

The Relation of Trauma to the Persistence of Functional Abdominal Pain from Childhood into
Adolescence and Young Adulthood

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Submitted in partial fulfillment of the requirements for a Bachelor of Arts in Psychology with
Honors under the direction of Dr. Lynn Walker, Ph.D.

Vanderbilt University

March, 2012

Approved:

Date:

Acknowledgements

I would first and foremost like to express my utmost gratitude to Dr. Lynn Walker and her lab team for their guidance, support, and encouragement throughout my tenure as an honors student in the Walker Lab. Thanks also to Drs. Craig Smith, Leslie Kirby, and Megan Saylor for their tireless commitment to the academic development of curious young minds in the Honors Program in Psychological Sciences at Vanderbilt University.

Abstract

Traumatic life experiences in childhood, particularly sexual and physical assault and abuse, have been consistently related to poor physical and mental health outcomes later in life. There is some evidence linking such childhood trauma to subsequent medically unexplained, or “functional,” abdominal pain (FAP). However, the clinical significance and course of the symptomology within this relationship have yet to be fully understood. To examine this, the current study followed a cohort of pediatric FAP patients from childhood into adolescence and young adulthood. We hypothesized that, at the time of the long-term follow-up, adolescents and young adults who reported a history of trauma would be more likely than those without a history of trauma to report clinically significant abdominal pain as defined by the Rome III diagnostic criteria for an abdominal pain-related functional gastrointestinal disorder (FGID). We also hypothesized that, among individuals who met criteria for an FGID at follow-up, those who reported a history of trauma would be at increased risk for developing psychiatric comorbidities and additional sites of chronic pain beyond the gastrointestinal system. Results supported both hypotheses, suggesting that trauma may contribute to the persistence of clinically significant FAP over time. Implications of these findings and directions for future research will be discussed.

Keywords: functional gastrointestinal disorder, Rome III, trauma, chronic pain

Introduction

Recent statistics indicate that more than 800,000 cases of child abuse occur each year, with an estimated 85% of abuse cases going unreported (Edwards, Holden, Felitti, & Anda, 2003). There is strong and consistent evidence linking abuse in childhood and adolescence to poor health status in adulthood. In a recent meta-analysis of 31 studies examining the long-term health outcomes associated with childhood abuse, Irish and colleagues (2009) found evidence that individuals with a history of abuse had significantly poorer physical health status across multiple domains compared to those with no abuse history. Abuse was consistently related to higher rates of physical symptoms including general, gynecological, gastrointestinal, and cardiopulmonary health, as well as increased rates of general pain and obesity. Several studies also have examined the relationship between abuse and psychological health outcomes, with results linking childhood abuse to increased rates of depression, anxiety, post-traumatic stress disorder, substance abuse, and suicide in adulthood (Fergusson, Boden, & Horwood, 2008; Flaherty et al., 2006; Neumann, Houskamp, Pollock, & Briere, 1996; Paolucci, Genuis, & Violato, 2001). Despite the strong evidence of an association between abuse and poor health outcomes, the underlying mechanisms accounting for this relationship have yet to be fully understood.

Several studies have examined the relation of sexual and physical abuse to gastrointestinal symptoms, particularly medically unexplained, or “functional” gastrointestinal symptoms. The prevalence of abuse history among individuals with functional abdominal pain (FAP) in clinical samples has been found to be as high as 53%, which is substantially higher than the 37% prevalence of abuse history in those whose gastrointestinal symptoms are disease-related (Drossman, 1995). Studies of gastrointestinal symptoms in community samples have

shown similar patterns. Talley and colleagues (1994) found that 43.1% of community members in Minnesota with irritable bowel syndrome (IBS) symptoms reported a history of abuse while only 19.4% of healthy residents without IBS symptoms reported such histories.

Existing studies of the relationship between childhood abuse and functional abdominal pain in adulthood have several limitations in their experimental designs. For example, Leserman (2005) noted that the literature has inconsistencies in defining the degree and nature of abuse (e.g., forced penetration versus exposure to pornography), as well as inconsistencies in the reliability of different methods of abuse assessment such as clinical interview versus anonymous mail-in survey. Even further, the reliability and validity of self-report measures of GI symptoms also is unclear. As no studies have applied the Rome III diagnostic criteria, the clinical significance of gastrointestinal symptomology associated with abuse is not yet fully understood. Moreover, no studies have examined the relation of abuse to the persistence of gastrointestinal symptoms over time, and therefore the duration of the impact of abuse on GI symptoms is unknown. Finally, the prevalence of psychiatric and other somatic comorbidities in persons reporting abuse history who meet diagnostic criteria for a Rome III functional gastrointestinal disorder has yet to be identified.

