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Positive schemas, coping, and quality of life in pediatric recurrent abdominal pain

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Positive Schemas, Coping, and Quality of Life in Pediatric Recurrent Abdominal Pain

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Abstract

Pediatric recurrent abdominal pain is commonly associated with negative impacts on quality of life (QOL). Positive schemas (core beliefs about the self with subthemes of self-efficacy, optimism, trust, success, and worthiness) are a resilience factor that has not yet been examined within a pediatric recurrent pain context. This cross-sectional study examined (a) associations between positive schemas, pain coping, and youth QOL, and (b) exploratory analyses to investigate whether specific positive schema subthemes predicted QOL outcomes in youth with recurrent abdominal pain. Participants were 98 youth with recurrent abdominal pain (i.e., pain related to a disorder of gut–brain interaction [DGBI] or organic cause) who completed measures on positive schemas, QOL, and pain coping. Age and diagnostic status were controlled for in analyses. Positive schemas were significantly positively correlated with emotional, social, school, and overall QOL, as well as with approach and problem-focused avoidant coping, and significantly negatively correlated with emotion-focused coping. Worthiness was the strongest and only significant predictor of youth social functioning. Positive schemas may be an important cognitive resilience factor to consider within interventions for pediatric recurrent pain.

Keywords Pediatric abdominal pain · Positive schemas · Quality of life · Coping

Introduction

Pediatric gastrointestinal (GI) disorders encompass a range of abdominal and digestive disorders experienced by children and adolescents (herein “youth”). The cause of pediatric GI disorders varies and can be conceptualized as a disorder of gut–brain interaction (DGBI), previously referred to as ‘functional’ gastrointestinal disorders, or those that cannot be fully explained by a pathologic cause, including

functional abdominal pain and irritable bowel syndrome; (Hyams et al., 2016; Sayuk, 2021) or ‘organic’ in nature (can be identified by pathologic abnormalities in the GI tract, such as Inflammatory Bowel Disease (IBD); Diefenbach & Breuer, 2006). Regardless of cause, youth with GI disorders commonly report recurrent abdominal pain as a symptom (Diefenbach & Breuer, 2006; Hyams et al., 2016). Moreover, youth with IBD can also experience IBS-related symptoms (e.g., pain) while in remission (Teruel et al., 2016), suggesting that recurrent abdominal pain may be a common experience for youth with both DGBI and ‘organic’ abdominal disorders. The maintenance of pediatric GI symptoms, such as recurrent pain, is best conceptualized by a biopsychosocial approach, which emphasizes the importance of psychological (e.g., cognitions, emotions) and social factors (e.g., environmental stressors, parents/family), in addition to the biological ones (Reed-Knight et al., 2017). Youth with recurrent abdominal pain report significantly lower physical, emotional, social, and academic quality of life (QOL) compared to youth with other chronic conditions (Warschburger et al., 2014), and are at risk of experiencing chronic pain in adulthood (Jawaid et al., 2019; Walker et al., 2010).

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However, not all youth with recurrent abdominal pain experience long-term consequences (Mackner & Crandall, 2005; Walker et al., 2010), suggesting there are psychosocial factors that can differentiate risk and resilience among these youth.

The resilience-risk model for pediatric chronic pain (Cousins et al., 2015a, b) was adapted from the original resilience-risk model for adults with chronic pain (Sturgeon & Zautra, 2010). Defined broadly, chronic pain can be characterized by pain that is persistent or recurrent and may be caused by an identifiable condition (e.g., IBD) or without any known physiological cause (e.g., DGBI). Therefore, this model provides a useful framework to examine potential risk (i.e., exacerbate pain experience) and resilience (i.e., promote adaptation to pain) factors in recurrent abdominal pain. This model also conceptualizes resilience as being both a relatively stable individual trait/capacity, as well as a process wherein an individual harnesses personal resources to adapt when faced with adversity and stress (Cousins et al., 2015a, b). Research on resilience in pediatric chronic/recurrent pain has predominantly focused on *pain-specific* factors such as pain acceptance and pain self-efficacy on pain and functional outcomes (e.g., Beekman et al., 2019; Kalapurakkel et al., 2015; Lee et al., 2020; Tomlinson et al., 2021, 2017a, b). Theoretically, however, these pain-specific factors may be fostered *after* a youth is faced with chronic/recurrent pain, and there may be other general underlying traits that also contribute to resilience. For example, optimism (conceptualized as a relatively stable individual trait) has been associated with higher QOL and lower functional disability in youth with chronic pain (Cousins et al., 2016, 2015a, b), and with higher QOL in youth with recurrent abdominal pain (Tomlinson et al., 2021). Further, a previous study on the role of self-esteem (i.e., an evaluation of one's worth) in youth with "functional somatic complaints" (including youth with recurrent DGBI related pain) found significantly lower self-esteem in youth with DGBI compared to well youth (Robinson et al., 1988). In addition to self-esteem, youth with DGBI have been found to have significantly lower self-reported self-efficacy (as reviewed by Newton et al., 2019), which is also associated with higher functional disability. These studies suggest the potential role of these broader, underlying factors, though there remains relatively little research on these factors.

