RESEARCH ARTICLE

Possible Involvement of Avoidant Attachment Style in the Relations Between Adult IBS and Reported Separation Anxiety in Childhood

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Abstract

Irritable bowel syndrome (IBS) in adults as well as separation anxiety disorder (SAD) and recurrent abdominal pain (RAP) in childhood are associated with anxiety and somatization. Our aim was to examine possible associations between IBS in adulthood and SAD in childhood. Patients with IBS and healthy subjects completed a demographic questionnaire, the Separation Anxiety Symptom Inventory (SASI), the Somatization Subscale of Symptom Checklist-90-R (SCL-90-R), the Attachment Style Questionnaire, and a retrospective self-report questionnaire regarding RAP. Compared with controls, patients with IBS were characterized by an avoidant attachment style and scored higher on the SCL-90-R scale regarding the tendency to somatization (25.35 ± 7.47 versus16.50 ± 4.40, $p < 0.001$). More patients with IBS (25% versus 7.5%) reported RAP in childhood, but contrary to prediction, also had significantly lower SASI scores. Adults with IBS were characterized by somatization, insecure attachment style and recalled higher rates of RAP and surprisingly less symptoms of SAD in childhood. Based on these results, an etiological model for IBS is suggested, in which an avoidant attachment style and a tendency to somatization play an important role in the development of IBS. Copyright © 2015 John Wiley & Sons, Ltd.

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Keywords
attachment style questionnaire; functional abdominal pain; irritable bowel syndrome; recurrent abdominal pain; separation anxiety disorder

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Introduction

Prevalence rates of irritable bowel syndrome (IBS) in the global adult population have been estimated as ranging from 10–22% (American College of Gastroenterology Task Force on Irritable Bowel Syndrome et al., 2009). As its pathophysiology is multidimensional and not completely understood, IBS is defined by the presence of chronic or recurrent symptoms that cannot be explained by known structural or biochemical abnormalities (Sperber & Dekel, 2010). Nevertheless, some researchers believe that a more pathophysiology-based approach should be developed. For example, it may transpire that patients with diarrhoea-type IBS have bile acid malabsorption and not IBS, or that IBS is actually a central sensitivity syndrome in a specific form (Neblett et al., 2013). Associations between IBS, psychosocial factors and psychiatric illness have long been recognized (Liss, Alpers, & Woodruff, 1973; Walker et al., 1990). High rates of comorbidity have been reported between IBS and other gastrointestinal disorders (gastroesophageal reflux disease, functional dyspepsia and constipation), psychiatric disorders (mainly anxiety disorders) and non-gastrointestinal, non-psychiatric disorders, such as asthma, fibromyalgia, pelvic pain syndrome, chronic fatigue and cardiac arrhythmias (Liss et al., 1973; Singh et al., 2012; Sperber & Dekel, 2010; Whitehead, Palsson, & Jones, 2002). Another well-established association was also found between IBS and recurrent abdominal pain (RAP), one of the most common functional gastrointestinal disorders in children (Blanchard & Scharff, 2002).

Recurrent abdominal pain is most analogous to functional abdominal pain, defined as episodes of pain with no known organic cause, and occurring at least once a week for a period of 2 months (Clouse et al., 2006). IBS and RAP show similarities in prevalence, symptomatic course, medical and psychiatric comorbidity, family medical and psychiatric history, and association with life events (Burke, Elliott, & Fleissner, 1999). Both IBS and RAP may exist simultaneously in childhood. The recollection of RAP in childhood has also been found to be associated with IBS in adulthood (Burke et al., 1999; Chitkara et al., 2009; Hotopf, Carr, Mayou, Wadsworth, & Wessely, 1998; Walker, Guite, Duke, Barnard, & Greene, 1998). According to one study, approximately 18–61% of children with RAP will develop IBS in adulthood (Blanchard & Scharff, 2002). In a prospective study, Hotopf et al. (1998) found that RAP in childhood was associated with ill health in the parents and with more psychiatric disorders in adulthood.

