Positive Psychological Factors, Abdominal Pain and Other Irritable Bowel Syndrome Symptoms in Emerging Adults

by

Rachel M. Tomlinson

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The purpose of the current study was to better understand how positive psychological factors relate to Irritable Bowel Syndrome (IBS) symptoms and related symptoms in emerging adults. In a university setting, 67 individuals aged 18 to 22 \((M = 18.93, SD = 1.10)\) completed a questionnaire online. Results did not provide statistical support for a positive psychological model through which positive psychological variables relate to IBS symptoms in a non-clinical sample of emerging adults. 52\% (\(n = 37\)) reported experiencing abdominal pain and thus completed additional measures related to that pain. Some important associations with well-being emerged. Higher levels of optimism significantly related to lower “worst” pain intensity ratings in people who endorsed experiencing abdominal pain. Additionally, lower levels of pain self-efficacy significantly associated with increased pain-related disability. Results provide promising effect sizes between positive psychological variables with IBS symptoms, pain-related disability, and pain intensity given the sample size.
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Chronic Pain

Pain is “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (Merskey & Boduk, 1994, p. 120). This definition of pain de-emphasizes a dualistic perspective of pain in which chronic pain is thought to come from one physical source (Weisman, 2008), and highlights the importance of considering emotional factors (Flor & Turk, 2011). There is also an acknowledgment that pain may exist in the absence of tissue damage (Flor & Turk, 2011). Pain is best understood in terms of a biopsychosocial model, in which biological, psychological, and social factors interact to impact pain experience (Gatchel, 2005). As such, the study of pain calls for the examination of physical, emotional and role functioning, along with cognitive and biological factors (see Gatchel et al., 2007 for review).

An individual's pain experience involves the subjective sensations, feelings, and thoughts pertaining to pain that can be related to both personal and interpersonal factors (Craig, 2009). Although pain can serve an adaptive function to prevent injury through initiating action for removal from the pain stimulus (e.g., removal of one’s hand from a hot stove element), chronic pain can exist in the absence of the ability to take action and limit the utility of the pain signal (Flor & Turk, 2011).

Chronic pain describes the experience of pain that lasts longer than 3 months (Merskey & Bogduk, 1994) and occurs in approximately 19% of Canadian adults with prevalence increasing with age (Schoplocher, Taenzer & Jovey, 2011). Health care costs related to adult chronic pain in Canada are estimated to be $6 billion per year, more than the combined costs of heart disease,
HIV, and cancer (Lynch, 2011). The impact of chronic pain is not limited to physical symptoms. Adults with chronic pain in Europe reported experiencing high rates of depression (21%), an inability to work outside of their homes (61%), and job loss (19%; Brevick et al., 2006). Further, the experience of chronic pain may strain romantic relationships (Flor, Turk & Berndt Scholz, 1987).

**Chronic Abdominal Pain: Functional Gastrointestinal Disorders and Irritable Bowel Syndrome**

Functional Gastrointestinal Disorders (FGIDs) describe chronic symptom patterns in the gastrointestinal tract that cannot fully be explained by organic abnormality (McOmber & Shulman, 2008) in which the primary symptom is chronic abdominal pain (Yacob & Di Lorenzo, 2009). Examples of FGID diagnoses include Functional Abdominal Pain, Functional Dyspepsia, Irritable Bowel Syndrome, and Abdominal Migraine (Yacob & Di Lorenzo, 2009). Adult FGID prevalence rates in North America range from 10-20% (e.g., Drossman et al., 1993), with 61% of adults in Canada experiencing one or more FGID symptom(s) (Thompson, Irvine, Pare, Ferrazzi, & Rance, 2002). Research improving understanding of psychological factors that influence FGIDs may provide insight into the incidence of FGIDs and inform interventions, possibly impacting population health and associated medical costs in Canada.

The symptom constellation and chronic pain found in FGIDs fits into a biopsychosocial model. Research suggests that FGIDs occur due to a complex interplay between the digestive system and the mind through the brain-gut axis (see Jones, Dilley, Drossman & Crowellet, 2005 for review). The most common subtype of FGIDs, and the focus of the current study, is Irritable Bowel Syndrome (IBS), which impacts approximately 10-15% of people in North America, with a higher prevalence in women than men (Drossman, Whitehead & Camilleri, 1997). According
to Rome Diagnostic Criteria, a “gold standard” for the definition of FGIDs in research and clinical practice (Drossman, 2007), Irritable Bowel Syndrome refers to the experience of abdominal pain or discomfort over three months along with a change in bowel features (Drossman et al., 2006). Since pain is a primary symptom of IBS, the experience of pain intensity is important to consider in models of IBS symptoms and pain-related disability.

Many adults who experience IBS are more likely to have experienced recurrent abdominal pain in childhood (Jones & Lydeard, 1992), suggesting that a symptom constellation related to IBS may persist throughout development. Children and adolescents with FGIDs, such as IBS experience disability, which may involve difficulty completing chores, sleeping through the night, and being social with friends (Walker & Greene, 1991). In addition, individuals experiencing IBS tend to use health care resources more than people who do not have IBS (Longstreth et al., 2003). Such help seeking can include visits to primary care physicians, emergency rooms, specialists, as well as hospitalization and the use of costly and invasive diagnostic medical procedures. The experience of IBS also impacts the economy indirectly, such as through absenteeism and reduced productivity in the workplace (Dean et al., 2005; Hahn, Yan & Strassels, 1999). Adults with IBS also tend to have significantly lower health-related quality of life compared to people who do not experience IBS (Dean et al., 2005, Gralnek et al., 2000). In adulthood, the prevalence of IBS symptoms is highest in emerging adulthood, and decreases as development progresses (Talley, Zinsmeister & Melton, 1995).

Emerging adulthood is a distinct period of time (age 18-29) during which young people experience a great deal of exploration and change (Arnett, 2000). In addition to the more normative experiences inherent in the transition to early adulthood, emerging adults with chronic pain are required to navigate the transition from the pediatric to adult health care system and take
more responsibility for the management of their own health (Stinson et al., 2013). Barriers to chronic pain management in emerging adulthood may include navigating diagnostic and referral processes, navigating the societal and program beliefs that chronic pain is an issue specific to older adults, and a lack of time or financial ability to prioritize pain management services, such as cognitive behavioural therapy (Stinson et al., 2013).

In one study examining relations between anxious symptoms and IBS in emerging adults, 11% of participants endorsed experiencing IBS (Hazlett-Stevens et al., 2003). It could be speculated that functional disability experienced by university students with IBS could involve missing classes, the inability to complete assigned homework or fulfill the responsibilities involved in volunteer work or part-time employment, or the inability to spend time with friends or romantic partners. Given the potential impact that IBS symptoms, including pain, could have on the lives of emerging adults, it is important to find positive psychological relations to IBS symptoms and pain-related disability in order to determine what helps people function more adaptively in spite of pain, and to provide direct points for intervention.

**Positive Factors**

Much pain research has been conducted examining chronic pain conditions in the context of vulnerability factors such as anxious and depressive symptoms (Fishbain et al., 1997; McWilliams, Cox & Enns, 2003), and pain catastrophization (Turner, Jenson & Romano, 2000). Some research pertaining to protective factors suggests that they increase positive outcomes (Sturgeon & Zautra, 2010) or resilience (Karoly & Ruelhman, 2006) in adults. For example, protective factors (e.g., optimism, purpose in life, active and acceptance coping) in adult females with arthritis uniquely predicted positive social interactions and vulnerability factors uniquely predicted the presence of negative interactions and affect (Smith & Zautra, 2008). These results
highlight the importance of examining protective factors as they may provide unique information about well-being beyond risk factors. Informed by a positive psychology perspective (Seligman & Csikszentmihalyi, 2000), the current research took a novel approach to examining IBS symptoms including pain experienced by emerging adults using a positive functioning framework. The purpose of this research was to better understand how positive factors (i.e., mindfulness, optimism, positive schemas, pain self-efficacy) relate to Irritable Bowel Syndrome symptoms and pain-related disability in emerging adults.

Mindfulness is a factor that cultivates positive psychological characteristics (Baer & Lykins, 2011) and may lead to positive health outcomes. Mindfulness describes awareness of the present moment and one’s actions as well as an accepting and nonjudgmental stance toward one’s cognitions and internal sensations (Greco, Baer & Smith, 2011). Recent meta-analytic findings indicate that mindfulness training is an effective intervention technique for reducing psychopathology (e.g., anxious symptoms, depressive symptoms) and physical disability (e.g., medical symptoms, disability, quality of life) in adults (Grossman, Niemann, Schmidt & Walach, 2004). There is also some evidence that mindfulness may be an important factor related to IBS.

In adolescents, trait mindfulness is a significant unique predictor of pain interference, or the extent to which pain interferes with every day functioning, and pain catastrophization mediates the relation between trait mindfulness and pain interference (Petter, Chambers, McGrath & Dick, 2013). This suggests that trait mindfulness may limit the tendency to catastrophize about pain symptoms, thus leading to less pain interference. IBS symptoms are thought to worsen when people with IBS encounter stress or heightened emotions (Blanchard et al., 2008; Hyams & Hyman, 1998). Increased mindfulness may provide individuals with tools to engage in emotional regulation resources early on when experiencing emotion, possibly allowing
for reduced stress reaction to stimuli (Goldin & Gross, 2010; Teper et al., 2013). For those with IBS, it could be speculated that the avoidance of a stressful reaction could prevent the exacerbation of symptoms due to stress. In addition to trait mindfulness, research suggests that mindfulness cultivated through intervention is also related to positive health outcomes.

