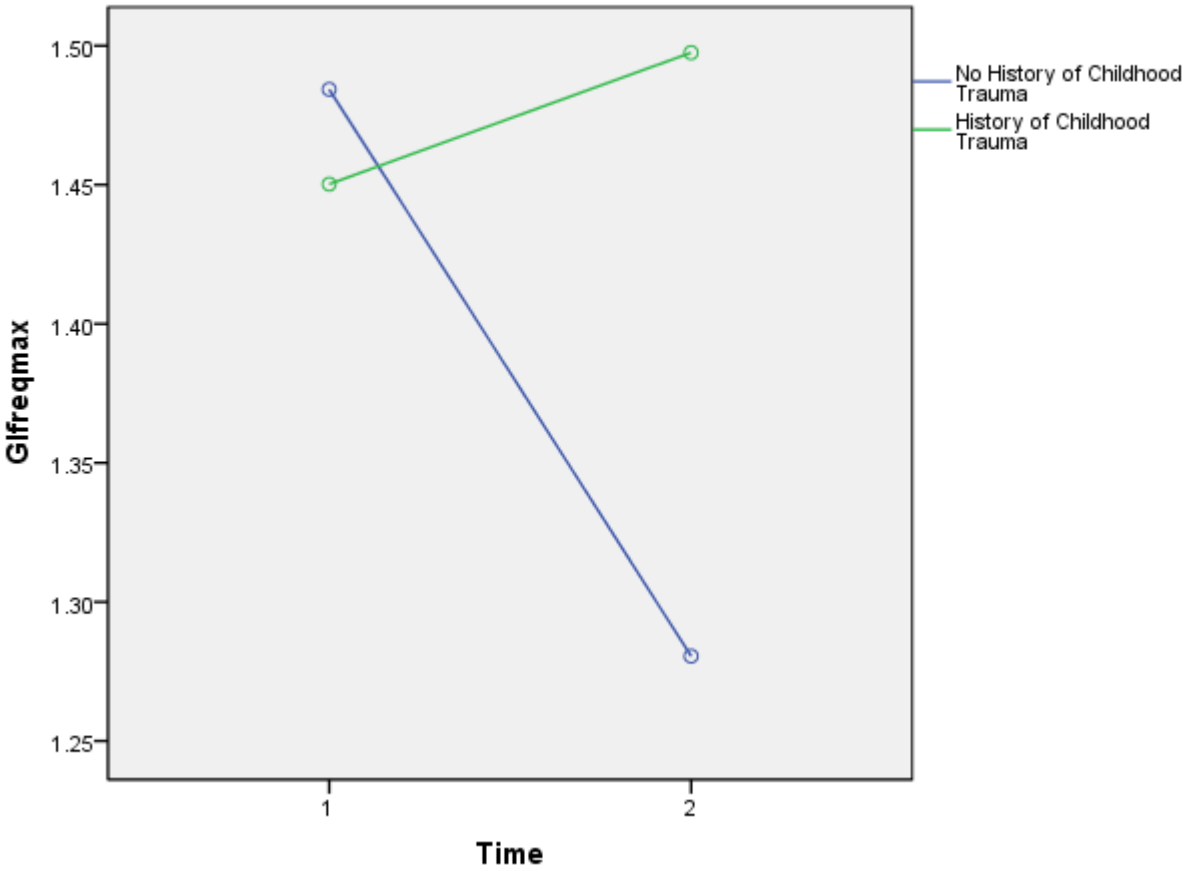


Figure 17. Means of GIfreqmax at Time 1 and Time 2 for Individuals with a History of Childhood Trauma and Individuals without a History of Childhood Trauma



Note. Sleep1, Sleep2, Caffeine1, Caffeine2, LEQ1, LEQ2, ICSRLE1 and ICSRLE2 were included in this analysis as covariates

Figure 18. Mean Change in PSS Between Time 1 and Time 2 for Individuals with a History of Childhood Trauma Grouped by Family History of IBS

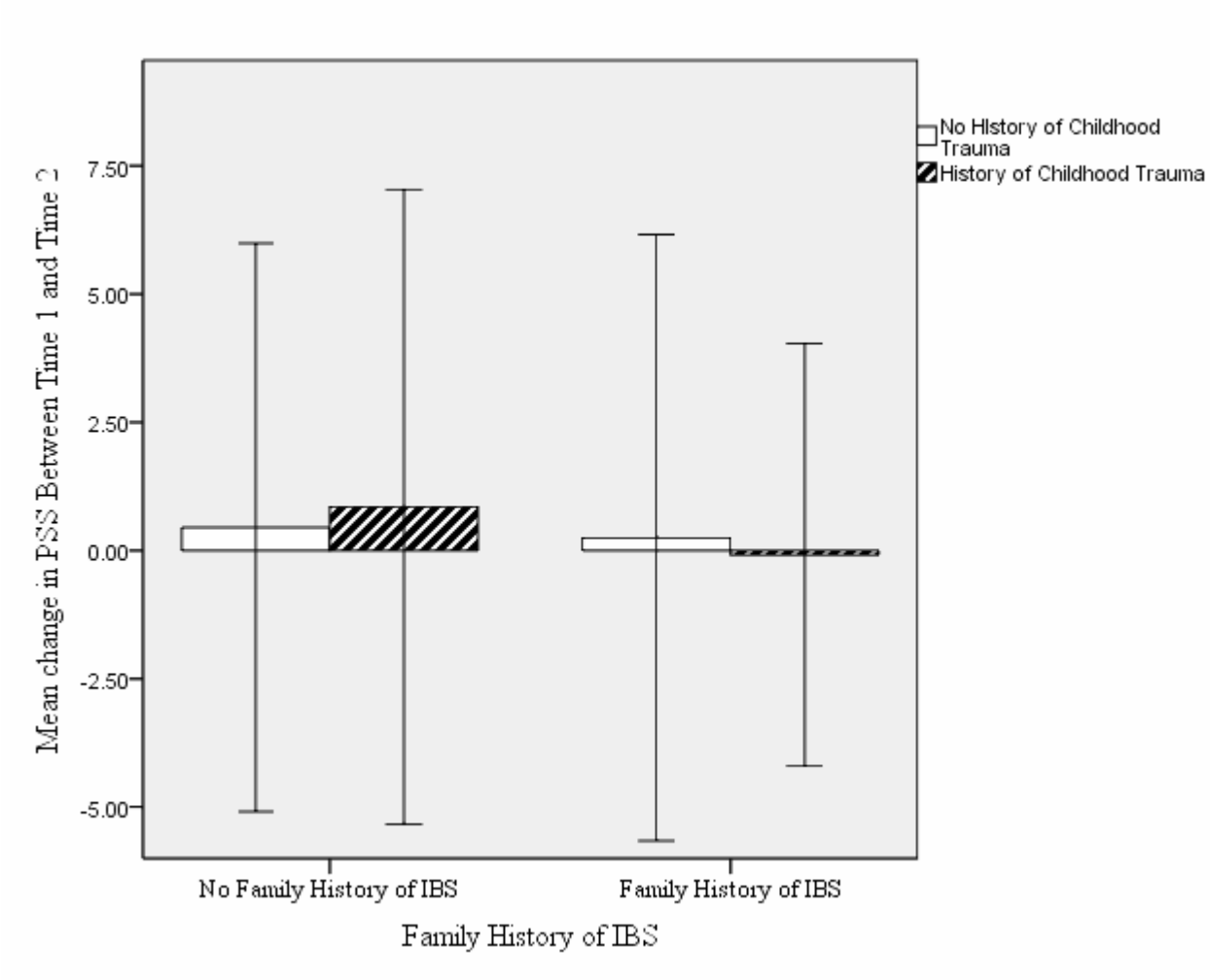


Figure 19. Mean Change in GIfreqmax for Individuals with a History of Childhood Trauma Grouped by Family History of IBS

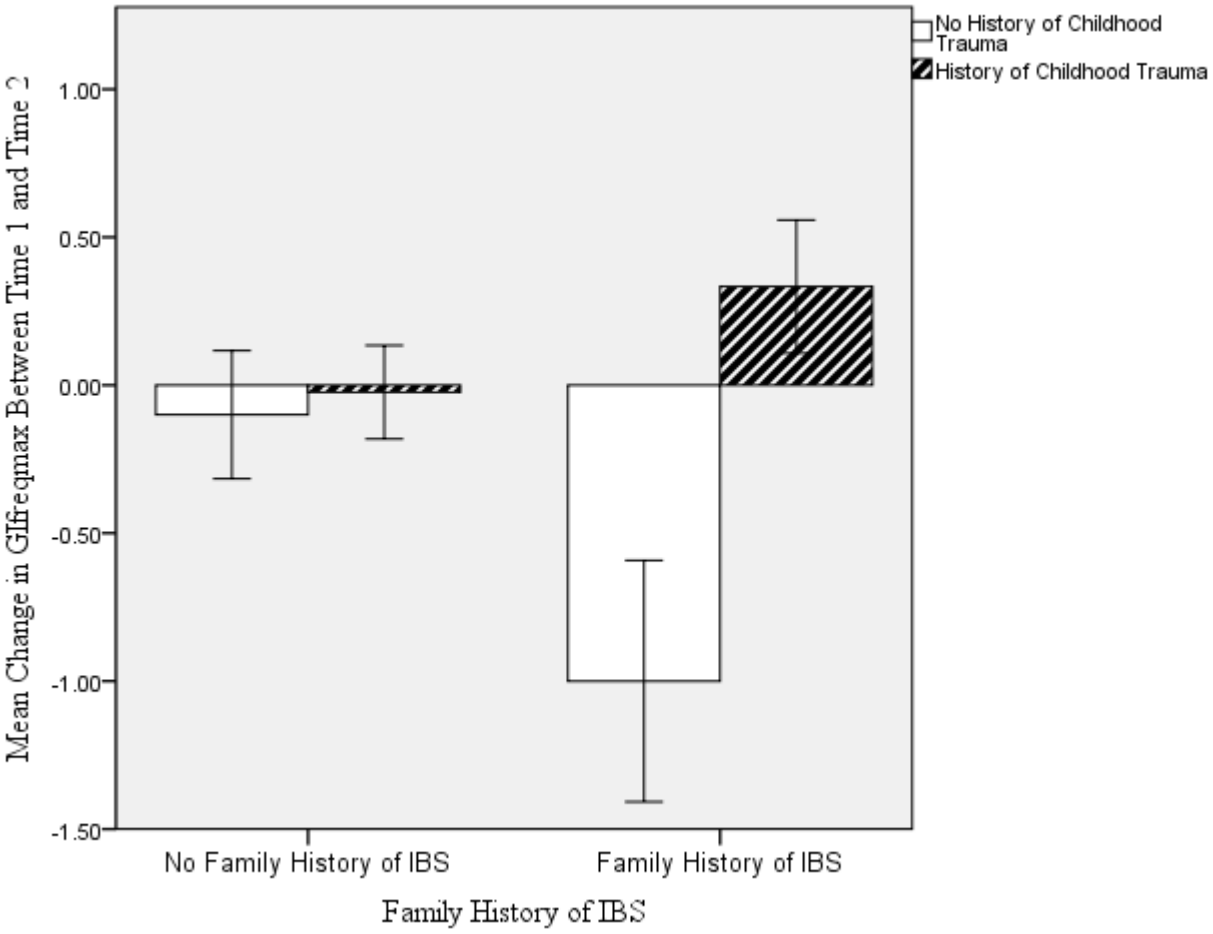


Table 1

Means, SEs, Minimum and Maximum Values and Number of Values Imputed for the Main Study Variables and Potentially Confounding Variables

		Time 1					Time 2				
Variable	Variable Description	Mean	SE	Min.	Max.	Number of Values Imputed	Mean	SE	Min.	Max.	Number of Values Imputed
GI Average Frequency	Average ratings of symptom frequency (0 = not at all, 3 = always)	.30	.03	0	1.74	5	.339	.04	0	1.44	2
GIfreqmax	Highest symptom frequency (0 = not at all, 3= always)	1.57	.10	0	3	5	1.53	.10	0	3	2
GItotal	Total number of gastrointestinal symptoms	6.51	.51	0	21	5	7.32	.67	0	26	2
PHQ	Total of ratings of severity of somatic symptoms	5.58	.36	0	16	5	5.72	.44	0	18	4
PSS	Score on Perceived Stress Scale 10 –item	18.81	.74	5	35	0	19.38	.81	2	36	1
ICSRLE	Total score on questionnaire of daily hassles	92.26	2.85	57	169	2	93.55	3.18	54	172	28
LEQ	Total number of life events over the past 6 months	2.49	.22	0	8	0	2.60	.28	0	12	0
Sleep	Average number of hours of sleep over the past week (1=1-4 hours, 2= 5-7 hours 3= 8-9 hours, 4= 10 + hours)	2.13	.07	1	4	0	2.01	.08	1	4	0
Caffeine	Average number of cups of caffeinated beverages over the past week (1= 1-2 cups, 2= 3-4 cups, 3 = 5-6 cups, 4 = 7+ cups)	1.20	.06	1	3	16	1.50	.10	1	4	19
Alcohol	Average number of alcoholic beverages over the past week	.38	.13	0	6	0	.562	.16	0	6	0
Exercise	Average number of hours of	1.70	.30	0	15	7	1.55	.23	0	8	14

exercise over the past week	.

Note. N = 78 for each measure
Number of Values Imputed = number of individuals with a missing value on an item of the measure

Table 2
Means, SEs, and ns for Perceived Stress

		Time 1				Time 2			
		History of Trauma		No History of Trauma		History of Trauma		No History of Trauma	
Variable		Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS
PSS	Mean (S.E.)	19.92 (1.91)	19.55 (1.03)	21.75 (3.40)	16.00 (1.23)	19.83 (1.81)	20.39 (1.16)	22.00 (1.47)	16.45 (1.48)
	n	12	42	4	20	12	42	4	20

Table 3
Means, SEs and ns for GItotal, GIfreqmax and GI average frequency

Variable	N	Mean	SE	Min.	Max.
Difficulty	78	2.35	.21	0	6
Satisfaction	78	3.27	.19	0	6
Controllability	78	3.74	.16	0	6
Unpredictability	78	2.60	.19	0	6
Stressfulness	78	3.75	.19	0	6
Challenging	78	3.95	.17	0	6
Novelty	78	1.90	.20	0	6

Table 4
Means, SEs, Minimum and Maximum Values for Ratings of Examination Period

		Time 1				Time 2			
		History of Trauma		No History of Trauma		History of Trauma		No History of Trauma	
		Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS
Variable									
GI	Mean	.542	.294	.438	.175	.559	.322	.565	.200
Average	S.E.	.123	.033	.103	.033	.113	.043	.322	.039
Frequency									
GIfreqmax	Mean	1.75	1.62	2.50	1.15	2.08	1.60	1.50	1.05
	S.E.	.218	.140	.289	.182	.260	.132	.646	.153
GItotal	Mean	10.42	6.30	8.50	4.20	11.00	6.98	10.50	5.20
	S.E.	1.51	.630	1.44	.790	1.78	.836	5.63	.991
	n	12	42	4	20	12	42	4	20

Note. GIAverageFrequency = average frequency of GI symptoms, GIfreqmax = highest symptom frequency reported,
GItotal = total number of symptoms reported

Table 5
Analysis of Variance Source Table for Difficulty of Examination Period

Imputation Number	Source	SS	df	MS	F	p
1	Corrected Model	0.73	3	.24	.08	.97
	Intercept	212.54	1	212.54	67.24	.00
	Trauma	0.14	1	.14	.04	.84
	FhxIBS	0.15	1	.15	.05	.83
	Trauma x FhxIBS	0.23	1	.23	.07	.79
	Error	233.91	74	3.16		
	Total	646.79	78			
	Corrected Total	234.64	77			
2	Corrected Model	0.54[c]	3	.18	.06	.98
	Intercept	197.04	1	197.04	62.16	.00
	Trauma	0.03	1	.03	.01	.93
	FhxIBS	0.02	1	.02	.01	.93
	Trauma x FhxIBS	0.15	1	.15	.05	.83
	Error	234.55	74	3.17		
	Total	638.53	78			
	Corrected Total	235.09	77			
3	Corrected Model	2.52	3	.84	.25	.86
	Intercept	220.23	1	220.23	65.27	.00
	Trauma	0.24	1	.24	.07	.79
	FhxIBS	0.13	1	.14	.04	.84
	Trauma x FhxIBS	0.73	1	.73	.22	.64
	Error	249.70	74	3.37		
	Total	682.10	78			
	Corrected Total	252.22	77			
4	Corrected Model	1.91	3	.64	.21	.89
	Intercept	227.04	1	227.05	75.30	.00
	Trauma	0.37	1	.37	.12	.73
	FhxIBS	0.27	1	.27	.09	.77
	Trauma x FhxIBS	0.76	1	.77	.25	.62
	Error	223.13	74	3.02		
	Total	662.04	78			

	Corrected Total	225.04	77			
5	Corrected Model	1.17[f]	3	.39	.13	.94
	Intercept	237.18	1	237.18	77.57	.00
	Trauma	0.06	1	.06	.02	.90
	FhxIBS	0.02	1	.018	.01	.94
	Trauma x FhxIBS	0.86	1	.859	.28	.60
	Error	226.25	74	3.057		
	Total	698.36	78			
	Corrected Total	227.42	77			

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 6

Analysis of Variance Source Table for Satisfaction with Examination Period

Imputation Number	Source	SS	df	Mean Square	F	Sig.
1	Corrected Model	5.08	3	1.69	.70	0.56
	Intercept	474.08	1	474.08	195.05	0.00
	Trauma	4.41	1	4.41	1.81	0.18
	FhxIBS	2.08	1	2.08	.85	0.36
	Trauma x FhxIBS	1.77	1	1.77	.73	0.40
	Error	179.86	74	2.43		
	Total	1007.29	78			
	Corrected Total	184.94	77			
2	Corrected Model	7.12	3	2.37	.95	0.42
	Intercept	493.65	1	493.65	198.35	0.00
	Trauma	5.35	1	5.35	2.15	0.15
	FhxIBS	1.80	1	1.80	.72	0.40
	Trauma x FhxIBS	0.59	1	0.59	.24	0.63
	Error	184.17	74	2.49		
	Total	1039.66	78			
	Corrected Total	191.29	77			
3	Corrected Model	6.09	3	2.03	.81	0.49
	Intercept	490.64	1	490.64	195.20	0.00
	Trauma	5.91	1	5.91	2.35	0.13
	FhxIBS	0.67	1	0.67	.27	0.61
	Trauma x FhxIBS	1.55	1	1.55	.62	0.44
	Error	186.00	74	2.51		
	Total	1063.79	78			
	Corrected Total	192.09	77			
4	Corrected Model	6.35	3	2.12	.86	0.47
	Intercept	467.93	1	467.93	189.17	0.00
	Trauma	5.95	1	5.95	2.41	0.13
	FhxIBS	1.53	1	1.53	.62	0.43
	Trauma x FhxIBS	1.78	1	1.78	.72	0.40
	Error	183.05	74	2.47		
	Total	999.54	78			

	Corrected Total	189.39	77			
5	Corrected Model	4.58	3	1.53	.61	0.61
	Intercept	473.24	1	473.24	189.92	0.00
	Trauma	3.39	1	3.39	1.36	0.25
	FhxIBS	2.74	1	2.74	1.10	0.30
	Trauma x FhxIBS	1.93	1	1.93	.78	0.38
	Error	184.39	74	2.49		
	Total	1008.44	78			
	Corrected Total	188.97	77			

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 7
Analysis of Variance Source Table for Controllability of Examination Period

Imputation Number	Source	SS	df	MS	F	p
1	Corrected Model	2.50	3	0.83	0.47	.702
	Intercept	566.14	1	566.14	320.63	.000
	Trauma	0.96	1	0.96	0.54	.464
	FhxIBS	0.27	1	0.27	0.15	.699
	Trauma x FhxIBS	0.05	1	0.05	0.03	.874
	Error	130.66	74	1.77		
	Total	1190.03	78			
	Corrected Total	133.17	77			
2	Corrected Model	4.24	3	1.41	0.85	.470
	Intercept	597.74	1	597.74	360.31	.000
	Trauma	0.01	1	0.01	0.01	.940
	FhxIBS	1.59	1	1.59	0.96	.331
	Trauma x FhxIBS	0.53	1	0.53	0.32	.573
	Error	122.76	74	1.66		
	Total	1226.61	78			
	Corrected Total	127.00	77			
3	Corrected Model	6.10	3	2.03	1.20	.315
	Intercept	600.50	1	600.50	354.79	.000
	Trauma	1.73	1	1.73	1.02	.316
	FhxIBS	0.00	1	0.00	0.00	.990
	Trauma x FhxIBS	0.58	1	0.58	0.34	.561
	Error	125.25	74	1.69		
	Total	1260.67	78			
	Corrected Total	131.35	77			
4	Corrected Model	4.46	3	1.49	0.92	.437
	Intercept	602.37	1	602.37	371.51	.000
	Trauma	0.67	1	0.67	0.42	.521
	FhxIBS	0.26	1	0.26	0.16	.688
	Trauma x FhxIBS	0.64	1	0.64	0.40	.530
	Error	119.98	74	1.62		
	Total	1246.89	78			

	Corrected Total	124.44	77			
5	Corrected Model	2.70	3	0.90	0.57	.636
	Intercept	572.67	1	572.67	363.87	.000
	Trauma	0.48	1	0.48	0.30	.583
	FhxIBS	0.67	1	0.67	0.43	.515
	Trauma x FhxIBS	0.14	1	0.14	0.09	.770
	Error	116.46	74	1.57		
	Total	1179.56	78			
	Corrected Total	119.16	77			

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 8
Analysis of Variance Source Table for Unpredictability of Examination Period

Imputation Number	Source	SS	df	MS	F	p
1	Corrected Model	8.25	3	2.75	1.17	.327
	Intercept	271.59	1	271.59	115.63	.000
	Trauma	3.34	1	3.34	1.42	.237
	FhxIBS	2.07	1	2.07	.88	.350
	Trauma x FhxIBS	0.18	1	0.18	.08	.784
	Error	173.81	74	2.35		
	Total	706.67	78			
	Corrected Total	182.06	77			
2	Corrected Model	5.90	3	1.97	.78	.511
	Intercept	272.92	1	272.92	107.70	.000
	Trauma	1.64	1	1.64	.65	.424
	FhxIBS	1.78	1	1.78	.70	.405
	Trauma x FhxIBS	0.82	1	0.82	.32	.572
	Error	187.52	74	2.53		
	Total	705.58	78			
	Corrected Total	193.42	77			
3	Corrected Model	10.27	3	3.42	1.47	.231
	Intercept	298.12	1	298.12	127.59	.000
	Trauma	3.62	1	3.62	1.55	.217
	FhxIBS	2.50	1	2.50	1.07	.304
	Trauma x FhxIBS	1.63	1	1.63	.70	.407
	Error	172.91	74	2.34		
	Total	745.72	78			
	Corrected Total	183.18	77			
4	Corrected Model	10.17	3	3.39	1.41	.247
	Intercept	285.00	1	285.00	118.58	.000
	Trauma	4.26	1	4.26	1.77	.187
	FhxIBS	2.46	1	2.46	1.02	.315
	Trauma x FhxIBS	0.51	1	0.51	.21	.647
	Error	177.85	74	2.40		
	Total	736.53	78			

	Corrected Total	188.02	77			
5	Corrected Model	10.45	3	3.48	1.40	.251
	Intercept	265.13	1	265.13	106.25	.000
	Trauma	3.52	1	3.52	1.41	.239
	FhxIBS	3.32	1	3.32	1.33	.252
	Trauma x FhxIBS	0.31	1	0.31	.13	.725
	Error	184.65	74	2.50		
	Total	692.40	78			
	Corrected Total	195.10	77			

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 9

Analysis of Variance Source Table for Stressfulness of Examination Period

Imputation Number	Source	SS	df	MS	F	p
1	Corrected Model	7.13	3	2.38	0.98	.408
	Intercept	622.17	1	622.17	256.17	.000
	Trauma	1.08	1	1.08	0.45	.507
	FhxIBS	7.04	1	7.04	2.90	.093
	Trauma x FhxIBS	1.30	1	1.30	0.53	.467
	Error	179.73	74	2.43		
	Total	1253.58	78			
	Corrected Total	186.85	77			
2	Corrected Model	6.45	3	2.15	0.84	.474
	Intercept	612.36	1	612.36	240.38	.000
	Trauma	0.87	1	0.87	0.34	.561
	FhxIBS	6.11	1	6.11	2.40	.126
	Trauma x FhxIBS	2.64	1	2.64	1.04	.312
	Error	188.51	74	2.55		
	Total	1265.18	78			
	Corrected Total	194.96	77			
3	Corrected Model	8.72[d]	3	2.91	1.31	.278
	Intercept	635.77	1	635.77	286.50	.000
	Trauma	0.71	1	0.71	0.32	.573
	FhxIBS	8.31	1	8.31	3.75	.057
	Trauma x FhxIBS	0.70	1	0.70	0.32	.576
	Error	164.21	74	2.22		
	Total	1254.22	78			
	Corrected Total	172.93	77			
4	Corrected Model	16.28	3	5.43	2.35	.079
	Intercept	681.72	1	681.72	295.78	.000
	Trauma	0.41	1	0.41	0.18	.675
	FhxIBS	11.07	1	11.07	4.80	.032
	Trauma x FhxIBS	0.09	1	0.09	0.04	.845
	Error	170.55	74	2.30		

	Total	1315.70	78			
	Corrected Total	186.84	77			
5	Corrected Model	7.47	3	2.49	1.02	.389
	Intercept	659.38	1	659.38	269.64	.000
	Trauma	2.12	1	2.12	0.87	.355
	FhxIBS	4.97	1	4.97	2.03	.158
	Trauma x FhxIBS	0.17	1	0.17	0.07	.792
	Error	180.96	74	2.45		
	Total	1320.10	78			
	Corrected Total	188.43	77			

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 10

Analysis of Variance Source Table for Challenge of Examination Period

Imputation Number	Source	SS	df	MS	F	p
1	Corrected Model	8.31	3	2.77	1.36	.261
	Intercept	664.61	1	664.61	326.42	.000
	Trauma	0.33	1	0.33	0.16	.688
	FhxIBS	5.97	1	5.97	2.93	.091
	Trauma x FhxIBS	0.32	1	0.32	0.16	.695
	Error	150.67	74	2.04		
	Total	1366.10	78			
	Corrected Total	158.98	77			
2	Corrected Model	4.66[c]	3	1.55	0.76	.521
	Intercept	669.96	1	669.96	327.51	.000
	Trauma	0.01	1	0.01	0.00	.960
	FhxIBS	3.97	1	3.97	1.94	.168
	Trauma x FhxIBS	0.16	1	0.16	0.08	.778
	Error	151.37	74	2.05		
	Total	1377.64	78			
	Corrected Total	156.03	77			
3	Corrected Model	5.96[d]	3	1.99	0.94	.426
	Intercept	675.59	1	675.59	319.63	.000
	Trauma	0.00	1	0.00	0.00	.962
	FhxIBS	4.75	1	4.75	2.25	.138
	Trauma x FhxIBS	0.01	1	0.01	0.01	.941
	Error	156.41	74	2.11		
	Total	1378.56	78			
	Corrected Total	162.37	77			
4	Corrected Model	2.26[e]	3	0.75	0.36	.782
	Intercept	677.46	1	677.46	323.12	.000
	Trauma	0.44	1	0.44	0.21	.648
	FhxIBS	1.70	1	1.70	0.81	.371
	Trauma x FhxIBS	0.05	1	0.05	0.02	.882
	Error	155.15	74	2.10		
	Total	1402.20	78			
	Corrected Total	157.42	77			

5	Corrected Model	6.28[f]	3	2.09	1.01	.392
	Intercept	642.54	1	642.54	310.84	.000
	Trauma	0.10	1	0.10	0.05	.829
	FhxIBS	4.07	1	4.07	1.97	.165
	Trauma x FhxIBS	1.33	1	1.33	0.65	.424
	Error	152.97	74	2.07		
	Total	1349.22	78			
	Corrected Total	159.25	77			

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 11

Analysis of Variance Source Table for Novelty of Examination Period

Imputation Number	Source	SS	df	MS	F	p
1	Corrected Model	6.26	3	2.09	.69	.563
	Intercept	162.59	1	162.59	53.47	.000
	Trauma	0.52	1	0.52	.17	.680
	FhxIBS	2.29	1	2.29	.75	.388
	Trauma x FhxIBS	5.08	1	5.08	1.67	.200
	Error	225.02	74	3.04		
	Total	516.40	78			
	Corrected Total	231.28	77			
2	Corrected Model	16.09	3	5.36	1.74	.165
	Intercept	165.77	1	165.77	53.92	.000
	Trauma	0.23	1	0.23	.08	.783
	FhxIBS	5.21	1	5.21	1.70	.197
	Trauma x FhxIBS	6.58	1	6.58	2.14	.148
	Error	227.51	74	3.07		
	Total	537.85	78			
	Corrected Total	243.60	77			
3	Corrected Model	12.62	3	4.21	1.50	.221
	Intercept	156.42	1	156.42	55.87	.000
	Trauma	0.04	1	0.04	.01	.907
	FhxIBS	2.92	1	2.92	1.04	.310
	Trauma x FhxIBS	7.98	1	7.98	2.85	.096
	Error	207.18	74	2.80		
	Total	502.28	78			
	Corrected Total	219.81	77			
4	Corrected Model	9.69	3	3.23	1.10	.357
	Intercept	147.76	1	147.76	50.08	.000
	Trauma	1.54	1	1.54	.52	.472
	FhxIBS	0.79	1	0.79	.27	.606
	Trauma x FhxIBS	8.72	1	8.72	2.96	.090
	Error	218.33	74	2.95		
	Total	498.97	78			