Although IBS is a gastroenterological syndrome, research shows that patients have distinct psychological features, mostly involving a deficiency in quality of interactions between individuals (Bertram, Kurland, Lydick, Locke, & Yawn, 2001; Voci & Cramer, 2009), and deficiencies that include maladaptive coping strategies, venting of emotions and behavioural disengagement (Rutter & Rutter, 2002). Such patients appear to be more inclined to use defence mechanisms of somatization and denial (Chitkara et al., 2009; Monsen & Havik, 2001), report lower levels of parental care in childhood (Salmon, Skaife, & Rhodes, 2003) and have an insecure attachment style (Seres & Bardos, 2006). All of these traits are congruent with the high comorbidity between IBS and psychiatric anxiety disorders (Liss et al., 1973; Singh et al., 2012; Whitehead et al., 2002).

Separation anxiety disorder (SAD) is the most common anxiety disorder in childhood (Jurbergs & Ledley, 2005). A possible distinguishing criterion is somatization symptoms, such as stomach aches, nausea or vomiting during separation from a significant attachment figure, as depicted in the Diagnostic and Statistical Manual Mental Disorders (DSM IV-TR) (American Psychiatric Association, 2000).

For most individuals who suffered from SAD in childhood, the symptoms disappeared before adulthood. Therefore, high rates of recollection of SAD during childhood among adults with anxiety disorders (Lipsitz et al., 1994; Osone & Takahashi, 2006) suggest an uninterrupted existence between SAD in childhood and anxiety disorders in adulthood.

As IBS may develop from interactions between psychological and somatic factors (similar to those in SAD), we proposed that SAD in childhood might represent an early and preliminary manifestation of IBS. This proposition is strengthened by the fact that adults with a history of SAD are found to have similar anxiety-related disorders to those suffering from IBS (Lewinsohn, Holm-Denoma, Small, Seeley, & Joiner, 2008).

This paper adds to the existing literature on IBS regarding the relationships between SAD, somatization and RAP in the development of IBS. The current study was designed to evaluate possible associations between SAD in childhood and IBS in adulthood. Our first hypothesis was that compared with a healthy control group, adults with IBS would experience more symptoms of somatization, be characterized by an insecure attachment style and would report greater retrospective recollection of SAD and RAP in childhood. Our second hypothesis was that SAD, somatization and RAP would be predictive of IBS in adulthood.

Method

Participants

The IBS group comprised 40 patients with IBS who were recruited between December 2010 and January 2011 from the Division of Gastroenterology at our Medical Center. Inclusion criteria were as follows: a positive diagnosis of IBS according to validated diagnostic criteria (American College of Gastroenterology Task Force on Irritable Bowel Syndrome et al., 2009), age 18 years or older and fluency in our national language (in which all questionnaires were administered). Exclusion criteria for study entry were as follows: known severe underlying comorbidities (cardiovascular, respiratory, renal, haematological, endocrine, hepatic, gastrointestinal, neurological or psychiatric). Patients who were unable to sign an informed consent, or complete study questionnaires, were also excluded. The control group included 40 healthy subjects, all recruited from the general population via publication of a request to participate in the study in various random internet forums and discussion groups, and by administrating the questionnaire to random participants in a teachers' seminar in Tel Aviv. None of the participants in the control group reported any past or present symptoms suggestive of IBS. In total, 75 participants were recruited for the control group, of which 40 were randomly chosen.

Participants in the IBS group share the same characteristics of IBS patients found in previous studies (Blanchard & Scharff, 2002). Moreover, no significant differences were found between the IBS and the control groups (p values reflect the difference between the IBS and control groups) in terms of age (IBS: $n = 40$, $m = 47.9 \pm 17.5$ years; Controls: $n = 40$, $m = 43.1 \pm 13.3$ years, $p =$ Non significant (NS)), sex: [IBS: 26 females (65%); Controls: 28 females (70%) $p =$ NS], demographic properties (marital status, employment status and educational level) and situational depression and anxiety (20% and 35%, respectively). Most of the participants were married (62%) and were employed full time (57%).

This study was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice and was approved by the Helsinki Committees of the Tel Aviv-Yaffo Academic College

and by the Human Subjects Protection Program and the Institutional Review Board of Rabin Medical Center (Approved date: 6 June 2010, IRB approval no. 5054).

Questionnaires

(1) The Separation Anxiety Symptom Inventory (SASI) is a retrospective measure of self-report of separation anxiety in childhood (Silove et al., 1993), developed according to the criteria of SAD in the DSM (American Psychiatric Association, 2000). Participants were requested to specify the frequency (*never*, *rarely*, *often* and *very often*) of their experiences up to the age of 18 years, in each of the 15 situations typical to childhood separation anxiety. Each item is scored from 0 to 3, depending on stated frequency of its recurrence, such that the maximal total score is 45. The SASI is a well-known and widely used questionnaire for measuring retrospective SAD symptoms, and it has been validated in previous studies against retrospective reports by twins, professional diagnosis by structured interviews and reports by teachers and other family members. It has also been found to be stable over time and unaffected by anxiety state and depression (Manicavasagar, Silove, & Hadzi-Pavlovic, 1998; Silove et al., 1993).