Cognitive schemas are core beliefs that shape the interpretation and evaluation of one's experiences, and individuals have both negative *and* positive schemas that contribute to outcomes (Dozois & Beck, 2008). The robust relations of negative schemas (e.g., core beliefs that one is not worthy or that others cannot be trusted) in predicting psychopathology among children, youth, and adults have been established (e.g., Cole et al., 2011; Dozois & Beck, 2008). In contrast, positive schemas are core beliefs about the self with themes

of self-efficacy, optimism, trust, success, and worthiness (Keyfitz et al., 2013), and have been relatively less studied. Among youth and young adults, positive schemas have been linked to lower depressive and anxiety symptoms, and higher levels of well-being and life satisfaction (Keyfitz et al., 2013; Lumley & McArthur, 2016; McArthur et al., 2018). Further, low levels of positive schemas appear to be as strong of a predictor of depressive symptoms and life satisfaction as high levels of negative schemas (Cherry & Lumley, 2019; Tomlinson et al., 2017a, b), highlighting their importance in clinical assessment and treatment. Youth positive schemas have also demonstrated stability over time (Cherry & Lumley, 2019; McArthur et al., 2019), suggesting a potentially robust/stable protective factor in the context of adverse life experiences, such as experiencing recurrent pain. Thus, positive schemas provide a unifying cognitive resilience construct that brings together variables that have been investigated in pediatric chronic pain (e.g., optimism, worthiness, self-efficacy) as well as novel variables for this population (e.g., trust, success).

Though the emerging evidence is promising regarding the role of positive schemas and youth functioning/well-being, research is scant in pediatric chronic health conditions. To date, one study has examined the role of positive schemas in youth with cancer, and found that greater self-reported positive schemas were significantly associated with higher overall QOL and social functioning, though not with physical, emotional, or academic functioning (McArthur et al., 2017). Though McArthur et al. (2017) examined a modest sample of participants ($n = 23$), results suggested that positive schemas may be an important resilience factor for youth with longstanding health concerns. Given that cognitive schemas are often targeted in cognitive behavioral interventions (Beck, 2011), an understanding of positive schemas in pediatric recurrent pain may be important for identifying cognitive constructs that could be targeted in interventions. Further, in addition to overall levels of positive schemas, it is possible that specific subthemes may uniquely predict different aspects of functioning. For example, the subtheme of trust may be important for social functioning, though this has not yet been examined. In the extant literature, self-efficacy and optimism have demonstrated a protective role for pediatric chronic/recurrent pain (Cousins et al., 2016; Tomlinson et al., 2017a, b). In school-based samples of youth, worthiness (believing that one has value and worth as a person), strongly and uniquely predicted depressive symptoms, life satisfaction, and happiness (Keyfitz et al., 2013; Tomlinson et al., 2017a, b). Thus, understanding the role of positive schemas as a broad, underlying factor, as well as an exploratory examination of the potential role of specific subthemes on different aspects of functioning may further clarify specific domains to target in interventions, particularly those taking a strength-based approach (e.g.,

Padesky & Mooney, 2012). Clinically, this may be important to assess and understand the role of broader resilience among youth with recurrent abdominal pain, as well as specific cognitive factors to target within interventions.

In the original adult resilience-risk framework for chronic pain, it was posited that resilience factors contribute to optimal outcomes by associating with adaptive pain coping (Sturgeon & Zautra, 2010). Therefore, it is also possible that having higher levels of positive schemas may influence how a youth manages their pain, which ultimately impacts their QOL. Within pediatric recurrent abdominal pain, pain coping has been identified as an important, though relatively less studied psychosocial factor (Murphy et al., 2020). In youth with chronic/recurrent pain, an “approach” style of coping (e.g., attempts to actively regulate oneself when faced with pain) has been associated with lower functional disability and depression (Kashikar-Zuck et al., 2001; Reid et al., 1998), whereas an emotion-focused avoidant style (e.g., internalizing/externalizing behaviors) has been associated with higher pain and emotional distress (Eccleston et al., 2004; Reid et al., 1998; Walker et al., 2005), and lower QOL when in pain (Merlijn et al., 2006). Research on a problem-focused avoidant coping style (i.e., distraction) has been inconsistent, with some studies finding an association with lower pain (Thastum et al., 2001), and others finding no association with pain nor disability (Reid et al., 1998; Vetter et al., 2013). Prior to investigating the longitudinal mediation model that Sturgeon and Zautra’s (2010) theory posits, it is necessary to first establish cross-sectional relations among positive schemas, pain coping, and functioning variables for this population.