	Corrected Total	228.02	77			
5	Corrected Model	12.64	3	4.21	1.43	.240
	Intercept	150.43	1	150.43	51.19	.000
	Trauma	0.35	1	0.35	.12	.730
	FhxIBS	1.69	1	1.69	.58	.451
	Trauma x FhxIBS	9.48	1	9.48	3.23	.077
	Error	217.46	74	2.94		
	Total	507.50	78			
	Corrected Total	230.10	77			

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 12

Means, SEs, ns, Minimum and Maximum Values for Ratings of Examination Period for Individuals Who Experienced an Increase in PSS Between Time 1 and Time 2

Variable	N	Mean	S.E.	Min.	Max.
Difficulty	44	1.90	.35	0	6
Satisfaction	44	3.39	.30	0	6
Controllability	44	3.90	.26	0	6
Unpredictability	44	2.48	.31	0	6
Stressfulness	44	3.65	.33	0	6
Challenging	44	3.84	.31	0	6
Novelty	44	2.10	.35	0	6

Table 13

Means, SEs, Ns, Minimum and Maximum Values for Study Variables Including only Participants Who Experienced an Increase in PSS Between Time 1 and Time 2

Variable	N	Mean	S.E.	Min.	Max.
PSS1	44	16.93	.87	5.00	31.00
PSS2	44	21.44	.92	6.00	36.00
GIAverageFrequency1	44	.31	.03	.00	.93
GIAverageFrequency2	44	.36	.05	.00	1.44
GItotal1	44	6.68	.65	.00	16.00
GItotal2	44	7.55	.99	.00	26.00
GIfreqmax1	44	1.59	.15	.00	3.00
GIfreqmax2	44	1.55	.15	.00	3.00
PHQ1	44	5.60	.47	.00	14.00
PHQ2	44	6.04	.55	.00	16.00

Note. PSS = score on Perceived Stress Scale, GIAverageFrequency = average frequency of GI symptoms, GIfreqmax = highest symptom frequency reported, GItotal = total number of symptoms reported

Table 14

Means, SEs and ns for PSS for Individuals Who Experienced an Increase in PSS Between Time 1 and Time 2

		Time 1				Time 2			
		History of Trauma		No History of Trauma		History of Trauma		No History of Trauma	
		Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS
Variable									
PSS	Mean	17.8	17.75	17.00	15.08	21.20	22.80	22.00	18.92
	(S.E.)	(1.60)	(1.25)	(2.00)	(1.66)	(1.32)	(1.32)	(3.00)	(1.75)
	n	5	24	2	13	5	24	2	13

Note. PSS = score on Perceived Stress Scale

Table 15

Means and SEs for GIAverageFrequency, GIfreqmax and GItotal Including Only Individuals Who Experienced an Increase in PSS Between Time 1 and Time 2

		Time 1				Time 2			
		History of Trauma		No History of Trauma		History of Trauma		No History of Trauma	
		Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS	Family History of IBS	No Family History of IBS
Variable									
GI Average Frequency	Mean	.44	.34	.32	.21	.64	.322	.72	.21
	S.E.	.08	.05	.11	.05	.16	.043	.72	.05
GI Highest Frequency	Mean	1.40	1.75	2.50	1.23	2.40	1.71	1.00	1.00
	S.E.	.24	.21	.50	.26	.40	.20	1.00	.23
GI Symptom Total	Mean	10.00	6.92	6.50	5.00	13.2	7.05	13.00	5.46
	S.E.	1.58	.93	1.50	1.09	2.89	1.22	13.00	1.28
	n	5	24	2	13	5	24	2	13

Note. GIAverageFrequency = average frequency of GI symptoms, GIfreqmax = highest symptom frequency reported, GItotal = total number of symptoms reported

Table 16
Repeated Measures ANOVA Source Table for PSS

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	2.59	1	2.59	.16	.693
	Timex FhxIBS	1.54	1	1.54	.09	.761
	Time x Trauma	0.00	1	0.00	.00	.988
	Time x FhxIBS x Trauma	0.64	1	0.64	.04	.845
	Error(PSS)	1219.56	74	16.48		
2	Time	2.63	1	2.63	.16	.691
	Time x FhxIBS	1.57	1	1.57	.10	.759
	Time x Trauma	0.00	1	0.00	.00	.986
	Time x FhxIBS x Trauma	0.65	1	0.65	.04	.843
	Error(Time)	1220.62	74	16.49		
3	Time	2.72	1	2.72	.16	.686
	Time x FhxIBS	1.64	1	1.64	.10	.754
	Time x Trauma	0.01	1	0.01	.00	.981
	Time x FhxIBS x Trauma	0.70	1	0.70	.04	.837
	Error(Time)	1224.17	74	16.54		
4	Time	2.50	1	2.50	.15	.698
	Time x FhxIBS	1.47	1	1.47	.09	.766
	Time x Trauma	0.00	1	0.00	.00	.994
	Time x FhxIBS x Trauma	0.59	1	0.59	.04	.850
	Error(Time)	1217.55	74	16.45		
5	Time	2.67	1	2.67	.16	.689
	Time x FhxIBS	1.60	1	1.60	.10	.757
	Time x Trauma	0.01	1	0.01	.00	.984
	Time x FhxIBS x Trauma	0.67	1	0.67	.04	.840
	Error(Time)	1221.96	74	16.51		
		1221.96	74.000	16.51		
		1221.96	74.000	16.51		
		1221.96	74.000	16.51		
		Between-Participants				

1	Intercept	29841.16	1	29841.16	406.67	.000
	FhxIBS	151.80	1	151.80	2.07	.155
	Trauma	14.89	1	14.89	.20	.654
	FhxIBS x Trauma	161.91	1	161.91	2.21	.142
	Error	5430.06	74	73.38		
2	Intercept	29845.01	1	29845.01	406.99	.000
	FhxIBS	151.52	1	151.52	2.07	.155
	Trauma	14.98	1	14.98	.20	.653
	FhxIBS x Trauma	162.19	1	162.19	2.21	.141
	Error	5426.43	74	73.33		
3	Intercept	29854.96	1	29854.96	407.77	.000
	FhxIBS	150.82	1	150.82	2.06	.155
	Trauma	15.20	1	15.20	.21	.650
	FhxIBS x Trauma	162.93	1	162.93	2.23	.140
	Error	5417.88	74	73.21		
4	Intercept	29830.69	1	29830.69	405.73	.000
	FhxIBS	152.55	1	152.55	2.07	.154
	Trauma	14.66	1	14.66	.20	.657
	FhxIBS x Trauma	161.14	1	161.14	2.19	.143
	Error	5440.78	74	73.52		
5	Intercept	29849.15	1	29849.15	407.33	.000
	FhxIBS	151.23	1	151.23	2.06	.155
	Trauma	15.07	1	15.07	.21	.652
	FhxIBS x Trauma	162.50	1	162.50	2.22	.141
	Error	5422.73	74	73.28		

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 17
Tests of Fixed Effects PSS

Imputation Number	Source	Numerator df	Denominator df	F	p
1	Intercept	1	148	664.17	0.00
	Time	1	148	0.06	0.81
	Trauma	1	148	0.33	0.57
	FhxIBS	1	148	3.38	0.07
	Time x Trauma	1	148	0.00	0.99
	Time x FhxIBS	1	148	0.03	0.85
	Time x Trauma x FhxIBS	2	148	1.81	0.17
2	Intercept	1	148	664.51	0.00
	Time	1	148	0.06	0.81
	Trauma	1	148	0.33	0.56
	FhxIBS	1	148	3.37	0.07
	Time x Trauma	1	148	0.00	0.99
	Time x FhxIBS	1	148	0.03	0.85
	Time x Trauma x FhxIBS	2	148	1.81	0.17
3	Intercept	1	148	665.24	0.00
	Time	1	148	0.06	0.81
	Trauma	1	148	0.34	0.56
	FhxIBS	1	148	3.36	0.07
	Time x Trauma	1	148	0.00	0.99
	Time x FhxIBS	1	148	0.04	0.85
	Time x Trauma x FhxIBS	2	148	1.82	0.17
4	Intercept	1	148	663.07	0.00
	Time	1	148	0.06	0.81
	Trauma	1	148	0.33	0.57
	FhxIBS	1	148	3.39	0.07
	Time x Trauma	1	148	0.00	1.00
	Time x FhxIBS	1	148	0.03	0.86
	Time x Trauma x FhxIBS	2	148	1.80	0.17
5	Intercept	1	148	664.84	0.00
	Time	1	148	0.06	0.81
	Trauma	1	148	0.34	0.56
	FhxIBS	1	148	3.37	0.07

Time x Trauma	1	148	0.00	0.99
Time x FhxIBS	1	148	0.04	0.85
Time x Trauma x FhxIBS	2	148	1.82	0.17

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 18

Repeated Measures ANOVA Source Table for PSS Only Including Participants Who Experienced an Increase in PSS Between Time 1 and Time 2

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	182.68	1	182.68	54.28	.00
	Time x Trauma	0.10	1	.10	.03	.87
	Time x FhxIBS	0.15	1	.15	.04	.83
	Time x Trauma x FhxIBS	4.79	1	4.79	1.42	.24
	Error(Time)	134.63	40	3.37		
2	Time	183.05	1	183.05	54.68	.00
	Time x Trauma	0.09	1	.09	.03	.87
	Time x FhxIBS	0.16	1	.16	.05	.83
	Time x Trauma x FhxIBS	4.85	1	4.85	1.45	.24
	Error(Time)	133.92	40	3.35		
3	Time	184.02	1	184.02	55.40	.00
	Time x Trauma	0.07	1	.07	.02	.89
	Time x FhxIBS	0.19	1	.19	.06	.81
	Time x Trauma x FhxIBS	5.01	1	5.01	1.51	.23
	Error(Time)	132.86	40	3.32		
4	Time	181.67	1	181.67	52.87	.00
	Time x Trauma	0.12	1	.12	.04	.85
	Time x FhxIBS	0.12	1	.12	.04	.85
	Time x Trauma x FhxIBS	4.63	1	4.63	1.35	.25
	Error(Time)	137.45	40	3.44		
5	Time	183.45	1	183.45	55.03	.00
	Time x Trauma	0.08	1	.08	.02	.88
	Time x FhxIBS	0.17	1	.17	.05	.82
	Time x Trauma x FhxIBS	4.92	1	4.92	1.48	.23
	Error(Time)	133.34	40	3.33		
		Between-Participants				
1	Intercept	14213.98	1	14213.98	209.68	0.00
	Trauma	26.19	1	26.19	0.39	0.54
	FhxIBS	7.28	1	7.28	0.11	0.74

	Trauma x FhxIBS	26.19	1	26.19	0.39	0.54
	Error	2711.58	40	67.79		
2	Intercept	14217.26	1	14217.26	210.03	0.00
	Trauma	26.33	1	26.33	0.39	0.54
	FhxIBS	7.21	1	7.21	0.11	0.75
	Trauma x FhxIBS	26.33	1	26.33	0.39	0.54
	Error	2707.69	40	67.69		
3	Intercept	14225.74	1	14225.74	210.87	0.00
	Trauma	26.69	1	26.69	0.40	0.53
	FhxIBS	7.02	1	7.02	0.10	0.75
	Trauma x FhxIBS	26.69	1	26.69	0.40	0.53
	Error	2698.45	40	67.46		
4	Intercept	14205.07	1	14205.07	208.67	0.00
	Trauma	25.81	1	25.81	0.38	0.54
	FhxIBS	7.48	1	7.48	0.11	0.74
	Trauma x FhxIBS	25.81	1	25.81	0.38	0.54
	Error	2723.00	40	68.08		
5	Intercept	14220.79	1	14220.79	210.39	0.00
	Trauma	26.48	1	26.48	0.39	0.53
	FhxIBS	7.13	1	7.13	0.11	0.75
	Trauma x FhxIBS	26.48	1	26.48	0.39	0.53
	Error	2703.71	40	67.59		

Note. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 19

Correlations Among Study Variables and Potential Confounding Variables

Variables	GI Average Frequency 1	GI Average Frequency 2	GIfreqmax 1	GIfreqmax2	GItotal1	GItotal2	PHQ 1	PHQ 2	PSS1	PSS2	ICSRLE 1	ICSRLE 2	LEQ 1	LEQ 2	Sleep 1	Sleep 2	Caffeinel
GIAverage Frequency 1	_	.69 ***	.68 ***	.53** *	.93 ***	.60 ***	.47 ***	.50 ***	.45 ***	.48 ***	.55 ***	.52 ***	.29 *	.22 *	-.12	- .11	.06
GIAverage Frequency 2		_	.47 ***	.73 ***	.65 ***	.97 ***	.43 ***	.73 ***	.34 **	.46 ***	.47 ***	.54 ***	.30 *	.16	.01	- .19	-.05
GIfreqmax 1			_	.39 ***	.64 ***	.42 ***	.15	.28 *	.21	.29 *	.29 **	.30 **	.09	.17	.03	- .01	.08
GIfreqmax 2				_	.51 ***	.68 ***	.31 **	.51 ***	.25 *	.40 ***	.34 **	.41 ***	.14	.06	.02	- .19	.10
GItotal 1					_	.64 ***	.47 ***	.50 ***	.44 ***	.49 ***	.53 ***	.52***	.31 **	.19	-.05	- .13	.08
GI t otal 2						_	.39 ***	.73 ***	.35 **	.43 ***	.44 ***	.53***	.29 **	.12	.04	- .16	-.07
PHQ 1							_	.61 ***	.47 ***	.42 ***	.49 ***	.38 **	.24 *	.12	.01	- .23 *	-.04
PHQ 2								_	.37 **	.51 ***	.47 ***	.55 ***	.29 *	.16	-.21	- .31 **	.05
PSS1									_	.66 ***	.70 ***	.59 ***	.33 **	.18	-.21	- .27 *	.12
PSS 2										_	.42 ***	.51 ***	.29 *	.28 *	-.11	- .31 **	.13
ICSRLE 1											_	.84 ***	.48***	.44 ** *	-.25 *	- .22	-.04
ICSRLE 2												_	.40***	.44 ** *	-.19	- .29**	-.01
LEQ 1													_	.67 ** *	-.13	- .10	-.00
LEQ 2														_	-.11	- .06	-.10
Sleep 1															_	.48 ***	-.20
Sleep 2																_	-.13
Caffeine 1																	_
Caffeine 2																	
Alcohol 1																	
Alcohol 2																	
Exercise 1																	
Exercise 2																	
n	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78

*p < .05, ** p < .01, ***p < .001

Note. GIAverageFrequency = average frequency of GI symptoms, GIfreqmax = highest symptom frequency reported, GItotal = total number of symptoms reported, PHQ = total of severity ratings of non-gastrointestinal somatic symptoms, PSS = scores on Perceived Stress Scale, ICSRLE = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages, Alcohol = average number of alcoholic beverages, Exercise = average number of hours exercised

Table 20

ANOVA Source Table for Sleep1

Source	SS	df	MS	F	p
Corrected Model	2.10	3	0.70	2.10	.107
Intercept	196.12	1	196.12	589.43	.000
Trauma	1.83	1	1.83	5.51	.022
FhxIBS	0.39	1	0.39	1.17	.284
Trauma x FhxIBS	1.58	1	1.58	4.75	.032
Error	24.62	74	0.33		
Total	380.00	78			
Corrected Total	26.72	77			
Corrected Total	26.72	77			

Note. Sleep1 represents the average number of hours of sleep reported at Time 1. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 21

Repeated Measures ANOVA Source Table for Sleep

Source	SS	df	MS	F	p
		Within-Participants			
Time	1.52	1	1.52	6.95	.010
Time x FhxIBS	0.64	1	.64	2.93	.091
Time x Trauma	1.45	1	1.45	6.65	.012
Time x FhxIBS x Trauma	1.43	1	1.43	6.54	.013
Error(Time)	16.17	74	.22		
		Between Participants			
Intercept	344.94	1	344.94	519.56	.000
FhxIBS	0.01	1	0.01	.01	.920
Trauma	0.50	1	0.50	.76	.387
FhxIBS x Trauma	0.34	1	0.34	.51	.476
Error	49.13	74	0.66		

Note. Sleep represents average number of hours of sleep. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 22

ANOVA Source Table for Caffeine1

Imputation Number	Source	SS	df	MS	F	Sig.
1	Corrected Model	0.04	3	0.01	1.42	.245
	Intercept	1.75	1	1.75	178.32	.000
	Trauma	0.03	1	0.03	2.95	.090
	FhxIBS	0.00	1	0.00	0.08	.779
	Trauma x FhxIBS	0.00	1	0.00	0.05	.827
	Error	0.73	74	0.01		
	Total	4.67	78			
	Corrected Total	0.77	77			
2	Corrected Model	0.04	3	0.01	1.79	.156
	Intercept	1.66	1	1.66	230.51	.000
	Trauma	0.03	1	0.03	3.87	.053
	FhxIBS	0.00	1	0.00	0.06	.806
	Trauma x FhxIBS	0.00	1	0.00	0.21	.649
	Error	0.53	74	0.01		
	Total	4.10	78			
	Corrected Total	0.57	77			
3	Corrected Model	0.04	3	0.01	1.78	.159
	Intercept	1.74	1	1.74	218.02	.000
	Trauma	0.03	1	0.03	4.05	.048
	FhxIBS	0.00	1	0.00	0.02	.891
	Trauma x FhxIBS	0.00	1	0.00	0.29	.591
	Error	0.59	74	0.01		
	Total	4.38	78			
	Corrected Total	0.63	77			
4	Corrected Model	0.07	3	0.02	3.05	.034
	Intercept	1.76	1	1.76	219.36	.000
	Trauma	0.05	1	0.05	6.16	.015
	FhxIBS	0.00	1	0.00	0.27	.607
	Trauma x FhxIBS	0.00	1	0.00	0.27	.607
	Error	0.59	74	0.01		
	Total	4.42	78			

	Corrected Total	0.67	77			
5	Corrected Model	0.05	3	0.02	1.78	.159
	Intercept	1.81	1	1.81	213.40	.000
	Trauma	0.03	1	0.03	4.05	.048
	FhxIBS	0.00	1	0.00	0.13	.717
	Trauma x FhxIBS	0.01	1	0.01	0.93	.338
	Error	0.63	74	0.01		
	Total	4.45	78			
	Corrected Total	0.67	77			

Note. Caffeine1 represents the average number of caffeinated beverages consumed over the past week as reported at Time 1. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 23

Repeated Measures ANOVA Source Table for Caffeine

Imputation Number	Source	SS	df	MS	F	Sig.
		Within-Participants				
1	Time	0.07	1	.07	6.82	.011
	Time x FhxIBS	0.01	1	.01	1.06	.306
	Time x Trauma	0.00	1	.00	.01	.916
	Time x FhxIBS x Trauma	0.00	1	.00	.29	.593
	Error(Time)	0.78	74	.01		
2	Time	0.07	1	.07	7.46	.008
	Time x FhxIBS	0.00	1	.00	.40	.529
	Time x Trauma	0.00	1	.00	.00	.996
	Time x FhxIBS x Trauma	0.00	1	.00	.05	.819
	Error(Time)	0.74	74	.01		
3	Time	0.10	1	.10	8.19	.005
	Time x FhxIBS	0.00	1	.00	.01	.926
	Time x Trauma	0.00	1	.00	.35	.555
	Time x FhxIBS x Trauma	0.01	1	.01	.41	.525
	Error(Time)	0.95	74	.01		
4	Time	0.05	1	.05	4.00	.049
	Time x FhxIBS	0.00	1	.00	.04	.835
	Time x Trauma	0.00	1	.00	.06	.811
	Time x FhxIBS x Trauma	0.00	1	.00	.06	.811
	Error(Time)	0.87	74	.01		
5	Time	0.08	1	.08	6.58	.012
	Time x FhxIBS	0.00	1	.00	.00	.982
	Time x Trauma	0.00	1	.00	.02	.897
	Time x FhxIBS x Trauma	0.00	1	.00	.07	.792
	Error(Time)	0.88	74	.01		
		Between-Participants				
1	Intercept	4.58	1	4.58	273.43	.000
	FhxIBS	0.00	1	0.00	.26	.611
	Trauma	0.05	1	0.05	3.16	.080

	FhxIBS x Trauma	0.00	1	0.00	.04	.851
	Error	1.24	74	0.02		
2	Intercept	4.39	1	4.39	325.64	.000
	FhxIBS	0.01	1	0.01	.64	.426
	Trauma	0.06	1	0.06	4.11	.046
	FhxIBS x Trauma	0.00	1	0.00	.08	.784
	Error	1.00	74	0.01		
3	Intercept	4.80	1	4.80	308.30	.000
	FhxIBS	0.00	1	0.00	.05	.824
	Trauma	0.04	1	0.04	2.26	.137
	FhxIBS x Trauma	0.00	1	0.00	.00	.975
	Error	1.15	74	0.02		
4	Intercept	4.38	1	4.38	316.10	.000
	FhxIBS	0.00	1	0.00	.13	.717
	Trauma	0.08	1	0.08	6.00	.017
	FhxIBS x Trauma	0.00	1	0.00	.11	.738
	Error	1.02	74	0.01		
5	Intercept	4.76	1	4.76	294.69	.000
	FhxIBS	0.00	1	0.00	.12	.725
	Trauma	0.06	1	0.06	3.80	.055
	FhxIBS x Trauma	0.01	1	0.01	.58	.450
	Error	1.19	74	0.02		

Note. Caffeine represents the average number of caffeinated beverages consumed over the past week. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 24

ANOVA Source Table for LEQ1

Source	SS	df	MS	F	p
Corrected Model	3.41	3	1.14	4.02	.010
Intercept	115.00	1	115.00	406.26	.000
Trauma	0.43	1	0.43	1.50	.224
FhxIBS	1.79	1	1.79	6.32	.014
Trauma x FhxIBS	0.14	1	0.14	.48	.489
Error	20.95	74	0.28		
Total	233.00	78			
Corrected Total	24.36	77			

Note. LEQ1 represents the total number of life events reported at Time 1. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 25

Repeated Measures ANOVA Source Table for LEQ

Source	SS	df	MS	F	Sig.
		Within-Participants			
Time	0.43	1	.43	3.79	.055
Time x FhxIBS	0.59	1	.59	5.14	.026
Time x Trauma	0.45	1	.45	3.93	.051
Time x FhxIBS x Trauma	0.07	1	.07	.61	.438
Error(LEQ)	8.49	74	.11		
		Between-Participants			
Intercept	210.44	1	210.44	378.99	.000
FhxIBS	1.26	1	1.26	2.27	.136
Trauma	2.54	1	2.54	4.58	.036
FhxIBS x Trauma	0.07	1	0.07	0.12	.729
Error	41.09	74	0.56		

Note. LEQ represents the total number of life events. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 26

ANOVA Source Table for ICSRLE1

Imputation Number	Source	SS	df	MS	F	Sig.
1	Corrected Model	4376.36	3	1458.79	2.42	.072
	Intercept	322482.97	1	322482.97	536.03	.000
	Trauma	2715.22	1	2715.22	4.51	.037
	FhxIBS	190.98	1	190.98	.32	.575
	Trauma x FhxIBS	59.40	1	59.40	.10	.754
	Error	44519.46	74	601.61		
	Total	712874.21	78			
	Corrected Total	48895.82	77			
2	Corrected Model	4375.63	3	1458.54	2.42	.072
	Intercept	322478.12	1	322478.12	536.10	.000
	Trauma	2714.77	1	2714.77	4.51	.037
	FhxIBS	191.10	1	191.10	.32	.575
	Trauma x FhxIBS	59.47	1	59.47	.10	.754
	Error	44513.27	74	601.53		
	Total	712846.18	78			
	Corrected Total	48888.90	77			
3	Corrected Model	4368.70	3	1456.23	2.42	.072
	Intercept	322432.17	1	322432.17	536.71	.000
	Trauma	2710.56	1	2710.56	4.51	.037
	FhxIBS	192.22	1	192.22	.32	.573
	Trauma x FhxIBS	60.09	1	60.09	.10	.753
	Error	44455.92	74	600.76		
	Total	712581.81	78			
	Corrected Total	48824.62	77			
4	Corrected Model	4373.86	3	1457.95	2.42	.072
	Intercept	322466.40	1	322466.40	536.26	.000
	Trauma	2713.70	1	2713.70	4.51	.037
	FhxIBS	191.38	1	191.38	.32	.574
	Trauma x FhxIBS	59.63	1	59.63	.10	.754
	Error	44498.43	74	601.33		
	Total	712778.54	78			

	Corrected Total	48872.29	77			
5	Corrected Model	4371.69	3	1457.23	2.42	.072
	Intercept	322452.02	1	322452.02	536.45	.000
	Trauma	2712.38	1	2712.38	4.51	.037
	FhxIBS	191.73	1	191.73	.32	.574
	Trauma x FhxIBS	59.82	1	59.82	.10	.753
	Error	44480.41	74	601.09		
	Total	712695.73	78			
	Corrected Total	48852.10	77			

Note. ICSRLE 1 represents total scores on questionnaire of daily hassles questionnaire administered at Time 1. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 27

Repeated Measures ANOVA Source Table for ICSRLE

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	57.75	1	57.75	.50	.481
	Time x FhxIBS	11.28	1	11.28	.10	.755
	Time x Trauma	59.52	1	59.52	.52	.474
	Time x FhxIBS x Trauma	298.42	1	298.42	2.59	.111
	Error(Time)	8511.28	74	115.02		
2	Time	56.44	1	56.44	.49	.487
	Time x FhxIBS	10.36	1	10.36	.09	.765
	Time x Trauma	53.71	1	53.71	.46	.498
	Time x FhxIBS x Trauma	287.06	1	287.06	2.48	.119
	Error(Time)	8550.99	74	115.55		
3	Time	34.07	1	34.07	.29	.589
	Time x FhxIBS	2.11	1	2.11	.02	.893
	Time x Trauma	32.34	1	32.34	.28	.599
	Time x FhxIBS x Trauma	236.89	1	236.89	2.04	.157
	Error(Time)	8585.71	74	116.02		
4	Time	51.02	1	51.02	.44	.508
	Time x FhxIBS	8.01	1	8.01	.07	.793
	Time x Trauma	51.68	1	51.68	.45	.505
	Time x FhxIBS x Trauma	282.93	1	282.93	2.46	.121
	Error(Time)	8517.78	74	115.11		
5	Time	46.25	1	46.25	.40	.530
	Time x FhxIBS	5.82	1	5.82	.05	.824
	Time x Trauma	45.84	1	45.84	.39	.532
	Time x FhxIBS x Trauma	271.55	1	271.55	2.34	.131
	Error(Time)	8600.93	74	116.23		
		Between-Participants				
1	Intercept	657230.10	1	657230.10	530.04	.000
	FhxIBS	524.52	1	524.52	0.42	.517
	Trauma	4352.91	1	4352.91	3.51	.065

	FhxIBS x Trauma	40.64	1	40.64	0.03	.857
	Error	91757.92	74	1239.97		
2	Intercept	657079.93	1	657079.93	530.85	.000
	FhxIBS	518.38	1	518.38	0.42	.520
	Trauma	4403.21	1	4403.21	3.56	.063
	FhxIBS x Trauma	36.44	1	36.44	0.03	.864
	Error	91596.76	74	1237.79		
3	Intercept	654273.60	1	654273.60	527.13	.000
	FhxIBS	443.48	1	443.48	0.36	.552
	Trauma	4616.03	1	4616.03	3.72	.058
	FhxIBS x Trauma	19.61	1	19.61	0.02	.900
	Error	91849.24	74	1241.21		
4	Intercept	656455.75	1	656455.75	529.51	.000
	FhxIBS	501.52	1	501.52	0.40	.527
	Trauma	4419.82	1	4419.82	3.57	.063
	FhxIBS x Trauma	34.81	1	34.81	0.03	.867
	Error	91741.20	74	1239.75		
5	Intercept	655872.94	1	655872.94	530.46	.000
	FhxIBS	483.73	1	483.73	0.39	.534
	Trauma	4473.26	1	4473.26	3.62	.061
	FhxIBS x Trauma	30.70	1	30.70	0.02	.875
	Error	91494.58	74	1236.41		

Note. ICSRLE represents total scores on questionnaire of daily hassles questionnaire. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 28

ANOVA Source Table for Alcohol1

Source	SS	df	MS	F	Sig.
Corrected Model	0.66	3	0.22	3.07	.033
Intercept	1.35	1	1.35	18.98	.000
Trauma	0.26	1	0.26	3.59	.062
FhxIBS	0.07	1	0.07	1.05	.309
Trauma * FhxIBS	0.24	1	0.24	3.41	.069
Error	5.27	74	0.07		
Total	8.87	78			
Corrected Total	5.92	77			

Note. Alcohol1 represents average number of alcoholic beverage consumed over the past week as reported at Time 1. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 29