(2) The Attachment Style Questionnaire (ASQ) assesses self-reported styles of interpersonal attachment (Feeney, Noller, & Hanrahan, 1994). Participants state their degree of agreement, from 0 (*no agreement*) to 5 (*total agreement*) for 40 items. The ASQ is composed of five dimensions that correspond with three main types of interpersonal attachment. The dimension *confidence in self and others* corresponds with secure attachment. The dimensions *discomfort with closeness* and *relationships as secondary to achievement* correspond with avoidant attachment and *preoccupation with relationships* and *need for approval* correspond with anxious attachment. Previous studies have shown that the five dimensions of the ASQ have high internal consistency (Cronbach's alpha between 0.76 and 0.84) and test–retest reliability (Feeney et al., 1994; Fossati et al., 2003). Moreover, the ASQ has been validated against other measures of adult attachment style, family functioning, psychiatric disorders (axis I and axis II) and other personality properties (Feeney et al., 1994; Waal, 2007).

The two aforementioned questionnaires were translated to Hebrew by a professional translator and subsequently corrected independently by three clinical psychologists, proficient in both English and Hebrew.

(3) The Somatization Subscale is one of nine subscales of the Symptom Checklist-90-R (SCL-90-R) (Derogatis & Cleary, 1977). The SCL-90-R questionnaire measures present time psychological indications, whereas most symptom checklists relate to symptoms that have occurred in the previous 2 weeks. Participants are requested to rate on a four-point scale (0 = *not at all* and 4 = *very much*), the degree of disturbance of 12 items during the 2-week period prior to filling in the questionnaire. The validated translation into Hebrew (Schwarzwald, Weisenberg, & Solomon, 1991) of the somatization subscale of the SCL-90-R was used in the current study. The somatization subscale of the SCL-90-R is a popular and widely accepted measure of somatization and was found in previous studies to be highly correlated with a variety of psychiatric disorders with a somatic component (e.g. panic disorder) and with psychosomatic disorders such as IBS (Kennedy, Morris, Pedley, & Schwab, 2001; Salmon et al., 2003). The somatization subscale was found to have a high internal and test–retest consistency (Derogatis, 2000).

(4) Recollection of RAP in childhood. Most studies use a direct approach to retrospectively determine the existence of RAP in childhood. For example, as part of a large-scale study of the American population designed to explore the relationship between IBS (and other gastrointestinal disorders) and childhood RAP, retrospective recollection of RAP was determined by simply asking the subjects 'Did you have many bouts of stomach or belly pain as a child?' (Chitkara et al., 2009). As there is no well-accepted and validated measure of retrospective existence of RAP in the current scientific literature, our study took/adopted a basically similar approach. A new two-item self-report questionnaire for the retrospective recollection of RAP was designed for this study, building on the original definition of RAP by Apley and Nash (Apley & Nash, 1958) and the current Rome III definitions of functional abdominal pain and childhood functional abdominal pain syndrome (Rasquin et al., 2006; Rasquin-Weber et al., 1999; Rome III, 2006). Specifically, the two items included in the new RAP questionnaire were (a) 'Did you have periods of time with stomach aches as a child?' and (b) 'Even when you did not have a "real" disease (sore throat, infection, etc.), did you suffer in your childhood from many stomach aches that disturbed your daily function (going to school, going on trips, etc.)?'. Both items had four optional responses: 'I do not remember feeling that at all', 'occasionally', 'often', and 'very often'. Our intention to include the study variables in a logistic regression model required that all variables would be either continuous or dichotomous. The RAP measure did not qualify as either, as the semantic values (that it) obtained did not allow for continuity assumption. In addition, the RAP distribution of responses to questions 1 and 2 was as follows: For question 1: not at all = 64%, occasionally = 21%, often = 9% and very often = 6%. For question 2: not at all = 79%, occasionally = 12%, often = 4% and very often = 5%. We found that the