Mindfulness interventions which directly target increasing mindfulness of participants, may lead to a reduction of IBS symptoms in adult females. Women with IBS who participated in a mindfulness intervention had significantly fewer IBS symptoms after the intervention and 3 months later, and higher health-related quality of life 3 months after the intervention compared to support group intervention controls; these results suggest that mindfulness training may lead to long term improvements in health-related quality of life (Gaylord et al., 2011). Other work has demonstrated that mindfulness training reduces IBS symptoms and increases health-related quality of life through the reduction of catastrophization and increasing non-reactivity (Garland et al., 2012). Taking a broader health view, research suggests that mindfulness-based interventions are effective in decreasing stress and improving sleep habits and self-compassion in emerging adults (Greeson et al., 2014). Taken together, these findings suggest that mindfulness interventions are effective for adults who experience various physical and mental health difficulties, including IBS. Although much of extant research focuses on positive outcomes from mindfulness interventions, the current study builds on previous studies on positive outcomes related to mindfulness, and seeks to better understand how self-reported trait mindfulness relates to IBS symptoms in emerging adults.

A second positive factor that could lead to increased well-being is optimism. Optimism refers to a personal disposition involving the expectation of positive results (Scheier & Carver, 1985). Meta-analytic findings have established optimism as a significant predictor of physical
well-being in adults (Rasmussen, Scheier & Greenhouse, 2009). Although much of this research to date has been conducted with adult populations, a number of research studies have examined the relations between optimism and physical health in emerging adults. For example, optimism has been related to increased immune function (Segerstrom et al., 1998) and overall physical health (Pritchard et al., 2007). Dispositional optimism is related to lower psychological distress and pain-related disability in obese adults with musculoskeletal pain (Wright et al., 2011).

Additionally, optimism predicts greater life satisfaction and fewer depressive symptoms in older adults with osteoarthritis, and mediates the relation between pain and life satisfaction as well as pain and depressive symptoms (Fereirra & Sherman, 2007). Further, longitudinal research indicates that adolescents who report higher levels of optimism also report lower levels of somatic symptoms one year later, even after controlling for initial somatic symptoms, depressive symptoms, and negative life events (Murberg, 2012). In sum, dispositional optimism appears to be related to positive physical functioning (e.g., Pritchard et al., 2007; Rasmussen et al., 2009), psychological functioning (e.g., Wright et al., 2011) and life satisfaction (Fereirra & Sherman, 2007) in adult and some adolescent samples (Murberg, 2012). No known research study to date has examined optimism in people with IBS, and as such exploration of optimism, IBS symptoms, and pain-related disability in emerging adults is warranted.

Positive cognitive schemas will be examined as the third positive psychological factor of interest. Cognitive schemas refer to core beliefs with which people interpret their environment (Beck, 1967). Positive schemas refer to core beliefs that are positive in nature (e.g., themes of self-worth; Keyfitz, Lumley, Hennig, & Dozois, 2013), while negative schemas refer to core beliefs that are negative in nature (e.g., mistrust, isolation; Young, Klosko & Weishar, 2003). Although positive and negative schemas are distinct constructs (Keyfitz et al., 2013), much of
the extant schema research is conducted with a focus on highly negative schemas, which are related to increased depressive symptoms in adults (Beck, 1967; Young et al., 2003). Higher positive schemas are associated with reduced depressive and anxious symptoms and increased resilience in children (Keyfitz et al., 2013), as well as happiness and life satisfaction in children and adolescents (Tomlinson et al. in preparation). Positive schemas may contribute more variance beyond the contribution of negative schemas to the prediction of depression and resilience in children (Keyfitz et al., 2013), as well as life satisfaction and happiness in children and adolescents (Tomlinson et al., in preparation).

Research suggests that 25% of people with depressive symptoms also suffer from comorbid IBS (Gros, Antony, McCabe & Swinton, 2009), indicating that vulnerability to depression is present within these populations. In a cyclical model described by Pincus and Williams (1999), a cognitive vulnerability to depression (highly negative schemas), in addition to pain and stressful life events leads to greater disability in those with chronic pain, leading to increased negative affect and further cognitive vulnerability to depression. The cyclical relationship between cognitive vulnerability and disability could increase IBS symptoms and pain-related disability in emerging adults with IBS symptoms. Shifting to a more positive approach and exploring the protective qualities of positive schemas in relation to IBS symptoms is a novel application of positive schema research.

The final positive factor of interest in the proposed research is pain self-efficacy, which describes the belief that one can function despite pain symptoms (Bursch, Tsao, Meldrum & Zeltzer, 2006). Higher pain self-efficacy in adults with chronic pain is related to lower pain intensity (Meredith, Strong & Feeney, 2006), less pain-related disability (Asghari & Nicholas, 2001), and psychological distress (Lefebvre et al., 1999), as well as fewer pain behaviours (e.g.,
complaints, avoidance; Asghari & Nicholas, 2001), and greater activity levels (Lefebvre et al., 1999). Conversely, low pain self-efficacy in adults with chronic pain is also related to patient perceived burden to caregivers (Kowal, Wilson, McWilliams, Peloquin & Duong, 2012), and more observed pain behaviours (e.g., sighing, grimacing, rubbing; McCahon, Strong, Sharry & Cramond, 2005). These findings indicate that pain self-efficacy may be an important predictor of pain severity, disability, mood, and pain behaviours in adults with chronic pain. Furthermore, pain self-efficacy partially mediates the relation between pain intensity and disability in adults with chronic pain (Costal, Maher, McAuley, Hancock & Smeets, 2011; Arnstein, Caudill, Mandle, Norris & Beasley, 1999; Arnstein, 2000). This mediation is more salient over time when compared to fear of movement (a factor that leads to impaired functioning) as a mediator in adults experiencing chronic back pain (Costal et al., 2011). This research suggests the belief in the ability to function despite pain symptoms may reduce the impact that pain intensity has on pain-related disability.

Taken together, extant research suggests that pain self-efficacy is related to better physical and mental health outcomes in those with chronic pain and thus may lead to fewer symptoms of IBS and less pain-related disability. Better understanding of the relations between pain self-efficacy and symptoms of IBS in adults with abdominal pain could provide unique information about how pain self-efficacy relates to self-reported experience of IBS symptoms and pain-related disability.

**Summary**

Irritable Bowel Syndrome is a Functional Gastrointestinal Disorder that impacts approximately 10-15% of people in North America (Drossman et al., 1997) and is associated with lower health-related quality of life (Dean et al., 2005, Gralnek et al., 2000). The experience
of IBS during emerging adulthood is of interest because this is a time during which young people experience a great deal of change and exploration (Arnett, 2000), setting the stage for adulthood. Study 1 sought to better understand how positive psychological factors (i.e., mindfulness, optimism, positive schemas) associate with the experience of IBS symptoms in a non-clinical sample of emerging adults. For those participants who endorsed experiencing abdominal pain, Study 2 examined the additional positive psychological factor of pain self-efficacy as it relates to pain intensity, pain-related disability, and IBS symptoms (See Figure 1).

**Study 1 Objectives and Hypotheses**

Using a web-based survey, the current set of studies examined how positive factors (i.e., mindfulness, optimism, and positive schemas) associate with Irritable Bowel Syndrome symptoms in emerging adults. Study 1 examined how positive psychological factors relate to IBS symptoms in a non-clinical sample of emerging adults. The specific objective and hypothesized results were as follows:

1. To determine if positive psychological factors are related to the endorsement of IBS symptoms. It was hypothesized that high levels of positive psychological factors (i.e., mindfulness, optimism, positive schemas) would be related to fewer symptoms of IBS. Conversely, low levels of positive psychological factors would relate to the endorsement of more IBS symptoms in a non-clinical sample of emerging adults.

**Study 1 Method**

**Study 1 Participants**

Participants were 67 emerging adults aged 18 to 22 ($M = 18.93, SD = 1.10$). Fourteen participants were male and 53 participants were female. 72.6% of participants identified themselves as White/European, 9.6% identified as Southeast Asian, 4.1% identified as Aboriginal, 2.7% identified as South Asian, and 4.4% identified as “Other”. 65.8% of
participants reported experiencing pain in the past three months (see Figure 2 for type of pain experienced by this subset of participants). 19.2 % of participants reported seeking medical treatment related to abdominal pain and related symptoms, with no participants endorsing a diagnosis of IBS. Only 17.2% of the full sample had never experienced abdominal pain or discomfort over the previous three months. Of those who endorsed experiencing abdominal pain or discomfort over the previous three months, 46.6% indicated it was related to menstruation. Although many participants related the experience of abdominal pain or discomfort to menstruation, 82.6% reported relief of pain or discomfort with defecation.

**Study 1 Procedure**

All participants involved in the current study were recruited from undergraduate psychology classes at a mid-sized Canadian university. Interested participants accessed a link to an online survey. Prior to completing the online survey, participants provided informed consent. Participants first completed demographics measures and moved on to self-report measures of IBS symptoms and positive psychological factors. At the conclusion of the study, participants who volunteered for a course credit received the credit.