Repeated Measures ANOVA Source Table for Alcohol

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.12	1	0.12	2.80	.098
	Time x FhxIBS	0.03	1	0.03	.70	.407
	Time x Trauma	0.01	1	0.01	.30	.588
	Time x FhxIBS x Trauma	0.02	1	0.02	.51	.479
	Error(Time)	3.13	74	0.04		
2	Time	0.11	1	0.11	2.69	.105
	Time x FhxIBS	0.04	1	0.04	.90	.347
	Time x Trauma	0.02	1	0.02	.42	.519
	Time x FhxIBS x Trauma	0.02	1	0.02	.42	.519
	Error(Time)	2.95	74	0.04		
3	Time	0.12	1	0.12	2.81	.098
	Time x FhxIBS	0.03	1	0.03	.74	.392
	Time x Trauma	0.01	1	0.01	.32	.572
	Time x FhxIBS x Trauma	0.02	1	0.02	.49	.484
	Error(Time)	3.06	74	0.04		
4	Time	0.11	1	0.11	2.80	.099
	Time x FhxIBS	0.03	1	0.03	.80	.374
	Time x Trauma	0.01	1	0.01	.36	.552
	Time x FhxIBS x Trauma	0.02	1	0.02	.47	.494
	Error(Time)	2.99	74	0.04		
5	Time	0.11	1	0.11	2.80	.099
	Time x FhxIBS	0.03	1	0.03	.79	.376
	Time x Trauma	0.01	1	0.01	.35	.554
	Time x FhxIBS x Trauma	0.02	1	0.02	.48	.492
	Error(Time)	3.00	74	0.04		
		Between-Participants				
1	Intercept	1.69	1	1.69	13.29	.000
	FhxIBS	0.31	1	0.31	2.45	.122
	Trauma	0.36	1	0.36	2.86	.095

	FhxIBS x Trauma	0.30	1	0.30	2.38	.127
	Error	9.41	74	0.13		
2	Intercept	1.73	1	1.73	13.78	.000
	FhxIBS	0.33	1	0.33	2.63	.109
	Trauma	0.34	1	0.34	2.72	.103
	FhxIBS x Trauma	0.32	1	0.32	2.56	.114
	Error	9.32	74	0.13		
3	Intercept	1.70	1	1.70	13.43	.000
	FhxIBS	0.32	1	0.32	2.50	.118
	Trauma	0.36	1	0.36	2.84	.096
	FhxIBS x Trauma	0.31	1	0.31	2.42	.124
	Error	9.35	74	0.13		
4	Intercept	1.71	1	1.71	13.59	.000
	FhxIBS	0.32	1	0.32	2.55	.115
	Trauma	0.35	1	0.35	2.81	.098
	FhxIBS x Trauma	0.31	1	0.31	2.47	.120
	Error	9.31	74	0.13		
5	Intercept	1.71	1	1.71	13.58	.000
	FhxIBS	0.32	1	0.32	2.54	.115
	Trauma	0.35	1	0.35	2.81	.098
	FhxIBS x Trauma	0.31	1	0.31	2.47	.120
	Error	9.32	74	0.13		

Note. Alcohol represents average number of alcoholic beverage consumed over the past week. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 30

ANOVA Source Table for Exercise1

Imputation Number	Source	SS	df	MS	F	p
1	Corrected Model	0.63	3	0.21	1.35	.265
	Intercept	1.20	1	1.20	7.76	.007
	Trauma	0.17	1	0.17	1.12	.293
	FhxIBS	0.13	1	0.13	.81	.370
	Trauma x FhxIBS	0.03	1	0.03	.20	.655
	Error	11.45	74	0.15		
	Total	14.38	78			
	Corrected Total	12.08	77			
2	Corrected Model	0.45	3	0.15	.95	.421
	Intercept	1.16	1	1.16	7.32	.008
	Trauma	0.01	1	0.01	.06	.809
	FhxIBS	0.08	1	0.08	.51	.476
	Trauma x FhxIBS	0.20	1	0.20	1.24	.269
	Error	11.77	74	0.16		
	Total	14.32	78			
	Corrected Total	12.23	77			
3	Corrected Model	0.40	3	0.13	.87	.459
	Intercept	0.83	1	0.83	5.46	.022
	Trauma	0.04	1	0.04	.25	.617
	FhxIBS	0.06	1	0.06	.40	.527
	Trauma x FhxIBS	0.11	1	0.11	.69	.407
	Error	11.24	74	0.15		
	Total	13.24	78			
	Corrected Total	11.64	77			
4	Corrected Model	0.52	3	0.17	1.14	.339
	Intercept	0.89	1	0.89	5.83	.018
	Trauma	0.07	1	0.07	.49	.488
	FhxIBS	0.10	1	0.10	.67	.415
	Trauma x FhxIBS	0.10	1	0.10	.63	.432
	Error	11.29	74	0.15		
	Total	13.47	78			

	Corrected Total	11.81	77			
5	Corrected Model	0.44	3	0.15	.93	.430
	Intercept	0.47	1	0.47	2.98	.088
	Trauma	0.21	1	0.21	1.37	.246
	FhxIBS	0.01	1	0.01	.07	.786
	Trauma x FhxIBS	0.00	1	0.00	.02	.893
	Error	11.54	74	0.16		
	Total	13.27	78			
	Corrected Total	11.98	77			

Note. Exercise1 represents average number of hours of exercise over the past week as reported at Time 1. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 31

Repeated Measures ANOVA Source Table for Exercise

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.01	1	.01	.08	.775
	Time x FhxIBS	0.01	1	.01	.07	.798
	Time x Trauma	0.02	1	.02	.31	.577
	Time x FhxIBS x Trauma	0.03	1	.03	.38	.538
	Error(Time)	5.69	74	.08		
2	Time	0.00	1	.00	.00	.951
	Time x FhxIBS	0.00	1	.00	.02	.899
	Time x Trauma	0.02	1	.02	.31	.578
	Time x FhxIBS x Trauma	0.08	1	.08	.99	.324
	Error(Time)	5.73	74	.08		
3	Time	0.01	1	.01	.12	.735
	Time x FhxIBS	0.01	1	.01	.10	.752
	Time x Trauma	0.00	1	.00	.03	.864
	Time x FhxIBS x Trauma	0.05	1	.05	.56	.457
	Error(Time)	6.75	74	.09		
4	Time	0.01	1	.01	.16	.690
	Time x FhxIBS	0.00	1	.00	.00	.965
	Time x Trauma	0.00	1	.00	.01	.914
	Time x FhxIBS x Trauma	0.03	1	.03	.43	.516
	Error(Time)	5.77	74	.08		
5	Time	0.12	1	.12	1.46	.231
	Time x FhxIBS	0.01	1	.01	.15	.696
	Time x Trauma	0.00	1	.00	.04	.851
	Time x FhxIBS x Trauma	0.00	1	.00	.03	.866
	Error(Time)	6.09	74	.08		
		Between-Participants				
1	Intercept	2.16	1	2.16	9.03	.004
	FhxIBS	0.33	1	0.33	1.37	.245
	Trauma	0.19	1	0.19	0.79	.378
	FhxIBS x Trauma	0.01	1	0.01	0.03	.874

	Error	17.71	74	0.24		
2	Intercept	2.38	1	2.38	9.90	.002
	FhxIBS	0.19	1	0.19	0.80	.373
	Trauma	0.09	1	0.09	0.36	.553
	FhxIBS x Trauma	0.12	1	0.12	0.51	.476
	Error	17.81	74	0.24		
3	Intercept	1.93	1	1.93	8.76	.004
	FhxIBS	0.20	1	0.20	0.90	.345
	Trauma	0.11	1	0.11	0.49	.486
	FhxIBS x Trauma	0.05	1	0.05	0.25	.621
	Error	16.33	74	0.22		
4	Intercept	2.09	1	2.09	8.85	.004
	FhxIBS	0.22	1	0.22	0.92	.341
	Trauma	0.17	1	0.17	0.73	.396
	FhxIBS x Trauma	0.06	1	0.06	0.27	.602
	Error	17.47	74	0.24		
5	Intercept	1.72	1	1.72	7.17	.009
	FhxIBS	0.07	1	0.07	0.29	.590
	Trauma	0.36	1	0.36	1.50	.225
	FhxIBS x Trauma	0.02	1	0.02	0.06	.801
	Error	17.75	74	0.24		

Note. Exercise represents average number of hours of exercise over the past week. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 32
Repeated Measures Source Table for PSS with Gender Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participant				
1	Time	7.94	1	7.94	0.50	.481
	Time x Gender	12.08	1	12.08	0.76	.386
	Error (Time)	1190.04	75	15.87		
2	Time	8.08	1	8.08	0.51	.478
	Time x Gender	12.26	1	12.26	0.77	.382
	Error (Time)	1191.01	75	15.88		
3	Time	8.46	1	8.46	0.53	.468
	Time x Gender	12.72	1	12.72	0.80	.374
	Error (Time)	1194.32	75	15.92		
4	Time	7.56	1	7.56	0.48	.492
	Time x Gender	11.62	1	11.62	0.73	.395
	Error (Time)	1188.29	75	15.84		
5	Time	8.24	1	8.24	0.52	.474
	Time x Gender	12.45	1	12.45	0.78	.379
	Error (Time)	1192.24	75	15.90		
		Between-Participants				
1	Intercept	50211.22	1	50211.22	653.85	.000
	Gender	87.74	1	87.74	1.14	.289
	Error	5759.45	75	76.79		
2	Intercept	50222.43	1	50222.43	654.39	.000
	Gender	88.21	1	88.21	1.15	.287
	Error	5756.04	75	76.75		
3	Intercept	50251.40	1	50251.40	655.68	.000
	Gender	89.43	1	89.43	1.17	.284

	Error	5748.04	75	76.64		
4	Intercept	50180.76	1	50180.76	652.31	.000
	Gender	86.47	1	86.47	1.12	.292
	Error	5769.59	75	76.93		
5	Intercept	50234.48	1	50234.48	654.94	.000
	Gender	88.72	1	88.72	1.16	.286
	Error	5752.57	75	76.70		

Note. PSS represents total score on 10-item Perceived Stress Scale.

Table 33

Repeated Measures ANOVA Source Table for PSS with Ethnicity Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	11.30	1	11.30	0.71	.404
	Time x Ethnicity	0.76	1	0.76	0.05	.828
	Error(Time)	1201.37	75	16.02		
2	Time	11.90	1	11.90	0.74	.392
	Time x Ethnicity	0.92	1	0.92	0.06	.811
	Error(Time)	1202.35	75	16.03		
3	Time	13.53	1	13.53	0.84	.362
	Time x Ethnicity	1.41	1	1.41	0.09	.768
	Error(Time)	1205.63	75	16.08		
4	Time	9.75	1	9.75	0.61	.437
	Time x Ethnicity	0.40	1	0.40	0.02	.875
	Error(Time)	1199.51	75	15.99		
5	Time	12.57	1	12.57	0.78	.379
	Time x Ethnicity	1.11	1	1.11	0.07	.793
	Error(Time)	1203.58	75	16.05		
		Between-Participants				
1	Intercept	23599.72	1	23599.72	306.39	.000
	Ethnicity	70.34	1	70.34	.91	.342
	Error	5776.84	75	77.02		
2	Intercept	23626.79	1	23626.79	306.82	.000
	Ethnicity	68.87	1	68.87	.89	.347
	Error	5775.38	75	77.01		
3	Intercept	23696.84	1	23696.84	307.89	.000
	Ethnicity	65.15	1	65.15	.85	.361
	Error	5772.32	75	76.96		
4	Intercept	23526.21	1	23526.21	305.18	.000
	Ethnicity	74.42	1	74.42	.97	.329
	Error	5781.65	75	77.09		
5	Intercept	23655.92	1	23655.92	307.27	.000

Ethnicity	67.31	1	67.31	.87	.353
Error	5773.98	75	76.99		

Note. PSS represents total score on 10-item Perceived Stress Scale.

Table 34

Repeated Measures ANOVA Source Table for PSS with Race Entered As a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	9.61	1	9.61	0.56	.455
	Time x Race	0.28	2	0.14	0.01	.992
	Error(Time)	1175.47	69	17.04		
2	Time	9.61	1	9.61	0.56	.455
	Time x Race	0.28	2	0.14	0.01	.992
	Error(Time)	1175.47	69	17.04		
3	Time	9.61	1	9.61	0.56	.455
	Time x Race	0.28	2	0.14	0.01	.992
	Error(Time)	1175.47	69	17.04		
4	Time	9.61	1	9.61	0.56	.455
	Time x Race	0.28	2	0.14	0.01	.992
	Error(Time)	1175.47	69	17.04		
5	Time	9.61	1	9.61	0.56	.455
	Time x Race	0.28	2	0.14	0.01	.992
	Error(Time)	1175.47	69	17.04		
		Between-Participants				
1	Intercept	40575.90	1	40575.90	511.59	.000
	Race	133.30	2	66.65	.84	.436
	Error	5472.67	69	79.31		
2	Intercept	40575.90	1	40575.90	511.59	.000
	Race	133.30	2	66.65	.84	.436
	Error	5472.67	69	79.31		
3	Intercept	40575.90	1	40575.90	511.59	.000
	Race	133.30	2	66.65	.84	.436
	Error	5472.67	69	79.31		
4	Intercept	40575.90	1	40575.90	511.59	.000
	Race	133.30	2	66.65	.84	.436
	Error	5472.67	69	79.31		
5	Intercept	40575.90	1	40575.90	511.59	.000
	Race	133.30	2	66.65	.84	.436
	Error	5472.67	69	79.31		

Note. PSS represents total score on 10-item Perceived Stress Scale.

Table 35
Repeated Measures ANOVA Source Table for PSS with Semester Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
1	Time	33.92	1	33.92	2.17	.145
	Time x Semester	48.88	2	24.44	1.56	.217
	Error(Time)	1175.09	75	15.67		
2	Time	34.18	1	34.18	2.18	.144
	Time x Semester	48.78	2	24.39	1.55	.218
	Error(Time)	1176.36	75	15.68		
3	Time	34.83	1	34.83	2.21	.141
	Time x Semester	48.53	2	24.27	1.54	.221
	Error(Time)	1180.47	75	15.74		
4	Time	33.24	1	33.24	2.13	.149
	Time x Semester	49.16	2	24.58	1.57	.214
	Error(Time)	1172.49	75	15.63		
5	Time	34.45	1	34.45	2.19	.143
	Time x Semester	48.67	2	24.34	1.55	.219
	Error(Time)	1177.93	75	15.71		
		Between-Participants				
1	Intercept	47075.36	1	47075.36	601.88	.000
	Semester	33.60	2	16.80	0.21	.807
	Error	5866.09	75	78.21		
2	Intercept	47084.73	1	47084.73	602.26	.000
	Semester	33.26	2	16.63	0.21	.809
	Error	5863.55	75	78.18		
3	Intercept	47108.96	1	47108.96	603.16	.000
	Semester	32.37	2	16.18	0.21	.813
	Error	5857.81	75	78.10		
4	Intercept	47049.89	1	47049.89	600.75	.000
	Semester	34.56	2	17.28	0.22	.803
	Error	5873.85	75	78.32		
5	Intercept	47094.81	1	47094.81	602.64	.000
	Semester	32.89	2	16.44	0.21	.811

Imputation Number	Source	SS	df	MS	F	p
1	Time	33.92	1	33.92	2.17	.145
	Time x Semester	48.88	2	24.44	1.56	.217
	Error(Time)	1175.09	75	15.67		
2	Time	34.18	1	34.18	2.18	.144
	Time x Semester	48.78	2	24.39	1.55	.218
	Error(Time)	1176.36	75	15.68		
3	Time	34.83	1	34.83	2.21	.141
	Time x Semester	48.53	2	24.27	1.54	.221
	Error(Time)	1180.47	75	15.74		
4	Time	33.24	1	33.24	2.13	.149
	Time x Semester	49.16	2	24.58	1.57	.214
	Error(Time)	1172.49	75	15.63		
5	Time	34.45	1	34.45	2.19	.143
	Time x Semester	48.67	2	24.34	1.55	.219
	Error(Time)	1177.93	75	15.71		
		Between-Participants				
1	Intercept	47075.36	1	47075.36	601.88	.000
	Semester	33.60	2	16.80	0.21	.807
	Error	5866.09	75	78.21		
2	Intercept	47084.73	1	47084.73	602.26	.000
	Semester	33.26	2	16.63	0.21	.809
	Error	5863.55	75	78.18		
3	Intercept	47108.96	1	47108.96	603.16	.000
	Semester	32.37	2	16.18	0.21	.813
	Error	5857.81	75	78.10		
4	Intercept	47049.89	1	47049.89	600.75	.000
	Semester	34.56	2	17.28	0.22	.803
	Error	5873.85	75	78.32		
5	Intercept	47094.81	1	47094.81	602.64	.000
	Semester	32.89	2	16.44	0.21	.811
	Error	5861.02	75	78.15		

Note. PSS represents total score on 10-item Perceived Stress Scale. Semester represents time during which participants participated in the study (Beginning of spring semester, middle to end of spring semester or summer semester).

Table 36

Repeated Measures ANOVA Source Table for PSS Including Covariates

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	16.44	1	16.44	1.25	.268
	Timex LEQ1	7.12	1	7.12	.54	.464
	Time x LEQ2	33.49	1	33.49	2.55	.115
	Time x Caffeine1	13.00	1	13.00	.99	.324
	Time x Caffeine2	3.70	1	3.70	.28	.598
	Time x Sleep1	11.45	1	11.45	.87	.354
	Time x Sleep2	0.41	1	0.41	.03	.861
	Time x ICSRLE1	159.80	1	159.80	12.15	.001
	Time x ICSRLE2	184.07	1	184.07	14.00	.000
	Time x FhxIBS	2.37	1	2.37	.18	.673
	Time x Trauma	0.10	1	0.10	.01	.929
	Time x FhxIBS x Trauma	6.58	1	6.58	.50	.482
	Error(Time)	867.93	66	13.15		
2	Time	3.03	1	3.03	.22	.637
	Timex LEQ1	4.99	1	4.99	.37	.545
	Time x LEQ2	26.15	1	26.15	1.94	.168
	Time x Caffeine1	1.60	1	1.60	.12	.731
	Time x Caffeine2	4.10	1	4.10	.30	.583
	Time x Sleep1	7.88	1	7.88	.58	.447
	Time x Sleep2	1.18	1	1.18	.09	.768
	Time x ICSRLE1	169.73	1	169.73	12.60	.001
	Time x ICSRLE2	188.95	1	188.95	14.02	.000
	Time x FhxIBS	2.75	1	2.75	.20	.653
	Time x Trauma	0.45	1	0.45	.03	.855
	Time x FhxIBS x Trauma	6.31	1	6.31	.47	.496
	Error(Time)	889.40	66	13.48		
3	Time	4.09	1	4.09	.30	.585
	Timex LEQ1	8.71	1	8.71	.64	.427
	Time x LEQ2	34.71	1	34.71	2.55	.115
	Time x Caffeine1	0.81	1	0.81	.06	.808
	Time x Caffeine2	0.42	1	0.42	.03	.862
	Time x Sleep1	10.62	1	10.62	.78	.380
	Time x Sleep2	1.72	1	1.72	.13	.723

	Time x ICSRLE1	155.86	1	155.86	11.45	.001
	Time x ICSRLE2	174.55	1	174.55	12.82	.001
	Time x FhxIBS	1.28	1	1.28	.09	.760
	Time x Trauma	0.04	1	0.04	.00	.955
	Time x FhxIBS x Trauma	4.70	1	4.70	.34	.559
	Error(Time)	898.76	66	13.62		
4	Time	4.43	1	4.43	.33	.567
	Timex LEQ1	5.24	1	5.24	.39	.534
	Time x LEQ2	26.89	1	26.89	2.01	.161
	Time x Caffeine1	0.66	1	0.66	.05	.825
	Time x Caffeine2	0.02	1	0.02	.00	.968
	Time x Sleep1	11.87	1	11.87	.89	.350
	Time x Sleep2	1.93	1	1.93	.14	.706
	Time x ICSRLE1	169.10	1	169.10	12.61	.001
	Time x ICSRLE2	190.48	1	190.48	14.21	.000
	Time x FhxIBS	2.46	1	2.46	.18	.670
	Time x Trauma	0.34	1	0.34	.03	.874
	Time x FhxIBS x Trauma	7.10	1	7.10	.53	.469
	Error(Time)	884.99	66	13.41		
5	Time	6.39	1	6.39	.47	.494
	Timex LEQ1	5.34	1	5.34	.40	.531
	Time x LEQ2	29.74	1	29.74	2.20	.142
	Time x Caffeine1	0.39	1	0.39	.03	.866
	Time x Caffeine2	5.53	1	5.53	.41	.524
	Time x Sleep1	8.71	1	8.71	.65	.425
	Time x Sleep2	1.41	1	1.41	.10	.748
	Time x ICSRLE1	159.02	1	159.02	11.79	.001
	Time x ICSRLE2	182.94	1	182.94	13.56	.000
	Time x FhxIBS	2.22	1	2.22	.16	.687
	Time x Trauma	0.01	1	0.01	.00	.974
	Time x FhxIBS x Trauma	4.85	1	4.85	.36	.551
	Error(Time)	890.33	66	13.49		
	Between-Participants					
1	Intercept	8.65	1	8.65	.26	.614
	LEQ1	7.34	1	7.34	.22	.642
	LEQ2	18.19	1	18.19	.54	.464
	Caffeine1	130.67	1	130.67	3.89	.053

	Caffeine2	1.65	1	1.65	.05	.825
	Sleep1	5.86	1	5.86	.17	.677
	Sleep2	50.73	1	50.73	1.51	.224
	ICSRLE	308.05	1	308.05	9.17	.004
	ICSRLE2	128.60	1	128.60	3.83	.055
	FhxIBS	36.77	1	36.77	1.09	.299
	Trauma	52.98	1	52.98	1.58	.214
	FhxIBS x Trauma	102.63	1	102.63	3.05	.085
	Error	2217.32	66	33.60		
2	Intercept	2.54	1	2.54	.08	.784
	LEQ1	7.84	1	7.84	.23	.631
	LEQ2	20.15	1	20.15	.60	.442
	Caffeine1	120.74	1	120.74	3.59	.062
	Caffeine2	7.36	1	7.36	.22	.641
	Sleep1	5.97	1	5.97	.18	.675
	Sleep2	46.93	1	46.93	1.40	.242
	ICSRLE	309.41	1	309.41	9.20	.003
	ICSRLE2	143.20	1	143.20	4.26	.043
	FhxIBS	27.04	1	27.04	.80	.373
	Trauma	60.33	1	60.33	1.79	.185
	FhxIBS x Trauma	109.54	1	109.54	3.26	.076
	Error	2219.38	66	33.63		
3	Intercept	5.06	1	5.06	.15	.702
	LEQ1	6.13	1	6.13	.18	.674
	LEQ2	13.51	1	13.51	.39	.533
	Caffeine1	88.17	1	88.17	2.57	.114
	Caffeine2	5.40	1	5.40	.16	.693
	Sleep1	6.13	1	6.13	.18	.674
	Sleep2	49.22	1	49.22	1.43	.236
	ICSRLE	320.63	1	320.63	9.33	.003
	ICSRLE2	125.50	1	125.50	3.65	.060
	FhxIBS	34.36	1	34.36	1.00	.321
	Trauma	58.63	1	58.63	1.71	.196
	FhxIBS x Trauma	115.63	1	115.63	3.37	.071
	Error	2267.28	66	34.35		
4	Intercept	1.54	1	1.54	.05	.831
	LEQ1	16.23	1	16.23	.48	.491

	LEQ2	22.10	1	22.10	.65	.422
	Caffeine1	105.01	1	105.01	3.10	.083
	Caffeine2	10.91	1	10.91	.32	.572
	Sleep1	7.08	1	7.08	.21	.649
	Sleep2	46.41	1	46.41	1.37	.246
	ICSRLE	313.42	1	313.42	9.26	.003
	ICSRLE2	125.57	1	125.57	3.71	.058
	FhxIBS	22.98	1	22.98	.68	.413
	Trauma	67.19	1	67.19	1.99	.163
	FhxIBS x Trauma	108.27	1	108.27	3.20	.078
	Error	2233.15	66	33.84		
5	Intercept	6.94	1	6.94	.20	.654
	LEQ1	6.32	1	6.32	.18	.669
	LEQ2	27.07	1	27.07	.79	.377
	Caffeine1	96.13	1	96.13	2.81	.099
	Caffeine2	0.67	1	0.67	.02	.889
	Sleep1	11.52	1	11.52	.34	.564
	Sleep2	64.41	1	64.41	1.88	.175
	ICSRLE	317.42	1	317.42	9.27	.003
	ICSRLE2	153.09	1	153.09	4.47	.038
	FhxIBS	28.11	1	28.11	.82	.368
	Trauma	47.20	1	47.20	1.38	.245
	FhxIBS x Trauma	113.34	1	113.34	3.31	.073
	Error	2259.84	66	34.24		

Note. PSS represents total score on 10-item Perceived Stress Scale. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 37

Tests of Fixed Effects for PSS Including Covariates

Imputation Number	Source	Numerator df	Denominator df	F	p
1	Intercept	1	144	1.93	.167
	Trauma	1	144	3.63	.059
	Time	1	144	.23	.633
	FhxIBS	1	144	2.75	.099
	Time x FhxIBS	1	144	.43	.515
	Trauma x Time	1	144	.26	.610
	Trauma x Time x FhxIBS	2	144	3.32	.039
	Sleep	1	144	1.51	.222
	Caffeine	1	144	3.01	.085
	LEQ	1	144	.02	.881
	ICSRLE	1	144	103.18	.000
2	Intercept	1	144	1.50	.222
	Trauma	1	144	4.00	.048
	Time	1	144	.31	.580
	FhxIBS	1	144	2.55	.112
	Time x FhxIBS	1	144	.38	.539
	Trauma x Time	1	144	.23	.629
	Trauma x Time x FhxIBS	2	144	3.54	.031
	Sleep	1	144	1.45	.231
	Caffeine	1	144	4.07	.046
	LEQ	1	144	.02	.890
	ICSRLE	1	144	104.36	.000
3	Intercept	1	144	2.38	.125
	Trauma	1	144	3.53	.062
	Time	1	144	.17	.685
	FhxIBS	1	144	3.09	.081
	Time x FhxIBS	1	144	.22	.641
	Trauma x Time	1	144	.25	.618
	Trauma x Time x FhxIBS	2	144	3.52	.032
	Sleep	1	144	1.72	.192
	Caffeine	1	144	2.16	.144
	LEQ	1	144	.00	.955

	ICSRLE	1	144	100.37	.000
4	Intercept	1	144	2.27	.134
	Trauma	1	144	3.81	.053
	Time	1	144	.16	.694
	FhxIBS	1	144	2.95	.088
	Time x FhxIBS	1	144	.23	.632
	Trauma x Time	1	144	.26	.608
	Trauma x Time x FhxIBS	2	144	3.53	.032
	Sleep	1	144	1.73	.190
	Caffeine	1	144	2.34	.129
	LEQ	1	144	.02	.882
	ICSRLE	1	144	103.38	.000
5	Intercept	1	144	2.86	.093
	Trauma	1	144	3.44	.066
	Time	1	144	.15	.704
	FhxIBS	1	144	2.98	.086
	Time x FhxIBS	1	144	.26	.614
	Trauma x Time	1	144	.25	.615
	Trauma x Time x FhxIBS	2	144	3.66	.028
	Sleep	1	144	2.01	.158
	Caffeine	1	144	1.53	.219
	LEQ	1	144	.02	.890
	ICSRLE	1	144	100.79	.000

Note. PSS represents total score on 10-item Perceived Stress Scale. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 38

Repeated ANOVA Source Table for PSS Including Covariates and Only Including Individuals Who experienced a Change in PSS Between Time 1 and Time 2

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	23.54	1	23.54	9.07	0.01
	Time x LEQ1	1.19	1	1.19	0.46	0.50
	Time x LEQ2	2.98	1	2.98	1.15	0.29
	Time x Caffeine1	4.47	1	4.47	1.72	0.20
	Time x Caffeine2	19.66	1	19.66	7.57	0.01
	Time x Sleep1	3.25	1	3.25	1.25	0.27
	Time x Sleep2	22.64	1	22.64	8.72	0.01
	Time x ICSRLE1	2.88	1	2.88	1.11	0.30
	Time x ICSRLE2	0.88	1	0.88	0.34	0.56
	Time x Trauma	3.38	1	3.38	1.30	0.26
	Time x FhxIBS	0.04	1	0.04	0.01	0.91
	Time x Trauma x FhxIBS	0.63	1	0.63	0.24	0.62
	Error(Time)	83.09	32	2.60		
2	Time	11.17	1	11.17	4.21	0.05
	Time x LEQ1	1.30	1	1.30	0.49	0.49
	Time x LEQ2	2.82	1	2.82	1.06	0.31
	Time x Caffeine1	10.84	1	10.84	4.09	0.05
	Time x Caffeine2	10.01	1	10.01	3.77	0.06
	Time x Sleep1	5.61	1	5.61	2.12	0.16
	Time x Sleep2	21.46	1	21.46	8.09	0.01
	Time x ICSRLE1	1.92	1	1.92	0.72	0.40
	Time x ICSRLE2	0.34	1	0.34	0.13	0.72
	Time x Trauma	2.67	1	2.67	1.01	0.32
	Time x FhxIBS	0.96	1	0.96	0.36	0.55

	Time x Trauma x FhxIBS	0.58	1	0.58	0.22	0.64
	Error(Time)	84.90	32	2.65		
3	Time	16.14	1	16.14	5.43	0.03
	Time x LEQ1	0.13	1	0.13	0.04	0.84
	Time x LEQ2	3.05	1	3.05	1.03	0.32
	Time x Caffeine1	0.70	1	0.70	0.24	0.63
	Time x Caffeine2	8.80	1	8.80	2.96	0.10
	Time x Sleep1	4.65	1	4.65	1.56	0.22
	Time x Sleep2	20.38	1	20.38	6.86	0.01
	Time x ICSRLE1	0.68	1	0.68	0.23	0.64
	Time x ICSRLE2	0.07	1	0.07	0.02	0.88
	Time x Trauma	3.41	1	3.41	1.15	0.29
	Time x FhxIBS	0.75	1	0.75	0.25	0.62
	Time x Trauma x FhxIBS	0.66	1	0.66	0.22	0.64
	Error(Time)	95.11	32	2.97		
4	Time	9.07	1	9.07	3.82	0.06
	Time x LEQ1	1.32	1	1.32	0.55	0.46
	Time x LEQ2	2.05	1	2.05	0.86	0.36
	Time x Caffeine1	8.26	1	8.26	3.48	0.07
	Time x Caffeine2	22.68	1	22.68	9.56	0.00
	Time x Sleep1	5.98	1	5.98	2.52	0.12
	Time x Sleep2	18.60	1	18.60	7.84	0.01
	Time x ICSRLE1	2.48	1	2.48	1.04	0.32
	Time x ICSRLE2	0.75	1	0.75	0.32	0.58
	Time x Trauma	3.49	1	3.49	1.47	0.23
	Time x FhxIBS	1.03	1	1.03	0.44	0.51
	Time x Trauma x FhxIBS	0.07	1	0.07	0.03	0.86
	Error(Time)	75.92	32	2.37		
5	Time	8.47	1	8.47	2.70	0.11