two questions were highly correlated (Spearman's $r = 0.6$), and almost all individuals who responded 'not at all' or 'occasionally' to question 1 gave identical answers to question 2. Similarly, almost all individuals who responded 'often' or 'very often' to question 1 responded identically to question 2. Therefore, we decided to consider dichotomous categorization of RAP and to code anyone who responded 'often' or 'very often' as having RAP, whereas all those who responded 'not at all' or 'occasionally' were coded as not having RAP. This way/method of splitting RAP into two categories concurs with the demands of the logistic regression model and with the limitation on continuity. Finally, it has been shown that the ratio of individuals classified with RAP in the general population is 9%–25% (Scharff, 1997). The ratio in the present research is 16.3%, which concurs with the overall population ratio. Therefore, we believe it may be considered valid.

(5) Situational anxiety and depression. Participants were asked to mark the points along two separate visual analogue scales that expressed their feelings of depression and anxiety during the previous week (from 'not at all' to 'very'). For analysis, the scale was divided with a ruler into nine equal segments. Scores from 1 to 5 were considered low and above 5 as high.

The Cronbach's alpha scores were 0.86 for the SASI, 0.82 for the somatization subscale of SCL-90-R and 0.82 for the RAP question. For the five dimensions of the ASQ, Cronbach's alpha scores were 0.71 for *confidence in self and others*, 0.75 for *discomfort with closeness*, 0.71 for *relationships as secondary to achievement*, 0.79 for *preoccupation with relationships* and 0.76 for the *need for approval*. An alpha Cronbach's score of 0.7–0.9 (as for all of the above) is considered 'good' (Kline, 2000).

Statistical analyses

Statistical analysis was performed using SPSS version 19 (Statistical Package for the Social Sciences, SPSS Inc., Chicago, IL, USA). The chi-squared test (exact test, as needed) was used to evaluate associations between groups and categorical variables (sex, marital status, employment status, educational level, situational depression, situational anxiety and recollection of RAP in childhood).

Student's *t*-test for independent samples was used to compare continuous variables (age, mean SAD score, SCL-90-R score and the five attachment dimensions of ASQ) by group. Cronbach's alpha was calculated for each of the questionnaires or subsections of questions. For this analysis, a coefficient of reliability >7 was considered an acceptable score, and >8 was considered good. Finally, we developed a multiple logistic regression model to predict the presence of IBS in adulthood with the study variables (which significantly differentiated the two groups) as coefficients, adjusting for age, sex, marital status, employment status, educational level, situational depression and situational anxiety.

Estimating the power of the logistic regression was carried out using the rule described by Hsieh, et al. (Hsieh, Bloch, & Larsen, 1998). Following this approximation and treating the SASI score as our main variable of interest, the rule suggests that the sample can detect an effect size (standardized coefficient) of 0.67 with power that exceeds 80%. The standardized coefficient of the SASI in our model is −0.84, which would guarantee power of approximately 96%.

Results

Table I shows the Pearson correlations between the main study variables. In the IBS group, correlations were found only between ASQ Discomfort and Relationships as secondary subscales. This is due either to lack of correlations between the variables, or to the presence of non-linear correlations. In the control group, several correlations were found e.g. SASI and RAP, RAP and somatization, and SASI and somatization.

Table II shows that the mean SASI score was significantly lower for the IBS group [20.98 ± 5.07, m ± standard deviation (*SD*)] than for the control group (25.33 ± 6.80, m ± *SD*), indicating a lower level of retrospective recall of separation anxiety among individuals with IBS $t(78) = 3.24$, $p < 0.005$.

The mean score for the somatization scale of the SCL-90-R was significantly higher for the IBS group (25.35 ± 7.47, m ± *SD*) than for the control group (16.50 ± 4.40, m ± *SD*), $t(78) = -6.45$, $p < 0.001$. Furthermore, 25% of the IBS group reported suffering from RAP in childhood compared with 7.5% of the control group (a significant difference: χ^2 (1, $n = 80$) $= 4.50$, $p = 0.034$). Regarding the attachment style, mean scores of the two dimensions of the ASQ that correspond with the avoidant attachment style, i.e. *discomfort with closeness* and *relationships as secondary to achievement*, were significantly higher in the IBS group than in the control group, $t(78) = 2.70$, $p = 0.009$ and $t(78) = 2.44$, $p = 0.01$, respectively.