The goal of this study was to examine the relationship of trauma, defined as both sexual and physical assault and abuse, to the course of functional abdominal pain (FAP) from childhood into adolescence and young adulthood. We used the Rome III (Drossman et al., 2006) diagnostic criteria for abdominal pain related functional gastrointestinal disorders (FGID) as our primary outcome variable. We hypothesized that, among individuals with a history of childhood-onset FAP, those who reported a history of trauma would be at increased risk for persistent FAP consistent with a Rome III FGID at long-term follow up in adolescence and young adulthood. In

addition, because of evidence linking trauma to multiple adverse outcomes, we hypothesized that among those who met criteria for an FGID at follow up, those who reported a history of trauma would exhibit a significantly higher incidence of comorbid anxiety or depressive disorders, as well as a higher incidence of non-abdominal chronic pain at follow-up.

Methods

Design and Sample

Data for this study were drawn from the database of a prospective cohort study on the health outcomes of pediatric chronic abdominal pain patients (Walker, 2011). Between 1993 and 2004, subjects ages 8 to 16 years old were recruited upon referral to a tertiary care gastroenterology clinic for evaluation of chronic abdominal pain. Initial enrollment criteria included recurrent abdominal pain of at least 3 months in duration and the absence of chronic illness or organic gastrointestinal disease diagnosis from the referring physician. Participants were later excluded from the current study if subsequent gastrointestinal evaluation at Vanderbilt provided evidence of significant organic abdominal disease.

Follow-up data from this initial cohort were collected on 335 participants an average of 10.7 (s.d=3.56) years after initial evaluation. Of those who participated in follow-up data collection, three subjects were unable to complete all necessary forms, and one was excluded due to pregnancy, leaving a final follow-up sample of 331 (64% female; 91.2% Caucasian; mean age=20.7). Subjects were categorized as resolved FAP (n=199) or unresolved FAP (n=132), based on the presence or absence of symptoms consistent with Rome III criteria for abdominal-pain related FGID at follow-up. Individuals who participated in the follow-up did not differ significantly from non-participants on gender, race, age, or baseline pain severity. For

participants under age 18 at follow-up (N=68; mean age=15.5), a parent completed a portion of the measures on behalf of the child.

Measures

The Persistent Pain Questionnaire: PPQ (Bruehl, France, France, Harju, & al'Absi, 2005) was designed to provide a structured assessment of history and location of any chronic pain. The PPQ lists the nine standard body locations described by the International Association for the Study of Pain, illustrated with a human figure drawing, and asks the respondent to indicate whether he/she currently experiences chronic pain at any of the specified body locations. This measure was used to assess for the presence of non-abdominal chronic pain, and was completed by the parent on behalf of the child if the child was under the age of 18 years old at initial follow-up.

The Rome III Diagnostic Questionnaire for Functional Gastrointestinal Disorders: Rome III (Drossman, et al., 2006) — is a self-report measure used to identify individuals who meet the Rome III criteria for functional gastrointestinal disorders (FGIDs). For the current study, only the 24-item segment that screens for abdominal pain related FGIDs (irritable bowel syndrome, functional dyspepsia, abdominal migraine, and functional abdominal pain) was used. Participants respond to inquiries of the frequency and duration of various abdominal pain symptoms, the results of which are scored to determine whether they meet criteria for an FGID.

The Anxiety Disorders Interview Schedule-IV: Adult Lifetime and Child and Parent Versions: ADIS (Dinardo, Brown, & Barlow, 1994; Silverman & Albano, 1996) — The ADIS is

a semi-structured interview designed to assign DSM-IV diagnoses based on participant report.

The ADIS was designed to focus on anxiety disorders, but also includes modules for the evaluation of mood disorders, somatoform disorders, and some externalizing disorders. The ADIS was used in this study to screen for the current presence or absence of an anxiety or depressive disorder, as well as a history of sexual or physical trauma. For anxiety and depression scores of participants under the age of 18 years old at initial follow-up, a composite parent-child score was calculated.