**Study 1 Measures**

**Demographics.** Information pertaining to participant age, sex, and history of experiencing pain were collected (see Appendices for all measures).

**Irritable bowel syndrome symptoms.** IBS symptoms were measured using a questionnaire developed by the Rome Foundation based on the Rome III criteria for the diagnosis of Irritable Bowel Syndrome (Drossman et al., 2006). The criteria on which the Rome III questionnaire are based were developed to create a “gold standard” measure for examining FGIDs including IBS in research (Drossman, 2007). The first question on the measure requires
participants to endorse how often they experienced pain or discomfort in the past month. If participants endorse experiencing abdominal pain or discomfort, they are directed to answer further questions regarding the experience of abdominal pain (e.g., *When this discomfort or pain started, did you have more frequent bowel movements?*) using a 5-point scale ranging from 0 = Never or Rarely to 4 = Always. For the purposes of the current study, the Rome III IBS questionnaire was used in a continuous manner. Internal consistency was .66 in the current study. Total scores range from 0 to 33, where higher scores represent more IBS symptoms.

**Mindfulness.** On the 39-item Five Factor Mindfulness Questionnaire (FFMQ; Baer et al., 2006), respondents endorse items related to five facets of mindfulness. A 5-point Likert scale is employed, where 1 = never true and 5 = always true (e.g., *when I’m walking, I deliberately notice the sensations of my body moving*). The five facets include observing (i.e., noticing sensations; range 6 to 30, internal consistency = .80), describing (i.e., labeling sensations; range 8 to 40, internal consistency = .83), awareness (i.e., attending to sensations; range 8 to 40, internal consistency = .82), non-judgment (i.e., taking non-judgmental stance toward sensations; 8 to 40, internal consistency = .75), and non-reactivity (i.e., not being reactive to sensations; range 7 to 35, internal consistency = .75; Baer et al., 2008). Higher scores represent higher levels of the mindfulness facet. The facets in this measure have shown adequate internal consistency and incremental validity in predicting psychopathology (Baer et al., 2006) and IBS diagnostic status (Garland et al., 2012).

**Optimism.** Optimism was assessed using the 6-item Life Orientation Test-Revised (LOT-R; Scheier, Carver & Bridges, 1994). The 3-item optimism and 3-item reverse scored pessimism subscales were used to calculate an overall optimism score. This measure employs a 5-point Likert scale where 0 = strongly disagree for me and 4 = strongly agree (e.g, *In uncertain*
times, I usually expect the best). Total scores range from 0 to 24, with higher scores representing higher levels of optimism. The Life Orientation Test-Revised has adequate internal consistency and test-retest reliability, and has demonstrated adequate convergent and discriminant validity (Scheier et al., 1994). Internal consistency in the current study was .77.

Positive schemas. The 20-item Positive Schema Questionnaire (PSQ; Keyfitz et al., 2013) measures positive core beliefs. This measure employs a 6-point Likert scale where 1 = completely untrue of me and 6 = describes me perfectly (e.g., I can adapt to new situations). Total scores range from 20 to 120 with higher scores representing higher levels of positive schemas. The PSQ had internal consistency reliability of .96 in the current study. The PSQ has demonstrated adequate face validity, discriminant validity, and internal consistency reliability in a community sample of children aged 9-14 (Keyfitz et al., 2013), and had adequate reliability in a sample of young adults (Lumley & MacArthur, in press).

Study 1 Results

Study 1 Analytic Plan

Prior to analyses, the data were screened for response sets, outliers, and incomplete questionnaires. The full sample consisted of 67 participants. Since the sample size was lower than desired to detect medium effect sizes for correlations (n = 85) and multiple regression analyses at an alpha level of .05 (n = 102; Cohen, 1992), an analytic plan considering both effect size and statistical significance was employed. Therefore, a decision was made to highlight zero-order correlations that represented small to medium (r = .20), medium (r = .30) and large (r = .50) effect sizes (Cohen, 1992). The lower limit of small to medium effect sizes (r = .20) was set because small effect sizes (r = .10) were deemed too liberal to draw conclusions for the current study and medium effect sizes (r = .30) were deemed too conservative. Similarly, effect sizes
were calculated for the multiple regression analyses using Cohen’s $f^2: \frac{R^2}{1-R^2}$ (Cohen, 1992). Therefore, small ($f^2 = .02$), medium ($f^2 = .15$), and large ($f^2 = .35$) effect sizes are noted for multiple regression analyses. Finally, analyses that trend toward significance ($p \leq .10$) are highlighted.

**Study 1 Results**

The purpose of the first study was to describe the experience of IBS symptoms in a sample of emerging adults. Means, standard deviations, and zero-order correlations can be found in Table 1. In line with expectations for a non-clinical sample, the mean level of IBS symptoms ($M = 7.74$) was low for the possible range of scores (*Possible Range* = 0-33, *Actual Range* = 0-20). Mean scores for mindfulness, optimism, and positive schemas were moderate to high.

Hypothesis 1, that positive psychological factors (increased levels of mindfulness, optimism, and positive schemas) would be associated with lower endorsement of IBS symptoms, was not statistically supported. This was evidenced by non-significant correlations between IBS symptoms and mindfulness, optimism, and positive schemas. However, a weak to moderate effect was found for the negative relation between IBS symptoms and the mindfulness facet of awareness ($r = -.20$). The positive psychological variables together also did not predict IBS symptoms in a multiple regression analysis $R^2 = .14, F(7, 57) = 1.32, p = .26$ (see Table 2), however the regression represents a medium effect size ($f^2 = .16$). Together, this suggests that a model of positive psychological factors do not predict increased IBS symptoms in an emerging adult sample of these characteristics and this size.

**Study 2 Objectives and Hypotheses**

Study 2 explored the subsample of participants from Study 1 who endorsed experiencing abdominal pain in the previous 3 months. In addition to the variables explored in Study 1, pain
self-efficacy and pain-related disability (e.g., days of school missed) were explored (See Figure 1 for study measures). The objectives and hypotheses for Study 2 were as follows:

1. To determine if positive psychological factors are related to the endorsement of IBS symptoms, pain intensity, and pain-related disability in people who report experiencing abdominal pain. It was hypothesized that higher levels of positive psychological factors (i.e., mindfulness, optimism, positive schemas, pain self-efficacy) would be related to a) fewer symptoms of IBS, b) lower pain intensity, and c) lower pain-related disability. Conversely, lower levels of positive psychological factors would relate to the endorsement of more IBS symptoms, greater pain intensity, and higher pain-related disability.

2. To determine if positive psychological factors mediate the relation between pain intensity and pain related disability. Exploratory mediational analyses were conducted to better understand if positive psychological factors (i.e., mindfulness, optimism, positive schemas, pain self-efficacy) mediate relations between pain intensity and pain-related disability.

**Study 2 Method**

**Study 2 Participants**

Participants were a subset of the sample from Study 1, which consisted of undergraduate students from psychology classes at a mid-sized Canadian university. Participants were selected for Study 2 if they had endorsed experiencing abdominal pain in the previous three months. A subset of $n = 37$ ($n = 3$ males, $n = 34$ females) participants endorsed the experience of abdominal pain and were included in Study 2.
Study 2 Measures

Measures included all questionnaires completed in Study 1: IBS symptoms (internal consistency = .61), optimism (internal consistency = .73), mindfulness (internal consistencies: observing = .75; describing = .87; awareness = .83; non-judgment = .94; non-reactivity = .60) positive schemas (internal consistency = .95). Additionally, Study 2 participants also completed a number of surveys specific to pain (see Figure 1).

Pain intensity. A Numerical Rating Scale (NRS-11; e.g., von Baeyer, 2009) was used to assess abdominal pain intensity, representing pain during a given period of time (current pain, pain on an average day, worst pain in the past week, best/lowest level of pain during past week) on a continuum ranging from 0 = no pain to 10 = worst possible pain. The numerical rating scale has been widely used in adults (Hjermstadt et al., 2011; Williamson & Hoggart, 2005), and has been identified as a key measure of pain intensity for use in clinical trials by the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT; Dworkin et al., 2005). The current sample consists of emerging adults in the University community who may not experience chronic pain, but more acute incidents of abdominal pain that would be best captured by a “worst” pain rating. As such, worst pain would presumably be experienced during acute abdominal pain episodes. Average pain ratings reflect abdominal pain across time during an average week. Thus, worst pain and average pain were used for analyses in the current study.

Pain self-efficacy. The Pain Self-Efficacy Questionnaire (Nicholas, 1989) measures self-efficacy for carrying on with daily activities in spite of pain. Pain self-efficacy, or the extent to which people experiencing pain believe they can participate in certain activities, is measured using a 7-point Likert scale where 0 = not at all confident and 6 = very confident (e.g., I can enjoy things despite pain). Total scores range from 0 to 60, with higher scores representing
higher levels of pain self-efficacy. Internal consistency reliability was .96 in the current study. The Pain Self-Efficacy Questionnaire has demonstrated strong psychometric properties across heterogeneous chronic pain samples (Nicholas, 2007).