All variables that showed a significant difference between the IBS and control groups (Table II) were included in a multiple logistic stepwise regression (i.e. SASI score, somatization score, RAP score and the two dimensions of the ASQ corresponding to avoidant attachment style), controlling for the demographic variables (gender, age, marital status, employment status, educational level, situational anxiety and depression).

The multiple logistic regression model for predicting the presence of IBS in adulthood was statistically significant with a total (omnibus) significance: chi-square [degrees of freedom (df) = 10, $n = 80$] = 80.56, $p < 0.0001$. The accuracy of the prediction was 63.5% (Cox and Snell's $R^2 = 0.63$). The final model included a positive association between IBS in adulthood and a tendency to somatization [odds ratio (OR) = 2.32], as well as one dimension of the ASQ, i.e. *discomfort with*

Table I. Pearson correlations between main study variables

Group		2	3	4	5	6	7	8
Control	1. SASI	0.481**	−0.30	−0.09	0.24	−0.01	0.33*	0.54**
	2. RAP (yes = 1)		−0.30	0.11	0.16	−0.00	0.11	0.40**
	3. ASQ confidence			−0.42**	−0.55**	−0.26	−0.52**	−0.27
	4. ASQ discomfort				0.47**	0.43**	0.35*	0.08
	5. ASQ preoccupation					0.14	0.70**	0.31*
	6. ASQ relationships as secondary						0.01	0.27
	7. ASQ need for approval							0.35*
	8. Somatization							1
IBS	1. SASI	0.13	−0.01	0.30	0.33*	0.05	0.24	0.02
	2. RAP (yes = 1)		0.16	−0.09	0.31*	−0.11	0.02	−0.01
	3. ASQ confidence			−0.15	0.10	−0.35	−0.05	0.03
	4. ASQ discomfort				0.43**	0.51**	0.44**	−0.02
	5. ASQ preoccupation					0.24	0.56**	0.01
	6. ASQ relationships as secondary						0.23	−0.12
	7. ASQ need for approval							0.22
	8. Somatization							1

SASI: Separation Anxiety Symptom Inventory; RAP: recurrent abdominal pain; ASQ: Attachment Style Questionnaire; IBS: irritable bowel syndrome

**$p < 0.01$ level (two-tailed) *$p < 0.05$ level (two-tailed)

Table II. Comparison of scores on psychological questionnaires between patients with irritable bowel syndrome and healthy controls

Questionnaire	Irritable bowel syndrome group ($n = 40$)	Control group ($n = 40$)	p value
SASI	20.98 ± 5.07	25.33 ± 6.80	0.002
Somatization (SCL-90-R)	25.35 ± 7.47	16.50 ± 4.40	<0.001
Self-report of childhood recurrent abdominal pain *n* (%)	10/40 (25%)	3/40 (7.5%)	0.034
ASQ dimensions			
Confidence in self and others	36.30 ± 4.62	34.45 ± 6.05	0.48
Discomfort with closeness	36.08 ± 7.23	31.75 ± 7.10	0.009
Placing relationships secondary to achievement	18.45 ± 5.74	15.48 ± 5.11	0.01
Preoccupation with relationships	27.30 ± 7.43	24.88 ± 7.09	0.14
Need for approval	21.95 ± 6.04	21.50 ± 6.18	0.74

SASI: Separation Anxiety Symptom Inventory; SCL-90-R: Somatization Subscale of Symptom Checklist-90-R; ASQ: Attachment Style Questionnaire; SD: standard deviation

Values are mean ± *SD* unless otherwise indicated.

closeness (OR = 1.35). In line with the lower mean SASI score in the IBS group, there was a negative association between IBS in adulthood and the retrospective report of SAD in childhood (OR = 0.63) (Table III).

Reports of RAP in childhood and the relationships as secondary to achievement ASQ dimension were not included in the final model.

Table III. Multiple logistic regression model for predicting adult irritable bowel syndrome*

Variables investigated	OR (95% CI)
Retrospective report of SAD	0.63 (0.48–0.84)
Tendency to somatization	2.32 (1.47–3.65)
Discomfort with closeness	1.35 (1.04–1.76)

OR: odds ratio; CI: confidence interval; SAD: separation anxiety disorder

*Controlling for gender, age, marital status, employment status, educational level, situational anxiety and depression

Discussion

This study was conducted to evaluate a possible etiological model for IBS. Our first hypothesis was that compared with a healthy control group, adults with IBS would have more symptoms of somatization, be characterized by an insecure attachment style and would report greater retrospective recollection of RAP and SAD in childhood. Our second hypothesis was that these variables would be predictive of IBS in adulthood.