	Time x LEQ1	0.75	1	0.75	0.24	0.63
	Time x LEQ2	3.40	1	3.40	1.09	0.31
	Time x Caffeine1	3.08	1	3.08	0.98	0.33
	Time x Caffeine2	1.47	1	1.47	0.47	0.50
	Time x Sleep1	3.88	1	3.88	1.24	0.28
	Time x Sleep2	17.00	1	17.00	5.42	0.03
	Time x ICSRLE1	0.91	1	0.91	0.29	0.59
	Time x ICSRLE2	0.51	1	0.51	0.16	0.69
	Time x Trauma	1.95	1	1.95	0.62	0.44
	Time x FhxIBS	2.17	1	2.17	0.69	0.41
	Time x Trauma x FhxIBS	0.53	1	0.53	0.17	0.68
	Error(Time)	100.41	32	3.14		
		Between-Participants				
1	Intercept	16.50	1	16.50	0.51	0.48
	LEQ1	1.20	1	1.20	0.04	0.85
	LEQ2	21.53	1	21.53	0.67	0.42
	Caffeine1	1.80	1	1.80	0.06	0.82
	Caffeine2	16.01	1	16.01	0.50	0.49
	Sleep1	17.14	1	17.14	0.53	0.47
	Sleep2	18.28	1	18.28	0.57	0.46
	ICSRLE1	181.55	1	181.55	5.61	0.02
	ICSRLE2	97.78	1	97.78	3.02	0.09
	Trauma	1.26	1	1.26	0.04	0.85
	FhxIBS	2.59	1	2.59	0.08	0.78
	Trauma x FhxIBS	1.59	1	1.59	0.05	0.83
	Error	1035.38	32	32.36		
2	Intercept	2.86	1	2.86	0.09	0.76
	LEQ1	2.09	1	2.09	0.07	0.80
	LEQ2	19.06	1	19.06	0.62	0.44
	Caffeine1	20.03	1	20.03	0.65	0.43
	Caffeine2	44.23	1	44.23	1.43	0.24
	Sleep1	20.54	1	20.54	0.66	0.42
	Sleep2	14.18	1	14.18	0.46	0.50
	ICSRLE1	182.61	1	182.61	5.90	0.02

	ICSRLE2	98.93	1	98.93	3.20	0.08
	Trauma	0.38	1	0.38	0.01	0.91
	FhxIBS	7.57	1	7.57	0.25	0.62
	Trauma x FhxIBS	4.56	1	4.56	0.15	0.70
	Error	990.20	32	30.94		
3	Intercept	17.43	1	17.43	0.54	0.47
	LEQ1	1.03	1	1.03	0.03	0.86
	LEQ2	17.11	1	17.11	0.53	0.47
	Caffeine1	0.23	1	0.23	0.01	0.93
	Caffeine2	31.47	1	31.47	0.97	0.33
	Sleep1	24.69	1	24.69	0.76	0.39
	Sleep2	17.57	1	17.57	0.54	0.47
	ICSRLE1	183.85	1	183.85	5.68	0.02
	ICSRLE2	103.42	1	103.42	3.20	0.08
	Trauma	0.35	1	0.35	0.01	0.92
	FhxIBS	1.52	1	1.52	0.05	0.83
	Trauma x FhxIBS	2.91	1	2.91	0.09	0.77
	Error	1035.16	32	32.35		
4	Intercept	1.75	1	1.75	0.06	0.82
	LEQ1	2.61	1	2.61	0.08	0.78
	LEQ2	14.37	1	14.37	0.46	0.51
	Caffeine1	26.57	1	26.57	0.84	0.37
	Caffeine2	11.81	1	11.81	0.37	0.55
	Sleep1	13.56	1	13.56	0.43	0.52
	Sleep2	17.41	1	17.41	0.55	0.46
	ICSRLE1	178.88	1	178.88	5.66	0.02
	ICSRLE2	105.37	1	105.37	3.33	0.08
	Trauma	0.42	1	0.42	0.01	0.91
	FhxIBS	2.53	1	2.53	0.08	0.78
	Trauma x FhxIBS	3.17	1	3.17	0.10	0.75
	Error	1011.27	32	31.60		
5	Intercept	27.80	1	27.80	0.84	0.37
	LEQ1	1.32	1	1.32	0.04	0.84
	LEQ2	22.19	1	22.19	0.67	0.42
	Caffeine1	2.10	1	2.10	0.06	0.80
	Caffeine2	1.91	1	1.91	0.06	0.81
	Sleep1	17.59	1	17.59	0.53	0.47

Sleep2	24.79	1	24.79	0.75	0.39
ICSRLE1	183.10	1	183.10	5.54	0.03
ICSRLE2	96.56	1	96.56	2.92	0.10
Trauma	1.89	1	1.89	0.06	0.81
FhxIBS	0.32	1	0.32	0.01	0.92
Trauma x FhxIBS	3.24	1	3.24	0.10	0.76
Error	1057.71	32	33.05		

Note. PSS represents total score on 10-item Perceived Stress Scale. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 39

Repeated Measures ANOVA Source Table for GIAverageFrequency

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.00	1	0.00	.171	.680
	Time x FhxIBS	0.00	1	0.00	.016	.901
	Time x Trauma	0.00	1	0.00	.004	.947
	Time x FhxIBS x Trauma	0.00	1	0.00	.007	.935
	Error(Time)	0.48	74	0.01		
2	Time	0.00	1	0.00	.182	.671
	Time x FhxIBS	0.00	1	0.00	.018	.892
	Time x Trauma	0.00	1	0.00	.003	.955
	Time x FhxIBS x Trauma	0.00	1	0.00	.005	.942
	Error(Time)	0.47	74	0.01		
3	Time	0.00	1	0.00	.181	.672
	Time x FhxIBS	0.00	1	0.00	.018	.893
	Time x Trauma	0.00	1	0.00	.003	.955
	Time x FhxIBS x Trauma	0.00	1	0.00	.005	.942
	Error(Time)	0.47	74	0.01		
4	Time	0.00	1	0.00	.190	.665
	Time x FhxIBS	0.00	1	0.00	.021	.886
	Time x Trauma	0.00	1	0.00	.002	.961
	Time x FhxIBS x Trauma	0.00	1	0.00	.004	.948
	Error(Time)	0.47	74	0.01		
5	Time	0.00	1	0.00	.193	.662
	Time x FhxIBS	0.00	1	0.00	.022	.883
	Time x Trauma	0.00	1	0.00	.002	.964
	Time x FhxIBS x Trauma	0.00	1	0.00	.004	.951
	Error(Time)	0.47	74	0.01		
		Between-Participants				
1	Intercept	0.51	1	0.51	19.38	.000
	FhxIBS	0.30	1	0.30	11.34	.001
	Trauma	0.04	1	0.04	1.56	.215
	FhxIBS x Trauma	0.01	1	0.01	0.22	.641

	Error	1.96	74	0.03		
2	Intercept	0.51	1	0.51	19.39	.000
	FhxIBS	0.30	1	0.30	11.35	.001
	Trauma	0.04	1	0.04	1.55	.217
	FhxIBS x Trauma	0.01	1	0.01	0.21	.644
	Error	1.96	74	0.03		
3	Intercept	0.51	1	0.51	19.41	.000
	FhxIBS	0.30	1	0.30	11.37	.001
	Trauma	0.04	1	0.04	1.54	.219
	FhxIBS x Trauma	0.01	1	0.01	0.21	.648
	Error	1.96	74	0.03		
4	Intercept	0.51	1	0.51	19.33	.000
	FhxIBS	0.30	1	0.30	11.31	.001
	Trauma	0.04	1	0.04	1.55	.218
	FhxIBS x Trauma	0.01	1	0.01	0.21	.645
	Error	1.96	74	0.03		
5	Intercept	0.51	1	0.51	19.33	.000
	FhxIBS	0.30	1	0.30	11.32	.001
	Trauma	0.04	1	0.04	1.54	.219
	FhxIBS x Trauma	0.01	1	0.01	0.21	.647
	Error	1.97	74	0.03		

Note. GIAverageFrequency represents total average frequency of GI symptoms. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 40
Repeated Measures ANOVA Source Table for GITotal

Imputation Number	*Source*	*SS*	*df*	*MS*	*F*	*p*
		Within-Participants				
1	Time	21.93	1	21.93	1.97	.164
	Time x FhxIBS	1.09	1	1.09	.10	.755
	Time x Trauma	3.86	1	3.86	.35	.557
	Time x FhxIBS x Trauma	1.38	1	1.38	.12	.726
	Error(Time)	822.28	74	11.11		
2	Time	22.18	1	22.18	2.01	.161
	Time x FhxIBS	1.03	1	1.03	.09	.761
	Time x Trauma	3.76	1	3.76	.34	.561
	Time x FhxIBS x Trauma	1.44	1	1.44	.13	.719
	Error(Time)	817.12	74	11.04		
3	Time	22.18	1	22.18	2.01	.161
	Time x FhxIBS	1.03	1	1.03	.09	.761
	Time x Trauma	3.76	1	3.76	.34	.561
	Time x FhxIBS x Trauma	1.44	1	1.44	.13	.719
	Error(Time)	817.12	74	11.04		
4	Time	22.68	1	22.68	2.09	.153
	Time x FhxIBS	0.93	1	0.93	.09	.771
	Time x Trauma	3.56	1	3.56	.33	.569
	Time x FhxIBS x Trauma	1.57	1	1.57	.14	.705
	Error(Time)	804.74	74	10.87		
5	Time	22.43	1	22.43	2.04	.157
	Time x FhxIBS	0.98	1	0.98	.09	.766
	Time x Trauma	3.66	1	3.66	.33	.566
	Time x FhxIBS x Trauma	1.51	1	1.51	.14	.712
	Error(Time)	812.95	74	10.99		
		Between-Participants				
1	Intercept	4893.76	1	4893.76	129.27	.000
	FhxIBS	385.05	1	385.05	10.17	.002

	Trauma	49.15	1	49.15	1.30	.258
	FhxIBS x Trauma	2.74	1	2.74	.07	.789
	Error	2801.35	74	37.86		
2	Intercept	4890.07	1	4890.07	129.14	.000
	FhxIBS	386.09	1	386.09	10.20	.002
	Trauma	48.78	1	48.78	1.29	.260
	FhxIBS x Trauma	2.65	1	2.65	.07	.792
	Error	2802.14	74	37.87		
3	Intercept	4890.07	1	4890.07	128.95	.000
	FhxIBS	386.09	1	386.09	10.18	.002
	Trauma	48.78	1	48.78	1.29	.260
	FhxIBS x Trauma	2.65	1	2.65	.07	.792
	Error	2806.14	74	37.92		
4	Intercept	4890.07	1	4890.07	128.45	.000
	FhxIBS	386.09	1	386.09	10.14	.002
	Trauma	48.78	1	48.78	1.28	.261
	FhxIBS x Trauma	2.65	1	2.65	.07	.793
	Error	2817.14	74	38.07		
5	Intercept	4886.38	1	4886.38	128.59	.000
	FhxIBS	387.13	1	387.13	10.19	.002
	Trauma	48.41	1	48.41	1.27	.263
	FhxIBS x Trauma	2.57	1	2.57	.07	.796
	Error	2811.92	74	38.00		

Note. GItotal represents total number of GI symptoms. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 41
Repeated Measures ANOVA Source Table for GIfreqmax

Imputation Number	Source	MS	df	SS	F	p
		Within-Participants				
1	Time	0.13	1	0.13	1.92	.169
	Time x FhxIBS	0.07	1	0.07	1.02	.315
	Time x Trauma	0.30	1	0.30	4.54	.036
	Time x FhxIBS x Trauma	0.27	1	0.27	4.12	.046
	Error(Time)	4.88	74	0.07		
2	Time	0.12	1	0.12	1.85	.178
	Time x FhxIBS	0.07	1	0.07	1.11	.295
	Time x Trauma	0.31	1	0.31	4.75	.032
	Time x FhxIBS x Trauma	0.26	1	0.26	4.03	.048
	Error(Time)	4.82	74	0.07		
3	Time	0.12	1	0.12	1.85	.178
	Time x FhxIBS	0.07	1	0.07	1.11	.295
	Time x Trauma	0.31	1	0.31	4.75	.032
	Time x FhxIBS x Trauma	0.26	1	0.26	4.03	.048
	Error(Time)	4.82	74	0.07		
4	Time	0.12	1	0.12	1.85	.178
	Time x FhxIBS	0.07	1	0.07	1.11	.295
	Time x Trauma	0.31	1	0.31	4.75	.032
	Time x FhxIBS x Trauma	0.26	1	0.26	4.03	.048
	Error(Time)	4.82	74	0.07		
5	Time	0.12	1	0.12	1.85	.178
	Time x FhxIBS	0.07	1	0.07	1.11	.295
	Time x Trauma	0.31	1	0.31	4.75	.032
	Time x FhxIBS x Trauma	0.26	1	0.26	4.03	.048
	Error(Time)	4.82	74	0.07		
		Between-Participants				
1	Intercept	160.54	1	160.54	1215.96	.000
	FhxIBS	0.86	1	0.86	6.54	.013

	Trauma	0.17	1	0.17	1.30	.257
	FhxIBS x Trauma	0.19	1	0.19	1.42	.238
	Error	9.77	74	0.13		
2	Intercept	160.30	1	160.30	1205.00	.000
	FhxIBS	0.88	1	0.88	6.62	.012
	Trauma	0.16	1	0.16	1.24	.270
	FhxIBS x Trauma	0.18	1	0.18	1.35	.250
	Error	9.84	74	0.13		
3	Intercept	160.30	1	160.30	1205.00	.000
	FhxIBS	0.88	1	0.88	6.62	.012
	Trauma	0.16	1	0.16	1.24	.270
	FhxIBS x Trauma	0.18	1	0.18	1.35	.250
	Error	9.84	74	0.13		
4	Intercept	160.30	1	160.30	1205.00	.000
	FhxIBS	0.88	1	0.88	6.62	.012
	Trauma	0.16	1	0.16	1.24	.270
	FhxIBS x Trauma	0.18	1	0.18	1.35	.250
	Error	9.84	74	0.13		
5	Intercept	160.30	1	160.30	1205.00	.000
	FhxIBS	0.88	1	0.88	6.62	.012
	Trauma	0.16	1	0.16	1.24	.270
	FhxIBS x Trauma	0.18	1	0.18	1.35	.250
	Error	9.84	74	0.13		

Note. GIfreqmax represents highest frequency of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 42

Tests of Fixed Effects for GIAverageFrequency

Imputation Number	Source	Numerator df	Denominator df	F	p
1	Intercept	1	148	31.16	.00
	Time	1	148	.07	.80
	Trauma	1	148	2.51	.12
	FhxIBS	1	148	18.23	.00
	Time x Trauma	1	148	.00	.97
	Time x FhxIBS	1	148	.01	.94
	Time x Trauma x FhxIBS	2	148	.18	.84
2	Intercept	1	148	31.26	.00
	Time	1	148	.07	.79
	Trauma	1	148	2.50	.12
	FhxIBS	1	148	18.30	.00
	Time x Trauma	1	148	.00	.97
	Time x FhxIBS	1	148	.01	.93
	Time x Trauma x FhxIBS	2	148.000	.174	.84
3	Intercept	1	148	31.29	.00
	Time	1	148	.07	.79
	Trauma	1	148	2.48	.12
	FhxIBS	1	148	18.33	.00
	Time x Trauma	1	148	.00	.97
	Time x FhxIBS	1	148	.01	.93
	Time x Trauma x FhxIBS	2	148	.17	.84
4	Intercept	1	148	31.23	.00
	Time	1	148	.07	.79
	Trauma	1	148	2.50	.12
	FhxIBS	1	148	18.27	.00
	Time x Trauma	1	148	.001	.98
	Time x FhxIBS	1	148	.01	.93
	Time x Trauma x FhxIBS	2	148	.17	.84
5	Intercept	1	148	31.24	.00
	Time	1	148	.07	.79
	Trauma	1	148	2.48	.12

FhxIBS	1	148	18.29	.00
Time x Trauma	1	148	.00	.98
Time x FhxIBS	1	148	.01	.93
Time x Trauma x FhxIBS	2	148	.17	.84

Note. GIAverageFrequency represents average frequency of GI symptoms. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 43

Tests of Fixed Effects for GItotal

Imputation Number	Source	Numerator df	Denominator df	F	p
1	Intercept	1	148	199.88	0.00
	Time	1	148	0.90	0.35
	Trauma	1	148	2.01	0.16
	FhxIBS	1	148	15.73	0.00
	Time x Trauma	1	148	0.16	0.69
	Time x FhxIBS	1	148	0.04	0.83
	Time x Trauma x FhxIBS	2	148.000	0.08	0.92
2	Intercept	1	148	199.97	0.00
	Time	1	148	0.91	0.34
	Trauma	1	148	1.99	0.16
	FhxIBS	1	148	15.79	0.00
	Time x Trauma	1	148	0.15	0.70
	Time x FhxIBS	1	148	0.04	0.84
	Time x Trauma x FhxIBS	2	148.000	0.08	0.92
3	Intercept	1	148	199.74	0.00
	Time	1	148	0.91	0.34
	Trauma	1	148	1.99	0.16
	FhxIBS	1	148	15.77	0.00
	Time x Trauma	1	148	0.15	0.70
	Time x FhxIBS	1	148	0.04	0.84
	Time x Trauma x FhxIBS	2	148.000	0.08	0.92
4	Intercept	1	148	199.82	0.00
	Time	1	148	0.93	0.34
	Trauma	1	148	1.99	0.16
	FhxIBS	1	148	15.78	0.00
	Time x Trauma	1	148	0.15	0.70
	Time x FhxIBS	1	148	0.04	0.85
	Time x Trauma x FhxIBS	2	148.000	0.09	0.92
5	Intercept	1	148	199.51	0.00
	Time	1	148	0.92	0.34
	Trauma	1	148	1.98	0.16

FhxIBS	1	148	15.81	0.00
Time x Trauma	1	148	0.15	0.70
Time x FhxIBS	1	148	0.04	0.84
Time x Trauma x FhxIBS	2	148.000	0.08	0.92

Note. GItotal represents total GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 44

Tests of Fixed Effects for GIfreqmax

Imputation Number	Source	Numerator df	Denominator df	F	Sig.
1	Intercept	1	148	1621.77	0.00
	Time	1	148	1.28	0.26
	Trauma	1	148	1.74	0.19
	FhxIBS	1	148	8.72	0.00
	Time x Trauma	1	148	3.02	0.08
	Time x FhxIBS	1	148	0.68	0.41
	Time x Trauma x FhxIBS	2	148	2.32	0.10
2	Intercept	1	148	1617.72	0.00
	Time	1	148	1.21	0.27
	Trauma	1	148	1.66	0.20
	FhxIBS	1	148	8.88	0.00
	Time x Trauma	1	148	3.13	0.08
	Time x FhxIBS	1	148	0.73	0.39
	Time x Trauma x FhxIBS	2	148	2.23	0.11
3	Intercept	1	148	1617.72	0.00
	Time	1	148	1.21	0.27
	Trauma	1	148	1.66	0.20
	FhxIBS	1	148	8.88	0.00
	Time x Trauma	1	148	3.13	0.08
	Time x FhxIBS	1	148	0.73	0.39
	Time x Trauma x FhxIBS	2	148	2.23	0.11
4	Intercept	1	148	1617.72	0.00
	Time	1	148	1.21	0.27
	Trauma	1	148	1.66	0.20
	FhxIBS	1	148	8.88	0.00
	Time x Trauma	1	148	3.13	0.08
	Time x FhxIBS	1	148	0.73	0.39
	Time x Trauma x FhxIBS	2	148	2.23	0.11
5	Intercept	1	148	1617.72	0.00
	Time	1	148	1.21	0.27
	Trauma	1	148	1.66	0.20

FhxIBS	1	148	8.88	0.00
Time x Trauma	1	148	3.13	0.08
Time x FhxIBS	1	148	0.73	0.39
Time x Trauma x FhxIBS	2	148	2.23	0.11

Note. GIfreqmax represents the highest frequency of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 45

Repeated Measures ANOVA Source Table for GIAverageFrequency Only Including Participants Who Experienced an Increase in PSS Between Time 1 and Time 2

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	.01	1	.01	1.77	.19
	Time x Trauma	.00	1	.00	.03	.87
	Time x FhxIBS	.01	1	.01	1.99	.17
	Time x Trauma x FhxIBS	.00	1	.00	.01	.92
	Error(Time)	.30	40	.01		
2	Time	.01	1	.01	1.78	.19
	Time x Trauma	.00	1	.00	.03	.87
	Time x FhxIBS	.01	1	.01	1.99	.17
	Time x Trauma x FhxIBS	.00	1	.00	.01	.92
	Error(Time)	.30	40	.01		
3	Time	.01	1	.01	1.75	.19
	Time x Trauma	.00	1	.00	.03	.86
	Time x FhxIBS	.01	1	.01	1.99	.17
	Time x Trauma x FhxIBS	.00	1	.00	.01	.92
	Error(Time)	.30	40	.01		
4	Time	.01	1	.01	1.80	.19
	Time x Trauma	.00	1	.00	.03	.87
	Time x FhxIBS	.01	1	.01	1.99	.17
	Time x Trauma x FhxIBS	.00	1	.00	.01	.92
	Error(Time)	.30	40	.01		
5	Time	.01	1	.01	1.79	.19
	Time x Trauma	.00	1	.00	.03	.87
	Time x FhxIBS	.01	1	.01	1.99	.17
	Time x Trauma x FhxIBS	.00	1	.00	.01	.92
	Error(Time)	.30	40	.01		
		Between Participants				
1	Intercept	0.22	1	0.22	7.27	0.01
	Trauma	0.03	1	0.03	1.06	0.31
	FhxIBS	0.11	1	0.11	3.57	0.07

	Trauma x FhxIBS	0.00	1	0.00	0.02	0.90
	Error	1.22	40	0.03		
2	Intercept	0.22	1	0.22	7.27	0.01
	Trauma	0.03	1	0.03	1.06	0.31
	FhxIBS	0.11	1	0.11	3.56	0.07
	Trauma x FhxIBS	0.00	1	0.00	0.02	0.89
	Error	1.22	40	0.03		
3	Intercept	0.22	1	0.22	7.30	0.01
	Trauma	0.03	1	0.03	1.06	0.31
	FhxIBS	0.11	1	0.11	3.58	0.07
	Trauma x FhxIBS	0.00	1	0.00	0.02	0.90
	Error	1.22	40	0.03		
4	Intercept	0.22	1	0.22	7.24	0.01
	Trauma	0.03	1	0.03	1.06	0.31
	FhxIBS	0.11	1	0.11	3.55	0.07
	Trauma x FhxIBS	0.00	1	0.00	0.02	0.89
	Error	1.22	40	0.03		
5	Intercept	0.22	1	0.22	7.25	0.01
	Trauma	0.03	1	0.03	1.06	0.31
	FhxIBS	0.11	1	0.11	3.56	0.07
	Trauma x FhxIBS	0.00	1	0.00	0.02	0.89
	Error	1.22	40	0.03		

Note. GIAverageFrequency represents the average frequency of GI symptoms. PSS represents the total score on 10-item Perceived Stress Scale. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 46
Repeated Measures ANOVA Source Table for GItotal Only Including Participants Who Experienced an Increase in PSS Between Time 1 and Time 2

Imputation Number	Source	SS	df	MS	F	p
1	Time	64.63	1	64.63	5.16	.03
	Time x Trauma	8.08	1	8.08	.65	.43
	Time x FhxIBS	50.73	1	50.73	4.05	.05
	Time x Trauma x FhxIBS	5.36	1	5.36	.43	.52
	Error(Time)	500.58	40	12.51		
2	Time	64.63	1	64.63	5.16	.03
	Time x Trauma	8.08	1	8.08	.65	.43
	Time x FhxIBS	50.73	1	50.73	4.05	.05
	Time x Trauma x FhxIBS	5.36	1	5.36	.43	.52
	Error(Time)	500.58	40	12.51		
3	Time	64.63	1	64.63	5.16	.03
	Time x Trauma	8.08	1	8.08	.65	.43
	Time x FhxIBS	50.73	1	50.73	4.05	.05
	Time x Trauma x FhxIBS	5.36	1	5.36	.43	.52
	Error(Time)	500.58	40	12.51		
4	Time	65.16	1	65.16	5.29	.03
	Time x Trauma	7.89	1	7.89	.64	.43
	Time x FhxIBS	50.27	1	50.27	4.08	.05
	Time x Trauma x FhxIBS	5.52	1	5.52	.45	.51
	Error(Time)	492.93	40	12.32		
5	Time	64.63	1	64.63	5.16	.03
	Time x Trauma	8.08	1	8.08	.65	.43
	Time x FhxIBS	50.73	1	50.73	4.05	.05
	Time x Trauma x FhxIBS	5.36	1	5.36	.43	.52
	Error(Time)	500.58	40	12.51		
	Between-Participants					
1	Intercept	2751.73	1	2751.73	61.26	0.00
	Trauma	31.64	1	31.64	0.70	0.41
	FhxIBS	204.11	1	204.11	4.54	0.04

	Trauma x FhxIBS	0.03	1	0.03	0.00	0.98
	Error	1796.74	40	44.92		
2	Intercept	2751.73	1	2751.73	61.26	0.00
	Trauma	31.64	1	31.64	0.70	0.41
	FhxIBS	204.11	1	204.11	4.54	0.04
	Trauma x FhxIBS	0.03	1	0.03	0.00	0.98
	Error	1796.74	40	44.92		
3	Intercept	2751.73	1	2751.73	61.26	0.00
	Trauma	31.64	1	31.64	0.70	0.41
	FhxIBS	204.11	1	204.11	4.54	0.04
	Trauma x FhxIBS	0.03	1	0.03	0.00	0.98
	Error	1796.74	40	44.92		
4	Intercept	2755.15	1	2755.15	61.18	0.00
	Trauma	32.00	1	32.00	0.71	0.40
	FhxIBS	203.18	1	203.18	4.51	0.04
	Trauma x FhxIBS	0.02	1	0.02	0.00	0.99
	Error	1801.27	40	45.03		
5	Intercept	2751.73	1	2751.73	61.26	0.00
	Trauma	31.64	1	31.64	0.70	0.41
	FhxIBS	204.11	1	204.11	4.54	0.04
	Trauma x FhxIBS	0.03	1	0.03	0.00	0.98
	Error	1796.74	40	44.92		

Note. GItotal represents total GI symptoms reported. PSS represents the total score on 10-item Perceived Stress Scale. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 47
Repeated Measures ANOVA Source Table for GIfreqmax Only Including Participants Who Experienced an Increase in PSS Between Time 1 and Time 2

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	.08	1	.08	.90	.35
	Time x Trauma	.57	1	.57	6.55	.01
	Time x FhxIBS	.02	1	.02	.20	.65
	Time x Trauma x FhxIBS	.42	1	.42	4.79	.03
	Error(Time)	3.50	40	.09		
2	Time	.08	1	.08	.90	.35
	Time x Trauma	.57	1	.57	6.55	.01
	Time x FhxIBS	.02	1	.02	.20	.65
	Time x Trauma x FhxIBS	.42	1	.42	4.79	.03
	Error(Time)	3.50	40	.09		
3	Time	.08	1	.08	.90	.35
	Time x Trauma	.57	1	.57	6.55	.01
	Time x FhxIBS	.02	1	.02	.20	.65
	Time x Trauma x FhxIBS	.42	1	.42	4.79	.03
	Error(Time)	3.50	40	.09		
4	Time	.08	1	.08	.90	.35
	Time x Trauma	.57	1	.57	6.55	.01
	Time x FhxIBS	.02	1	.02	.20	.65
	Time x Trauma x FhxIBS	.42	1	.42	4.79	.03
	Error(Time)	3.50	40	.09		
5	Time	.08	1	.08	.90	.35
	Time x Trauma	.57	1	.57	6.55	.01
	Time x FhxIBS	.02	1	.02	.20	.65
	Time x Trauma x FhxIBS	.42	1	.42	4.79	.03
	Error(Time)	3.50	40	.09		
		Between-Participants				
1	Intercept	77.46	1	77.46	441.39	0.00
	Trauma	0.24	1	0.24	1.37	0.25

	FhxIBS	0.21	1	0.21	1.18	0.28
	Trauma x FhxIBS	0.04	1	0.04	0.24	0.62
	Error	7.02	40	0.18		
2	Intercept	77.46	1	77.46	441.39	0.00
	Trauma	0.24	1	0.24	1.37	0.25
	FhxIBS	0.21	1	0.21	1.18	0.28
	Trauma x FhxIBS	0.04	1	0.04	0.24	0.62
	Error	7.02	40	0.18		
3	Intercept	77.46	1	77.46	441.39	0.00
	Trauma	0.24	1	0.24	1.37	0.25
	FhxIBS	0.21	1	0.21	1.18	0.28
	Trauma x FhxIBS	0.04	1	0.04	0.24	0.62
	Error	7.02	40	0.18		
4	Intercept	77.46	1	77.46	441.39	0.00
	Trauma	0.24	1	0.24	1.37	0.25
	FhxIBS	0.21	1	0.21	1.18	0.28
	Trauma x FhxIBS	0.04	1	0.04	0.24	0.62
	Error	7.02	40	0.18		
5	Intercept	77.46	1	77.46	441.39	0.00
	Trauma	0.24	1	0.24	1.37	0.25
	FhxIBS	0.21	1	0.21	1.18	0.28
	Trauma x FhxIBS	0.04	1	0.04	0.24	0.62
	Error	7.02	40	0.18		

Note. GIfreqmax represents the highest frequency of GI symptoms reported. PSS represents total scores on the 10-item perceived stress scale. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 48

Repeated Measures Source Table for GIAverageFrequency by Gender

Imputation Number	Source	SS	df	MS	F	p
1	Time	0.00	1	0.00	.09	.768
	Time x Gender	0.00	1	0.00	.67	.416
	Error(Time)	0.47	75	0.01		
2	Time	0.00	1	0.00	.09	.759
	Time x Gender	0.00	1	0.00	.79	.377
	Error(Time)	0.46	75	0.01		
3	Time	0.00	1	0.00	.10	.748
	Time x Gender	0.00	1	0.00	.69	.408
	Error(Time)	0.47	75	0.01		
4	Time	0.00	1	0.00	.11	.739
	Time x Gender	0.00	1	0.00	.78	.379
	Error(Time)	0.46	75	0.01		
5	Time	0.00	1	0.00	.12	.727
	Time x Gender	0.00	1	0.00	.74	.391
	Error(Time)	0.46	75	0.01		
		Between-Participants				
1	Intercept	1.68	1	1.68	52.29	.000
	Gender	0.02	1	0.02	.58	.449
	Error	2.40	75	0.03		
2	Intercept	1.68	1	1.68	52.24	.000
	Gender	0.02	1	0.02	.54	.466
	Error	2.41	75	0.03		
3	Intercept	1.68	1	1.68	52.45	.000
	Gender	0.02	1	0.02	.56	.458
	Error	2.41	75	0.03		
4	Intercept	1.68	1	1.68	52.17	.000
	Gender	0.02	1	0.02	.55	.459
	Error	2.41	75	0.03		
5	Intercept	1.68	1	1.68	52.26	.000
	Gender	0.02	1	0.02	.56	.456
	Error	2.42	75	0.03		

Note. GIAverageFrequency represents the average frequency of GI symptoms.