This study aimed to investigate the role of resilience-related factors on QOL in youth (up to 18 years) with recurrent abdominal pain. Specifically, the primary aim of this study was to describe the relations between positive schemas, pain coping, and QOL in youth with recurrent abdominal pain. Based on the previous research in school-based samples and youth with cancer, it was hypothesized that positive schemas would a) significantly correlate with higher overall, social, emotional, physical, and school QOL, and b) significantly associate with greater approach coping and lower emotion-focused avoidant coping. Given the inconsistent literature on problem-focused coping, a directional hypothesis was not made, though a significant effect was expected. Finally, an exploratory aim of this study was to examine whether specific positive schema subthemes uniquely predicted QOL in youth with recurrent abdominal pain. Given the lack of extant research in this domain, specific hypotheses were not formulated.

Method

Participants and Procedure

This study was part of a larger study examining positive psychological variables in youth with recurrent abdominal pain and their parents. A separate paper (Tomlinson et al., 2021) from the same dataset has been published, examining whether optimism and pain self-efficacy serve as buffers between pain and QOL. This paper examines different and distinct factors (i.e., positive schemas, pain coping), as well as individual QOL domains (e.g., physical, emotional, social, and school functioning).

Participants were new patients visiting a tertiary care pediatric gastroenterology clinic within a children’s hospital in Canada. Inclusion criteria were youth between 8 and 17 years with self-reported current abdominal pain and a diagnosis of either a DGBI (e.g., irritable bowel syndrome) or organic GI disorder (e.g., Crohn’s disease).¹ This diagnosis was made by a gastroenterologist. Youth who did not have the ability to read and complete the questionnaires (e.g., could not read in English, significant developmental delays) were excluded. Following informed consent and assent, youth were asked to complete each of the self-reported measures; questionnaires were completed either in person or online during a clinic visit. Youth between 8 and 12 years were asked to complete the measures with the help of a parent/caregiver to ensure their understanding of the questions, and older youth completed them independently. Participating youth were entered into a draw to win a \$25 gift card. Approval from the institutional research ethics boards (hospital, university) were received for this study.

Data were collected between January 2014 and June 2017. One hundred eleven youth provided informed consent/assent to participate in this study. Thirteen were excluded for not reporting current abdominal pain ($n = 11$) or not completing measures ($n = 2$).

Measures

Quality of Life

The Pediatric QOL Inventory Generic Core Scales (Ped-sQL) is a 23-item self-report scale used to assess for QOL in youth between the ages of 8 and 17 years (J W Varni et al., 2001). Items are rated on a 5-point scale ranging from 0 (“Never”) to 4 (“Almost always”). Subscale scores (physical, emotional, social, and school) and a total score can be

¹ Zero-order correlations and independent samples t-tests were conducted to examine whether any of the outcome variables differed depending on diagnostic status (i.e., DGBI or organic diagnosis).

computed, with higher scores indicating higher QOL. The PedsQL has demonstrated adequate internal consistency, as well as concurrent and construct validity (J W Varni et al., 2001). Internal consistencies in this study were adequate for the total scale ($\alpha=0.91$), as well as for the physical ($\alpha=0.83$), emotional ($\alpha=0.73$), social ($\alpha=0.79$), and school functioning subscales ($\alpha=0.78$).

Positive Schemas

The Positive Schema Questionnaire (PSQ) is a 20-item measure used to assess positive schemas in youth (Keyfitz et al., 2013), consisting of five subscales including optimism (“*I believe things will turn out well*”), self-efficacy (“*I can deal with tough things*”), success (“*If I try I will succeed*”), trust (“*I feel comfortable depending on other people*”), and worthiness (“*I value myself*”). Items are rated on a 6-point scale from 1 (“*Completely untrue of me*”) to 6 (“*Describes me perfectly*”). Both subscale and total scores can be calculated, with higher scores indicating higher endorsement of positive schemas. The PSQ has demonstrated adequate internal consistency, face, and discriminant validity (Keyfitz et al., 2013). In our sample, internal consistency was high for the total scale ($\alpha=0.95$) and the subscales ($\alpha=0.86$ – 0.91).