We found that individuals with IBS were characterized by somatization and by insecure attachment style, recalled

higher rates of RAP and reported less symptoms of SAD in childhood, compared with individuals without IBS.

The first hypothesis concerning IBS and somatization was supported, as higher mean scores for somatization were observed among individuals with IBS. This finding is in concordance with two other studies in which somatization disorder was diagnosed in 25% of individuals with IBS (Miller et al., 2001; North et al., 2004).

The second hypothesis regarding IBS and avoidant attachment style was also corroborated, as adults with IBS scored higher on the *discomfort with others* and *placing relationships secondary to achievement* dimensions of the ASQ, which coincide with the 'avoidant' or 'dismissing' type of attachment style (Feeney et al., 1994; Salmon et al., 2003; Seres & Bardos, 2006). The *discomfort with closeness* dimension of the ASQ was included in the last step of the stepwise logistic regression, namely the final logistic regression model. Such attachment style may well be involved in the association between SAD in childhood and IBS in adulthood, as children with SAD have, by definition, an insecure attachment style.

One of the main findings of our research that needs to be addressed is that contrary to our original hypothesis, significantly more patients with IBS had lower retrospective report of SAD symptoms in childhood than the control group. We cannot preclude the explanation that individuals with IBS had fewer SAD symptoms in childhood. If this is so, the etiological model hypothesized in this research was not supported, and other etiologies may be suggested for future research. Another explanation for the lack of hypothesized positive relations may be that the methodology and research tools employed were unable to discern these relations. However, the fact that a statistically significant inverse relation was found suggests the possibility of yet another explanation. Accordingly, the reason IBS patients reported less SAD symptoms than the control group may be attributed to an unconscious bias in their retrospective self-reports of childhood separation experiences as reported by Mikulincer and Shaver (2007). This unconscious bias may well be because the fact that in our study, IBS patients unlike the control group, were found to have a distinct insecure-avoidant attachment style, which significantly correlates with attachment distress in childhood [the measured variable of SASI (Silove et al., 1993)] and more importantly, also correlates with a tendency to distort unpleasant past events. It was argued and demonstrated that an insecure (e.g. avoidant) attachment style in adulthood is the product of emotional distress, a sense of loneliness and an experience of being unprotected in childhood, because of parental unavailability (Bowlby, 1973; Torquati & Vazsonyi, 1999).

In accordance, studies have shown that an avoidant attachment style is actually the product of SAD-related distress and anxieties in childhood (Mikulincer & Shaver, 2007); thus, it is reasonable to assume that adults with an avoidant attachment style will also show a higher rate of childhood SAD symptoms. This assumption is strengthened by the scientific literature suggesting a link between SAD and an unsecure attachment style (Manicavasagar, Silove, Marnane, & Wagner, 2009). In addition, individuals with an avoidant attachment style (i.e. the IBS group more than the control group in the current study) tended to distort and falsify their retrospective reports of childhood SAD experiences. Mikulincer and Shaver (2007) found that adults with avoidant attachment have a tendency to deny anxiety-provoking childhood experiences, to use narcissistic defence mechanisms involving the denial of weakness, to exaggerate positive traits and to falsify self-reports regarding attachment difficulties with their parents (Filippides, 2004; Kulley, 1995; Mikulincer & Shaver, 2007). Moreover, such adults attempt to remove from their consciousness any self or others' negative representations, which leads them to idealize their parents and avoid describing them in non-flattering ways in self-report measures. Similar claims can be found in the study of Bowlby (1973) who described the extent to which children with insecure attachment styles tend to 'hide' the parental influences that contributed to their separation anxiety. Specifically, such children will try to deny their separation anxieties and frustrations altogether (Bowlby, 1973). Current practical and theoretical thinking suggests that these insecure tendencies and denial of needs, will be most obvious in adults with an avoidant attachment style. Although such a hypothesis may seem too speculative to present an explanation for the current results, there is an abundance of research that supports the notion that adults with an avoidant attachment style deny and suppress unpleasant childhood experiences (Brennan & Shaver, 1995; Hartman & Zimberoff, 2004; Holmberg, Lomore, Takacs, & Price, 2011; Kobak, Cole, Ferenz-Gillies, Fleming, & Gamble, 1993; Mikulincer & Shaver, 2007; Sonnby-Borgström & Jönsson, 2004; Wei, Liao, Ku, & Shaffer, 2011).