**Pain-related disability.** The Migraine Disability Assessment Scale (MIDAS; Stewart et al., 2001) measures disability due to the experience of migraines. The MIDAS has adequate reliability, validity, and internal consistency (Stewart et al., 2001). In line with previous research (e.g., Durkalski et al., 2010), this scale was adapted to reflect the disability experienced due to abdominal pain, rather than migraine, as measured by number of days abdominal pain impacted the respondent’s ability to function (e.g., *On how many days in the last 3 months did you miss work or school due to abdominal pain?*), with higher scores indicating higher levels of pain-related disability. Internal consistency was .85 in the current study.

**Study 2 Procedure**

The procedure for Study 2 was identical to that of Study 1, with the exception of the addition of measures administered if the participants had endorsed experiencing abdominal pain within the previous three months.

**Study 2 Results**

**Study 2 Analytic Plan**

The purpose of Study 2 was to better understand how positive psychological factors relate to IBS symptoms, pain intensity, and pain-related disability in people who endorsed experiencing abdominal pain in the previous 3 months. In line with Study 1, correlations and regression coefficients that represent small to medium ($r = .20$), medium ($r = .30$), or large ($r = .50$) effect sizes but are not significant are discussed. Additionally, analyses that trend toward significance ($p \leq .10$) are highlighted.
A major goal of Study 2 was to determine if “worst” pain intensity predicts pain-related disability through the positive psychological factors of interest (mindfulness, optimism, positive schemas, and pain self-efficacy). To test these relations, a multiple mediation model using bootstrapping (e.g., Shrout & Bolger, 2002) was employed. The theory behind multiple mediation and the process is outlined by Preacher and Hayes (2008). In addition to testing the direct relationship (c; see Figure 3), the multiple mediation method allows for analysis of the total indirect effect of the predictor onto the outcome variable, denoted by c’ in Figure 3. This provides information about whether or not the total set of mediators (ab₁, ab₂ … ab₈) significantly mediate the relation between the predictor, X (worst pain intensity), and outcome variable, Y (pain-related disability), using the following formula (a₁ + b₁, a₂ + b₂… a₈ + b₈). Next, the extent to which each of the mediators mediate the relation between the predictor and outcome variables is examined using each specific indirect effect (ab₁, ab₂, ab₃, ab₄, ab₅, ab₆, ab₇, ab₈). In comparison to a simple mediation, a multiple mediation model reduces the likelihood of biased parameter estimates because all mediators are included in one model, rather than separate models. Finally, a multiple mediation model provides information about the relative proportion through which each variable mediates the relationship between the predictor and outcome variable. Bootstrapping was conducted using an SPSS macro created by Preacher and Hayes (2008). Bootstrapping is a resampling procedure (5,000 resamples were chosen), through which indirect effects are estimated using confidence intervals. Indirect effects are considered non-significant if the range of the confidence interval crosses zero, and significant if it does not.

The abdominal pain sample was examined through testing a) the total indirect effect of pain intensity on pain-related disability through positive psychological variables (mindfulness, optimism, positive schemas, and pain self-efficacy) and b) the specific indirect effects of pain...
intensity on pain-related disability through each of the positive psychological variables (mindfulness, optimism, positive schemas, and pain self-efficacy). A bootstrapping procedure was used to obtain estimates of indirect effects to test their significance using confidence intervals.

**Study 2 Results**

Means, standard deviations, and zero-order correlations can be found in Table 3. 55% of participants in the current study endorsed that the discomfort or pain in their abdomen was related to menstrual pain, however 76% of participants reported experiencing looser bowel movements (sometimes, often, most of the time, always) and 81% reported relief after a bowel movement (sometimes, often, most of the time, always) when experiencing the abdominal pain or discomfort. Again, consistent with expectations for a non-clinical sample, average IBS symptoms were on the low end \( M = 10.36 \) of the possible range \((0 – 33)\). Also in line with a non-clinical sample, average pain ratings were low \( M = 2.00, SD = 2.19 \), however worst pain ratings were moderate for participants \( M = 4.18, SD = 3.14 \), suggesting that participants in this non-clinical sample experience periods of acute abdominal pain at times. On average, participants in Study 2 reported experiencing \( M = 8.57, SD = 12.46 \) days of disability related to their abdominal pain over a 3 month period. In line with Study 1, participants reported moderate to high levels of the positive psychological factors (i.e., mindfulness, positive schemas, optimism, and pain self-efficacy). IBS symptoms were significantly associated with average \( r = .36, p < .05 \) and worst pain \( r = .38, p < .05 \).

**Objective 1a: Do positive psychological factors relate to IBS symptoms?** IBS symptoms in the participants who endorsed experiencing abdominal pain did not significantly associate with any of the positive psychological variables of interest (mindfulness, optimism,
positive schemas, pain self-efficacy). However, there was a trend for the positive psychological variable of positive schemas, $r = -.27, p = .10$, negatively relating to IBS symptoms (see Table 3). When examining the positive psychological associates of IBS symptoms according to effect size, a non-significant moderate relation was found for optimism ($r = -.25, ns$), suggesting that lower levels of optimism could significantly associate with more IBS symptoms in a larger sample.

The positive psychological variables (mindfulness, optimism, positive schemas, pain self-efficacy) were then entered into a multiple regression analysis to see if a model of positive psychological variables predict IBS symptoms in people who endorse experiencing abdominal pain (see Table 4). This model was not statistically significant, $R^2 = .14, F(8, 27) = .53, p = .82$, thus Hypothesis 1a was not supported in the current study. However, the regression represents a medium effect size ($f^2 = .16$), and could lead to a significant relation with a larger sample size.

**Objective 1b: Do positive psychological factors relate to pain intensity?** Relations between self-reported pain intensity (worst pain, average pain) and the positive psychological factors were also examined. The positive psychological factor of optimism, $r = -.38, p < .05$, significantly associated with worst pain intensity ratings, and there was a trend for positive schemas, $r = -.28, p = .09$. Although statistically non-significant, the mindfulness facet of observing represented a moderate positive relation with pain intensity ($r = .28, ns$), suggesting that as the mindfulness facet of observing increased, worst pain-intensity could also increase.

In terms of average pain, the mindfulness facet of awareness trended towards statistical significance with average pain, $r = -.29, p = .09$ (see Table 3). Additionally, a positive weak to moderate effect was found for the mindfulness facet of non-reactivity ($r = .22, ns$). The mindfulness facet of non-reactivity associated with average pain intensity in the opposite
direction than predicted, with higher levels of non-reaction and higher average pain intensity occurring together.

The hypothesis that a positive psychological model (mindfulness, optimism, positive schemas, pain self-efficacy) would significantly predict worst pain intensity was unsupported in the current study, $R^2 = .32, F(8, 27) = 1.61, p = .17$ (see Table 4). Although this model was not significant, the regression represents a large effect size ($f^2 = .47$).

**Objective 1c: Do positive psychological factors relate to pain-related disability?** Zero-order correlations were conducted to determine if any positive psychological variables significantly associate with pain-related disability. The hypothesis that positive psychological variables would relate to pain-related disability was partially supported. Pain self-efficacy was negatively related to pain-related disability, $r = -.41, p < .01$, suggesting that as pain self-efficacy increases, pain-related disability decreases in emerging adults. The mindfulness facets of observing ($r = .25, ns$) and non-judgment ($r = .24, ns$), along with positive schemas ($r = .20, ns$) represented weak to moderate relations with pain-related disability, however these were positive effects occurring in the opposite direction than would be expected based on hypotheses (i.e., higher levels of positive variables lead to greater pain-related disability).

The hypothesis that a positive psychological model (mindfulness, optimism, positive schemas, pain self-efficacy) would significantly predict pain-related disability was unsupported, $R^2 = .33, F(8, 27) = 1.65, p = .16$ (see Table 4). Although this model was not significant, the regression represents a large effect size ($f^2 = .47$).

**Objective 2: Do positive psychological variables mediate the relation between pain intensity and pain-related disability?** A multiple mediational analysis was conducted to determine if positive psychological factors mediated the relation between worst pain intensity
and pain-related disability (See Table 5). The total effect between pain intensity and pain-related disability was not significant in this model, \( B = .66, p = .21 \), and the total indirect effect for the model was also not significant, \( B = 1.05, p = .18 \) (see Figure 3). Specific indirect effects for each positive psychological variable were examined to determine whether they mediated the relation between worst pain intensity and pain-related disability. None of proposed variables significantly mediated the relation between pain intensity and pain-related disability in this model.