Coding of Trauma. Trauma data were collected from the post-traumatic stress disorder portion of the ADIS clinical interview, which includes assessment of traumatic events that are physical or sexual in nature. If willing, participants recounted a description of each traumatic event and the age at which it occurred. A research assistant then listened to audio-recordings of each clinical interview, and coded each incident as sexual or physical trauma in accordance with the criteria proposed by Leserman and colleagues (1995, 1997) in their structured abuse and trauma interview. Traumatic events were defined as sexual in nature if they included 1.) unwanted touching of the subject's sexual organs with hands, mouth, or objects, 2.) having the subject touch the perpetrator's sexual organs or anus with hands, mouth, or objects, or 3.) having the subject participate in vaginal or anal intercourse against their will. Traumatic events were defined as physical in nature if they included 1.) life threat through being physically attacked with or without a weapon, with the intent to kill or seriously injure, or 2.) other physical assaults such as being kicked, hit, beat up, bit, or burned by another person outside of normal disciplinary spanking or children fighting. Singular isolated events were coded as sexual or physical assault,

and recurrent events were coded as sexual or physical abuse. The term “any trauma” refers to a combination of these four categories.

Procedure

Data for the current study were collected in two primary segments under the approval of the Vanderbilt Institutional Review Board. The first part of the study consisted of telephone health interviews of approximately 45 minutes in duration. The second part of the study consisted of an hour-long diagnostic interview administered either over the telephone or in person depending on the participant’s interest in coming to the research laboratory. Adult participants who came to the laboratory received \$100 for participation and \$20 toward travel costs. Parent and adolescent participants who came to the laboratory received \$100 for teen participant, \$30 for parent participation, and \$20 toward travel costs. A bonus of \$20 was provided for completing the first scheduled laboratory appointment. Adult and adolescent participants who completed both interviews by phone received \$50 for participation. Parents of adolescent participants who completed both interviews by phone received \$30 for their participation. A bonus of \$10 was provided to phone participants for completing their first scheduled phone appointments.

Health Interview. For the first portion of the study, participants were contacted by telephone at a scheduled time by a research team member. Upon obtaining informed consent from adult and parent participants and informed assent from adolescent participants, research team members read question stems and response options to participants, and provided clarification when appropriate. All interviews were audio recorded. After the interview, the participant was confirmed or scheduled for the next part of the study that would either take place in the

laboratory or over the phone. In some cases, the health interview was administered in the laboratory prior to administration of the diagnostic interview.

Diagnostic Interview. For participants who came to the research laboratory, a research team member administered the Anxiety Disorders Interview Schedule (ADIS) diagnostic interview. After the interview, participants completed additional measures on Survey Monkey either in the lab or upon returning home. For participants who did not come to the research laboratory, the ADIS was administered over the phone, and the subsequent Survey Monkey measures were emailed or mailed to the participant. In both cases, participants were informed beforehand that interviews typically last 1 hour.

Statistical Analyses

All data were analyzed using SPSS version 17 for Windows (SPSS, Inc., Chicago, IL). Type 1 error rate values for all analyses were set as two-tailed with a $p < 0.05$ criterion for significance. Three binary logistic regression analyses were conducted with trauma as the independent variable, and presence of an FGID, FGID comorbid with additional non-abdominal chronic pain, and FGID comorbid with a current anxiety or depressive disorder as the dependent variables, respectively. All analyses were conducted controlling for gender, baseline pain severity, and age at follow-up.

Results

Trauma Characteristics of the Cohort

Overall, 20.5% of the 335 person cohort reported one or more types of trauma. Within the cohort, the most common type of trauma reported was sexual assault (N=35, 10.6%), followed by physical assault (N=31, 9.5%), physical abuse (N=10, 3.0%), and sexual abuse (N=6, 1.8%). 12 individuals in the cohort (17.6%) experienced both sexual and physical trauma, and of those reporting any type of trauma (N=68), the majority were female (N=51, 75%).

Longitudinal Associations of Trauma History

As can be seen from Table 1, logistic regression analyses yielded significant associations between retrospective self report of trauma and FGID recovery status. Odds ratios indicate that adolescents and young adults who reported a history of sexual or physical trauma were at increased risk for persistent clinically significant abdominal pain as defined by Rome III diagnostic criteria for FGIDs at long term follow-up. Those reporting a history of trauma were also shown to be at increased risk for meeting DSM-IV criteria for a current anxiety or depressive disorder, as well as the development of multiple sites of non-abdominal chronic pain. Figure 1 shows that these diagnoses and symptoms are disproportionately represented among victims of trauma when compared to those who did not report such histories.