Table 49

Repeated Measures ANOVA Source Table for GItotal by Gender

Imputation Number	Source	SS	df	MS	F	p
		Within-Participant Effects				
1	Time	11.172	1	11.172	1.037	.312
	Time x Gender	16.003	1	16.003	1.486	.227
	Error(Time3)	807.893	75	10.772		
2	Time	11.230	1	11.230	1.052	.308
	Time x Gender	17.880	1	17.880	1.675	.200
	Error(Time3)	800.744	75	10.677		
3	Time	11.571	1	11.571	1.082	.302
	Time x Gender	16.480	1	16.480	1.541	.218
	Error(Time3)	802.143	75	10.695		
4	Time	12.391	1	12.391	1.178	.281
	Time x Gender	17.456	1	17.456	1.660	.202
	Error(Time3)	788.583	75	10.514		
5	Time	11.977	1	11.977	1.127	.292
	Time x Gender	16.964	1	16.964	1.596	.210
	Error(Time3)	797.373	75	10.632		
		Between-Participants				
1	Intercept	6467.25	1	6467.25	144.88	.000
	Gender	42.37	1	42.37	.95	.333
	Error	3347.81	75	44.64		
2	Intercept	6465.84	1	6465.84	144.67	.000
	Gender	39.45	1	39.45	.88	.350
	Error	3352.13	75	44.70		
3	Intercept	6457.73	1	6457.73	144.40	.000
	Gender	41.60	1	41.60	.93	.338
	Error	3353.98	75	44.72		
4	Intercept	6457.73	1	6457.73	143.93	.000
	Gender	41.60	1	41.60	.93	.339
	Error	3364.98	75	44.87		
5	Intercept	6448.22	1	6448.22	143.89	.000
	Gender	40.84	1	40.84	.91	.343
	Error	3361.13	75	44.82		

Note. GItotal represents total number of GI symptoms.

Table 50

Repeated Measures ANOVA Source Table for GIfreqmax with Gender Included as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.03	1	0.03	.44	.508
	Time x Gender	0.04	1	0.04	.54	.463
	Error(Time)	5.19	75	0.07		
2	Time	0.02	1	0.02	.35	.558
	Time x Gender	0.05	1	0.05	.68	.413
	Error(Time)	5.13	75	0.07		
3	Time	0.02	1	0.02	.35	.558
	Time x Gender	0.05	1	0.05	.68	.413
	Error(Time)	5.13	75	0.07		
4	Time	0.02	1	0.02	.35	.558
	Time x Gender	0.05	1	0.05	.68	.413
	Error(Time)	5.13	75	0.07		
5	Time	0.02	1	0.02	.35	.558
	Time x Gender	0.05	1	0.05	.68	.413
	Error(Time)	5.13	75	0.07		
		Between-Participants				
1	Intercept	272.28	1	272.28	1781.40	.000
	Gender	0.01	1	0.01	.10	.756
	Error	11.46	75	0.15		
2	Intercept	271.58	1	271.58	1767.18	.000
	Gender	0.01	1	0.01	.07	.797
	Error	11.53	75	0.15		
3	Intercept	271.58	1	271.58	1767.18	.000
	Gender	0.01	1	0.01	.07	.797
	Error	11.53	75	0.15		
4	Intercept	271.58	1	271.58	1767.18	.000
	Gender	0.01	1	0.01	.07	.797
	Error	11.53	75	0.15		
5	Intercept	271.58	1	271.58	1767.18	.000
	Gender	0.01	1	0.01	.07	.797
	Error	11.53	75	0.15		

Note. GIfreqmax represents highest frequency of GI symptoms reported.

Table 51

Repeated Measures ANOVA Source Table for GIAverageFrequency with Ethnicity Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
1	Time	0.00	1	0.00	0.04	.838
	Time x Ethnicity	0.00	1	0.00	0.06	.815
	Error(Time)	0.47	75	0.01		
2	Time	0.00	1	0.00	0.05	.828
	Time x Ethnicity	0.00	1	0.00	0.06	.805
	Error(Time)	0.47	75	0.01		
3	Time	0.00	1	0.00	0.05	.828
	Time x Ethnicity	0.00	1	0.00	0.06	.805
	Error(Time)	0.47	75	0.01		
4	Time	0.00	1	0.00	0.05	.820
	Time x Ethnicity	0.00	1	0.00	0.07	.797
	Error(Time)	0.47	75	0.01		
5	Time	0.00	1	0.00	0.05	.817
	Time x Ethnicity	0.00	1	0.00	0.07	.794
	Error(Time)	0.46	75	0.01		
		Between-Participants				
1	Intercept	1.07	1	1.07	33.68	.000
	Ethnicity	0.04	1	0.04	1.31	.257
	Error	2.38	75	0.03		
2	Intercept	1.07	1	1.07	33.69	.000
	Ethnicity	0.04	1	0.04	1.29	.259
	Error	2.38	75	0.03		
3	Intercept	1.07	1	1.07	33.71	.000
	Ethnicity	0.04	1	0.04	1.28	.262
	Error	2.39	75	0.03		
4	Intercept	1.07	1	1.07	33.60	.000
	Ethnicity	0.04	1	0.04	1.29	.259
	Error	2.39	75	0.03		

5	Intercept	1.07	1	1.07	33.60	.000
	Ethnicity	0.04	1	0.04	1.28	.261
	Error	2.39	75	0.03		

Note. GIAverageFrequency represents the average frequency of GI symptoms.

Table 52

Repeated Measures ANOVA Source Table for GItotal with Ethnicity Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	4.80	1	4.80	0.44	.510
	Time x Ethnicity	1.84	1	1.84	0.17	.683
	Error(Time)	822.05	75	10.96		
2	Time	4.94	1	4.94	0.45	.503
	Time x Ethnicity	1.93	1	1.93	0.18	.675
	Error(Time)	816.70	75	10.89		
3	Time	4.94	1	4.94	0.45	.503
	Time x Ethnicity	1.93	1	1.93	0.18	.675
	Error(Time)	816.70	75	10.89		
4	Time	5.22	1	5.22	0.49	.487
	Time x Ethnicity	2.10	1	2.10	0.20	.659
	Error(Time)	803.93	75	10.72		
5	Time	5.08	1	5.08	0.47	.496
	Time x Ethnicity	2.02	1	2.02	0.19	.667
	Error(Time)	812.32	75	10.83		
		Between-Participants				
1	Intercept	2502.24	1	2502.24	57.33	.000
	Ethnicity	116.83	1	116.83	2.68	.106
	Error	3273.35	75	43.64		
2	Intercept	2499.12	1	2499.12	57.22	.000
	Ethnicity	116.16	1	116.16	2.66	.107
	Error	3275.42	75	43.67		
3	Intercept	2499.12	1	2499.12	57.15	.000
	Ethnicity	116.16	1	116.16	2.66	.107
	Error	3279.42	75	43.73		
4	Intercept	2499.12	1	2499.12	56.96	.000
	Ethnicity	116.16	1	116.16	2.65	.108
	Error	3290.42	75	43.87		
5	Intercept	2496.01	1	2496.01	56.96	.000

	Ethnicity	115.49	1	115.49	2.64	.109
	Error	3286.48	75	43.82		

Note. GItotal represents total number of GI symptoms.

Table 53

Repeated Measures ANOVA for GIfreqmax with Ethnicity Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
1	Time	0.00	1	0.00	.05	.823
	Time x Ethnicity	0.00	1	0.00	.01	.906
	Error(Time)	5.23	75	0.07		
2	Time	0.00	1	0.00	.03	.855
	Time x Ethnicity	0.00	1	0.00	.01	.939
	Error(Time)	5.17	75	0.07		
3	Time	0.00	1	0.00	.03	.855
	Time x Ethnicity	0.00	1	0.00	.01	.939
	Error(Time)	5.17	75	0.07		
4	Time	0.00	1	0.00	.03	.855
	Time x Ethnicity	0.00	1	0.00	.01	.939
	Error(Time)	5.17	75	0.07		
5	Time	0.00	1	0.00	.03	.855
	Time x Ethnicity	0.00	1	0.00	.01	.939
	Error(Time)	5.17	75	0.07		
		Between-Participants				
1	Intercept	139.48	1	139.48	915.09	.000
	Ethnicity	0.05	1	0.05	0.31	.582
	Error	11.43	75	0.15		
2	Intercept	139.22	1	139.22	909.15	.000
	Ethnicity	0.05	1	0.05	0.34	.563
	Error	11.48	75	0.15		
3	Intercept	139.22	1	139.22	909.15	.000
	Ethnicity	0.05	1	0.05	0.34	.563
	Error	11.48	75	0.15		
4	Intercept	139.22	1	139.22	909.15	.000
	Ethnicity	0.05	1	0.05	0.34	.563
	Error	11.48	75	0.15		
5	Intercept	139.22	1	139.22	909.15	.000
	Ethnicity	0.05	1	0.05	0.34	.563
	Error	11.48	75	0.15		

Note. GIfreqmax represents highest frequency of GI symptoms reported.

Table 54

Repeated Measures ANOVA Source Table for GIAverageFrequency with Race Entered as a Factor

Imputation Number	Source	SS	df	MS	F	Sig.
		Within-Participants				
1	Time	0.00	1	0.00	0.09	.766
	Time x Race	0.01	2	0.00	0.57	.569
	Error(Time)	0.43	69	0.01		
2	Time	0.00	1	0.00	0.09	.769
	Time x Race	0.01	2	0.00	0.63	.534
	Error(Time)	0.42	69	0.01		
3	Time	0.00	1	0.00	0.11	.743
	Time x Race	0.01	2	0.00	0.56	.573
	Error(Time)	0.42	69	0.01		
4	Time	0.00	1	0.00	0.11	.743
	Time x Race	0.01	2	0.00	0.61	.549
	Error(Time)	0.42	69	0.01		
5	Time	0.00	1	0.00	0.13	.724
	Time x Race	0.01	2	0.00	0.57	.568
	Error(Time)	0.42	69	0.01		
		Between-Participants				
1	Intercept	1.49	1	1.49	44.38	.000
	Race	0.05	2	0.02	0.68	.508
	Error	2.32	69	0.03		
2	Intercept	1.49	1	1.49	44.23	.000
	Race	0.04	2	0.02	0.65	.525
	Error	2.32	69	0.03		
3	Intercept	1.50	1	1.50	44.55	.000
	Race	0.05	2	0.02	0.68	.509
	Error	2.32	69	0.03		
4	Intercept	1.49	1	1.49	44.23	.000
	Race	0.04	2	0.02	0.67	.517
	Error	2.33	69	0.03		
5	Intercept	1.50	1	1.50	44.38	.000
	Race	0.05	2	0.02	0.68	.509
	Error	2.33	69	0.03		

Note. GIAverageFrequency represents the average frequency of GI symptoms.

Table 55

Repeated Measures ANOVA Source Table for GItotal with Race Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
1	Time	14.42	1	14.42	1.29	.260
	Time x Race	7.83	2	3.92	0.35	.706
	Error(Time)	770.92	69	11.17		
2	Time	14.04	1	14.04	1.27	.264
	Time x Race	8.92	2	4.46	0.40	.670
	Error(Time)	764.41	69	11.08		
3	Time	14.85	1	14.85	1.34	.251
	Time x Race	7.83	2	3.92	0.35	.704
	Error(Time)	765.50	69	11.09		
4	Time	15.72	1	15.72	1.44	.234
	Time x Race	7.88	2	3.94	0.36	.698
	Error(Time)	752.56	69	10.91		
5	Time	15.28	1	15.28	1.39	.243
	Time x Race	7.85	2	3.92	0.36	.702
	Error(Time)	761.04	69	11.03		
		Between-Participants				
1	Intercept	5193.13	1	5193.13	110.49	.000
	Race	71.74	2	35.87	0.76	.470
	Error	3243.01	69	47.00		
2	Intercept	5200.45	1	5200.45	110.49	.000
	Race	68.73	2	34.37	0.73	.486
	Error	3247.59	69	47.07		
3	Intercept	5185.09	1	5185.09	110.13	.000
	Race	71.73	2	35.87	0.76	.471
	Error	3248.59	69	47.08		
4	Intercept	5185.09	1	5185.09	109.76	.000
	Race	71.73	2	35.87	0.76	.472
	Error	3259.59	69	47.24		
5	Intercept	5177.05	1	5177.05	109.74	.000
	Race	71.75	2	35.87	0.76	.471
	Error	3255.14	69	47.18		

Note. GItotal represents total number of GI symptoms.

Table 56

Repeated Measures ANOVA Source Table for GIfreqmax with Race Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.09	1	0.09	1.45	.233
	Time x Race	0.42	2	0.21	3.56	.034
	Error(Time)	4.10	69	0.06		
2	Time	0.07	1	0.07	1.27	.263
	Time x Race	0.42	2	0.21	3.58	.033
	Error(Time)	4.04	69	0.06		
3	Time	0.07	1	0.07	1.27	.263
	Time x Race	0.42	2	0.21	3.58	.033
	Error(Time)	4.04	69	0.06		
4	Time	0.07	1	0.07	1.27	.263
	Time x Race	0.42	2	0.21	3.58	.033
	Error(Time)	4.04	69	0.06		
5	Time	0.07	1	0.07	1.27	.263
	Time x Race	0.42	2	0.21	3.58	.033
	Error(Time)	4.04	69	0.06		
		Between-Participants				
1	Intercept	214.43	1	214.43	1383.30	.000
	Race	0.34	2	0.17	1.10	.338
	Error	10.70	69	0.16		
2	Intercept	213.85	1	213.85	1370.53	.000
	Race	0.33	2	0.16	1.04	.358
	Error	10.77	69	0.16		
3	Intercept	213.85	1	213.85	1370.53	.000
	Race	0.33	2	0.16	1.04	.358
	Error	10.77	69	0.16		
4	Intercept	213.85	1	213.85	1370.53	.000
	Race	0.33	2	0.16	1.04	.358
	Error	10.77	69	0.16		
5	Intercept	213.85	1	213.85	1370.53	.000
	Race	0.33	2	0.16	1.04	.358
	Error	10.77	69	0.16		

Note. GIfreqmax represents the highest frequency of GI symptoms reported.

Table 57

Repeated Measures ANOVA Source Table for GIAverageFrequency with Semester Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.01	1	0.01	0.98	.326
	Time x Semester	0.01	2	0.01	1.22	.302
	Error(Time)	0.46	75	0.01		
2	Time	0.01	1	0.01	1.05	.308
	Time x Semester	0.02	2	0.01	1.34	.268
	Error(Time)	0.45	75	0.01		
3	Time	0.01	1	0.01	1.04	.310
	Time x Semester	0.02	2	0.01	1.30	.278
	Error(Time)	0.46	75	0.01		
4	Time	0.01	1	0.01	1.09	.300
	Time x Semester	0.02	2	0.01	1.30	.277
	Error(Time)	0.45	75	0.01		
5	Time	0.01	1	0.01	1.11	.296
	Time x Semester	0.02	2	0.01	1.29	.280
	Error(Time)	0.45	75	0.01		
		Between-Participants				
1	Intercept	1.69	1	1.69	53.63	.000
	Semester	0.07	2	0.03	1.07	.348
	Error	2.36	75	0.03		
2	Intercept	1.70	1	1.70	53.79	.000
	Semester	0.07	2	0.03	1.11	.336
	Error	2.37	75	0.03		
3	Intercept	1.70	1	1.70	53.80	.000
	Semester	0.07	2	0.03	1.07	.348
	Error	2.37	75	0.03		
4	Intercept	1.70	1	1.70	53.65	.000
	Semester	0.07	2	0.03	1.10	.337
	Error	2.37	75	0.03		
5	Intercept	1.70	1	1.70	53.65	.000

Semester	0.07	2	0.03	1.09	.342
Error	2.37	75	0.03		

Note. GIAverageFrequency represents average frequency of GI symptoms. Semester represents time during which participants participated in the study (Beginning of spring semester, middle to end of spring semester or summer semester).

Table 58

Repeated Measures ANOVA Source Table for GItotal with Semester Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
1	Time	28.85	1	28.85	2.67	.106
	Time x Semester	16.92	2	8.46	0.78	.460
	Error(Time)	809.44	75	10.79		
2	Time	29.76	1	29.76	2.78	.099
	Time x Semester	19.10	2	9.55	0.89	.414
	Error(Time)	801.96	75	10.69		
3	Time	29.58	1	29.58	2.76	.101
	Time x Semester	17.64	2	8.82	0.82	.443
	Error(Time)	803.42	75	10.71		
4	Time	30.89	1	30.89	2.93	.091
	Time x Semester	17.67	2	8.84	0.84	.437
	Error(Time)	790.74	75	10.54		
5	Time	30.32	1	30.32	2.85	.096
	Time x Semester	18.38	2	9.19	0.86	.426
	Error(Time)	798.37	75	10.64		
		Between-Participants				
1	Intercept	5790.49	1	5790.49	129.99	.000
	Semester	61.14	2	30.57	0.69	.507
	Error	3340.94	75	44.55		
2	Intercept	5777.71	1	5777.71	129.78	.000
	Semester	64.34	2	32.17	0.72	.489
	Error	3339.07	75	44.52		
3	Intercept	5780.21	1	5780.21	129.59	.000
	Semester	62.07	2	31.03	0.70	.502
	Error	3345.35	75	44.60		
4	Intercept	5777.71	1	5777.71	129.19	.000
	Semester	64.34	2	32.17	0.72	.490
	Error	3354.07	75	44.72		
5	Intercept	5769.94	1	5769.94	129.15	.000
	Semester	63.02	2	31.51	0.71	.497

Imputation Number	Source	SS	df	MS	F	p
1	Time	28.85	1	28.85	2.67	.106
	Time x Semester	16.92	2	8.46	0.78	.460
	Error(Time)	809.44	75	10.79		
2	Time	29.76	1	29.76	2.78	.099
	Time x Semester	19.10	2	9.55	0.89	.414
	Error(Time)	801.96	75	10.69		
3	Time	29.58	1	29.58	2.76	.101
	Time x Semester	17.64	2	8.82	0.82	.443
	Error(Time)	803.42	75	10.71		
4	Time	30.89	1	30.89	2.93	.091
	Time x Semester	17.67	2	8.84	0.84	.437
	Error(Time)	790.74	75	10.54		
5	Time	30.32	1	30.32	2.85	.096
	Time x Semester	18.38	2	9.19	0.86	.426
	Error(Time)	798.37	75	10.64		
		Between-Participants				
1	Intercept	5790.49	1	5790.49	129.99	.000
	Semester	61.14	2	30.57	0.69	.507
	Error	3340.94	75	44.55		
2	Intercept	5777.71	1	5777.71	129.78	.000
	Semester	64.34	2	32.17	0.72	.489
	Error	3339.07	75	44.52		
3	Intercept	5780.21	1	5780.21	129.59	.000
	Semester	62.07	2	31.03	0.70	.502
	Error	3345.35	75	44.60		
4	Intercept	5777.71	1	5777.71	129.19	.000
	Semester	64.34	2	32.17	0.72	.490
	Error	3354.07	75	44.72		
5	Intercept	5769.94	1	5769.94	129.15	.000
	Semester	63.02	2	31.51	0.71	.497
	Error	3350.72	75	44.68		

Note. GItotal represents average total number of GI symptoms. Semester represents time during which participants participated in the study (Beginning of spring semester, middle to end of spring semester or summer semester).

Table 59

Repeated Measures ANOVA Source Table for GIfreqmax with Semester Entered as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.03	1	0.03	.45	.503
	Time x Semester	0.48	2	0.24	3.79	.027
	Error(Time)	4.75	75	0.06		
2	Time	0.04	1	0.04	.60	.441
	Time x Semester	0.49	2	0.24	3.91	.024
	Error(Time)	4.68	75	0.06		
3	Time	0.04	1	0.04	.60	.441
	Time x semester	0.49	2	0.24	3.91	.024
	Error(Time)	4.68	75	0.06		
4	Time	0.04	1	0.04	.60	.441
	Time x Semester	0.49	2	0.24	3.91	.024
	Error(Time)	4.68	75	0.06		
5	Time	0.04	1	0.04	.60	.441
	Time x Semester	0.49	2	0.24	3.91	.024
	Error(Time)	4.68	75	0.06		
		Between-Participants				
1	Intercept	239.02	1	239.02	1671.76	.000
	Semester	0.81	2	0.41	2.84	.064
	Error	10.72	75	0.14		
2	Intercept	238.28	1	238.28	1659.14	.000
	Semester	0.82	2	0.41	2.86	.063
	Error	10.77	75	0.14		
3	Intercept	238.28	1	238.28	1659.14	.000
	Semester	0.82	2	0.41	2.86	.063
	Error	10.77	75	0.14		
4	Intercept	238.28	1	238.28	1659.14	.000
	Semester	0.82	2	0.41	2.86	.063
	Error	10.77	75	0.14		
5	Intercept	238.28	1	238.28	1659.14	.000
	Semester	0.82	2	0.41	2.86	.063
	Error	10.77	75	0.14		

Note. GIfreqmax represents highest frequency of GI symptoms reported. Semester represents time during which participants participated in the study (Beginning of spring semester, middle to end of spring semester or summer semester).

Table 60
Repeated Measures ANOVA Source Table for GIAverageFrequency

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.00	1	.00	.00	.960
	Time x LEQ1	0.01	1	.01	1.14	.290
	Time x LEQ2	0.01	1	.01	1.58	.214
	Time x Caffeine1	0.05	1	.05	7.81	.007
	Time x Caffeine2	0.00	1	.00	.16	.686
	Time x Sleep 1	0.00	1	.00	.69	.411
	Time x Sleep2	0.00	1	.00	.79	.379
	Time x ICSRLE1	0.00	1	.00	.24	.624
	Time x ICSRLE2	0.01	1	.01	.85	.361
	Time x FhxIBS	0.02	1	.02	3.34	.073
	Time x Trauma	0.00	1	.00	.62	.433
	Time x Race	0.00	2	.00	.06	.941
	Time x FhxIBS x Trauma	0.00	1	.00	.19	.667
	Time x FhxIBS x Race	0.00	1	.00	.29	.592
	Time x Trauma x Race	0.01	2	.01	.92	.406
	Time x FhxIBS x Trauma x Race	0.01	1	.01	2.10	.153
	Error(Time)	0.33	54	.01		
2	Time	0.00	1	.00	.04	.849
	Time x LEQ1	0.01	1	.01	1.28	.263
	Time x LEQ2	0.01	1	.01	1.67	.202
	Time x Caffeine1	0.04	1	.04	6.19	.016
	Time x Caffeine2	0.00	1	.00	.12	.731
	Time x Sleep 1	0.00	1	.00	.54	.468
	Time x Sleep2	0.01	1	.01	.81	.371
	Time x ICSRLE1	0.00	1	.00	.21	.650
	Time x ICSRLE2	0.00	1	.00	.69	.408
	Time x FhxIBS	0.02	1	.02	3.09	.084
	Time x Trauma	0.00	1	.00	.63	.433
	Time x Race	0.00	2	.00	.07	.931
	Time x FhxIBS x Trauma	0.00	1	.00	.15	.696
	Time x FhxIBS x Race	0.00	1	.00	.23	.635

	Time x Trauma x Race	0.02	2	.01	1.23	.300
	Time x FhxIBS x Trauma x Race	0.01	1	.01	2.30	.135
	Error(Time)	0.34	54	.01		
3	Time	0.00	1	.00	.37	.544
	Time x LEQ1	0.01	1	.01	1.55	.219
	Time x LEQ2	0.01	1	.01	2.22	.142
	Time x Caffeine1	0.05	1	.05	8.26	.006
	Time x Caffeine2	0.00	1	.00	.09	.767
	Time x Sleep 1	0.00	1	.00	.49	.489
	Time x Sleep2	0.01	1	.01	1.13	.293
	Time x ICSRLE1	0.00	1	.00	.60	.443
	Time x ICSRLE2	0.01	1	.01	1.06	.308
	Time x FhxIBS	0.02	1	.02	2.88	.096
	Time x Trauma	0.01	1	.01	1.00	.322
	Time x Race	0.00	2	.00	.05	.954
	Time x FhxIBS x Trauma	0.00	1	.00	.27	.605
	Time x FhxIBS x Race	0.00	1	.00	.50	.484
	Time x Trauma x Race	0.02	2	.01	1.28	.286
	Time x FhxIBS x Trauma x Race	0.01	1	.01	1.67	.202
	Error(Time)	0.33	54	.01		
4	Time	0.00	1	.00	.22	.641
	Time x LEQ1	0.01	1	.01	1.60	.212
	Time x LEQ2	0.01	1	.01	1.94	.170
	Time x Caffeine1	0.04	1	.04	6.97	.011
	Time x Caffeine2	0.00	1	.00	.42	.518
	Time x Sleep 1	0.00	1	.00	.26	.615
	Time x Sleep2	0.01	1	.01	.90	.346
	Time x ICSRLE1	0.00	1	.00	.66	.419
	Time x ICSRLE2	0.01	1	.01	1.15	.289
	Time x FhxIBS	0.01	1	.01	2.11	.152
	Time x Trauma	0.01	1	.01	1.53	.221
	Time x Race	0.00	2	.00	.39	.681
	Time x FhxIBS x Trauma	0.00	1	.00	.50	.482
	Time x FhxIBS x Race	0.00	1	.00	.76	.386
	Time x Trauma x Race	0.01	2	.00	.76	.475

	Time x FhxIBS x Trauma x Race	0.01	1	.01	1.01	.320
	Error(Time)	0.33	54	.01		
5	Time	0.00	1	.00	.04	.843
	Time x LEQ1	0.01	1	.01	1.15	.287
	Time x LEQ2	0.01	1	.01	1.30	.260
	Time x Caffeine1	0.03	1	.03	5.23	.026
	Time x Caffeine2	0.01	1	.01	.88	.353
	Time x Sleep 1	0.00	1	.00	.16	.690
	Time x Sleep2	0.00	1	.00	.50	.484
	Time x ICSRLE1	0.00	1	.00	.52	.472
	Time x ICSRLE2	0.00	1	.00	.79	.378
	Time x FhxIBS	0.02	1	.02	2.51	.119
	Time x Trauma	0.00	1	.00	.50	.484
	Time x Race	0.00	2	.00	.13	.879
	Time x FhxIBS x Trauma	0.00	1	.00	.17	.679
	Time x FhxIBS x Race	0.00	1	.00	.14	.714
	Time x Trauma x Race	0.01	2	.01	1.08	.347
	Time x FhxIBS x Trauma x Race	0.01	1	.01	2.23	.141
	Error(Time)	0.34	54	.01		
	Between-Participants					
1	Intercept	0.30	1	0.30	13.96	.000
	LEQ1	0.01	1	0.01	.57	.453
	LEQ2	0.03	1	0.03	1.19	.280
	Caffeine 1	0.00	1	0.00	.20	.655
	Caffeine 2	0.00	1	0.00	.07	.794
	Sleep	0.01	1	0.01	.66	.420
	Sleep2	0.00	1	0.00	.03	.856
	ICSRLE1	0.00	1	0.00	.12	.736
	ICSRLE2	0.09	1	0.09	4.08	.048
	FhxIBS	0.12	1	0.12	5.62	.021
	Trauma	0.03	1	0.03	1.20	.278
	Race	0.01	2	0.01	.29	.748
	FhxIBS x Trauma	0.01	1	0.01	.44	.508
	FhxIBS x Race	0.01	1	0.01	.67	.417
	Trauma x Race	0.00	2	0.00	.05	.948
	FhxIBS x Trauma x Race	0.00	1	0.00	.09	.759
	Error	1.17	54	0.02		