**Discussion**

These preliminary studies sought to identify the relations between positive psychological factors and irritable bowel syndrome (IBS) symptoms in a non-clinical sample of emerging adults. The relations between positive psychological factors, pain intensity, and pain-related disability were explored for participants who had experienced abdominal pain in the previous three months. This research was divided into two parts: the first study examined how positive psychological factors (mindfulness, optimism, positive schemas) predict IBS symptoms in a non-clinical sample of emerging adults. The second study examined how positive psychological factors (mindfulness, optimism, positive schemas, pain self-efficacy) predict pain intensity, pain-related disability, and IBS symptoms in emerging adults with abdominal pain. Further, the second study sought to explore the positive psychological factors as mediators between pain intensity and pain-related disability. Current results do not support a positive psychological model for IBS symptoms and pain-related disability in emerging adults. However, a number of positive psychological factors were related to different aspects of IBS symptoms, pain-related disability, and pain intensity.
Study 1

**IBS symptoms and positive psychological factors.** Although a wealth of information has linked stressful experiences (Blanchard et al., 2008; Hyams & Hyman, 1998), psychopathology (Gros et al., 2009; Sykes et al., 2003), and negative psychological factors (e.g., catastrophizing; Turner et al., 2000) with IBS symptoms, Study 1 results suggest that positive psychological factors (mindfulness, optimism, positive schemas) do not significantly predict IBS symptoms in a population sample of emerging adults. Although the association was not statistically significant, the mindfulness facet of awareness represented a weak to moderate negative association with IBS symptoms. There were a number of positive psychological factors that fell just below the set cut-off point for effect size analyses, including negative associations between the mindfulness facets of non-reacting and non-judgment and optimism. These associations suggest that a number of positive psychological factors could significantly relate to fewer IBS symptoms in a larger sample.

The positive psychological factors together in a model did not significantly predict IBS symptoms, however there was a moderate effect for the regression. It is possible that in this non-clinical population, positive psychological factors may not have such a direct impact on physical symptoms found in IBS. It is also possible that deficits in positive psychological factors may be more closely related to general indices of well-being, such as health-related quality of life, in a non-clinical sample where IBS symptoms and pain-related disability are likely less severe. Further, those who did not experience abdominal pain or discomfort over the previous three months received a score of zero on the entire battery. Since the mean level of IBS symptoms fell far below the middle of the possible range of scores, it is possible that the range was restricted for this sample, thus not allowing adequate variability for this analysis.
Study 2

For Study 2, emerging adults who endorsed the experience of abdominal pain were considered. This group completed the additional positive psychological measure of pain self-efficacy. Pain intensity (worst, average) and pain-related disability were also measured.

**IBS symptoms and positive psychological factors.** Positive psychological factors were examined in relation to IBS symptoms in the subsample experiencing abdominal pain. In line with the findings from Study 1, results indicate that no positive psychological factors significantly associate with IBS symptoms, either separately or together in a model, however, positive schemas approached significance through a moderate negative relation with IBS symptoms. This may suggest that low levels of positive schemas, or the positive core beliefs through which people interpret their environment (Beck, 1967), such as self-efficacy, trust, success, optimism, and worthiness (Keyfitz et al., 2013) may be related to increased physical symptomatology. This fits with the depressogenic cognitive schema profile (e.g., low levels of positive schemas; Keyfitz et al., 2013) and the comorbidity of depression and IBS (Gros et al., 2009). In line with extant research associating optimism with physical well-being (e.g., Rasmussen et al., 2009), results suggest a non-significant negative association between optimism and IBS symptoms.

**Positive psychological factors and pain intensity.** Positive psychological factors were then examined in relation to pain intensity ratings. Results suggest that optimism and positive schemas (trend) are related to worst pain intensity, indicating that people who view their experiences through a positive framework may consider past pain experiences to be less intense than people who do not have strong positive schemas or highly optimistic outlooks. This process may occur because cognitive schemas guide the interpretation of environmental stimuli (Beck,
a process which relies heavily on memory and attentional processes (Ingram, Miranda & Segel, 1998). For example, people who do not have depressive symptoms recall more positive words than people who do have depressive symptoms, suggesting that positive schemas also guide memory processes (Prieto, Cole & Tageson, 1992). Therefore, it is possible that people with highly positive schemas remember pain experiences differently than people who have low positive schema levels. The negative relation between optimism and pain intensity falls in line with extant experimental pain research through which participants reported lower pain intensity in an optimism priming condition (Hansenn et al., 2011). Finally, the mindfulness facet of observing showed a moderate positive association with “worst” abdominal pain (i.e., in the opposite direction than would be expected). Although the associations are not significant, it is possible that those who observe their inner sensations are more likely to report higher pain intensity.

In other research with emerging adults, four of the five mindfulness facets (i.e., describing, awareness, non-judgment, non-reacting) associate together with outcomes such as psychological symptoms and well-being (e.g., higher non-judgment related to increased psychological well-being), while the mindfulness facet of observing does not associate with study outcomes alongside the other four facets (Baer et al., 2008). In people who are experienced meditators, however, all five facets of mindfulness, including observing, associate with positive outcomes in the expected direction (Baer et al., 2008). In the current study, the mindfulness facets do not relate in the same direction to the outcome variables of interest. It is possible that with mindfulness training, these associations would consolidate, leading to consistency in the direction of the relations.
The positive association between observing and pain intensity contrasts with study hypotheses but is consistent within the context of pain experience. Those who observe their pain may be more attuned to those symptoms and more likely to endorse them. This falls in line with experimental pain research suggesting that attending to pain stimuli elicits a stronger pain response than distraction from pain stimuli (Arntz, Dressen & Merkelbach, 1991). In other research, higher levels of observing related to increased psychological symptoms in a non-meditating sample, and fewer psychological symptoms and better psychological adjustment in a meditating sample (Baer et al., 2008). Therefore, meditators may be better able to observe stimuli in collaboration with the other four facets of mindfulness, leading to positive well-being. In other words, for mindfulness to be protective, one may need to have skills across all five facets.

It is also possible that the observing facet of mindfulness could overlap with visceral anxiety. Research suggests that visceral anxiety, or anxiety surrounding visceral sensations (e.g., “if I find a stomach cramp, I worry about finding a bathroom” p. 504; Hazlett-Stevens et al., 2003), is significantly higher in those who have IBS compared to those who do not (Hazlett-Stevens et al., 2003; Labus et al., 2007). In people with IBS, visceral anxiety significantly related to severity of abdominal pain and did not significantly relate to other types of pain (Labus et al., 2007). Therefore, because the mindfulness facet of observing may overlap with visceral anxiety in people with IBS, the finding that higher levels of observing has a moderate positive association with worst pain intensity is not surprising given the extant research.

In terms of average pain experienced, the mindfulness facet of awareness was moderately but not statistically significantly related in the current model. Relations between mindfulness and pain intensity have occurred in experimental pain research where participants report lower pain
intensity than controls when they completed mindfulness training (Kingston et al., 2007). Weak to moderate positive effects were found for non-reactivity and average pain. The direction of the effect between non-reactivity and average pain intensity suggests that people who are non-reactive to internal sensations could report higher pain intensity ratings.

The mindfulness facet of non-reactivity also positively associates with observing in the current sample. Observing and non-reactivity significantly increased through a body scanning (i.e., attending to sensations of the body in a non-judgmental manner) training program (Carmody & Baer, 2008), suggesting that these two facets associate similarly when attention to bodily sensations is studied. Although the non-reactivity facet from the Five Facet Mindfulness Questionnaire highlights a non-reactive stance to thoughts and sensations, many of the questions inquire about observing the thoughts and sensations and non-reaction to those thoughts and sensations (e.g., “When I have distressing thoughts or images I am able just to notice them without reacting”; Baer et al., 2006). As such, it is not unreasonable for observing and non-reacting to be associated due to overlap between the items. It is also possible that although participants are reporting having a non-reactive stance toward physical sensations, it may not be adaptive without marshalling the other facets of mindfulness (i.e., acting with awareness, taking a non-judgmental stance, and describing).

A positive psychological model (mindfulness, optimism, positive schemas, pain self-efficacy) did not significantly predict worst pain intensity\(^1\). Although this model was not significant, the effect size was large, suggesting that a positive psychological model could significantly predict worst pain intensity in a study with more participants.

\(^1\) For the purposes of further analyses, “worst” pain intensity ratings were employed. This is because it is possible that participants only experienced one instance of abdominal pain and a non-clinical sample is more likely to experience fewer acute instances of abdominal pain.
Positive psychological factors and pain-related disability. Finally, positive psychological factors were examined in relation to pain-related disability in people who experience abdominal pain. The only positive psychological factor that statistically associated with pain-related disability was pain self-efficacy. In line with previous research (Asghari & Nicholas, 2001), this result suggests that people who believe they can function in spite of pain also report having less pain-related disability (e.g., missing fewer days of work/school, etc.). Although non-significant, the mindfulness facet of observing (see above for discussion about observing) and non-judgment, along with positive schemas represented small to medium effect sizes in the opposite direction than would be expected, suggesting that these factors associate with higher pain-related disability. This contradicts study hypotheses and previous research suggesting that mindfulness (Petter et al., 2013) may reduce pain-related disability. It is possible that the mindfulness facet of non-judgment positively associated with pain-related disability because people who take a non-judgmental stance toward their emotions and sensations are more likely to endorse that abdominal pain interfered with functioning (i.e., are not particularly threatened by admitting this). Finally, although the positive association between positive schemas and pain-related disability was not expected, it could be speculated that this association is positive because a number of the items require the participants to reflect on difficult times (e.g., “I can depend on others” and “I can respond to challenges”; Keyfitz et al., 2013) that could be more easily identified for those who have experienced adversity, such as pain-related disability.