Pain Coping

The Pain Coping Questionnaire (PCQ) is a 39-item measure used to assess pain coping styles in youth with chronic pain (Reid et al., 1998). Items are rated on a 5-point scale ranging from 1 (“*Never*”) to 5 (“*Very Often*”). Three higher-order coping styles can be calculated. The approach subscale consists of information seeking, seeking social support, positive self-statements, and problem solving. The problem-focused avoidance subscale consists of behavioral and cognitive distraction. The emotion-focused avoidance subscale consists of internalizing and externalizing behaviors. The PCQ is considered a well-established measure with good internal consistency (Blount et al., 2008; Reid et al., 1998). Internal consistencies for this study were adequate ($\alpha=0.91$ for approach and problem-focused avoidance subscales; $\alpha=0.86$ for the emotion-focused avoidance subscale).

Analytic Plan

Analyses were conducted using the Statistical Package for Social Sciences software program (SPSS version 26) and R Studio. Data were checked for normality; most scores (e.g., total positive schemas, positive schema subthemes, all PedsQL subscales) were found to be non-normally distributed (i.e., Shapiro–Wilk test $p < 0.05$). Therefore, non-parametric Spearman correlations were used to test associations between positive schemas, QOL, and pain coping.

Descriptive statistics and 95% confidence intervals (CI) were calculated.

Youth age and diagnostic status were included as control variables in all analyses. Gender² was not significantly associated with any of the variables in this study, thus, to maximize power and offer the most interpretable results, only youth age and diagnostic status were controlled for in analyses. Multiple regression analyses were conducted to examine how the positive schema subthemes related to QOL outcomes. Data were standardized and scores were centered prior to the regression to account for multicollinearity. The relative importance of the predictors (i.e., positive schemas subthemes) was calculated using R Studio (‘relaimpo’ package for CRAN). Relative importance was calculated using the recommended approach of averaging the sequential sums of squares over all of the orderings of the independent variables (Grömping, 2007). This method further partitions the R^2 of the total model for each of the subthemes, thus providing an indicator of relative importance.

A power analysis was conducted using R studio; to test study hypotheses using correlations and multiple regression (7 predictors) with a power of 0.8 and a significance (alpha) level of 0.05, a minimum sample of 85 and 102 participants were required to detect medium-sized effects, respectively. Thus, results for the multiple regression are slightly underpowered.

Results

Participants

The final sample included 98 youth (42.9% male, 57.1% female), between 8 and 17 years ($M=13.38$, $SD=2.85$) who reported experiencing abdominal pain for an average of 3.57 years ($SD=3.74$). Most participants identified as white (86.7%), with a minority identifying as Black (5.1%), Asian or East Indian (4%), and First Nations (1%). Over half of the youth had a diagnosis of a DGBI (60.2%) and slightly fewer had an organic GI disorder (39.8%). See Table 1 for more information on demographic variables.

Zero-order correlations and independent samples t -tests were conducted to compare outcomes depending on diagnostic status (i.e., DGBI or organic disease). Youth with a DGBI reported significantly lower overall QOL ($t[96] = -2.11$, $p < 0.05$; DGBI, $M=63.75$, $SD=17.54$; organic GI diagnosis, $M=71.37$, $SD=17.66$) and emotional functioning on the PedsQL ($t[96] = -3.05$, $p < 0.01$, DGBI, $M=58.73$, $SD=23.16$; organic GI diagnosis, $M=72.31$,

² In this study, gender was a parent-reported variable based on “male” or “female”.

$SD = 18.98$) compared to youth with an organic GI disorder. Group differences on physical functioning approached statistical significance ($t[97] = -1.99, p = 0.05$; DGBI, $M = 64.06, SD = 22.34$; organic GI diagnosis, $M = 73.09, SD = 21.45$). Participants did not significantly differ on other study variables (i.e., positive schemas, pain coping, age, gender) according to diagnostic status.

Associations Between Positive Schemas, QOL, and Coping

Means, standard deviations, medians, ranges, Spearman's correlations, and 95% confidence intervals are presented in Table 2. Significant small- to medium-sized correlations

Table 1 Demographic information on the total sample

Total participants ($n = 98$)	
Age (range; $M \pm SD$)	8–17; 13.38 ± 2.85
Gender (n [%])	
Female	56 (57.1%)
Male	42 (42.9%)
Ethnicity (n [%])	
White	84 (86%)
Black	5 (5%)
Asian	2 (2%)
East Indian	2 (2%)
First nations	1 (1%)
Other	3 (3%)
DGBI diagnosis ($n = 59$)	
Irritable Bowel Syndrome	16 (27%)
Functional abdominal pain	20 (34%)
Functional dyspepsia	13 (22%)
Abdominal migraine	3 (5%)
Other	7 (12%)
Organic GI diagnosis ($n = 39$)	
Crohn's disease	27 (69%)
Ulcerative colitis	12 (31%)