Comorbid Chronic Pain Sites

As hypothesized, adolescents and young adults who reported a history of trauma at long term follow-up were at increased risk for developing other sites of chronic pain in addition to meeting Rome III criteria for an FGID. 50% (N=34) of those who experienced trauma developed at least

one or more additional site of chronic pain, with the most frequent sites of comorbid pain being in the shoulder, lower back, and legs, respectively.

5. Discussion

The current study examined the relation of retrospective self reports of trauma, defined as both sexual and physical assault and abuse, to the persistence of functional abdominal pain from childhood into adolescence and young adulthood. Compared to those reporting no history of trauma, participants with a history of pediatric functional abdominal pain who reported one or more instances of trauma were significantly more likely to meet Rome III criteria for an abdominal pain-related FGID at long term follow up. Additionally, those who reported a history of trauma also were significantly more likely than those without such histories to report sites of non-abdominal chronic pain and to meet DSM-IV criteria for a current anxiety or depressive disorder at follow-up

Although our results link sexual and physical trauma to the persistence of abdominal pain from childhood into adolescence and young adulthood, as well as to the development of psychiatric and other pain comorbidities, the mechanisms underlying these associations are not yet understood. The literature has identified several potential mediators of the association between trauma and poor health outcomes. For example, both direct injury from medical procedures (Anand, Runeson, & Jacobson, 2004), and from trauma itself (Leserman et al., 1997), have been associated with increased reports of unexplained GI symptoms and other somatic complaints later in life, potentially through long-lasting changes in nociceptive processing (Drossman, 2006; van Tilburg et al., 2010). Sexual abuse and other psychosocial stressors have also been hypothesized to influence GI symptomology through dysregulation of the

hypothalamic-pituitary-adrenocortical (HPA) axis, which may lead to increased baseline and stress-responsive autonomic activation (Heim et al., 2000; Leserman, 2005). Such an increase in arousal has been linked to visceral hypersensitivity and increased gastrointestinal motor reactivity in response to stress, particularly among patients with irritable bowel syndrome (Drossman, 2006; Murray et al., 2004). Sachs-Ericsson and colleagues (2009) suggested that some of the poor mental and physical health outcomes of those who report histories of sexual and physical abuse may be due to the fact that abuse survivors often have lower levels of perceived social support, which may exacerbate perceived pain intensity in response to nociceptive stimuli, as well as influence the development of depression (Golding, Wilsnack, & Cooper, 2002; Plant & Sachs-Ericsson, 2004). Finally, the health behavior of trauma victims also may play a role in the development of poorer physical and mental health status, as adult survivors of physical and sexual abuse are more likely to be obese, use alcohol and tobacco, and engage in riskier sexual and non-sexual activities that may affect GI function. (Kendall-Tackett, 2002; Parillo, Freeman, Collier, & Young, 2001; Williamson, Thompson, Anda, Dietz, & Felitti, 2002; Wilsnack, Vogeltanz, Klassen, & Harris, 1997).

As only a small number of our sample reported experiencing their first episode of trauma before our initial evaluation of FAP symptoms in childhood, our study suggests that trauma may not only be an etiological factor in FAP but may also influence the persistence of already present functional pain. Similarly, it could be that chronic stress of environments that facilitate the perpetuation of trauma, such as those lacking adequate adult support and supervision, may be more etiological of FGIDs than the acute stressful experience of trauma itself. Differentiating between these acute and chronic stressors that may contribute to the development of FGIDs will be important in future investigations into the nature of this relationship.

It also is possible that the psychiatric sequelae of traumatic experiences precede the emergence of FGIDs, and are therefore a more relevant factor in their development than the traumatic experiences themselves. Future longitudinal studies will benefit from including repeated evaluations over time in order to identify the sequence of symptom emergence among children who experience trauma. This may lead to a better understanding of the complex etiology of FGIDs, as well as enhance the development of more targeted interventions for their prevention and treatment.

Unexplained abdominal pain and related GI symptoms are common among community samples, yet only around 1 in 5 individuals who report abdominal pain symptoms feel their pain is disruptive enough to seek medical attention (Hadler & Locke, 2009). A strength of the current work is that, unlike studies of the relationship between trauma and gastrointestinal health that measure outcomes with unvalidated measures of abdominal symptoms experienced in the days preceding the assessment, the use of a validated measure such as the Rome III diagnostic criteria for FGIDs allowed us to assess whether symptoms were clinically significant. When used concurrently with the semi-structured interview for psychiatric diagnoses and trauma through administration of the Anxiety Disorders Interview Schedule-IV, we were able to examine the relationship between trauma and functional abdominal pain outcomes using more stringent criteria than conventionally utilized. These findings not only add validity to the relationship between trauma and FGIDs in general, but also serve as a model through which future studies can better understand the severity of GI symptomology associated with trauma.