2	Intercept	0.26	1	0.26	11.94	.001
	LEQ1	0.01	1	0.01	.55	.460
	LEQ2	0.03	1	0.03	1.15	.287
	Caffeine 1	0.00	1	0.00	.01	.941
	Caffeine 2	0.01	1	0.01	.29	.591
	Sleep	0.02	1	0.02	.71	.403
	Sleep2	0.00	1	0.00	.01	.916
	ICSRLE1	0.00	1	0.00	.14	.705
	ICSRLE2	0.09	1	0.09	3.98	.051
	FhxIBS	0.12	1	0.12	5.31	.025
	Trauma	0.03	1	0.03	1.33	.253
	Race	0.01	2	0.01	.31	.735
	FhxIBS x Trauma	0.01	1	0.01	.42	.519
	FhxIBS x Race	0.02	1	0.02	.71	.403
	Trauma x Race	0.00	2	0.00	.04	.962
	FhxIBS x Trauma x Race	0.00	1	0.00	.12	.735
	Error	1.17	54	0.02		
3	Intercept	0.18	1	0.18	8.43	.005
	LEQ1	0.02	1	0.02	.77	.383
	LEQ2	0.03	1	0.03	1.60	.211
	Caffeine 1	0.02	1	0.02	.95	.335
	Caffeine 2	0.00	1	0.00	.00	.981
	Sleep	0.01	1	0.01	.39	.534
	Sleep2	0.00	1	0.00	.01	.923
	ICSRLE1	0.00	1	0.00	.03	.861
	ICSRLE2	0.10	1	0.10	4.73	.034
	FhxIBS	0.12	1	0.12	5.57	.022
	Trauma	0.03	1	0.03	1.61	.211
	Race	0.01	2	0.01	.24	.790
	FhxIBS x Trauma	0.01	1	0.01	.40	.527
	FhxIBS x Race	0.02	1	0.02	.91	.344
	Trauma x Race	0.00	2	0.00	.02	.984
	FhxIBS x Trauma x Race	0.00	1	0.00	.03	.863
	Error	1.15	54	0.02		
4	Intercept	0.20	1	0.20	9.30	.004
	LEQ1	0.02	1	0.02	.80	.375
	LEQ2	0.03	1	0.03	1.45	.233
	Caffeine 1	0.01	1	0.01	.43	.515
	Caffeine 2	0.00	1	0.00	.06	.802
	Sleep	0.01	1	0.01	.33	.569

	Sleep2	0.00	1	0.00	.03	.873
	ICSRLE1	0.00	1	0.00	.04	.840
	ICSRLE2	0.10	1	0.10	4.40	.041
	FhxIBS	0.12	1	0.12	5.71	.020
	Trauma	0.03	1	0.03	1.58	.214
	Race	0.02	2	0.01	.35	.705
	FhxIBS x Trauma	0.01	1	0.01	.50	.483
	FhxIBS x Race	0.02	1	0.02	.88	.353
	Trauma x Race	0.00	2	0.00	.09	.917
	FhxIBS x Trauma x Race	0.00	1	0.00	.01	.929
	Error	1.17	54	0.02		
5	Intercept	0.28	1	0.28	12.94	.001
	LEQ1	0.01	1	0.01	.48	.493
	LEQ2	0.03	1	0.03	1.22	.275
	Caffeine 1	0.01	1	0.01	.41	.527
	Caffeine 2	0.00	1	0.00	.17	.685
	Sleep	0.02	1	0.02	.86	.357
	Sleep2	0.00	1	0.00	.04	.849
	ICSRLE1	0.00	1	0.00	.16	.688
	ICSRLE2	0.10	1	0.10	4.43	.040
	FhxIBS	0.12	1	0.12	5.59	.022
	Trauma	0.02	1	0.02	1.11	.296
	Race	0.01	2	0.01	.24	.788
	FhxIBS x Trauma	0.01	1	0.01	.47	.498
	FhxIBS x Race	0.02	1	0.02	.75	.389
	Trauma x Race	0.00	2	0.00	.07	.935
	FhxIBS x Trauma x Race	0.00	1	0.00	.10	.757
	Error	1.17	54	0.02		

Note. GIAverageFrequency represents the average number of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 61
Repeated Measures ANOVA Source Table for GITotal

Imputation Number	Source	SS	df	MS	F	p
1	Time	0.00	1	0.00	.00	.997
	Time x LEQ1	22.56	1	22.56	2.17	.145
	Time x LEQ2	27.64	1	27.64	2.66	.108
	Time x Caffeine1	55.45	1	55.45	5.33	.024
	Time x Caffeine2	2.42	1	2.42	.23	.631
	Time x Sleep1	7.84	1	7.84	.75	.388
	Time x Sleep2	4.36	1	4.36	.42	.519
	Time x ICSRLE1	29.25	1	29.25	2.81	.098
	Time x ICSRLE2	56.86	1	56.86	5.47	.022
	Time x FhxIBS	3.74	1	3.74	.36	.551
	Time x Trauma	2.32	1	2.32	.22	.638
	Time x FhxIBS x Trauma	3.89	1	3.89	.37	.543
	Error(Time)	686.07	66	10.40		
2	Time	0.90	1	0.90	.08	.774
	Time x LEQ1	20.01	1	20.01	1.85	.178
	Time x LEQ2	23.42	1	23.42	2.17	.146
	Time x Caffeine1	18.99	1	18.99	1.76	.190
	Time x Caffeine2	3.52	1	3.52	.33	.570
	Time x Sleep1	7.64	1	7.64	.71	.404
	Time x Sleep2	3.04	1	3.04	.28	.598
	Time x ICSRLE1	27.82	1	27.82	2.57	.114
	Time x ICSRLE2	54.55	1	54.55	5.04	.028
	Time x FhxIBS	2.26	1	2.26	.21	.649
	Time x Trauma	0.73	1	0.73	.07	.795
	Time x FhxIBS x Trauma	3.17	1	3.17	.29	.590
	Error(Time)	713.89	66	10.82		
3	Time	0.07	1	0.07	.01	.937
	Time x LEQ1	23.91	1	23.91	2.26	.137
	Time x LEQ2	29.80	1	29.80	2.82	.098
	Time x Caffeine1	34.94	1	34.94	3.31	.073
	Time x Caffeine2	3.15	1	3.15	.30	.587
	Time x Sleep1	5.62	1	5.62	.53	.468
	Time x Sleep2	4.08	1	4.08	.39	.536

	Time x ICSRLE1	35.72	1	35.72	3.38	.070
	Time x ICSRLE2	61.57	1	61.57	5.83	.019
	Time x FhxIBS	1.79	1	1.79	.17	.682
	Time x Trauma	2.27	1	2.27	.21	.644
	Time x FhxIBS x Trauma	3.85	1	3.85	.36	.548
	Error(Time)	697.10	66	10.56		
4	Time	0.00	1	0.00	.00	.985
	Time x LEQ1	20.15	1	20.15	1.94	.169
	Time x LEQ2	28.95	1	28.95	2.78	.100
	Time x Caffeine1	31.43	1	31.43	3.02	.087
	Time x Caffeine2	4.44	1	4.44	.43	.516
	Time x Sleep1	5.07	1	5.07	.49	.488
	Time x Sleep2	3.96	1	3.96	.38	.539
	Time x ICSRLE1	33.65	1	33.65	3.23	.077
	Time x ICSRLE2	63.06	1	63.06	6.06	.016
	Time x FhxIBS	1.21	1	1.21	.12	.734
	Time x Trauma	2.37	1	2.37	.23	.635
	Time x FhxIBS x Trauma	3.31	1	3.31	.32	.575
	Error(Time)	687.29	66	10.41		
5	Time	0.36	1	0.36	.03	.856
	Time x LEQ1	23.10	1	23.10	2.17	.146
	Time x LEQ2	22.62	1	22.62	2.12	.150
	Time x Caffeine1	20.90	1	20.90	1.96	.166
	Time x Caffeine2	8.63	1	8.63	.81	.372
	Time x Sleep1	4.84	1	4.84	.45	.503
	Time x Sleep2	3.05	1	3.05	.29	.594
	Time x ICSRLE1	32.69	1	32.69	3.07	.085
	Time x ICSRLE2	53.81	1	53.81	5.05	.028
	Time x FhxIBS	1.67	1	1.67	.16	.694
	Time x Trauma	0.62	1	0.62	.06	.810
	Time x FhxIBS x Trauma	3.26	1	3.26	.31	.582
	Error(Time)	703.68	66	10.66		
	Between-Participants					
1	Intercept	29.65	1	29.65	1.13	.292
	LEQ1	16.46	1	16.46	0.63	.432
	LEQ2	48.09	1	48.09	1.83	.181
	Caffeine1	0.17	1	0.17	0.01	.937

	Caffeine2	0.23	1	0.23	0.01	.925
	Sleep1	60.95	1	60.95	2.32	.133
	Sleep2	8.45	1	8.45	0.32	.573
	ICSRLE1	7.24	1	7.24	0.28	.602
	ICSRLE2	223.84	1	223.84	8.50	.005
	FhxIBS	166.98	1	166.98	6.34	.014
	Trauma	22.91	1	22.91	0.87	.354
	FhxIBS x Trauma	9.85	1	9.85	0.37	.543
	Error	1737.14	66	26.32		
2	Intercept	17.78	1	17.78	0.67	.415
	LEQ1	16.90	1	16.90	0.64	.426
	LEQ2	47.75	1	47.75	1.81	.183
	Caffeine1	2.57	1	2.57	0.10	.756
	Caffeine2	0.66	1	0.66	0.03	.874
	Sleep1	61.48	1	61.48	2.33	.132
	Sleep2	11.44	1	11.44	0.43	.513
	ICSRLE1	7.32	1	7.32	0.28	.600
	ICSRLE2	217.82	1	217.82	8.25	.005
	FhxIBS	172.23	1	172.23	6.53	.013
	Trauma	27.09	1	27.09	1.03	.315
	FhxIBS x Trauma	10.22	1	10.22	0.39	.536
	Error	1741.83	66	26.39		
3	Intercept	9.09	1	9.09	0.35	.555
	LEQ1	22.38	1	22.38	0.87	.356
	LEQ2	63.00	1	63.00	2.44	.123
	Caffeine1	24.49	1	24.49	0.95	.334
	Caffeine2	3.06	1	3.06	0.12	.732
	Sleep1	45.17	1	45.17	1.75	.191
	Sleep2	9.18	1	9.18	0.35	.554
	ICSRLE1	2.55	1	2.55	0.10	.755
	ICSRLE2	248.99	1	248.99	9.62	.003
	FhxIBS	178.84	1	178.84	6.91	.011
	Trauma	31.19	1	31.19	1.21	.276
	FhxIBS x Trauma	10.09	1	10.09	0.39	.535
	Error	1707.44	66	25.87		
4	Intercept	15.39	1	15.39	0.59	.447
	LEQ1	20.00	1	20.00	0.76	.386
	LEQ2	58.10	1	58.10	2.21	.142
	Caffeine1	13.32	1	13.32	0.51	.479
	Caffeine2	5.70	1	5.70	0.22	.643

	Sleep1	46.30	1	46.30	1.76	.189
	Sleep2	8.69	1	8.69	0.33	.567
	ICSRLE1	4.75	1	4.75	0.18	.672
	ICSRLE2	235.58	1	235.58	8.96	.004
	FhxIBS	177.65	1	177.65	6.76	.012
	Trauma	26.77	1	26.77	1.02	.317
	FhxIBS x Trauma	9.81	1	9.81	0.37	.543
	Error	1734.99	66	26.29		
5	Intercept	29.70	1	29.70	1.12	.293
	LEQ1	15.10	1	15.10	0.57	.452
	LEQ2	45.25	1	45.25	1.71	.195
	Caffeine1	0.11	1	0.11	0.00	.949
	Caffeine2	0.00	1	0.00	0.00	.992
	Sleep1	61.75	1	61.75	2.34	.131
	Sleep2	9.41	1	9.41	0.36	.553
	ICSRLE1	7.90	1	7.90	0.30	.586
	ICSRLE2	226.40	1	226.40	8.57	.005
	FhxIBS	174.52	1	174.52	6.61	.012
	Trauma	20.05	1	20.05	0.76	.387
	FhxIBS x Trauma	9.11	1	9.11	0.34	.559
	Error	1742.60	66	26.40		

Table 62
Repeated Measure ANOVA Source Table for GIfreqmax

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.01	1	.01	.18	.669
	Time x LEQ1	0.39	1	.39	7.47	.008
	Time x LEQ2	0.83	1	.83	15.80	.000
	Time x Caffeine1	0.09	1	.09	1.78	.188
	Time x Caffeine2	0.04	1	.04	.74	.392
	Time x Sleep1	0.04	1	.04	.84	.364
	Time x Sleep2	0.19	1	.19	3.53	.065
	Time x ICSRLE1	0.03	1	.03	.58	.447
	Time x ICSRLE2	0.06	1	.06	1.06	.308
	Time x FhxIBS	0.34	1	.34	6.44	.014
	Time x Trauma	0.73	1	.73	13.90	.000
	Time x Semester	0.39	2	.20	3.71	.030
	Time x FhxIBS x Trauma	0.35	1	.35	6.70	.012
	Time x FhxIBS x Semester	0.28	2	.14	2.67	.078
	Time x Trauma x Semester	0.05	2	.02	.45	.641
	Time x FhxIBS x Trauma x Semester	0.01	1	.01	.16	.694
	Error(Time)	3.11	59	.05		
2	Time	0.01	1	.01	.30	.583
	Time x LEQ1	0.44	1	.44	8.97	.004
	Time x LEQ2	0.92	1	.92	18.70	.000
	Time x Caffeine1	0.14	1	.14	2.83	.098
	Time x Caffeine2	0.11	1	.11	2.14	.149
	Time x Sleep1	0.02	1	.02	.43	.516
	Time x Sleep2	0.16	1	.16	3.22	.078
	Time x ICSRLE1	0.05	1	.05	1.00	.322
	Time x ICSRLE2	0.07	1	.07	1.49	.227
	Time x FhxIBS	0.34	1	.34	6.92	.011
	Time x Trauma	0.72	1	.72	14.70	.000
	Time x Semester	0.32	2	.16	3.30	.044
	Time x FhxIBS x Trauma	0.34	1	.34	6.87	.011
	Time x FhxIBS x Semester	0.29	2	.15	2.97	.059
	Time x Trauma x Semester	0.04	2	.02	.38	.687
	Time x FhxIBS x Trauma x Semester	0.00	1	.00	.10	.752

	Error(Time)	2.90	59	.05		
3	Time	0.03	1	.03	.52	.475
	Time x LEQ1	0.40	1	.40	7.92	.007
	Time x LEQ2	0.88	1	.88	17.38	.000
	Time x Caffeine1	0.10	1	.10	2.07	.155
	Time x Caffeine2	0.03	1	.03	.58	.448
	Time x Sleep1	0.02	1	.02	.45	.503
	Time x Sleep2	0.17	1	.17	3.42	.069
	Time x ICSRLE1	0.06	1	.06	1.17	.283
	Time x ICSRLE2	0.08	1	.08	1.56	.216
	Time x FhxIBS	0.27	1	.27	5.41	.023
	Time x Trauma	0.76	1	.76	15.09	.000
	Time x Semester	0.30	2	.15	2.97	.059
	Time x FhxIBS x Trauma	0.33	1	.33	6.61	.013
	Time x FhxIBS x Semester	0.24	2	.12	2.37	.102
	Time x Trauma x Semester	0.02	2	.01	.20	.821
	Time x FhxIBS x Trauma x Semester	0.01	1	.01	.14	.713
	Error(Time)	2.99	59	.05		
4	Time	0.02	1	.02	.44	.508
	Time x LEQ1	0.40	1	.40	7.80	.007
	Time x LEQ2	0.89	1	.89	17.46	.000
	Time x Caffeine1	0.09	1	.09	1.82	.183
	Time x Caffeine2	0.03	1	.03	.67	.415
	Time x Sleep1	0.02	1	.02	.45	.503
	Time x Sleep2	0.18	1	.18	3.46	.068
	Time x ICSRLE1	0.06	1	.06	1.13	.291
	Time x ICSRLE2	0.09	1	.09	1.69	.198
	Time x FhxIBS	0.27	1	.27	5.32	.025
	Time x Trauma	0.73	1	.73	14.34	.000
	Time x Semester	0.32	2	.16	3.11	.052
	Time x FhxIBS x Trauma	0.32	1	.32	6.29	.015
	Time x FhxIBS x Semester	0.26	2	.13	2.54	.087
	Time x Trauma x Semester	0.02	2	.01	.19	.828
	Time x FhxIBS x Trauma x Semester	0.00	1	.00	.07	.790
	Error(Time)	2.99	59	.05		
5	Time	0.01	1	.01	.16	.689
	Time x LEQ1	0.44	1	.44	9.00	.004
	Time x LEQ2	0.85	1	.85	17.30	.000

	Time x Caffeine1	0.10	1	.10	2.07	.156
	Time x Caffeine2	0.17	1	.17	3.38	.071
	Time x Sleep1	0.01	1	.01	.26	.611
	Time x Sleep2	0.14	1	.14	2.84	.097
	Time x ICSRLE1	0.06	1	.06	1.29	.261
	Time x ICSRLE2	0.07	1	.07	1.42	.239
	Time x FhxIBS	0.21	1	.21	4.31	.042
	Time x Trauma	0.59	1	.59	12.12	.001
	Time x Semester	0.27	2	.14	2.77	.071
	Time x FhxIBS x Trauma	0.29	1	.29	5.82	.019
	Time x FhxIBS x Semester	0.20	2	.10	2.07	.135
	Time x Trauma x Semester	0.00	2	.00	.04	.960
	Time x FhxIBS x Trauma x Semester	0.00	1	.00	.00	.950
	Error(Time)	2.89	59	.05		
	Between-Participants					
1	Intercept	1.67	1	1.67	17.40	.000
	LEQ1	0.30	1	.30	3.16	.081
	LEQ2	0.02	1	.02	.16	.687
	Caffeine1	0.19	1	.19	1.93	.170
	Caffeine2	0.23	1	.23	2.43	.124
	Sleep1	0.68	1	.68	7.13	.010
	Sleep2	0.11	1	.11	1.15	.289
	ICSRLE	0.06	1	.06	.68	.414
	ICSRLE2	0.21	1	.21	2.21	.142
	FhxIBS	0.46	1	.46	4.77	.033
	Trauma	0.17	1	.17	1.75	.191
	Semester	1.50	2	.75	7.83	.001
	FhxIBS x Trauma	0.03	1	.03	.36	.551
	FhxIBS x Semester	0.48	2	.24	2.52	.089
	Trauma x Semester	0.19	2	.09	.98	.382
	FhxIBS x Trauma x Semester	0.00	1	.00	.00	.971
	Error	5.65	59	.10		
2	Intercept	1.46	1	1.46	14.36	.000
	LEQ1	0.28	1	.28	2.77	.102
	LEQ2	0.01	1	.01	.10	.756
	Caffeine1	0.06	1	.06	.63	.430
	Caffeine2	0.04	1	.04	.39	.535
	Sleep1	0.64	1	.64	6.34	.015
	Sleep2	0.09	1	.09	.92	.341

	ICSRLE	0.09	1	.09	.86	.358
	ICSRLE2	0.20	1	.20	2.01	.162
	FhxIBS	0.37	1	.37	3.64	.061
	Trauma	0.19	1	.19	1.86	.178
	Semester	1.59	2	.80	7.84	.001
	FhxIBS x Trauma	0.05	1	.05	.48	.493
	FhxIBS x Semester	0.46	2	.23	2.24	.115
	Trauma x Semester	0.18	2	.09	.86	.427
	FhxIBS x Trauma x Semester	0.00	1	.00	.00	.955
	Error	6.00	59	.10		
3	Intercept	1.78	1	1.78	17.31	.000
	LEQ1	0.22	1	.22	2.09	.153
	LEQ2	0.00	1	.00	.00	.974
	Caffeine1	0.01	1	.01	.12	.730
	Caffeine2	0.00	1	.00	.00	.945
	Sleep1	0.52	1	.52	5.08	.028
	Sleep2	0.10	1	.10	.93	.339
	ICSRLE	0.05	1	.05	.53	.470
	ICSRLE2	0.24	1	.24	2.32	.133
	FhxIBS	0.34	1	.34	3.27	.076
	Trauma	0.27	1	.27	2.63	.110
	Semester	1.61	2	.80	7.81	.001
	FhxIBS x Trauma	0.06	1	.06	.55	.462
	FhxIBS x Semester	0.41	2	.20	1.97	.149
	Trauma x Semester	0.13	2	.07	.64	.530
	FhxIBS x Trauma x Semester	0.00	1	.00	.01	.922
	Error	6.08	59	.10		
4	Intercept	1.31	1	1.31	13.23	.001
	LEQ1	0.32	1	.32	3.24	.077
	LEQ2	0.03	1	.03	.29	.593
	Caffeine1	0.18	1	.18	1.82	.183
	Caffeine2	0.12	1	.12	1.21	.276
	Sleep1	0.75	1	.75	7.58	.008
	Sleep2	0.11	1	.11	1.09	.302
	ICSRLE	0.12	1	.12	1.21	.276
	ICSRLE2	0.15	1	.15	1.51	.224
	FhxIBS	0.33	1	.33	3.33	.073
	Trauma	0.17	1	.17	1.70	.198
	Semester	1.59	2	.80	8.07	.001
	FhxIBS x Trauma	0.05	1	.05	.52	.475

	FhxIBS x Semester	0.50	2	.25	2.54	.088
	Trauma x Semester	0.19	2	.09	.94	.396
	FhxIBS x Trauma x Semester	0.00	1	.00	.04	.841
	Error	5.82	59	.10		
5	Intercept	1.49	1	1.49	14.81	.000
	LEQ1	0.30	1	.30	2.97	.090
	LEQ2	0.00	1	.00	.05	.828
	Caffeine1	0.09	1	.09	.89	.349
	Caffeine2	0.11	1	.11	1.11	.297
	Sleep1	0.71	1	.71	7.02	.010
	Sleep2	0.12	1	.12	1.17	.284
	ICSRLE	0.11	1	.11	1.09	.300
	ICSRLE2	0.20	1	.20	2.02	.160
	FhxIBS	0.28	1	.28	2.74	.103
	Trauma	0.25	1	.25	2.49	.120
	Semester	1.40	2	.70	6.95	.002
	FhxIBS x Trauma	0.06	1	.06	.55	.460
	FhxIBS x Semester	0.45	2	.23	2.26	.113
	Trauma x Semester	0.12	2	.06	.62	.543
	FhxIBS x Trauma x Semester	0.00	1	.00	.04	.837
	Error	5.93	59	.10		

Table 63
Tests of Fixed Effects for GIAverageFrequency

Imputation Number	Source	Numerator df	Denominator df	F	p
1	Intercept	1	130	26.87	0.00
	Trauma	1	130	0.39	0.54
	Time	1	130	0.05	0.83
	FhxIBS	1	130	18.27	0.00
	Time x FhxIBS	1	130	0.14	0.71
	Trauma x Time	1	130	0.04	0.84
	Trauma x Time x FhxIBS	2	130	0.07	0.94
	Sleep	1	130	0.55	0.46
	Caffeine	1	130	1.33	0.25
	LEQ	1	130	1.37	0.24
	ICSRLE	1	130	40.87	0.00
	Race	2	130	0.75	0.47
2	Intercept	1	130	24.32	0.00
	Trauma	1	130	0.45	0.51
	Time	1	130	0.01	0.92
	FhxIBS	1	130	18.18	0.00
	Time x FhxIBS	1	130	0.09	0.76
	Trauma x Time	1	130	0.04	0.84
	Trauma x Time x FhxIBS	2	130	0.07	0.93
	Sleep	1	130	0.37	0.54
	Caffeine	1	130	0.25	0.62
	LEQ	1	130	1.27	0.26
	ICSRLE	1	130	39.83	0.00
	Race	2	130	0.68	0.51
3	Intercept	1	130	24.90	0.00
	Trauma	1	130	0.41	0.52
	Time	1	130	0.01	0.93
	FhxIBS	1	130	18.79	0.00
	Time x FhxIBS	1	130	0.06	0.81
	Trauma x Time	1	130	0.04	0.85
	Trauma x Time x FhxIBS	2	130	0.07	0.93
	Sleep	1	130	0.41	0.52
	Caffeine	1	130	0.32	0.58

	LEQ	1	130	1.30	0.26
	ICSRLE	1	130	40.85	0.00
	Race	2	130	0.75	0.47
4	Intercept	1	130	26.29	0.00
	Trauma	1	130	0.36	0.55
	Time	1	130	0.02	0.90
	FhxIBS	1	130	18.46	0.00
	Time x FhxIBS	1	130	0.06	0.80
	Trauma x Time	1	130	0.05	0.83
	Trauma x Time x FhxIBS	2	130	0.07	0.93
	Sleep	1	130	0.45	0.50
	Caffeine	1	130	0.78	0.38
	LEQ	1	130	1.31	0.26
	ICSRLE	1	130	40.48	0.00
	Race	2	130	0.73	0.49
5	Intercept	1	130	26.59	0.00
	Trauma	1	130	0.34	0.56
	Time	1	130	0.03	0.87
	FhxIBS	1	130	18.30	0.00
	Time x FhxIBS	1	130	0.07	0.79
	Trauma x Time	1	130	0.04	0.84
	Trauma x Time x FhxIBS	2	130	0.08	0.93
	Sleep	1	130	0.45	0.50
	Caffeine	1	130	1.01	0.32
	LEQ	1	130	1.20	0.27
	ICSRLE	1	130	41.07	0.00
	Race	2	130	0.87	0.42

Note. GIAverageFrequency represents the average number of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 64
Tests of Fixed Effects for GItotal

Imputation Number	Source	Numerator df	Denominator df	F	Sig.
1	Intercept	1	144	0.88	0.35
	Trauma	1	144	0.03	0.86
	Time	1	144	0.46	0.50
	FhxIBS	1	144	17.01	0.00
	Time x FhxIBS	1	144	0.00	1.00
	Trauma x Time	1	144	0.05	0.82
	Trauma x Time x FhxIBS	2	144	0.03	0.97
	Sleep	1	144	0.48	0.49
	Caffeine	1	144	0.92	0.34
	LEQ	1	144	1.64	0.20
	ICSRLE	1	144	49.53	0.00
2	Intercept	1	144	0.50	0.48
	Trauma	1	144	0.05	0.82
	Time	1	144	0.58	0.45
	FhxIBS	1	144	17.06	0.00
	Time x FhxIBS	1	144	0.00	0.96
	Trauma x Time	1	144	0.05	0.82
	Trauma x Time x FhxIBS	2	144	0.04	0.97
	Sleep	1	144	0.35	0.55
	Caffeine	1	144	0.19	0.67
	LEQ	1	144	1.52	0.22
	ICSRLE	1	144	48.21	0.00
3	Intercept	1	144	0.65	0.42
	Trauma	1	144	0.03	0.85
	Time	1	144	0.57	0.45
	FhxIBS	1	144	17.77	0.00
	Time x FhxIBS	1	144	0.01	0.91
	Trauma x Time	1	144	0.06	0.81
	Trauma x Time x FhxIBS	2	144	0.04	0.96
	Sleep	1	144	0.41	0.52
	Caffeine	1	144	0.39	0.53
	LEQ	1	144	1.60	0.21
	ICSRLE	1	144	49.69	0.00

4	Intercept	1	144	0.82	0.37
	Trauma	1	144	0.02	0.90
	Time	1	144	0.57	0.45
	FhxIBS	1	144	17.35	0.00
	Time x FhxIBS	1	144	0.01	0.93
	Trauma x Time	1	144	0.04	0.83
	Trauma x Time x FhxIBS	2	144	0.04	0.96
	Sleep	1	144	0.44	0.51
	Caffeine	1	144	0.72	0.40
	LEQ	1	144	1.57	0.21
	ICSRLE	1	144	49.75	0.00
5	Intercept	1	144	0.82	0.37
	Trauma	1	144	0.02	0.89
	Time	1	144	0.51	0.47
	FhxIBS	1	144	17.49	0.00
	Time x FhxIBS	1	144	0.01	0.93
	Trauma x Time	1	144	0.05	0.82
	Trauma x Time x FhxIBS	2	144	0.05	0.95
	Sleep	1	144	0.41	0.52
	Caffeine	1	144	0.70	0.40
	LEQ	1	144	1.61	0.21
	ICSRLE	1	144	49.85	0.00

Note. GItotal represents the total number of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 65

Tests of Fixed Effects for GIfreqmax

Imputation Number	Source	Numerator df	Denominator df	F	Sig.
1	Intercept	1	142	47.34	0.00
	Trauma	1	142	1.07	0.30
	Time	1	142	2.71	0.10
	FhxIBS	1	142	8.89	0.00
	Time x FhxIBS	1	142	1.66	0.20
	Trauma x Time	1	142	5.12	0.03
	Trauma x Time x FhxIBS	2	142	2.61	0.08
	Sleep	1	142	0.01	0.91
	Caffeine	1	142	0.09	0.76
	LEQ	1	142	8.09	0.01
	ICSRLE	1	142	23.69	0.00
	Semester	2	142	3.60	0.03
2	Intercept	1	142	39.91	0.00
	Trauma	1	142	0.65	0.42
	Time	1	142	3.19	0.08
	FhxIBS	1	142	8.52	0.00
	Time x FhxIBS	1	142	1.79	0.18
	Trauma x Time	1	142	5.12	0.03
	Trauma x Time x FhxIBS	2	142	2.49	0.09
	Sleep	1	142	0.12	0.73
	Caffeine	1	142	1.68	0.20
	LEQ	1	142	7.79	0.01
	ICSRLE	1	142	25.29	0.00
	Semester	2	142	3.96	0.02
3	Intercept	1	142	45.28	0.00
	Trauma	1	142	0.90	0.34
	Time	1	142	2.63	0.11
	FhxIBS	1	142	9.27	0.00
	Time x FhxIBS	1	142	1.58	0.21
	Trauma x Time	1	142	5.15	0.02
	Trauma x Time x FhxIBS	2	142	2.48	0.09
	Sleep	1	142	0.04	0.84