were found between positive schemas and overall QOL ($r = 0.28, p < 0.01, 95\%CI [0.07, 0.46]$), and emotional ($r = 0.26, p < 0.05, 95\%CI [0.05, 0.45]$) and school functioning ($r = 0.25, p < 0.05, 95\%CI [0.04, 0.44]$). A significant moderate to large correlation was found between positive schemas and social functioning ($r = 0.44, p < 0.001, 95\%CI [0.25, 0.60]$). Positive schemas and physical functioning were not significantly correlated. Regarding coping, positive schemas demonstrated a significant, positive, moderate to large correlation with approach coping ($r = 0.48, p < 0.001, 95\%CI [0.29, 0.62]$), and a small to moderate correlation with problem-focused avoidant coping ($r = 0.24, p < 0.05, 95\%CI [0.03, 0.43]$). A significant, large-sized negative correlation was found between positive schemas and emotion-focused avoidant coping ($r = -0.56, p < 0.01, 95\%CI [-0.67, -0.37]$). Only emotion-focused avoidant coping was significantly correlated with overall QOL ($r = -0.36, p < 0.001, 95\%CI [-0.53, -0.17]$).

Positive Schema Subthemes and Youth QOL

Table 3 presents multiple regression analyses and the relative contributions of the five positive schemas subthemes (self-efficacy, success, trust, optimism, and worthiness) on youth QOL. Youth age and diagnosis were the strongest predictors for overall QOL. Youth age was also the strongest predictor of school functioning, and diagnosis was the strongest predictor of physical and emotional functioning. The regression predicting social functioning was significant with worthiness as the strongest and only significant predictor accounting for 36.6% of the partitioned variance.

Exploratory analyses separated by diagnostic status (i.e., DGBI or organic GI disorder) were conducted for the regression analyses on physical and emotional functioning, given that diagnosis was the strongest predictor; see supplemental Table 3. No positive schema subtheme significantly predicted emotional or physical functioning for either youth with DGBI or an organic GI disorder,

Table 2 Spearman correlations, means, standard deviations, medians, and ranges between positive schemas and QOL and coping ($n = 86$)

Variable	Mean (SD)	Median	Range	Spearman correlation with total positive schemas ($r, 95\% CI$)
Overall QOL	66.68 (18.13)	66.85	21.74–100.00	.28** [.07, .46]
Physical functioning	67.65 (22.32)	70.31	15.63–100.00	.09 [–.12, .30]
Social functioning	77.78 (21.23)	80.00	15.00–100.00	.44*** [.25, .60]
Emotional functioning	64.13 (22.50)	65.00	5.00–100.00	.26* [.05, .45]
School functioning	59.47 (21.88)	60.00	0–100.00	.25* [.04, .44]
Approach coping	3.04 (.72)	3.14	1.00–5.00	.48*** [.29, .62]
Problem-focused avoidant coping	3.09 (.95)	3.20	1.00–5.00	.24* [.03, .43]
Emotion-focused avoidant coping	2.17 (.85)	2.10	1.00–5.00	–.54*** [–.67, –.37]

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

Table 3 Positive schema subscale contributions to overall QOL and QOL subscales (emotional, social, physical, school functioning)

Factor	R^2	F	β	β error	t -value	Relative contribution (%)	95% CI
Overall QOL	0.28	6.39***					
Self-efficacy			0.06	0.14	0.41	15.6	[-.22, .33]
Success			0.01	0.16	0.07	19.2	[-.31, .33]
Trust			0.07	0.12	0.54	14.6	[-.18, .32]
Optimism			-0.06	0.14	-0.44	10.7	[-.34, .22]
Worthiness			0.29	0.19	1.52	39.8	[-.09, .68]
Age			-0.11	0.04	-2.86**	-	[-.18, -.03]
Diagnosis			0.45	0.18	2.42*	-	[.08, .81]
Emotional functioning	0.16	3.67**					
Self-efficacy			0.09	0.15	0.62	23.0	[-.20, .39]
Success			0.11	0.18	0.64	20.9	[-.24, .46]
Trust			0.06	0.13	0.48	14.0	[-.20, .33]
Optimism			0.14	0.15	0.89	26.4	[-.17, .44]
Worthiness			-0.06	0.21	-0.25	15.6	[-.47, .36]
Age			-0.06	0.04	-1.52	-	[-.14, .02]
Diagnosis			0.53	0.20	2.70**	-	[.14, .94]
Social functioning	0.29	6.62***					
Self-efficacy			0.17	0.14	1.26	17.3	[-.10, .45]
Success			-0.08	0.16	-0.48	14.1	[-.40, .25]
Trust			0.22	0.12	1.79	22.4	[-.02, .47]
Optimism			-0.23	0.14	-1.64	9.4	[-.51, .05]
Worthiness			0.49	0.19	2.53*	36.6	[.10, .88]
Age			-0.02	0.04	-0.59	-	[-.10, .05]
Diagnosis			-0.11	0.19	-0.60	-	[-.48, .26]
Physical functioning	0.14	3.25**					
Self-efficacy			-0.10	0.15	-0.66	8.6	[-.40, .20]
Success			-0.04	0.17	-0.20	11.6	[-.39, .32]
Trust			0.07	0.14	0.49	15.8	[-.20, .34]
Optimism			-0.09	0.15	-0.55	7.3	[-.39, .22]
Worthiness			0.32	0.21	1.52	56.7	[-.01, .74]
Age			-0.08	0.04	-1.85	-	[-.16, .01]
Diagnosis			0.45	0.20	2.25*	-	[.05, .86]
School functioning	0.32	7.61***					
Self-efficacy			0.04	0.13	0.27	14.0	[-.23, .30]
Success			0.00	0.16	0.01	19.8	[-.31, .32]
Trust			-0.01	0.12	-0.09	8.3	[-.25, .23]
Optimism			-0.04	0.14	-0.27	11.3	[-.31, .24]
Worthiness			0.37	0.19	1.99	46.6	[.00, .75]
Age			-0.12	0.04	3.53***	-	[-.20, -.06]
Diagnosis			0.24	0.18	1.35	-	[-.11, .59]