Accordingly, it seems to us that the reason IBS patients reported less retrospective SAD symptoms is due to their avoidant attachment style that, unlike the control group with no such avoidant attachment style, led them to unconsciously falsify their self-reports, by denying or repressing childhood experiences involving separation anxieties and feelings of loneliness and vulnerability. This means that future research on IBS should take into account an individual's attachment style as a possible mediating factor in IBS development.

The hypothesis concerning IBS and RAP was partially substantiated as a higher proportion of individuals with IBS recalled RAP in childhood. An interesting finding was that RAP was already associated with anxiety and somatization (Dengler-Crish, Horst, & Walker, 2011; Dorn et al., 2003; Dufton, Dunn, & Compas, 2009; Walker, Garber, Van Slyke, & Greene, 1995), whereas IBS was associated with higher rates of anxiety disorders compared with the general population (Lydiard, 2001; Mikocka-Walus et al., 2008; Schwarz et al., 1993; Singh et al., 2012; Walker, Roy-Byrne, & Katon, 1990). The current

findings of a correlation between IBS, RAP and anxiety, may support these earlier findings. It was also suggested that RAP and IBS may stem from the same common cause (Barker, Pistrang, & Elliott, 2002), whereas other researchers proposed that RAP may manifest a certain expression of somatization rather than serve as an independent indicator of IBS (Schulte, Petermann, & Noeker, 2010). In our research, the association observed in the univariate analysis between RAP and IBS was not found in the final logistic regression model. As such, an association was already reported in other studies using univariate analysis (Blanchard & Scharff, 2002; Walker et al., 1998); the absence of RAP from our final model may be explained by its statistical redundancy, as both SAD and the tendency to somatization (both of which co-occurs in childhood) were already included in the model.

Based on the existing literature and on the results of the current study, we suggest a potential etiological model for the development of IBS.

Many children with SAD are also characterized by an avoidant attachment style and, therefore, are prone to deny their separation anxiety and emotional distress. Moreover, many of them also have a strong innate tendency for somatization (i.e. stomach aches). Therefore, children who are characterized by SAD, avoidant attachment style and a strong somatization tendency are more likely to 'exchange' their denied separation anxiety for more acute and recurrent stomach aches (RAP). As they mature, these individuals/children will exhibit fewer symptoms of SAD, and more and more/increased symptoms of a gastrointestinal functional disorder, in particular IBS. With the exception of RAP involvement (as discussed earlier), all parts of the model suggested earlier were supported by the current study results.

This study has several limitations. Firstly, our study was not a prospective study of children with SAD. The model for predicting the presence of IBS was based on statistical correlations with retrospective reports and not on prospective long-term follow-up. Recall bias is a potential limitation because of the requisite of participants with somatic complaints to recollect data from childhood. It would have been helpful to have had all past medical charts of the patients to exclude various gastrointestinal disorders in childhood. Nevertheless, despite the lack of such charts, it can be stated that participants did not suffer from major comorbid disorders, most importantly, gastrointestinal disorders. In addition, it should be emphasized that the questionnaires used for the current research are intended specifically for retrospective symptom reporting and that with the exception of the 'recollection of RAP in childhood' questionnaire, are valid and widely used. In this context, findings concerning RAP should be interpreted with caution until further validation of this scale is attained. It may also be that the higher rate of recollection of RAP among those with IBS was due, at least in part, to the individuals' current preoccupation with abdominal pain. Since this was a retrospective study, we cannot rule out the possibility of reverse causation as a possible explanation for the association between IBS and anxiety/avoidant attachment style as abdominal pain and discomfort could result in anxiety and in a reluctance to participate in social interactions (Dufton et al., 2009). Future research designed as prospective studies could overcome this limitation. The RAP questionnaire was compiled and validated for the current research as there was no available questionnaire for retrospective RAP or functional abdominal pain.

In conclusion, although this study cannot prove causality, it is hypothesized that when SAD in childhood is accompanied by a tendency to somatization and by an avoidant attachment style, it is indicative of IBS in adulthood. Prospective studies are warranted to investigate the proposed model, and to examine its possible relevance to IBS.

Conflict of interest

The authors have declared that they have no conflict of interest.

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