	Caffeine	1	142	0.30	0.58
	LEQ	1	142	7.73	0.01
	ICSRLE	1	142	24.57	0.00
	Semester	2	142	3.81	0.02
4	Intercept	1	142	44.27	0.00
	Trauma	1	142	0.76	0.39
	Time	1	142	2.77	0.10
	FhxIBS	1	142	9.02	0.00
	Time x FhxIBS	1	142	1.59	0.21
	Trauma x Time	1	142	5.20	0.02
	Trauma x Time x FhxIBS	2	142	2.50	0.09
	Sleep	1	142	0.06	0.81
	Caffeine	1	142	0.70	0.41
	LEQ	1	142	7.70	0.01
	ICSRLE	1	142	24.61	0.00
	Semester	2	142	3.88	0.02
5	Intercept	1	142	43.47	0.00
	Trauma	1	142	0.69	0.41
	Time	1	142	3.06	0.08
	FhxIBS	1	142	9.05	0.00
	Time x FhxIBS	1	142	1.61	0.21
	Trauma x Time	1	142	5.19	0.02
	Trauma x Time x FhxIBS	2	142	2.57	0.08
	Sleep	1	142	0.07	0.80
	Caffeine	1	142	1.40	0.24
	LEQ	1	142	7.90	0.01
	ICSRLE	1	142	25.33	0.00
	Semester	2	142	3.82	0.02

Note. GIfreqmax represents the highest frequency of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 66

Repeated ANOVA Source Table for GIAverageFrequency Including Only Individuals That experienced a Change in PSS Between Time 1 and Time 2

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.01	1	.01	1.71	.20
	Time x LEQ1	0.02	1	.02	3.20	.09
	Time x LEQ2	0.01	1	.01	2.45	.13
	Time x Caffeine1	0.00	1	.00	.48	.50
	Time x Caffeine2	0.03	1	.03	4.84	.04
	Time x Sleep1	0.00	1	.00	.01	.94
	Time x Sleep2	0.00	1	.00	.33	.57
	Time x ICSRLE1	0.00	1	.00	.08	.77
	Time x ICSRLE2	0.00	1	.00	.81	.38
	Time x FhxIBS	0.00	1	.00	.49	.49
	Time x Trauma	0.00	1	.00	.02	.90
	Time x Race	0.01	2	.00	.68	.52
	Time x FhxIBS x Trauma	0.00	0	.	.	.
	Time x FhxIBS x Race	0.00	0	.	.	.
	Time x Trauma x Race	0.02	2	.01	1.85	.18
	Time x FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error(Time)	0.14	25	.01		
2	Time	0.01	1	.01	1.25	.27
	Time x LEQ1	0.02	1	.02	3.02	.09
	Time x LEQ2	0.01	1	.01	2.14	.16
	Time x Caffeine1	0.00	1	.00	.01	.93
	Time x Caffeine2	0.02	1	.02	2.81	.11
	Time x Sleep1	0.00	1	.00	.01	.93
	Time x Sleep2	0.00	1	.00	.73	.40
	Time x ICSRLE1	0.00	1	.00	.07	.80
	Time x ICSRLE2	0.00	1	.00	.50	.49
	Time x FhxIBS	0.00	1	.00	.19	.67
	Time x Trauma	0.00	1	.00	.00	.98
	Time x Race	0.00	2	.00	.35	.71

	Time x FhxIBS x Trauma	0.00	0	.	.	.
	Time x FhxIBS x Race	0.00	0	.	.	.
	Time x Trauma x Race	0.01	2	.01	1.18	.32
	Time x FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error(Time)	0.16	25	.01		
3	Time	0.00	1	.00	.79	.38
	Time x LEQ1	0.03	1	.03	4.85	.04
	Time x LEQ2	0.01	1	.01	2.44	.13
	Time x Caffeine1	0.00	1	.00	.23	.63
	Time x Caffeine2	0.03	1	.03	4.77	.04
	Time x Sleep1	0.00	1	.00	.14	.71
	Time x Sleep2	0.00	1	.00	.45	.51
	Time x ICSRLE1	0.00	1	.00	.67	.42
	Time x ICSRLE2	0.01	1	.01	1.72	.20
	Time x FhxIBS	0.00	1	.00	.30	.59
	Time x Trauma	0.00	1	.00	.00	.95
	Time x Race	0.00	2	.00	.40	.67
	Time x FhxIBS x Trauma	0.00	0	.	.	.
	Time x FhxIBS x Race	0.00	0	.	.	.
	Time x Trauma x Race	0.02	2	.01	2.03	.15
	Time x FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error(Time)	0.14	25	.01		
4	Time	0.00	1	.00	.83	.37
	Time x LEQ1	0.02	1	.02	4.05	.06
	Time x LEQ2	0.01	1	.01	2.51	.13
	Time x Caffeine1	0.00	1	.00	.11	.74
	Time x Caffeine2	0.03	1	.03	5.16	.03
	Time x Sleep1	0.00	1	.00	.06	.80
	Time x Sleep2	0.00	1	.00	.46	.50
	Time x ICSRLE1	0.00	1	.00	.16	.69
	Time x ICSRLE2	0.01	1	.01	.94	.34
	Time x FhxIBS	0.00	1	.00	.18	.68

	Time x Trauma	0.00	1	.00	.00	.98
	Time x Race	0.01	2	.00	.59	.56
	Time x FhxIBS x Trauma	0.00	0	.	.	.
	Time x FhxIBS x Race	0.00	0	.	.	.
	Time x Trauma x Race	0.02	2	.01	1.79	.19
	Time x FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error(Time)	0.14	25	.01		
5	Time	0.01	1	.01	1.50	.23
	Time x LEQ1	0.03	1	.03	4.66	.04
	Time x LEQ2	0.01	1	.01	2.16	.15
	Time x Caffeine1	0.00	1	.00	.00	.97
	Time x Caffeine2	0.03	1	.03	5.28	.03
	Time x Sleep1	0.00	1	.00	.07	.79
	Time x Sleep2	0.00	1	.00	.42	.52
	Time x ICSRLE1	0.00	1	.00	.24	.63
	Time x ICSRLE2	0.01	1	.01	.99	.33
	Time x FhxIBS	0.00	1	.00	.10	.75
	Time x Trauma	0.00	1	.00	.00	.95
	Time x Race	0.01	2	.00	.47	.63
	Time x FhxIBS x Trauma	0.00	0	.	.	.
	Time x FhxIBS x Race	0.00	0	.	.	.
	Time x Trauma x Race	0.02	2	.01	1.64	.22
	Time x FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error(Time)	0.14	25	.01		
	Between-Participants					
1	Intercept	0.38	1	.38	17.01	.00
	LEQ1	0.02	1	.02	.99	.33
	LEQ2	0.04	1	.04	1.81	.19
	Caffeine1	0.02	1	.02	.76	.39
	Caffeine2	0.00	1	.00	.06	.81
	Sleep1	0.01	1	.01	.63	.43
	Sleep2	0.00	1	.00	.06	.81

	ICSRLE1	0.02	1	.02	.94	.34
	ICSRLE2	0.02	1	.02	.87	.36
	FhxIBS	0.02	1	.02	1.02	.32
	Trauma	0.01	1	.01	.38	.54
	Race	0.01	2	.00	.20	.82
	FhxIBS x Trauma	0.00	0	.	.	.
	FhxIBS x Race	0.00	0	.	.	.
	Trauma x Race	0.02	2	.01	.49	.62
	FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error	0.55	25	.02		
2	Intercept	0.37	1	.37	17.56	.00
	LEQ1	0.03	1	.03	1.59	.22
	LEQ2	0.05	1	.05	2.35	.14
	Caffeine1	0.03	1	.03	1.65	.21
	Caffeine2	0.01	1	.01	.48	.49
	Sleep1	0.03	1	.03	1.43	.24
	Sleep2	0.01	1	.01	.28	.60
	ICSRLE1	0.03	1	.03	1.29	.27
	ICSRLE2	0.01	1	.01	.50	.49
	FhxIBS	0.04	1	.04	1.76	.20
	Trauma	0.02	1	.02	.82	.37
	Race	0.01	2	.00	.23	.80
	FhxIBS x Trauma	0.00	0	.	.	.
	FhxIBS x Race	0.00	0	.	.	.
	Trauma x Race	0.03	2	.01	.67	.52
	FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error	0.53	25	.02		
3	Intercept	0.28	1	.28	12.48	.00
	LEQ1	0.02	1	.02	1.11	.30
	LEQ2	0.04	1	.04	1.93	.18
	Caffeine1	0.01	1	.01	.34	.57
	Caffeine2	0.00	1	.00	.00	.97
	Sleep1	0.02	1	.02	.84	.37
	Sleep2	0.00	1	.00	.13	.73
	ICSRLE1	0.03	1	.03	1.20	.28
	ICSRLE2	0.02	1	.02	.77	.39
	FhxIBS	0.03	1	.03	1.31	.26
	Trauma	0.01	1	.01	.49	.49

	Race	0.01	2	.00	.12	.88
	FhxIBS x Trauma	0.00	0	.	.	.
	FhxIBS x Race	0.00	0	.	.	.
	Trauma x Race	0.03	2	.01	.63	.54
	FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error	0.56	25	.02		
4	Intercept	0.33	1	.33	15.01	.00
	LEQ1	0.02	1	.02	.94	.34
	LEQ2	0.04	1	.04	1.63	.21
	Caffeine1	0.03	1	.03	1.26	.27
	Caffeine2	0.00	1	.00	.14	.71
	Sleep1	0.02	1	.02	1.10	.31
	Sleep2	0.00	1	.00	.06	.81
	ICSRLE1	0.03	1	.03	1.43	.24
	ICSRLE2	0.01	1	.01	.62	.44
	FhxIBS	0.03	1	.03	1.35	.26
	Trauma	0.00	1	.00	.04	.83
	Race	0.00	2	.00	.10	.90
	FhxIBS x Trauma	0.00	0	.	.	.
	FhxIBS x Race	0.00	0	.	.	.
	Trauma x Race	0.03	2	.01	.67	.52
	FhxIBS x Trauma x Race	0.00	0	.	.	.
	Error	0.55	25	.02		
5	Intercept	0.44	1	.44	23.12	.00
	LEQ1	0.04	1	.04	2.18	.15
	LEQ2	0.06	1	.06	3.05	.09
	Caffeine1	0.09	1	.09	4.93	.04
	Caffeine2	0.00	1	.00	.12	.73
	Sleep1	0.02	1	.02	1.27	.27
	Sleep2	0.00	1	.00	.08	.78
	ICSRLE1	0.03	1	.03	1.51	.23
	ICSRLE2	0.02	1	.02	.98	.33
	FhxIBS	0.03	1	.03	1.71	.20
	Trauma	0.01	1	.01	.61	.44
	Race	0.01	2	.01	.37	.70
	FhxIBS x Trauma	0.00	0	.	.	.
	FhxIBS x Race	0.00	0	.	.	.

Trauma x Race	0.03	2	.01	.74	.49
FhxIBS x Trauma x Race	0.00	0	.	.	.
Error	0.48	25	.02		

Note. GIAverageFrequency represents the average number of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 67
Repeated Measures ANOVA Source Table for GItotal Including Only Individuals That experienced a Change in PSS Between Time 1 and Time 2

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	12.77	1	12.77	1.23	.27
	Time x LEQ1	77.99	1	77.99	7.54	.01
	Timex LEQ2	45.09	1	45.09	4.36	.04
	Time x Caffeine1	3.22	1	3.22	.31	.58
	Time x Caffeine2	9.25	1	9.25	.89	.35
	Time x Sleep1	4.69	1	4.69	.45	.51
	Time x Sleep2	4.29	1	4.29	.41	.52
	Time x ICSRLE1	4.29	1	4.29	.41	.52
	Time x ICSRLE2	17.16	1	17.16	1.66	.21
	Time x FhxIBS	6.30	1	6.30	.61	.44
	Time x Trauma	0.77	1	.77	.07	.79
	Time x FhxIBS x Trauma	0.04	1	.04	.00	.95
	Error(Time)	331.01	32	10.34		
2	Time	30.77	1	30.77	3.09	.09
	Time x LEQ1	83.30	1	83.30	8.35	.01
	Timex LEQ2	38.53	1	38.53	3.86	.06
	Time x Caffeine1	5.77	1	5.77	.58	.45
	Time x Caffeine2	15.50	1	15.50	1.55	.22
	Time x Sleep1	4.49	1	4.49	.45	.51
	Time x Sleep2	3.53	1	3.53	.35	.56
	Time x ICSRLE1	5.71	1	5.71	.57	.45
	Time x ICSRLE2	18.50	1	18.50	1.85	.18
	Time x FhxIBS	4.15	1	4.15	.42	.52
	Time x Trauma	4.83	1	4.83	.48	.49
	Time x FhxIBS x Trauma	0.50	1	.50	.05	.82
	Error(Time)	319.15	32	9.97		
3	Time	20.07	1	20.07	2.00	.17
	Time x LEQ1	81.41	1	81.41	8.13	.01
	Timex LEQ2	32.91	1	32.91	3.28	.08
	Time x Caffeine1	0.32	1	.32	.03	.86
	Time x Caffeine2	17.34	1	17.34	1.73	.20

	Time x Sleep1	2.88	1	2.88	.29	.60
	Time x Sleep2	3.35	1	3.35	.33	.57
	Time x ICSRLE1	8.08	1	8.08	.81	.38
	Time x ICSRLE2	25.70	1	25.70	2.57	.12
	Time x FhxIBS	7.07	1	7.07	.71	.41
	Time x Trauma	3.70	1	3.70	.37	.55
	Time x FhxIBS x Trauma	0.15	1	.15	.01	.90
	Error(Time)	320.61	32	10.02		
4	Time	33.35	1	33.35	3.52	.07
	Time x LEQ1	81.39	1	81.39	8.60	.01
	Timex LEQ2	33.33	1	33.33	3.52	.07
	Time x Caffeine1	5.57	1	5.57	.59	.45
	Time x Caffeine2	26.14	1	26.14	2.76	.11
	Time x Sleep1	5.00	1	5.00	.53	.47
	Time x Sleep2	3.21	1	3.21	.34	.56
	Time x ICSRLE1	4.30	1	4.30	.45	.51
	Time x ICSRLE2	19.78	1	19.78	2.09	.16
	Time x FhxIBS	5.27	1	5.27	.56	.46
	Time x Trauma	8.25	1	8.25	.87	.36
	Time x FhxIBS x Trauma	0.67	1	.67	.07	.79
	Error(Time)	302.88	32	9.47		
5	Time	28.28	1	28.28	3.00	.09
	Time x LEQ1	81.62	1	81.62	8.67	.01
	Timex LEQ2	38.08	1	38.08	4.04	.05
	Time x Caffeine1	0.69	1	.69	.07	.79
	Time x Caffeine2	35.85	1	35.85	3.81	.06
	Time x Sleep1	2.49	1	2.49	.26	.61
	Time x Sleep2	4.10	1	4.10	.44	.51
	Time x ICSRLE1	6.17	1	6.17	.65	.42
	Time x ICSRLE2	23.63	1	23.63	2.51	.12
	Time x FhxIBS	6.69	1	6.69	.71	.41
	Time x Trauma	5.96	1	5.96	.63	.43
	Time x FhxIBS x Trauma	0.59	1	.59	.06	.80
	Error(Time)	301.37	32	9.42		

Note. GItotal represents the total number of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable

indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 68
Repeated ANOVA Source Table for GIfreqmax Including Only Individuals That experienced a Change in PSS Between Time 1 and Time

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.00	1	.00	.01	.92
	Time x LEQ1	0.48	1	.48	6.44	.02
	Time x LEQ2	0.58	1	.58	7.77	.01
	Time x Caffeine1	0.01	1	.01	.10	.75
	Time x Caffeine2	0.01	1	.01	.07	.80
	Time x Sleep1	0.03	1	.03	.35	.56
	Time x Sleep2	0.11	1	.11	1.45	.24
	Time x ICSRLE1	0.00	1	.00	.00	.97
	Time x ICSRLE2	0.00	1	.00	.03	.86
	Time x FhxIBS	0.11	1	.11	1.48	.23
	Time x Trauma	0.62	1	.62	8.37	.01
	Time x Semester	0.05	2	.02	.33	.72
	Time x FhxIBS x Trauma	0.31	1	.31	4.12	.05
	Time x FhxIBS x Semester	0.13	2	.07	.90	.42
	Time x Trauma x Semester	0.04	2	.02	.27	.76
	Time x FhxIBS x Trauma x Semester	0.01	1	.01	.12	.74
	Error(Time)	1.87	25	.07		
2	Time	0.01	1	.01	.07	.79
	Time x LEQ1	0.48	1	.48	6.42	.02
	Time x LEQ2	0.59	1	.59	7.87	.01
	Time x Caffeine1	0.00	1	.00	.01	.91
	Time x Caffeine2	0.02	1	.02	.22	.65
	Time x Sleep1	0.02	1	.02	.32	.57
	Time x Sleep2	0.10	1	.10	1.29	.27
	Time x ICSRLE1	0.00	1	.00	.01	.93
	Time x ICSRLE2	0.00	1	.00	.06	.81
	Time x FhxIBS	0.11	1	.11	1.50	.23
	Time x Trauma	0.47	1	.47	6.34	.02
	Time x Semester	0.05	2	.02	.32	.73

	Time x FhxIBS x Trauma	0.26	1	.26	3.54	.07
	Time x FhxIBS x Semester	0.09	2	.04	.57	.57
	Time x Trauma x Semester	0.03	2	.02	.22	.81
	Time x FhxIBS x Trauma x Semester	0.01	1	.01	.13	.73
	Error(Time)	1.86	25	.07		
3	Time	0.00	1	.00	.00	.97
	Time x LEQ1	0.50	1	.50	6.77	.02
	Time x LEQ2	0.59	1	.59	7.94	.01
	Time x Caffeine1	0.02	1	.02	.28	.60
	Time x Caffeine2	0.01	1	.01	.09	.76
	Time x Sleep1	0.01	1	.01	.18	.68
	Time x Sleep2	0.10	1	.10	1.35	.26
	Time x ICSRLE1	0.00	1	.00	.04	.85
	Time x ICSRLE2	0.01	1	.01	.09	.77
	Time x FhxIBS	0.08	1	.08	1.09	.31
	Time x Trauma	0.67	1	.67	9.06	.01
	Time x Semester	0.02	2	.01	.15	.86
	Time x FhxIBS x Trauma	0.32	1	.32	4.33	.05
	Time x FhxIBS x Semester	0.16	2	.08	1.08	.36
	Time x Trauma x Semester	0.02	2	.01	.14	.87
	Time x FhxIBS x Trauma x Semester	0.00	1	.00	.04	.85
	Error(Time)	1.85	25	.07		
4	Time	0.00	1	.00	.04	.85
	Time x LEQ1	0.50	1	.50	6.76	.02
	Time x LEQ2	0.62	1	.62	8.34	.01
	Time x Caffeine1	0.03	1	.03	.35	.56
	Time x Caffeine2	0.00	1	.00	.03	.86
	Time x Sleep1	0.02	1	.02	.21	.65
	Time x Sleep2	0.12	1	.12	1.58	.22
	Time x ICSRLE1	0.00	1	.00	.02	.88
	Time x ICSRLE2	0.01	1	.01	.07	.79
	Time x FhxIBS	0.08	1	.08	1.07	.31

	Time x Trauma	0.58	1	.58	7.90	.01
	Time x Semester	0.02	2	.01	.11	.89
	Time x FhxIBS x Trauma	0.32	1	.32	4.31	.05
	Time x FhxIBS x Semester	0.15	2	.08	1.03	.37
	Time x Trauma x Semester	0.03	2	.02	.20	.82
	Time x FhxIBS x Trauma x Semester	0.00	1	.00	.02	.89
	Error(Time)	1.85	25	.07		
5	Time	0.03	1	.03	.47	.50
	Time x LEQ1	0.46	1	.46	6.44	.02
	Time x LEQ2	0.45	1	.45	6.35	.02
	Time x Caffeine1	0.00	1	.00	.00	.97
	Time x Caffeine2	0.10	1	.10	1.48	.23
	Time x Sleep1	0.01	1	.01	.09	.77
	Time x Sleep2	0.07	1	.07	1.03	.32
	Time x ICSRLE1	0.00	1	.00	.06	.82
	Time x ICSRLE2	0.02	1	.02	.27	.61
	Time x FhxIBS	0.07	1	.07	.94	.34
	Time x Trauma	0.41	1	.41	5.85	.02
	Time x Semester	0.07	2	.03	.49	.62
	Time x FhxIBS x Trauma	0.17	1	.17	2.40	.13
	Time x FhxIBS x Semester	0.04	2	.02	.28	.76
	Time x Trauma x Semester	0.01	2	.00	.04	.96
	Time x FhxIBS x Trauma x Semester	0.00	1	.00	.00	.99
	Error(Time)	1.77	25	.07		

Note. GIfreqmax represents the highest frequency of GI symptoms reported. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 69
Repeated Measures ANOVA Source Table for PHQ

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	.00	1	.00	.02	.90
	Time x FhxIBS	.08	1	.08	.35	.56
	Time x Trauma	.38	1	.38	1.58	.22
	Time x FhxIBS x Trauma	.60	1	.60	2.49	.12
	Error(Time)	9.63	40	.24		
2	Time	.01	1	.01	.02	.89
	Time x FhxIBS	.08	1	.08	.33	.57
	Time x Trauma	.41	1	.41	1.65	.21
	Time x FhxIBS x Trauma	.57	1	.57	2.30	.14
	Error(Time)	9.83	40	.25		
3	Time	.00	1	.00	.01	.90
	Time x FhxIBS	.09	1	.09	.36	.55
	Time x Trauma	.39	1	.39	1.59	.21
	Time x FhxIBS x Trauma	.59	1	.59	2.43	.13
	Error(Time)	9.73	40	.24		
4	Time	.00	1	.00	.02	.89
	Time x FhxIBS	.08	1	.08	.34	.57
	Time x Trauma	.39	1	.39	1.62	.21
	Time x FhxIBS x Trauma	.58	1	.58	2.40	.13
	Error(Time)	9.70	40	.24		
5	Time	.00	1	.00	.01	.91
	Time x FhxIBS	.09	1	.09	.36	.55
	Time x Trauma	.39	1	.39	1.59	.21
	Time x FhxIBS x Trauma	.59	1	.59	2.41	.13
	Error(Time)	9.76	40	.24		
		Between-Participants				
1	Intercept	241.54	1	241.54	311.45	0.00
	FhxIBS	0.47	1	0.47	0.61	0.44
	Trauma	0.03	1	0.03	0.04	0.84

	FhxIBS x Trauma	0.04	1	0.04	0.05	0.83
	Error	31.02	40	0.78		
2	Intercept	242.20	1	242.20	315.50	0.00
	FhxIBS	0.44	1	0.44	0.58	0.45
	Trauma	0.03	1	0.03	0.04	0.85
	FhxIBS x Trauma	0.04	1	0.04	0.05	0.82
	Error	30.71	40	0.77		
3	Intercept	241.70	1	241.70	313.24	0.00
	FhxIBS	0.46	1	0.46	0.60	0.44
	Trauma	0.03	1	0.03	0.04	0.84
	FhxIBS x Trauma	0.03	1	0.03	0.05	0.83
	Error	30.86	40	0.77		
4	Intercept	241.86	1	241.86	313.29	0.00
	FhxIBS	0.46	1	0.46	0.59	0.45
	Trauma	0.03	1	0.03	0.04	0.85
	FhxIBS x Trauma	0.04	1	0.04	0.05	0.82
	Error	30.88	40	0.77		
5	Intercept	241.75	1	241.75	313.69	0.00
	FhxIBS	0.46	1	0.46	0.60	0.44
	Trauma	0.03	1	0.03	0.04	0.84
	FhxIBS x Trauma	0.03	1	0.03	0.04	0.83
	Error	30.83	40	0.77		

Note. PHQ represents the total score on ratings of severity of non-gastrointestinal somatic symptoms. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 70
Tests of Fixed Effects for PHQ

Imputation Number	Source	Numerator df	Denominator df	F	p
1	Intercept	1	148	896.35	0.00
	Time	1	148	0.37	0.54
	Trauma	1	148	0.62	0.43
	FhxIBS	1	148	2.81	0.10
	Time x Trauma	1	148	2.04	0.16
	Time x FhxIBS	1	148	0.09	0.77
	Time x Trauma x FhxIBS	2	148.000	0.78	0.46
2	Intercept	1	148	904.26	0.00
	Time	1	148	0.43	0.51
	Trauma	1	148	0.59	0.44
	FhxIBS	1	148	2.65	0.11
	Time x Trauma	1	148	2.19	0.14
	Time x FhxIBS	1	148	0.06	0.80
	Time x Trauma x FhxIBS	2	148.000	0.74	0.48
3	Intercept	1	148	896.44	0.00
	Time	1	148	0.37	0.54
	Trauma	1	148	0.66	0.42
	FhxIBS	1	148	2.82	0.10
	Time x Trauma	1	148	2.08	0.15
	Time x FhxIBS	1	148	0.09	0.77
	Time x Trauma x FhxIBS	2	148.000	0.76	0.47
4	Intercept	1	148	894.56	0.00
	Time	1	148	0.41	0.52
	Trauma	1	148	0.65	0.42
	FhxIBS	1	148	2.81	0.10
	Time x Trauma	1	148	2.12	0.15
	Time x FhxIBS	1	148	0.07	0.79
	Time x Trauma x FhxIBS	2	148.000	0.74	0.48
5	Intercept	1	148	896.86	0.00
	Time	1	148	0.34	0.56
	Trauma	1	148	0.61	0.44

FhxIBS	1	148	2.75	0.10
Time x Trauma	1	148	1.99	0.16
Time x FhxIBS	1	148	0.10	0.75
Time x Trauma x FhxIBS	2	148.000	0.80	0.45

Note. PHQ represents the total score on ratings of severity of non-gastrointestinal somatic symptoms. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS.

Table 71

Repeated Measures ANOVA Source Table for PHQ with Gender Included as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.04	1	0.04	0.15	.699
	Timex Gender	0.18	1	0.18	0.68	.411
	Error(Time)	19.56	75	0.26		
2	Time	0.05	1	0.05	0.20	.653
	Timex Gender	0.14	1	0.14	0.55	.461
	Error(Time)	19.82	75	0.26		
3	Time	0.04	1	0.04	0.13	.717
	Timex Gender	0.16	1	0.16	0.60	.440
	Error(Time)	19.82	75	0.26		
4	Time	0.05	1	0.05	0.18	.670
	Timex Gender	0.15	1	0.15	0.59	.446
	Error(Time)	19.77	75	0.26		
5	Time	0.03	1	0.03	0.10	.754
	Timex Gender	0.15	1	0.15	0.55	.459
	Error(Time)	19.77	75	0.26		
		Between-Participants				
1	Intercept	797.35	1	797.35	1002.91	.000
	Gender	0.63	1	0.63	.80	.375
	Error	59.63	75	0.80		
2	Intercept	801.41	1	801.41	1020.27	.000
	Gender	0.65	1	0.65	.82	.367
	Error	58.91	75	0.79		
3	Intercept	798.04	1	798.04	1007.92	.000
	Gender	0.64	1	0.64	.81	.371
	Error	59.38	75	0.79		
4	Intercept	797.82	1	797.82	1003.43	.000
	Gender	0.63	1	0.63	.80	.375
	Error	59.63	75	0.80		
5	Intercept	798.98	1	798.98	1009.15	.000

Gender	0.68	1	0.68	.86	.356
Error	59.38	75	0.79		

Note. PHQ represents the total score on ratings of severity of non-gastrointestinal somatic symptoms.

Table 72

Repeated Measures ANOVA Source Table for PHQ with Ethnicity Included as a Factor

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.02	1	0.02	.08	.784
	Time x Ethnicity	0.07	1	0.07	.25	.615
	Error(Time)	19.67	75	0.26		
2	Time	0.01	1	0.01	.06	.813
	Time x Ethnicity	0.08	1	0.08	.29	.592
	Error(Time)	19.88	75	0.27		
3	Time	0.02	1	0.02	.08	.783
	Time x Ethnicity	0.07	1	0.07	.25	.620
	Error(Time)	19.92	75	0.27		
4	Time	0.02	1	0.02	.06	.804
	Time x Ethnicity	0.07	1	0.07	.28	.600
	Error(Time)	19.85	75	0.26		
5	Time	0.02	1	0.02	.09	.770
	Time x Ethnicity	0.06	1	0.06	.23	.631
	Error(Time)	19.85	75	0.26		
		Between-Participants				
1	Intercept	353.93	1	353.93	451.87	.000
	Ethnicity	1.52	1	1.52	1.94	.168
	Error	58.74	75	0.78		
2	Intercept	354.99	1	354.99	459.27	.000
	Ethnicity	1.59	1	1.59	2.06	.156
	Error	57.97	75	0.77		
3	Intercept	354.10	1	354.10	454.02	.000
	Ethnicity	1.53	1	1.53	1.96	.166
	Error	58.49	75	0.78		
4	Intercept	354.06	1	354.06	452.07	.000
	Ethnicity	1.53	1	1.53	1.95	.167
	Error	58.74	75	0.78		
5	Intercept	354.23	1	354.23	453.94	.000

Ethnicity	1.54	1	1.54	1.97	.164
Error	58.53	75	0.78		

Note. PHQ represents the total score on ratings of severity of non-gastrointestinal somatic symptoms.