A positive psychological model of factors predicting pain-related disability was not significant, however, it represented a large effect. In the multiple mediation model, worst pain intensity also did not significantly predict pain-related disability through the positive
psychological factors. This suggests that the positive psychological factors (mindfulness, optimism, positive schemas, pain self-efficacy) do not mediate the relation between the intensity of pain experienced by people with abdominal pain and the level of disability that they face. Although this multiple mediational model did not reach significance, past research has established that pain self-efficacy partially mediates the relation between pain intensity and pain-related disability in people with chronic pain (Costal et al., 2011; Arnstein et al., 1999; Arnstein, 2000). It is possible that the associations between positive psychological factors and pain-related disability did not occur in expected ways within this non-clinical sample because participants likely experienced lower levels of disability related to pain than a clinical sample. As such, exploration of positive psychological variables with IBS symptoms and associated features (i.e., pain intensity, pain-related disability) within a clinical sample is warranted.

Results of this study provide preliminary information about the experience of abdominal pain and IBS symptoms in emerging adults. Although a “positive psychological model” of abdominal pain was not established within the non-clinical sample examined in this study, promising relations between the positive psychological variables, IBS symptoms, pain intensity, and pain-related disability were established.

Limitations and Future Research Directions

This is the first study to date that has applied a positive psychological model to physical symptoms, pain, and functioning in a non-clinical sample of emerging adults. Rather than examining a single positive factor like in past research, the current study examined multiple positive factors using validated measures. Although there were a number of non-significant results in the current study, the effect sizes are promising for future research. There are also limitations to the current study. Due to time and departmental constraints, the sample size was
smaller than desired to detect small to medium effects. This sample was even further reduced for Study 2, where only participants who endorsed experiencing abdominal pain participated. In the current study, many analyses were non-significant or trended towards significance. It is possible, even likely, that with a larger sample, a number of relations could reach significance. Related to sample characteristics, it would be ideal to have more equal distribution of males and females. However, females are more likely to experience IBS symptoms (Drossman et al., 2007), and there is a greater proportion of females to males in a university setting. Another limitation in the current research is that it is cross-sectional in nature. Although the purpose of this line of research was to describe a population sample of emerging adults, it would be informative to examine how these positive psychological factors predict IBS symptoms, pain-related disability, and chronic pain over time.

Since this is a novel line of research, the opportunities for future research directions are plentiful. Now that a population sample of emerging adults has been described, the next step would be to create a model of positive psychological factors with clinical samples with IBS. Research is currently underway to describe a clinical sample of children and adolescents with chronic abdominal pain, such as those with Functional Gastrointestinal Disorders such as IBS and “organic” gastrointestinal disorders, like Inflammatory Bowel Disease. It is possible that the relations between the positive psychological factors presented in the current study would be more strongly tied to outcomes, such as pain-related disability in a clinical sample.

In future research, the outcome measures of IBS symptoms and pain-related disability could be supplemented with another broader psychosocial outcome measure, such as health-related quality of life. Meta-analytic findings suggest that health-related quality of life differs significantly from health status alone in that respondents extend beyond physical well-being and
consider their mental health in their ratings (Smith, Avis & Assmann, 1999). It is possible that stronger effects would be demonstrated between positive psychological factors and health-related quality of life in a population sample because health-related quality of life may include less specific symptoms than IBS symptoms. Further, the use of a health-related quality of life measure could allow for comparisons across health conditions (Dworkin et al., 2005). The sample in the current study was divided based on whether or not abdominal pain was experienced and the role of positive psychological factors as associates of IBS symptoms and associates/mediators of pain-related disability was examined. However, it is possible that the abdominal pain reported could be related to symptoms of organic and functional gastrointestinal disorders that differ from the symptoms of IBS. The abdominal pain reported in the current study could also be related to menstrual pain. Although approximately half of Study 2 participants endorsed that abdominal pain was related to menstrual pain, most participants indicated that there were associated bowel features (e.g., loose stool), and discomfort was relieved after defecation. This falls in line with research suggesting that women with IBS tend to have increased IBS symptoms with their menstrual cycles (see Heitkemper & Chang, 2009 for review).

**Conclusion**

The framework demonstrated here provides preliminary data that should be explored in larger samples. This line of research could lead to the development of interventions to reduce IBS symptoms and pain, and pain-related disability in emerging adults with abdominal pain. Such interventions could include mindfulness training (e.g., Garland et al., 2012; Gaylord et al., 2011; Ljótsson et al., 2010) and cognitive behavioural therapy (e.g., Lackner et al., 2007). Specific points of intervention could include integrating the facets of mindfulness to allow for
mindful acceptance and non-judgment of pain sensations (Baer et al., 2008). Pain self-efficacy could be targeted to help reduce the pain-related disability that people who have abdominal pain experience. Finally, increasing optimism and positive schemas could lead to a promising reduction in IBS symptoms. Early intervention is critical given the increased medical system usage and pain-related disability demonstrated by people with chronic pain related to conditions such as IBS throughout their development.


Hjermstad, M. J., Fayers, P. M., Haugen, D. F., Caraceni, A., Hanks, G. W., Loge, J. H., ... & Kaasa, S. (2011). Studies comparing numerical rating scales, verbal rating scales, and
visual analogue scales for assessment of pain intensity in adults: a systematic literature review. *Journal of pain and symptom management, 41*(6), 1073-1093.


Table 1
Summary of Correlations, Means, and Standard Deviations for Positive Psychological Variables and IBS Symptoms for Study One

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Observed Range/Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. IBS Sx</td>
<td>7.74</td>
<td>5.56</td>
<td>0 - 20</td>
</tr>
<tr>
<td>2. Mind Observe</td>
<td>19.78</td>
<td>4.08</td>
<td>6 - 28</td>
</tr>
<tr>
<td>3. Mind Describe</td>
<td>26.89</td>
<td>5.04</td>
<td>18 - 40</td>
</tr>
<tr>
<td>4. Mind Awareness</td>
<td>24.75</td>
<td>4.98</td>
<td>14 - 40</td>
</tr>
<tr>
<td>5. Mind Nonjudgment</td>
<td>25.12</td>
<td>7.04</td>
<td>8 - 40</td>
</tr>
<tr>
<td>6. Mind Nonreact</td>
<td>20.28</td>
<td>3.89</td>
<td>7 - 27</td>
</tr>
<tr>
<td>7. PSQ</td>
<td>87.77</td>
<td>14.16</td>
<td>40 - 113</td>
</tr>
<tr>
<td>8. Optimism</td>
<td>13.64</td>
<td>4.19</td>
<td>2 - 21</td>
</tr>
</tbody>
</table>

Note: Correlations for all participants (n = 67). IBS Sx = Irritable Bowel Syndrome Symptoms, Mind = Mindfulness, PSQ = Positive Schemas. 
Correlations: *p < .05, **p < .01, 10 < d < 1.0 indicates large effect size, 1.0 > d indicates medium effect size, 2.0 > d indicates small effect size.
Table 2

Multiple Regression Analysis for Positive Psychological Factors Predicting IBS Symptoms for All Participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>16.96</td>
<td>7.11</td>
<td>2.39</td>
<td>*</td>
<td>.02</td>
</tr>
<tr>
<td>Mind Observe</td>
<td>.29</td>
<td>.19</td>
<td>.22</td>
<td>1.52</td>
<td>.13</td>
</tr>
<tr>
<td>Mind Describe</td>
<td>.05</td>
<td>.15</td>
<td>.04</td>
<td>.31</td>
<td>.76</td>
</tr>
<tr>
<td>Mind Awareness</td>
<td>-</td>
<td>.16</td>
<td>-</td>
<td>-.15</td>
<td>-.86</td>
</tr>
<tr>
<td>Mind Nonjudgment</td>
<td>-</td>
<td>.07</td>
<td>-</td>
<td>-.08</td>
<td>-.44</td>
</tr>
<tr>
<td>Mind Nonreact</td>
<td>-</td>
<td>.37</td>
<td>-</td>
<td>-.26</td>
<td>-.74</td>
</tr>
<tr>
<td>Positive Schemas</td>
<td>-</td>
<td>.01</td>
<td>-</td>
<td>-.02</td>
<td>-.10</td>
</tr>
<tr>
<td>Optimism</td>
<td>-</td>
<td>.23</td>
<td>-</td>
<td>-.19</td>
<td>-.92</td>
</tr>
</tbody>
</table>

Note: Regression including all participants (n = 64). IBS = Irritable Bowel Syndrome Symptoms, Mind = Mindfulness. † indicates p < .10, * indicates p < .05, ** indicates p < .01.
### Table 3

Summary of Correlations, Means, and Standard Deviations for Positive Psychological Variables, Pain-Related Disability, and IBS Symptoms for Study Two