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

though this may in part be limited by the small sample sizes ($n = 59$ for DGBI and $n = 39$ for organic diagnosis).

Discussion

Evidence-based treatments for pediatric chronic pain commonly include cognitive-behavioral approaches

(Coakley & Wihak, 2017), which often target cognitive schemas. However, research has focused primarily on negative schemas or pain-specific cognitive factors in pediatric chronic/recurrent pain. In line with the resilience-risk framework and strength-based cognitive-behavioral approach (Cousins et al., 2015a, b; Padesky & Mooney, 2012), positive schemas may play an important role as a general/underlying resilience factor for pediatric recurrent pain. This study is the first to examine the role of positive schemas as a unifying cognitive construct in pediatric chronic/recurrent pain by providing a foundational examination of positive schemas as they relate to QOL and pain coping in youth with recurrent abdominal pain. Consistent with the previous research (McArthur et al., 2017), higher self-reported positive schemas were significantly associated with higher overall QOL among youth with recurrent abdominal pain, suggesting an important role in maintaining QOL in this population.

Significant associations were found between positive schemas and specific QOL domains of physical, emotional, social, and school functioning; consistent with hypotheses, higher positive schemas shared a significant, small- to moderate-sized effect with higher emotional functioning in youth with recurrent abdominal pain. These results contribute to a growing body of literature that has demonstrated a positive role of positive schemas for youth emotional functioning (Keyfitz et al., 2013; Lumley & McArthur, 2016; McArthur et al., 2018; Tomlinson et al., 2017a, b). However, contrary to expectations, none of the positive schema subthemes predicted emotional functioning in this study. Rather, diagnostic status (e.g., DGBI or organic GI disorder) was the only and strongest predictor. This is in line with the findings from a meta-analysis that found that adults with IBS report more severe depressive symptoms compared to adults with IBD (Geng et al., 2019). Exploratory analyses separating participants by diagnostic status indicated that no positive schema subtheme significantly predicted either emotional or physical functioning. However, given the small sample sizes in these analyses and the exploratory nature, this may be an area warranting further research. Further, the PedsQL in this study measures emotional functioning via a brief 5-item subscale including items such as “I feel sad or blue” and “I have trouble sleeping.” Thus, it may be less sensitive than specific depression or anxiety measures that have been used in previous studies examining positive schemas. Future research including measures that specifically assess depressive and anxiety symptoms, as well as aim to recruit large samples where comparative analyses based on diagnostic status may be important.

A positive, moderate-sized relation was found between positive schemas and social functioning, consistent with hypotheses and previous findings (McArthur et al., 2017). Further, when controlling for age and diagnostic status, the