Table 73

Repeated Measures ANOVA Source Table for PHQ with Race Included as a Factor

Imputation Number	Source	SS	df	MS	F	p
1	Time	0.02	1	0.02	.10	.754
	Time x Race	0.69	2	0.34	1.40	.254
	Error(Time)	17.02	69	0.25		
2	Time	0.02	1	0.02	.09	.768
	Time x Race	0.81	2	0.41	1.64	.201
	Error(Time)	17.13	69	0.25		
3	Time	0.03	1	0.03	.12	.725
	Time x Race	0.73	2	0.37	1.47	.237
	Error(Time)	17.23	69	0.25		
4	Time	0.02	1	0.02	.08	.775
	Time x Race	0.77	2	0.38	1.54	.221
	Error(Time)	17.14	69	0.25		
5	Time	0.04	1	0.04	.16	.693
	Time x Race	0.75	2	0.37	1.50	.230
	Error(Time)	17.15	69	0.25		
		Between-Participants				
1	Intercept	617.38	1	617.38	771.40	.000
	Race	2.50	2	1.25	1.56	.217
	Error	55.22	69	0.80		
2	Intercept	621.19	1	621.19	784.93	.000
	Race	2.39	2	1.20	1.51	.228
	Error	54.61	69	0.79		
3	Intercept	618.61	1	618.61	774.79	.000
	Race	2.39	2	1.20	1.50	.231
	Error	55.09	69	0.80		
4	Intercept	618.10	1	618.10	771.51	.000
	Race	2.45	2	1.22	1.53	.225
	Error	55.28	69	0.80		
5	Intercept	619.20	1	619.20	775.14	.000
	Race	2.40	2	1.20	1.50	.230
	Error	55.12	69	0.80		

Note. PHQ represents the total score on ratings of severity of non-gastrointestinal somatic symptoms.

Table 74

Repeated Measures ANOVA Source Table PHQ with Semester Included as a Factor

Imputation Number	Source	SS	df	MS	F	p
1	Time	0.02	1	0.02	0.09	.762
	Time x Semester	0.13	2	0.06	0.25	.783
	Error(Time)	19.66	75	0.26		
2	Time	0.04	1	0.04	0.14	.711
	Time x Semester	0.10	2	0.05	0.19	.824
	Error(Time)	19.91	75	0.27		
3	Time	0.02	1	0.02	0.07	.790
	Time x Semester	0.12	2	0.06	0.23	.798
	Error(Time)	19.92	75	0.27		
4	Time	0.03	1	0.03	0.13	.724
	Time x Semester	0.13	2	0.06	0.24	.784
	Error(Time)	19.85	75	0.26		
5	Time	0.01	1	0.01	0.05	.818
	Time x Semester	0.11	2	0.06	0.21	.809
	Error(Time)	19.86	75	0.26		
		Between-Participants				
1	Intercept	717.03	1	717.03	920.01	.000
	Semester	2.40	2	1.20	1.54	.221
	Error	58.45	75	0.78		
2	Intercept	722.11	1	722.11	937.18	.000
	Semester	2.35	2	1.17	1.52	.225
	Error	57.79	75	0.77		
3	Intercept	718.33	1	718.33	924.64	.000
	Semester	2.34	2	1.17	1.51	.228
	Error	58.27	75	0.78		
4	Intercept	718.51	1	718.51	920.54	.000
	Semester	2.31	2	1.16	1.48	.234
	Error	58.54	75	0.78		
5	Intercept	718.74	1	718.74	926.04	.000

Semester	2.44	2	1.22	1.57	.215
Error	58.21	75	0.78		

Note. PHQ represents the total score on ratings of severity of non-gastrointestinal somatic symptoms. Semester represents the time during which participants participated in the study (beginning of spring semester, middle to end of spring semester or summer semester).

Table 75
Repeated Measures ANOVA Source Table for PHQ Including Covariates

Imputation Number	Source	SS	df	MS	F	p
		Within-Participants				
1	Time	0.15	1	.15	.73	.40
	Time x LEQ	0.29	1	.29	1.44	.23
	Time x LEQ2	0.41	1	.41	2.04	.16
	Time x Caffeine1	0.00	1	.00	.02	.89
	Time x Caffeine2	0.26	1	.26	1.29	.26
	Time x Sleep1	0.73	1	.73	3.63	.06
	Time x Sleep2	0.01	1	.01	.07	.79
	Time x ICSRLE2	2.83	1	2.83	14.06	.00
	Time x ICSRLE2	3.83	1	3.83	19.02	.00
	Time x FhxIBS	0.06	1	.06	.32	.57
	Time x Trauma	0.90	1	.90	4.45	.04
	Time x FhxIBS x Trauma	0.89	1	.89	4.42	.04
	Error(Time)	13.31	66	.20		
2	Time	0.07	1	.07	.35	.56
	Time x LEQ	0.40	1	.40	1.90	.17
	Time x LEQ2	0.50	1	.50	2.38	.13
	Time x Caffeine1	0.06	1	.06	.31	.58
	Time x Caffeine2	0.00	1	.00	.00	.97
	Time x Sleep1	0.90	1	.90	4.29	.04
	Time x Sleep2	0.06	1	.06	.31	.58
	Time x ICSRLE2	2.78	1	2.78	13.32	.00
	Time x ICSRLE2	3.92	1	3.92	18.74	.00
	Time x FhxIBS	0.08	1	.08	.38	.54
	Time x Trauma	0.85	1	.85	4.04	.05
	Time x FhxIBS x Trauma	0.84	1	.84	4.01	.05

	Error(Time)	13.80	66	.21		
3	Time	0.09	1	.09	.42	.52
	Time x LEQ	0.38	1	.38	1.85	.18
	Time x LEQ2	0.54	1	.54	2.64	.11
	Time x Caffeine1	0.12	1	.12	.57	.45
	Time x Caffeine2	0.03	1	.03	.15	.70
	Time x Sleep1	0.99	1	.99	4.81	.03
	Time x Sleep2	0.08	1	.08	.41	.53
	Time x ICSRLE2	2.95	1	2.95	14.32	.00
	Time x ICSRLE2	4.22	1	4.22	20.48	.00
	Time x FhxIBS	0.07	1	.07	.34	.56
	Time x Trauma	0.78	1	.78	3.77	.06
	Time x FhxIBS x Trauma	0.84	1	.84	4.08	.05
	Error(Time)	13.60	66	.21		
4	Time	0.06	1	.06	.30	.58
	Time x LEQ	0.38	1	.38	1.85	.18
	Time x LEQ2	0.52	1	.52	2.50	.12
	Time x Caffeine1	0.06	1	.06	.29	.59
	Time x Caffeine2	0.02	1	.02	.12	.73
	Time x Sleep1	0.96	1	.96	4.63	.04
	Time x Sleep2	0.07	1	.07	.35	.55
	Time x ICSRLE2	2.86	1	2.86	13.83	.00
	Time x ICSRLE2	4.06	1	4.06	19.63	.00
	Time x FhxIBS	0.07	1	.07	.35	.56
	Time x Trauma	0.77	1	.77	3.72	.06
	Time x FhxIBS x Trauma	0.85	1	.85	4.10	.05
	Error(Time)	13.66	66	.21		
5	Time	0.00	1	.00	.02	.90
	Time x LEQ	0.32	1	.32	1.54	.22
	Time x LEQ2	0.45	1	.45	2.14	.15

	Time x Caffeine1	0.02	1	.02	.09	.76
	Time x Caffeine2	0.01	1	.01	.04	.85
	Time x Sleep1	0.73	1	.73	3.48	.07
	Time x Sleep2	0.07	1	.07	.32	.57
	Time x ICSRLE2	2.55	1	2.55	12.14	.00
	Time x ICSRLE2	3.93	1	3.93	18.75	.00
	Time x FhxIBS	0.10	1	.10	.50	.48
	Time x Trauma	0.61	1	.61	2.89	.09
	Time x FhxIBS x Trauma	0.86	1	.86	4.09	.05
	Error(Time)	13.84	66	.21		
	Between-Participants					
1	Intercept	3.57	1	3.57	6.29	0.01
	LEQ1	0.67	1	0.67	1.18	0.28
	LEQ2	1.08	1	1.08	1.91	0.17
	Caffeine1	0.11	1	0.11	0.19	0.67
	Caffeine2	0.75	1	0.75	1.32	0.25
	Sleep1	0.29	1	0.29	0.51	0.48
	Sleep2	1.35	1	1.35	2.39	0.13
	ICSRLE1	0.67	1	0.67	1.18	0.28
	ICSRLE2	1.91	1	1.91	3.37	0.07
	FhxIBS	0.08	1	0.08	0.14	0.71
	Trauma	0.03	1	0.03	0.05	0.83
	FhxIBS x Trauma	0.53	1	0.53	0.93	0.34
	Error	37.39	66	0.57		
2	Intercept	2.92	1	2.92	5.23	0.03
	LEQ1	0.58	1	0.58	1.04	0.31
	LEQ2	0.96	1	0.96	1.72	0.19
	Caffeine1	0.01	1	0.01	0.01	0.90
	Caffeine2	0.47	1	0.47	0.84	0.36
	Sleep1	0.37	1	0.37	0.67	0.42
	Sleep2	1.42	1	1.42	2.55	0.12
	ICSRLE1	0.75	1	0.75	1.34	0.25
	ICSRLE2	1.84	1	1.84	3.30	0.07
	FhxIBS	0.08	1	0.08	0.14	0.71

	Trauma	0.01	1	0.01	0.01	0.92
	FhxIBS x Trauma	0.47	1	0.47	0.85	0.36
	Error	36.82	66	0.56		
3	Intercept	3.83	1	3.83	6.71	0.01
	LEQ1	0.56	1	0.56	0.99	0.32
	LEQ2	0.94	1	0.94	1.65	0.20
	Caffeine1	0.01	1	0.01	0.02	0.88
	Caffeine2	0.04	1	0.04	0.07	0.79
	Sleep1	0.38	1	0.38	0.66	0.42
	Sleep2	1.69	1	1.69	2.96	0.09
	ICSRLE1	0.57	1	0.57	0.99	0.32
	ICSRLE2	1.95	1	1.95	3.42	0.07
	FhxIBS	0.17	1	0.17	0.30	0.59
	Trauma	0.06	1	0.06	0.11	0.74
	FhxIBS x Trauma	0.46	1	0.46	0.81	0.37
	Error	37.64	66	0.57		
4	Intercept	3.26	1	3.26	5.71	0.02
	LEQ1	0.59	1	0.59	1.03	0.31
	LEQ2	0.94	1	0.94	1.64	0.20
	Caffeine1	0.00	1	0.00	0.00	0.95
	Caffeine2	0.19	1	0.19	0.33	0.57
	Sleep1	0.36	1	0.36	0.64	0.43
	Sleep2	1.60	1	1.60	2.81	0.10
	ICSRLE1	0.64	1	0.64	1.12	0.29
	ICSRLE2	1.87	1	1.87	3.29	0.07
	FhxIBS	0.14	1	0.14	0.25	0.62
	Trauma	0.02	1	0.02	0.04	0.84
	FhxIBS x Trauma	0.45	1	0.45	0.79	0.38
	Error	37.66	66	0.57		
5	Intercept	3.18	1	3.18	5.57	0.02
	LEQ1	0.45	1	0.45	0.78	0.38
	LEQ2	0.83	1	0.83	1.46	0.23
	Caffeine1	0.14	1	0.14	0.25	0.62
	Caffeine2	0.01	1	0.01	0.01	0.91
	Sleep1	0.63	1	0.63	1.10	0.30
	Sleep2	1.95	1	1.95	3.41	0.07
	ICSRLE1	0.78	1	0.78	1.37	0.25

ICSRLE2	1.77	1	1.77	3.10	0.08
FhxIBS	0.13	1	0.13	0.23	0.63
Trauma	0.03	1	0.03	0.05	0.82
FhxIBS x Trauma	0.48	1	0.48	0.84	0.36
Error	37.64	66	0.57		

Note. PHQ represents the total score on ratings of severity of non-gastrointestinal somatic symptoms. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 76
Tests of Fixed Effects for PHQ Including Covariates

Imputation Number	Source	Numerator df	Denominator df	F	p
1	Intercept	1	144	15.06	0.00
	Trauma	1	144	0.23	0.63
	Time	1	144	1.26	0.26
	FhxIBS	1	144	2.40	0.12
	Time x FhxIBS	1	144	0.40	0.53
	Trauma x Time	1	144	4.07	0.05
	Trauma x Time x FhxIBS	2	144	1.99	0.14
	Sleep	1	144	0.46	0.50
	Caffeine	1	144	0.08	0.77
	LEQ	1	144	1.12	0.29
	ICSRLE	1	144	42.56	0.00
2	Intercept	1	144	12.66	0.00
	Trauma	1	144	0.39	0.53
	Time	1	144	1.65	0.20
	FhxIBS	1	144	2.10	0.15
	Time x FhxIBS	1	144	0.35	0.55
	Trauma x Time	1	144	4.24	0.04
	Trauma x Time x FhxIBS	2	144	1.88	0.16
	Sleep	1	144	0.26	0.61
	Caffeine	1	144	0.76	0.39
	LEQ	1	144	1.27	0.26
	ICSRLE	1	144	45.24	0.00
3	Intercept	1	144	14.71	0.00
	Trauma	1	144	0.25	0.62
	Time	1	144	1.17	0.28
	FhxIBS	1	144	2.58	0.11
	Time x FhxIBS	1	144	0.32	0.57
	Trauma x Time	1	144	3.99	0.05
	Trauma x Time x FhxIBS	2	144	1.85	0.16
	Sleep	1	144	0.38	0.54
	Caffeine	1	144	0.08	0.78
	LEQ	1	144	1.13	0.29
	ICSRLE	1	144	44.10	0.00

4	Intercept	1	144	14.32	0.00
	Trauma	1	144	0.28	0.60
	Time	1	144	1.37	0.24
	FhxIBS	1	144	2.44	0.12
	Time x FhxIBS	1	144	0.31	0.58
	Trauma x Time	1	144	4.19	0.04
	Trauma x Time x FhxIBS	2	144	1.88	0.16
	Sleep	1	144	0.39	0.54
	Caffeine	1	144	0.23	0.63
	LEQ	1	144	1.17	0.28
	ICSRLE	1	144	44.31	0.00
5	Intercept	1	144	16.56	0.00
	Trauma	1	144	0.22	0.64
	Time	1	144	1.06	0.31
	FhxIBS	1	144	2.46	0.12
	Time x FhxIBS	1	144	0.39	0.53
	Trauma x Time	1	144	3.93	0.05
	Trauma x Time x FhxIBS	2	144	1.97	0.14
	Sleep	1	144	0.52	0.47
	Caffeine	1	144	0.00	0.99
	LEQ	1	144	1.12	0.29
	ICSRLE	1	144	42.66	0.00

Note. PHQ represents the total score on ratings of severity of non-gastrointestinal somatic symptoms. A 0 on the Trauma variable indicates no history of childhood trauma and a 1 on this variable indicates a history of childhood trauma. A 0 on the FhxIBS variable indicates no family history of IBS and a 1 on this variable indicates a family history of IBS. ICSRLE = total score on questionnaire of daily hassles, LEQ = number of life events over the past 6 months, Sleep = average number of hours of sleep, Caffeine = average number of caffeinated beverages.

Table 77
Correlations Between Types of Trauma Gastrointestinal Symptoms and Non-Somatic Gastrointestinal Symptoms

Variable	EA	PA	SA	EN	PN	PHQ 1	PHQ 2	GI Average Frequency 1	GI Average Frequency 2	GI total 1	GI total 2	GI freqmax 1	GI freqmax 2
EA	_	.45** 77	.11 77	.61*** 78	.10 78	.21 78	.23 78	.35** 78	.24* 78	.33** 78	.20 78	.21 78	.24* 78
PA		_	.04 76	.42*** 77	.12 77	-.06 77	.10 77	.05 77	.02 77	.01 77	-.01 77	.15 77	-.03 77
SA			_	-.01 77	.15 77	.10 77	.16 77	.08 77	.08 77	.07 77	.06 77	.04 77	.10 77
EN				_	.41*** 78	.06 78	.13 78	.15 78	.15 78	.14 78	.11 78	.06 78	.12 78
PN					_	-.14 78	.00 78	.03 78	.04 78	.01 78	.02 78	-.04 78	.03 78

***p<.001, ** p<.01, * p<.05
Note. EA represents emotional abuse, PA represents physical abuse, SA represents sexual abuse, EN represents emotional neglect and PN represents physical neglect.

Appendix B

Web Assessment Questionnaires:

Demographic Questionnaire

Note: If you feel uncomfortable answering any question, you can leave it blank.

1. Gender
__ Female
__ Male

2. Age
__ 18 to 20 years
__ 21 to 23 years
__ 24 to 25 years

3. Answer both parts of this question.
Ethnicity:
__ Hispanic or Latino
__ Not Hispanic or Latino
Race: (You may choose more than one.)
__ American Indian or Alaska Native
__ Asian
__ Black or African American
__ Native Hawaiian or other Pacific Islander
__ White

4. Highest level of education completed:

__ High school graduate or GED
__ Vocational certification
__ Associate degree
__ Some college

5. Marital Status
__Single
__Married
__Divorced
__Separated
__Widowed
__Domestic Partnership (living together but not married)

6. Do you have any children?
__Yes
__No

7. Please list any illnesses you have been diagnosed with by a physician_____

Family History of Irritable Bowel Syndrome (IBS)

Have either of your parents, or any of your siblings ever complained of recurring abdominal pain or discomfort with abnormal bowel habits such as very infrequent bowel movements or very frequent bowel movements?

__Yes
__No

If so, please specify by placing a check next to the family member(s) that has (have) experienced such symptoms:

___ Mother
___ Father
___Sister
___Brother

Do your parents or siblings have a history of Irritable Bowel Syndrome (IBS)?
__Yes
__No
__I don't Know

If so, please put a check next to the family member(s) with a history of IBS:

___Mother
___Father
___Sister
___Brother

Gastro-Questionnaire

Below you find a list of bodily symptoms, which are related to ingestion, digestion and defecation.

Please indicate, how often you have had each symptom **during the last week** and how much you were distressed by this symptom

'Frequently' means **more than 25%** of days **'(nearly) always'** means **at least 75%** of days

1. Sensation of lump in the throat (independently from meals)

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

2. Regurgitation of food

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

3. Difficulty swallowing

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**

How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

4. Nausea

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

5. Vomiting

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

6. Heart Burn (changing after Meals; relieved by antacids)

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

7. Chest Pain

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

8. Intolerance to several foods

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

9. Abdominal fullness

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

10. Abdominal bloating

How often have you had this symptom?	**not at all _____ from time to time_____ frequently_____ (nearly) always_____**
How distressed were you by this?	**no distress_____ mild distress_____ intermediate distress_____ severe distress_____ very severe distress_____**

11. Feeling of abdominal distension

How often have you had this symptom?	**not at all _____ from time to time_____ frequently_____ (nearly) always_____**
How distressed were you by this?	**no distress_____ mild distress_____ intermediate distress_____ severe distress_____ very severe distress_____**

12. Abdominal pain

How often have you had this symptom?	**not at all _____ from time to time_____ frequently_____ (nearly) always_____**
How distressed were you by this?	**no distress_____ mild distress_____ intermediate distress_____ severe distress_____ very severe distress_____**

a) If present

Is abdominal pain associated with food intake?	**not at all__ from time to time__ frequently___ nearly always__**
Is abdominal pain relieved by antacids?	**not at all__ from time to time__ frequently___ nearly always__**

Is abdominal pain relieved by defecation or associated with changes in stool form?	**not at all__ from time to time__ frequently___ nearly always__**

13. Bowel noises

How often have you had this symptom?	**not at all _____ from time to time_____ frequently_____ (nearly) always_____**
How distressed were you by this?	**no distress_____ mild distress_____ intermediate distress_____ severe distress_____ very severe distress_____**

14. Stools very often
(> 3defecations daily)

How often have you had this symptom?	**not at all _____ from time to time_____ frequently_____ (nearly) always_____**
How distressed were you by this?	**no distress_____ mild distress_____ intermediate distress_____ severe distress_____ very severe distress_____**

15. Stools very rarely (< 3 defecations per week)

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

16. Stool urgency

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

17. Fecal soiling

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**

18. Frequent changing of stool consistency

How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

19. Loose or watery stools

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

20. Hairy or lumpy stools

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**

21. Straining during a bowel movement

How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

22. Passage of mucus

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

23. Passage of blood

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

24. Feeling of incomplete evacuation

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

25. Stool residues in underwear

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

26. Frequent farting

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**

27. Pain in rectum

How often have you had this symptom?	**not at all _____** **from time to time_____** **frequently_____** **(nearly) always_____**
How distressed were you by this?	**no distress_____** **mild distress_____** **intermediate distress_____** **severe distress_____** **very severe distress_____**
If present: **Was pain in the rectum….**	**Lasting over a long period of time_____** **Episodic (few seconds up to 30 min.)_____**

Patient Health Questionnaire

During the past week, how much have you been bothered by any of the following problems? (Put an "x" in the column that applies to you.):

	Not bothered at all	Bothered a little	Bothered a lot
a. Stomach pain			
b. Back pain			
c. Pain in your arms, legs, or joints			
d. Menstrual cramps or other problems with your period (Women only)			
e. Headaches			
f. Chest pain			
g. Dizziness			
h. Fainting spells			
i. Feeling your heart pound or race			
j. Shortness of breath			
k. Pain or problems during sexual intercourse			
l. Constipation, loose bowels, or diarrhea			
m. Nausea, gas, or indigestion			
n. Feeling tired or having low energy			
o. Trouble sleeping			

Perceived Stress Scale 10-item

The questions in this scale ask you about your feelings and thoughts <u>during the last week</u>. In each case, please indicate with a check how often you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
1. In the last week, how often have you been upset because of something that happened unexpectedly?	**0**	**1**	**2**	**3**	**4**
2. In the last week, how often have you felt that you were unable to control the important things in your life?	**0**	**1**	**2**	**3**	**4**
3. In the last week, how often have you felt nervous and "stressed"?	**0**	**1**	**2**	**3**	**4**
4. In the last week, how often have you felt confident about your ability to handle your personal problems?	**0**	**1**	**2**	**3**	**4**
5. In the last week, how often have you felt that things were going your way?	**0**	**1**	**2**	**3**	**4**
6. In the last week, how often have you found that you could not cope with all the things that you had to do?	**0**	**1**	**2**	**3**	**4**
7. In the last week, how often have you been able to control irritations in your life?	**0**	**1**	**2**	**3**	**4**
8. In the last week, how often have you felt that you were on top of things?	**0**	**1**	**2**	**3**	**4**

	Never	Almost Never	Sometimes	Fairly Often	Very Often
9. In the last week, how often have you been angered because of things that were outside of your control?	**0**	**1**	**2**	**3**	**4**
10. In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?	**0**	**1**	**2**	**3**	**4**

Health Behaviors Questionnaire

1) Over the past week on average how much sleep did you get each night?
__1-4 hours
__5-7 hours
__8-9 hours
__10 or more hours

2) Over the past week how many cigarettes did you smoke each day? (1pack = 20 cigarettes)

_____

3) Over the past week, how many cups of coffee or caffeinated tea did you have each day?

__1-2 cups
__ 3-4 cups
__ 5-6 cups
__ 7 or more cups

4) In the past week did you take any substances other than caffeine to help you concentrate, such as Ritalin?

__Yes
__No

a)If yes, over the past week, how often did you take these substances? _____

5) Over the past week were there any changes in the medications that you usually take?

__ Yes
__ No

a) If so, please elaborate:
_____
_____
_____
_____

b) Did you take any medications more frequently over the past week?

__Yes
__No

c) If so which medications? _____

6) Over the past week how many alcoholic drinks did you have each night? (1 drink = 1 beer, 1 glass of wine, 1 shot or 1 mixed drink)

- 0
- 1
- 2
- 3
- 4
- 5
- 6 or more

7) Over the past week, how many hours each day did you spend exercising? _____

Perceived Stressfulness of Exam Period

Please answer these questions with regard to the examination period:

Please answer all questions on a scale of 0-6, where 0 = not at all and 6 = extremely

1) To what extent did you feel you were personally involved in this task?

0 Not at all
1
2
3
4
5
6 Extremely

2) Please rate the difficulty of this task?

0 Not at all
1
2
3
4
5
6 Extremely

3) How satisfied were you with the outcome of this exam period?

0 Not at all
1
2
3
4
5
6 Extremely

3) How controllable was this task?

0 Not at all
1
2
3
4
5

6 Extremely

4) How unpredictable did you feel this exam period was?

0 Not at all
1
2
3
4
5
6 Extremely

5) How stressful did you feel this exam period was?

0 Not at all
1
2
3
4
5
6 Extremely

6) How challenging did you feel this exam period was?

0 Not at all
1
2
3
4
5
6 Extremely

7) How new did you feel this experience was?

0 Not at all
1
2
3
4
5
6 Extremely

Inventory of College Students' Recent Life Experiences (ICSRLE)

Following is a list of experiences which many students have some time or other. Please indicate for each experience how much it has been a part of your life *over the past week*. Put a "1" in the space provided next to an experience if it was *not at all part* of your life over the past week (e.g. "trouble with mother in law-1); "2" for an experience which was *only slightly* part of your life over that time; "3" for an experience which was *distinctly* part of your life; and "4" for an experience which was *very much* part of your life over the past week.

Intensity of Experience over Past Week

1= not at all part of my life
2= only slightly part of my life
3= distinctly part of my life
4= very much part of my life

1. Conflicts with boyfriend's/ girlfriend's/ spouse's family ____
2. Being let down or disappointed by friends ____
3. Conflict with professor(s) ____
4. Social rejection ____
5. Too many things to do at once ____
6. Being taken for granted ____
7. Financial conflicts with family members ____
8. Having your trust betrayed by a friend ____
9. Separation from people you care about ____
10. Having your contributions overlooked ____
11. Struggling to meet your own academic standards ____
12. Being taken advantage of ____
13. Not enough leisure time ____
14. Struggling to meet the academic standards of others ____
15. A lot of responsibilities ____
16. Dissatisfaction about school ____
17. Decisions about intimate relationship(s) ____
18. Not enough time to meet your obligations ____
19. Dissatisfaction with your mathematical ability ____
20. Important decisions about your future career ____
21. Financial burdens ____

22. Dissatisfaction with your reading ability ____
23. Important decisions about your education ____
24. Loneliness ____
25. Lower grades than you hoped for ____
26. Conflict with teaching assistant ____
27. Not enough time for sleep ____
28. Conflicts with your family ____
29. Heavy demands from extracurricular activities ____
30. Finding courses too demanding ____
31. Conflicts with friends ____
32. Hard effort to get ahead ____
33. Poor health of a friend ____
34. Disliking your studies ____
35. Getting “ripped” off or cheated in a purchase of services ____
36. Social conflicts over smoking ____
37. Difficulties with transportation ____
38. Disliking fellow students ____
39. Conflicts with boyfriend/girlfriend/spouse ____
40. Dissatisfaction with your ability at written expression ____
41. Interruptions of your school work ____
42. Social isolation ____
43. Long waits to get service ____
44. Being ignored ____
45. Dissatisfaction with your physical appearance ____
46. Finding course(s) uninteresting ____
47. Gossip concerning someone you care about ____
48. Failing to get expected job ____
49. Dissatisfaction with your athletic skills ____

Life Events Questionnaire

Have any of the following life events or problems happened to you <u>during the last 6 months</u>? Please check the box or boxes corresponding to the month or months in which any event happened or began. You may circle more than one.
Write in the name of each month to help you remember back to that specific month.
Month 1=last month.

	Month 1 _____	**Month 2_____**	**Month 3_____**	**Month 4_____**	**Month 5 _____**	Month 6 _____
1. You yourself suffered a serious illness, injury, or an assault.	**1**	**2**	**3**	**4**	**5**	**6**
2. A serious illness, injury, or assault happened to a close relative.	**1**	**2**	**3**	**4**	**5**	**6**
3. Your parent, child, or spouse died.	**1**	**2**	**3**	**4**	**5**	**6**
4. A close family friend or another relative (aunt, cousin, grandparent) died.	**1**	**2**	**3**	**4**	**5**	**6**
5. You had a separation due to marital difficulties.	**1**	**2**	**3**	**4**	**5**	**6**
6. You broke off a steady relationship.	**1**	**2**	**3**	**4**	**5**	**6**
7. You had a serious problem with a close friend, neighbor, or relative.	**1**	**2**	**3**	**4**	**5**	**6**
8. You became unemployed or you were seeking work unsuccessfully for more than one month.	**1**	**2**	**3**	**4**	**5**	**6**
9. You were sacked from your job.	**1**	**2**	**3**	**4**	**5**	**6**

	Month 1 _____	**Month 2_____**	**Month 3_____**	**Month 4_____**	**Month 5 _____**	Month 6 _____
10. You had a major financial crisis.	**1**	**2**	**3**	**4**	**5**	**6**
11. You had problems with the police and a court appearance.	**1**	**2**	**3**	**4**	**5**	**6**
12. Something you valued was lost or stolen	**1**	**2**	**3**	**4**	**5**	**6**