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Observed Range</th>
<th>Total Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBS Sx</td>
<td>10.36</td>
<td>4.37</td>
<td>3 - 20</td>
<td>33 - 15.36*</td>
</tr>
<tr>
<td>Disability</td>
<td>8.57</td>
<td>12.46</td>
<td>0 - 50</td>
<td>23.24 - 0.08*</td>
</tr>
<tr>
<td>Average Pain</td>
<td>2.00</td>
<td>2.19</td>
<td>0 - 8</td>
<td>10 - 0.49**</td>
</tr>
<tr>
<td>Worst Pain</td>
<td>4.18</td>
<td>3.14</td>
<td>0 - 10</td>
<td>10 - 0.28**</td>
</tr>
<tr>
<td>Mind Observe</td>
<td>19.56</td>
<td>3.96</td>
<td>13 - 27</td>
<td>30 - 0.64*</td>
</tr>
<tr>
<td>Mind Describe</td>
<td>27.01</td>
<td>5.24</td>
<td>18 - 40</td>
<td>40 - 0.21</td>
</tr>
<tr>
<td>Mind Awareness</td>
<td>24.19</td>
<td>5.15</td>
<td>14 - 34</td>
<td>40 - 0.06*</td>
</tr>
<tr>
<td>Mind Nonjudgment</td>
<td>25.02</td>
<td>7.59</td>
<td>8 - 39</td>
<td>40 - 0.21</td>
</tr>
<tr>
<td>Mind Nonreact</td>
<td>19.77</td>
<td>3.28</td>
<td>12 - 27</td>
<td>35 - 0.06*</td>
</tr>
<tr>
<td>Positive Schemas</td>
<td>89.90</td>
<td>15.30</td>
<td>40 - 111</td>
<td>120 - 0.12</td>
</tr>
<tr>
<td>Optimism</td>
<td>14.43</td>
<td>3.91</td>
<td>3 - 21</td>
<td>24 - 0.04</td>
</tr>
<tr>
<td>Pain Self-Efficacy</td>
<td>45.64</td>
<td>12.82</td>
<td>9 - 60</td>
<td>60 - 0.06*</td>
</tr>
</tbody>
</table>

Note. Correlations for participants with abdominal pain (n = 35). IBS = Irritable Bowel Syndrome, Mind = Mindfulness. † indicates \( p < 0.10 \), * indicates \( p < 0.05 \), ** indicates \( p < 0.01 \).
Table 4

Multiple Regression Analysis for Positive Psychological Factors Predicting IBS Symptoms and Pain-Related Disability for Study Participants Endorsing Abdominal Pain

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>p</th>
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<tbody>
<tr>
<td><strong>IBS Symptoms</strong></td>
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<tr>
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<td>.23</td>
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<td>.21</td>
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<td>.08</td>
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<td>-.18</td>
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<td>-.05</td>
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</tr>
<tr>
<td>R²</td>
<td>.14</td>
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</tr>
<tr>
<td>F</td>
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<td><strong>Pain Intensity</strong></td>
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<td></td>
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<td></td>
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<tr>
<td>Observe</td>
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<td>.30</td>
<td>1.83†</td>
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<td>Describe</td>
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<td>-.18</td>
<td>-.80</td>
<td>.43</td>
</tr>
<tr>
<td>Pain Self-Efficacy</td>
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<td>.16</td>
<td>-.35</td>
<td>-2.11*</td>
<td>.04</td>
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<tr>
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<td>.33</td>
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</tr>
<tr>
<td>F</td>
<td>1.65</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Regression including participants endorsing abdominal pain (n = 35). IBS = Irritable Bowel Syndrome Symptoms, Mind = Mindfulness. † indicates p < .10, * indicates p < .05.
Table 5

Mediation of the Effect of Pain Intensity on Pain-Related Disability Through Positive Psychological Factors (ab paths)

<table>
<thead>
<tr>
<th>Mediators</th>
<th>Estimate</th>
<th>SE</th>
<th>Z</th>
<th>Lower</th>
<th>Upper</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Indirect Effect</td>
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<td>0.54</td>
<td>-0.37</td>
<td>-0.19</td>
<td>0.37</td>
<td>-0.19</td>
<td>0.37</td>
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<tr>
<td>8. Pain Self-Efficacy</td>
<td>-1.30</td>
<td>1.00</td>
<td>-1.69</td>
<td>-1.92</td>
<td>1.69</td>
<td>-1.92</td>
<td>1.69</td>
</tr>
<tr>
<td>7. Optimism</td>
<td>-1.13</td>
<td>0.99</td>
<td>-1.01</td>
<td>-1.22</td>
<td>1.01</td>
<td>-1.22</td>
<td>1.01</td>
</tr>
<tr>
<td>6. Positive Schemas</td>
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<td>0.99</td>
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<td>-1.35</td>
<td>1.35</td>
<td>-1.35</td>
<td>1.35</td>
</tr>
<tr>
<td>5. Mind Nonreact</td>
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<td>0.99</td>
<td>-0.17</td>
<td>-0.33</td>
<td>0.33</td>
<td>-0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>4. Mind Nonattachment</td>
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<td>-0.15</td>
<td>-0.29</td>
<td>0.29</td>
<td>-0.29</td>
<td>0.29</td>
</tr>
<tr>
<td>3. Mind Awareness</td>
<td>-0.06</td>
<td>0.99</td>
<td>-0.14</td>
<td>-0.28</td>
<td>0.28</td>
<td>-0.28</td>
<td>0.28</td>
</tr>
<tr>
<td>2. Mind Describe</td>
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<td>0.99</td>
<td>-0.13</td>
<td>-0.27</td>
<td>0.27</td>
<td>-0.27</td>
<td>0.27</td>
</tr>
<tr>
<td>1. Mind Observe</td>
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<td>0.99</td>
<td>-0.12</td>
<td>-0.26</td>
<td>0.26</td>
<td>-0.26</td>
<td>0.26</td>
</tr>
<tr>
<td>Note. Based on 5,000 bootstrap samples. BCa = bias corrected and accelerated. CI = confidence interval.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Figure 1

Description of Completed Measures for People Who Endorse the Experience of Abdominal Pain Versus Those Who Do Not

Demographics

Endorsed Abdominal Pain Experience

Pain Intensity

Pain Self-Efficacy

Pain-Related Disability

Pain Experience

Mindfulness

Optimism

Positive Schemas

IBS Symptoms

Study 2 Pain in Study 1 and Participation: All

Study 2
Figure 2

Types of Pain Experience by a Subset of Participants ($n = 48$) who Endorsed the Experience of Pain in the Previous Three Months
Figure 3

Multiple mediation model for pain intensity and pain-related disability through positive psychological factors
Appendix A: Demographic and Basic Information

Please answer the following questions about yourself

1. What is your gender?:
   a. Male ☐
   b. Female ☐
   c. Other (specify): ☐ ______________

2. Age (years): (drop-down menu with options from 17 to 50+)

3. Ethnicity (select all that apply):
   a. Aboriginal/First Nations/Metis ☐
   b. White/European ☐
   c. Black/African/Caribbean ☐
   d. Southeast Asian (e.g., Chinese, Japanese, Korean, Vietnamese, Filipino, etc.) ☐
   e. Arab (Saudi Arabian, Palestinian, Iraqi, etc.) ☐
   f. South Asian (East Indian, Sri Lankan, etc.) ☐
   g. Latin American (Costa Rican, Guatemalan, Brazilian, Columbian, etc.) ☐
   h. West Asian (Iranian, Afghani, etc.) ☐
   i. Other (please specify): ☐ ______________

4. Have you experienced pain in the past three months?
   a. Yes ☐
   b. No ☐

THE FOLLOWING QUESTIONS ARE FOR THOSE WHO INDICATE THAT THEY HAVE EXPERIENCED PAIN

5. If yes, what kind of pain have you experienced (select all that apply)?
   a. Abdominal/stomach pain ☐
   b. Headache/migraine ☐
   c. Joint pain ☐
      i. If joint pain, location: _________
   d. Back pain ☐
   e. Other (describe): ____________________________
6. Have you ever pursued medical treatment related to abdominal pain and related symptoms (e.g., change in stool consistency, discomfort)? Yes/no

7. If yes, please specify
   a. Emergency Room □
   b. Walk In Clinic □
   c. Family Doctor □
   d. Gastroenterologist □
   e. Other Specialist (describe): _________________________
   f. Other (describe): ___________________________________

8. Have you ever been diagnosed with a gastrointestinal disorder (e.g., Irritable Bowel Syndrome, Inflammatory Bowel Disease, Functional Abdominal Pain, Crohn’s Disease, etc.). yes/no.
   If yes, select:
   a. Functional Abdominal Pain □
   b. Functional Dyspepsia □
   c. Irritable Bowel Syndrome □
   d. Abdominal Migraine □
   e. Crohn’s Disease □
   f. Ulcerative Colitis □
   g. Other (Describe): _____________________

9. Have you ever been hospitalized for abdominal pain? yes/no
   If yes, for how long?
   a. Less than 1 day □
   b. 1-2 Days □
   c. 3-4 Days □
   d. 5-6 Days □
   e. 7-8 Days □
   f. Other (Specify): ________________
### Appendix B: Irritable Bowel Syndrome Symptoms *(Rome Foundation)*