worthiness subtheme was the strongest predictor of social functioning (accounting for over 36% of the partitioned variance). Thus, worthiness, or the belief that one has value or worth as a person, was the only positive schema subtheme to predict social functioning. The subtheme of trust accounted for 22% of the partitioned variance in social functioning, though this was not statistically significant. This suggests that higher perceived worth (questionnaire items such as “I value myself” and “I think I have many good qualities”) uniquely predicts social functioning, even beyond a higher sense of trust (questionnaire items such as “I trust other people” and “I feel comfortable depending on other people”). An association with self-esteem (i.e., worthiness) and DGBI in youth has been examined before, though this is the first study to suggest the potential consideration for worthiness for social functioning specifically. Given that these are exploratory analyses, further research is warranted to better understand the validity of these results. However, the findings are in line with the previous research that has found that higher self-worth appears to predict close and/or reciprocal friendships in youth with obesity or physical disabilities (Reiter-Purtill et al., 2010; Shapiro & Martin, 2014). There is established evidence that social functioning and peer relationships are negatively impacted for youth with chronic/recurrent pain (Forgeron et al., 2010; Jones et al., 2020). However, very little research has examined factors that may underlie resilience within this domain, and this is the first study to suggest that self-perceived worthiness and trust in others in youth with chronic/recurrent pain may potentially be important to assess in youth who are experiencing difficulties with social functioning. Due to the exploratory and correlational methods, it is unknown whether youth with greater social functioning are more likely to report higher positive schemas, or if higher positive schemas help youth foster and maintain their social functioning; further, the transactional and/or interactive nature of these relations over time are also unclear. Upon replication, greater longitudinal evidence, and information from multiple sources of data (e.g., qualitative approaches), greater support for including positive schemas (including subthemes such as worthiness) in assessment and intervention for pediatric recurrent pain may be indicated.

Difficulties with school functioning for youth with chronic/recurrent pain (e.g., more school absences, trouble keeping up with schoolwork) have also been well documented, although the underlying mechanisms and factors contributing to impaired school functioning are not yet fully understood (Jones et al., 2018). In this study, positive schemas were significantly correlated with higher school functioning, suggesting a potentially important resilience factor to consider in models of school functioning in youth with pediatric chronic/recurrent pain. The strongest predictor of school functioning was age (followed by positive schema

subtheme of worthiness, non-significant effect), which is consistent with previous studies finding that adolescents between 15 and 17 years of age report more impaired school functioning compared to younger age groups (Groenewald, Tham, & Palermo, 2020). Thus, although age-based analyses were not a focus of this exploratory study, it may be important to investigate whether the role of positive schemas in school functioning differ by age groups. Given that positive schemas have demonstrated relative stability over time (Cherry & Lumley, 2019), it is likely that increases in school impairment with age are due to a combination of other factors (e.g., increasing demands at school, increased need for independent management of pain and schoolwork), although further research may clarify whether specific interventions to target positive schemas can foster resilience in youth who are experiencing difficulties with school functioning.

No significant association was found between positive schemas and physical functioning, which was consistent with a small sample study in youth with cancer (McArthur et al., 2017). In contrast, pain-specific positive schemas, such as pain self-efficacy, have been associated with lower functional disability (e.g., higher physical functioning; Kalapurakkel et al., 2015; Tomlinson et al., 2017a, b) and higher QOL in youth with recurrent abdominal pain (Tomlinson et al., 2021). This suggests that youth with chronic/recurrent pain may benefit more from harnessing pain-specific resilience factors that are related to their condition. Therefore, if the specific priority for treatment is focused on physical functioning, it is possible that targeting pain-specific beliefs may be particularly helpful.

Diagnostic status (i.e., DGBI vs. organic disorder) was the strongest unique predictor of some quality of life outcomes (overall QOL, emotional functioning, physical functioning) though not all. In the extant literature, the impact of diagnostic status on QOL outcomes has been mixed with some finding no differences on outcomes by diagnostic groups (Warschburger et al., 2014), and others finding evidence of worse QOL outcomes for youth with DGBI (Varni et al., 2015). The impact of diagnostic status is further complicated by the high degree of overlap between DGBI and organic causes of GI disorders (Langshaw et al., 2018). A more nuanced investigation that considers other relevant factors is likely warranted. For example, in Warschburger et al (2014), pain severity and catastrophizing were significantly associated with QOL, suggesting that these may be important factors to consider in addition to/regardless of diagnostic status (see Tomlinson et al., 2021 for results from the same dataset examining associations between self-reported average pain severity, diagnosis, and QOL). In this study, positive schemas did not significantly account for unique variance in overall QOL, emotional functioning, or physical functioning, though there may be other important factors to consider in future research.