Nevertheless, the current study also has several limitations to consider. Although retrospective self-reports of sexual and physical trauma were acquired through clinical interview either in person or over the phone, the Anxiety Disorders Interview Schedule-IV was not

designed specifically for the screening of trauma, which may have allowed us to overlook relevant traumatic experiences. A more sensitive and empirically validated measure of trauma assessment should be used in future research in this area. In addition, the current study was conducted using a clinical population, so a selection bias may have exaggerated psychiatric and somatic complaints of the cohort which limits our ability to generalize findings to non-clinical populations. More studies using sensitive trauma assessments are needed in both clinical and non-clinical populations in order to gain a more precise understanding of the relation of traumatic experiences to the emergence and persistence of FGIDs.

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Tables

Table 1.

Odds ratios and confidence intervals comparing the groups on outcomes, controlling for sex and age at follow-up.

	FGID	<i>p</i> -value	FGID + Other Chronic Pain	<i>p</i> -value	FGID + Anx/Dep	<i>p</i> -value
No Trauma	REFERENT		REFERENT		REFERENT	
Trauma	2.2 CI (1.3, 3.9)	< 0.01	3.3 CI (1.7, 6.4)	< 0.01	2.8 CI (1.5, 5.2)	< 0.01

Note: Analyses adjusted for sex and age at follow-up. FGID = Functional Gastrointestinal

Disorder; Anx/Dep = Anxiety of Depression; NS = nonsignificant; CI = Confidence Interval

Table 2.

Number of chronic pain sites in addition to abdominal pain at follow-up.

**Table 2: Number of Additional Sites of
Chronic Pain**

# of sites	Frequency
0	N=34 (50%)
1	N=12 (17.6%)
2	N=13 (19.2%)
3 or more	N=9 (13.2%)

Figure Captions

Figure 1. *Relation of abuse history to presence of FGID, FGID with chronic pain, and FGID with DSM-IV anxiety or depressive disorder in adolescents and young adults*

Figures

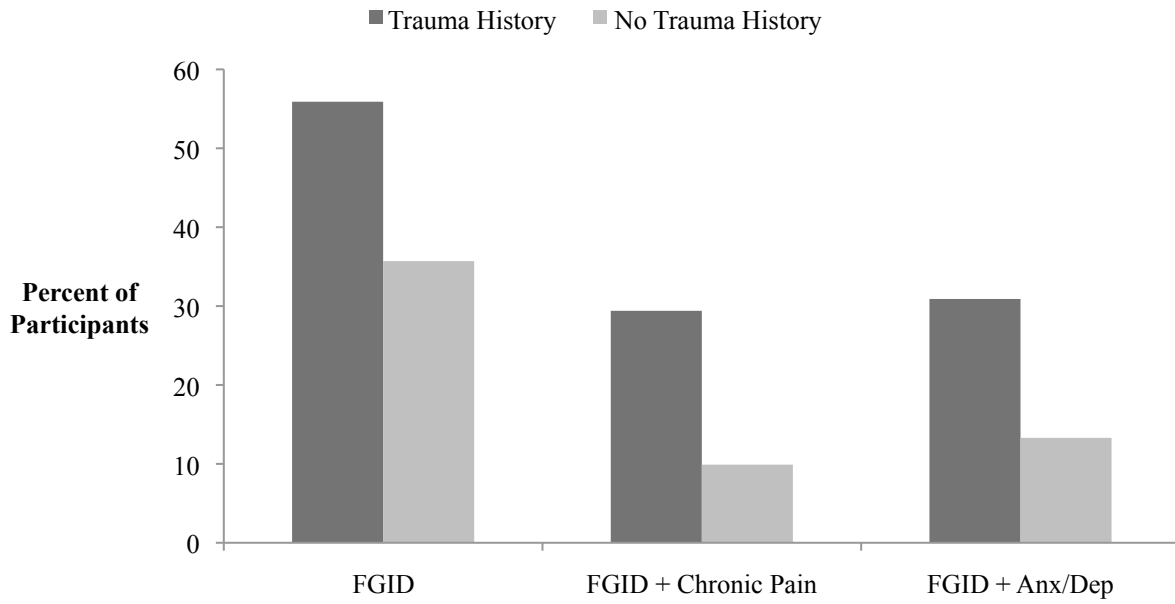


Figure 1.