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
</table>
| 1. In the last 3 months, how often did you have discomfort or pain anywhere in your abdomen? | 0 Never → discontinue  
1 Less than one day a month  
2 One day a month  
3 Two to three days a month  
4 One day a week  
5 More than one day a week  
6 Every day |
| 2. For women: Did this discomfort or pain occur only during your menstrual bleeding and not at other times? | 0 No  
1 Yes  
2 Does not apply because I have gone through menopause or I am a male |
| 3. Have you had this discomfort or pain 6 months or longer?               | 0 No  
1 Yes |
| 4. How often did this discomfort or pain get better or stop after you had a bowel movement? | 0 Never or rarely  
1 Sometimes  
2 Often  
3 Most of the time  
4 Always |
| 5. When this discomfort or pain started, did you have more frequent bowel movements? | 0 Never or rarely  
1 Sometimes  
2 Often  
3 Most of the time  
4 Always |
| 6. When this discomfort or pain started, did you have less frequent bowel movements? | 0 Never or rarely  
1 Sometimes  
2 Often  
3 Most of the time  
4 Always |
| 7. When this discomfort or pain started, were your stools (bowel movements) looser? | 0 Never or rarely  
1 Sometimes  
2 Often  
3 Most of the time  
4 Always |
| 8. When this discomfort or pain started, how often did you have harder stools? | 0 Never or rarely  
1 Sometimes  
2 Often  
3 Most of the time  
4 Always |
| 9. In the last 3 months, how often did you have hard or lumpy stools?      | 0 Never or rarely  
1 Sometimes  
2 Often  
3 Most of the time  
4 Always |
10. In the last 3 months, how often did you have loose, mushy or watery stools?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Never or rarely</td>
</tr>
<tr>
<td>1</td>
<td>Sometimes</td>
</tr>
<tr>
<td>2</td>
<td>Often</td>
</tr>
<tr>
<td>3</td>
<td>Most of the time</td>
</tr>
<tr>
<td>4</td>
<td>Always</td>
</tr>
</tbody>
</table>
Appendix C: Mindfulness

Please rate each of the following statements using the scale provided. Select the number that best describes your own opinion of what is generally true for you.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Never or Very Rarely True</th>
<th>Rarely True</th>
<th>Sometimes True</th>
<th>Often True</th>
<th>Very Often or Always True</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When I’m walking, I deliberately notice the sensations of my body moving.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I’m good at finding words to describe my feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. I criticize myself for having irrational or inappropriate emotions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I perceive my feelings and emotions without having to react to them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. When I do things, my mind wanders off and I’m easily distracted.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. When I take a shower or bath, I stay alert to the sensations of water on my body.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I can easily put my beliefs, opinions, and expectations into words.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. I don’t pay attention to what I’m doing because I’m daydreaming, worrying, or otherwise distracted.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I watch my feelings without getting lost in them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. I tell myself I shouldn’t be feeling the way I’m feeling.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. It’s hard for me to find the words to describe what I’m thinking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. I am easily distracted.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. I believe some of my thoughts are abnormal or bad and I shouldn’t think that way.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. I pay attention to sensations, such as the wind in my hair or sun on my face.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. I have trouble thinking of the right</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
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<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>words to express how I feel about things.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. I make judgments about whether my thoughts are good or bad.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>18. I find it difficult to stay focused on what’s happening in the present.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>19. When I have distressing thoughts or images, I “step back” and am aware of the thought or image without getting taken over by it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>21. In difficult situations, I can pause without immediately reacting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>22. When I have a sensation in my body, it’s difficult for me to describe it because I can’t find the right words.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>23. It seems I am “running on automatic” without much awareness of what I’m doing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>24. When I have distressing thoughts or images, I feel calm soon after.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>25. I tell myself that I shouldn’t be thinking the way I’m thinking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>26. I notice the smells and aromas of things.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>27. Even when I’m feeling terribly upset, I can find a way to put it into words.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>28. I rush through activities without being really attentive to them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>29. When I have distressing thoughts or images I am able just to notice them without reacting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>30. I think some of my emotions are bad or inappropriate and I shouldn’t feel them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>32. My natural tendency is to put my experiences into words.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
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<tr>
<td></td>
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<tr>
<td>---</td>
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<td>---</td>
<td>---</td>
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<td></td>
</tr>
<tr>
<td>33. When I have distressing thoughts or images, I just notice them and let them go.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>34. I do jobs or tasks automatically without being aware of what I’m doing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>36. I pay attention to how my emotions affect my thoughts and behavior.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>37. I can usually describe how I feel at the moment in considerable detail.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>38. I find myself doing things without paying attention.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>39. I disapprove of myself when I have irrational ideas.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Using the scale below as a guide, indicate how much you agree with each statement below.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In uncertain times, I usually expect the best.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. It’s easy for me to relax.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. If something can go wrong for me it will.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. I am always optimistic about my future.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I enjoy my friends a lot.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. It’s important for me to keep busy.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I hardly ever expect things to go my way.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. I don’t get upset too easily.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I rarely count on good things happening to me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. Overall, I expect more good things to happen to me than bad.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Appendix E: Positive Schema Questionnaire

Please read the following statements. To the right of each you will find six numbers, ranging from "1" (Completely untrue of me) on the left to "6" (Describes me perfectly) on the right. Choose the number which best indicates how much you believe each statement is true for you.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I believe in myself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. I feel I can depend on people to keep my secrets</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. I believe things will turn out well</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. I feel comfortable depending on other people</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. I have the ability to be successful</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. I can deal well with difficult situations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. I know how to find something good in every situation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. I think I have many good qualities</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9. I trust other people</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10. I can adapt to new situations</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11. I usually see the positive side of things</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>12. If I try hard I can usually do well</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>13. I can respond well to challenges</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>14. I value many things about myself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>15. I do well when I try my best</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>16. When things are bad I can still think of something good</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>17. I value myself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>18. I feel comfortable telling people important things about myself</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>19. If I try I will succeed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>20. I can deal with tough things</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Appendix F: Pain Experience

The next 8 questions all ask about your abdominal/stomach pain ONLY:

1. In a typical week, on how many days would you experience abdominal/stomach pain (select)?

   0  1  2  3  4  5  6  7

   a) How long does the pain last (select)?
      i. Less than one hour □
      ii. 1-2 hours □
      iii. 3-6 hours □
      iv. 7-10 hours □
      v. About half the day (11-14 hours) □
      vi. More than half the day (15-22) hours □
      vii. All day (23-24 hours) □

2. Where do you feel your abdominal/stomach pain (select)?

   a) Top-right section of my stomach □
   b) Top-left section of my stomach □
   c) Bottom-right section of my stomach □
   d) Bottom-left section of my stomach □
   e) Right in the centre, behind my belly button □

3. How would you describe your stomach pain (check)?

   Sharp □  Cutting □  Pressure □  Throbbing □  Dull □  Muscle Pain □
   Pinching □  Aching □  Cramping □  Stinging □  Scraping □  Pins and
   Needles □
4. On a scale of 0-10, where 0 means no pain and 10 means the worst pain possible, rate how much abdominal pain you have right now:

5. On a scale of 0-10, rate how much abdominal pain you have on an average day:

6. On a scale of 0-10, rate the highest/worst abdominal pain you had in the past week (7 days):

7. On a scale of 0-10, rate the lowest/best level of abdominal pain in the past week:

8. On a scale of 0-10, rate your overall level of abdominal pain in the last week:
Appendix G: Pain Self-Efficacy

THE FOLLOWING QUESTIONS SPECIFICALLY RELATE TO THE ABDOMINAL PAIN YOU HAVE EXPERIENCED

Please rate how confident you are that you can do the following things at present, despite the pain. To indicate your answer select one of the numbers on the scale under each item, where 0 = not at all confident and 6 = completely confident.

Remember, this questionnaire is not asking whether of not you have been doing these things, but rather how confident you are that you can do them at present, despite the pain.

<table>
<thead>
<tr>
<th></th>
<th>Not at All Confident</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I can enjoy things, despite pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. I can do most of the household chores (e.g., tidying up, washing dishes, etc.), despite the pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. I can socialize with my friends or family members as often as I used to, despite the pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. I can cope with pain in most situations.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. I can do some form of work, despite the pain. (“work” includes housework, paid and unpaid work).</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. I can still do many things I enjoy doing, such as hobbies or leisure activity, despite pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. I can cope with my pain without medication.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. I can still accomplish my goals in life, despite the pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9. I can live a normal lifestyle, despite the pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10. I can gradually become more active, despite the pain.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Appendix H: Pain-Related Disability

INSTRUCTIONS

Please answer the following questions about ALL of the abdominal pain you have had over the last 3 months. Type your answer in the box next to each question. Type zero if you did not have the activity in the last 3 months.

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. On how many days in the last 3 months did you miss work or school because of your abdominal pain?</td>
<td></td>
</tr>
<tr>
<td>2. How many days in the last 3 months was your productivity at work or school reduced by half or more because of your abdominal pain? (Do not include days you counted in question 1 where you missed work or school.)</td>
<td></td>
</tr>
<tr>
<td>3. On how many days in the last 3 months did you not do household work (such as housework, home repairs and maintenance, shopping, caring for children and relatives) because of your abdominal pain?</td>
<td></td>
</tr>
<tr>
<td>4. How many days in the last 3 months was your productivity in household work reduced by half of more because of your abdominal pain? (Do not include days you counted in question 3 where you did not do household work.)</td>
<td></td>
</tr>
<tr>
<td>5. On how many days in the last 3 months did you miss family, social or leisure activities because of your abdominal pain?</td>
<td></td>
</tr>
<tr>
<td>6. On how many days in the last 3 months did you have abdominal pain? (If abdominal pain lasted more than 1 day, count each day.)</td>
<td></td>
</tr>
<tr>
<td>7. On a scale of 0 - 10, on average how painful was this abdominal pain? (where 0 = no pain at all, and 10 = pain as bad as it can be.)</td>
<td></td>
</tr>
</tbody>
</table>