It has been hypothesized that resilience factors lead to optimal outcomes via a greater use of adaptive coping (Sturgeon & Zautra, 2010). Thus, this study examined the relations among positive schemas, pain coping, and QOL to provide a foundational examination within pediatric recurrent pain. Consistent with hypotheses and existing research, positive schemas were significantly and positively associated with an approach (moderate to large association) and problem-focused avoidant coping style (small to moderate correlation). Further, positive schemas were significantly and negatively associated with an emotion-focused avoidant style (moderate to large negative association). In general, the results suggest that youth who endorsed greater positive schemas were more likely to use coping styles that includes strategies such as seeking information and/or social support, problem solving, and doing things that are fun/enjoyable, and less likely to use coping strategies involving internalizing/externalizing behaviors (e.g., acting out, worrying/ruminating). Notably, only emotion-focused avoidance was significantly and negatively correlated with QOL, adding to a small but growing literature suggesting that an emotion-focused avoidant coping style appears to be associated with negative outcomes on functioning (Eccleston et al., 2004; Reid et al., 1998; Walker et al., 2005). Definitional and conceptual clarity has been variable within the pediatric pain coping literature (Nabbijohn et al., 2021). Greater definitional clarity regarding ‘adaptive’ vs. ‘maladaptive’ coping styles is needed to better understand the role of pain coping and positive schemas in youth QOL. Further, while this preliminary study focused on higher-order coping ‘styles,’ it is possible that understanding which specific coping strategies (such as seeking social support) that a youth uses would be more informative to their chronic/recurrent pain treatment. Additionally, some research has found that the use of specific pain coping strategies may differ in youth with DGBI versus organic GI disorders (van Tilburg et al., 2015). Therefore, future research examining the role of positive schemas on specific and well-defined coping styles/strategies, in addition to comparisons between diagnostic status, age, and gender, may be important.

This study has several strengths; foremost, this is the first study to extend the research on positive schemas to youth with recurrent abdominal pain and expand upon the resilience-risk framework for pediatric chronic/recurrent pain by suggesting positive schemas as a potential general/underlying individual resilience factor. This is also the first study to examine the relation between positive schemas and pain coping styles, as well as the first to identify specific positive schema subthemes (e.g., worthiness and trust) that may be particularly important to consider specifically for social functioning in youth with chronic/recurrent pain.

The sample was also relatively evenly matched in terms of gender and diagnosis.

This study must also be considered within the context of its limitations, in addition to the challenges with cross-sectional data discussed earlier. First, although age was controlled for in all analyses, the sample was comprised of a large developmental range, and age effects were evident for some of the regression models. Previous research has found that positive schemas demonstrate stability over time in a general sample of youth (Cherry & Lumley, 2019; McArthur et al., 2019), but the trajectory is unknown for youth with recurrent/chronic pain. Though developmental analyses were not a focus of this study, it is important for future research to examine age differences to better understand priorities for treatment. Second, data from this study were collected as part of a previous, larger dataset in which information on youth who declined participating were not collected; thus it is possible that youth who did not participate in this research study differed on demographic or clinical characteristics. Further, other variables that may have played a role (e.g., pain severity) were not included in these analyses, and may be an important consideration in future research.³ Third, it is understood that both positive and negative schemas exert individual influences on QOL, well-being, and psychopathology. Future research including both positive and negative schemas would be valuable to understand the individual contributions of positive and negative schemas to QOL and functioning in youth with chronic/recurrent pain. Finally, given that this was a preliminary study (and was slightly underpowered), longitudinal investigations with larger samples are necessary to clarify the processes and mechanisms by which positive schemas contribute to optimal outcomes, and potential targets for intervention.

This preliminary, cross-sectional study was the first to examine the role of positive schemas in pain coping and QOL outcomes in youth with recurrent abdominal pain. Promisingly, results demonstrated that positive schemas may be particularly important factors to consider for social, emotional, and school functioning in youth with recurrent abdominal pain. Additionally, positive schemas appear to be positively associated with an approach and problem-focused avoidant coping style, and negatively associated with an emotion-focused avoidant coping style, although the mechanisms linking these results to youth outcomes on QOL are not yet clear. Future research directions include extending and replicating these findings in youth with recurrent/chronic pain and assessing their response to treatment.

³ Associations between self-reported average pain severity and QOL in youth with recurrent abdominal pain from the same dataset are reported in Tomlinson et al., 2021.

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Authors Contributions Conceptualization (SL, RT, ML, MM); methodology (RT, KB, DA, MM); formal analysis and investigation (SL, MM), writing—original draft preparation (SL); writing—review and editing (RT, ML, MM, KB, DA); funding acquisition (MM, KB); supervision (MM).

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Data Availability Data are not publicly available due to ethical restrictions.

Code Availability Not applicable.

Declarations

Conflict of interest Soeun Lee, Rachel Tomlinson, Margaret N. Lumley, Kevin C. Bax, Dhandapani Ashok, C. Meghan McMurtry declares that they have no conflict of interest.

Ethical Approval Obtained from all institutional ethics approval boards (Guelph REB #16-12-104; Western University REB #103658).

Consent to Participate All included participants provided assent (youth) and informed consent (parent for youth) to participate in the study.

Consent for Publication All included participants provided informed consent to the use of their anonymized data for research purposes (including publication).

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