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Multidimensional Interoceptive Awareness, Psychosomatic Symptoms, and Risk for Eating Disorders in a Female at Birth Adolescent Sample

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Key Words

Interoceptive awareness; Psychosomatic symptoms; Eating disorders; Adolescence; Well-being

Abbreviation

MAIA: Multidimensional Assessment of Interoceptive Awareness; QPF/R: Psychophysiological Questionnaire Reduced Form; EDI: Eating Disorder Inventory; ED: Eating disorders; EDRC: Eating Disorder Risk Composite; CBT: Cognitive-Behavioral Therapy

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Abstract

Aim: This study aimed to identify specific interoceptive awareness dimensions related to the risk for eating disorders (ED) in a sample of female adolescents.

Subjects and Method: A sample of 317 female adolescents (Mage=17.04±1.22) completed the Multidimensional Assessment of Interoceptive Awareness (MAIA), the Psychophysiological Questionnaire (QPF-R), and the Eating Disorder Inventory 3 (EDI 3). The scores obtained at the MAIA subscales and the QPF-R were employed to predict the eating disorder risk composite score derived from the EDI-3.

Results: The results showed that lower levels of self-regulation and trusting and higher levels of body listening significantly predicted the ED risk. Moreover, higher levels of enteric symptoms and lower levels of sympathetic symptoms were able to predict the ED risk in adolescents

Conclusion: These findings point out the importance of discriminating the dimensions of interoceptive awareness for the assessment of ED risk and the central role of body signals' awareness for the treatment of ED.

Introduction

Eating Disorders (ED) and subclinical problems related to eating, body weight, and shape affect many adolescents [1,2]. The most relevant risk factors include parenting and educational style, socio-cultural factors, perceived parenting criticism, perfectionism, internalization of the standards of cultural thinness conveyed by mass media, and dissatisfaction with the body image [3,4]. Along with these studies, a growing body of literature has investigated the role of interoceptive awareness (interoceptive awareness) in ED [5 ,6]. Interoceptive awareness has been defined as "the process by which the nervous system sense, interprets, and integrates signal originating from within the body, providing a moment-by-moment mapping of the body's internal landscape" [6]. Individuals with anorexia nervosa reported abnormal interoceptive awareness levels than healthy individuals [3 ,6-10]. Furthermore, impaired interoceptive awareness has been linked to a higher risk of developing an ED in subclinical samples [11]. These data suggest that impaired interoceptive awareness might predispose ED onset [11]. Interoceptive awareness is a multidimensional construct [12], the ability to identify inner sensations, discriminate body signals, and emotional/physiological condition. These dimensions are then subdivided into four domains: perceptions of comfort, perceptions of worry and tension, perceptions of the neutral state, and the affective component of the previously cited bodily sensations. Interoceptive awareness refers to two domains, representing how individuals perceive their bodily signals: trust in their bodily sensations and concern for bodily messages as a psychological attitude capable of modulating their perception. These domains affect perceived sensations, mediated by the mode of attention. The authors came to another conceptualization with five dimensions and 13 subdomains: Body sensations awareness, Emotional reaction and attentional response (included four subdimensions: affective response to sensations, suppressing or ignoring perceptions, narrative awareness to analyze the sensations, present-moment awareness), capacity to regulate attention (included four subdimensions: sustain awareness, actively direct attention to body parts, narrow/widen attention focus, accepting sensations without changing them), trusting body sensations, mind-body integration (included three subdimensions: emotional awareness, emotional and behavioral self-regulation, feeling of an embodied self) [12,13,14].

The relationship between interoceptive awareness dimensions and ED was investigated in a clinical sample (58.2% anorexia nervosa, 23.9% bulimia nervosa, 3.2% binge eating disorder and other feeding and eating disorders) of 94.4.% of female adults (182) and adolescents (194); the Not distracting, Self-regulation, Body Listening and Trusting subscales of MAIA were the factors most strongly associated with ED symptoms [12]. Not-Distracting refers to not ignoring or distracting oneself from uncomfortable body sensations such as pain; Self-Regulation is the ability to control psychological distress by consciously attending to body sensations; Body Listening assess the tendency to listen to the body for insight actively; Trusting assess the experience of one's body as safe and trustworthy [13,14]. An additional factor in body awareness is the individuals' perception of somatic symptoms. Few studies explored the association between psychosomatic conditions and ED. Abbate-Daga [15,16] investigated the comorbidity of psychosomatic symptoms in ED, and the results showed that 93,6% of the sample (108 inpatients with anorexia nervosa) reported a psychosomatic syndrome. In the case of overeating disorders, the presence of somatic disorders is due to the condition dictated by the disorder [17,18], but in the case of psychosomatic symptoms, the relationship is less clear. The need to clarify the presence of psychosomatic symptoms as risk factors for ED is strong. This relationship has been investigated in few other studies, which had considered the role of somatization as a risk and maintenance factor in ED [19,20] and, in particular, the role that gastrointestinal symptoms play with gender, ethnicity, shape, weight concerns and negative self-evaluation as a risk factor [21]. The primary purpose of the present study was to clarify the relationship between body

awareness and ED risk. In particular, to investigate the role that the specific dimensions of interoceptive awareness, enteric, and sympathetic somatic symptoms cover in adolescence concerning ED risk. A risk factor paradigm for ED risks in adolescence is relevant to understand better the link between body attention and the development of symptoms related to the clinical or subclinical ED level. One of these studies investigates the multidimensional construct of interoceptive awareness and its relationship with ED risk factors in a non-clinical sample of adolescents. Moreover, to investigate whether the dimensions of interoceptive awareness, already emerged in the previous study as more related to ED [12], relate to ED risk. Furthermore, based on the results of the annual review on ED's risk factors [21], another aim was to clarify the relationship between Enteric psychosomatic symptoms and ED risk.

Therefore, based on the literature, our hypotheses are the following:

i. Adolescents with lower interoceptive awareness in not distracting, self-regulation, body listening and trusting domains show higher levels of risk status for ED, measured by Eating Disorder Risk Composite (EDI-3), than adolescents with higher interoceptive awareness in these specific domains;

ii. Adolescents with high Enteric psychosomatic symptoms show higher levels of risk status for ED than adolescents with low Enteric psychosomatic symptoms.

Method

Participants

Participants were recruited from a high school located in the North of Italy (Emilia-Romagna region) during a two-day not mandatory school convention about ED and the promotion of wellbeing. During the first day, students were informed about the study, and they were given informed consent. Parental informed consent was requested in case participants were minors. A total of 330 female students gave their consent to participate. Thirteen participants (3.93%) were excluded from the study as they did not complete the questionnaire part of the questionnaire. Therefore, the final sample was composed of 317 female high school students (M_{age}=17.04±1.22, age range: 14-19 years). Before statistical analysis, a compromise power analysis was conducted using the GPower software (3.1) for nine predictors at three levels of effect size: 0.05, 0.15, and 0.35. The obtained power with 317 participants was 0.950, 0.995, and 0.999, respectively. Participants received school credits for their participation in the study. The Sigmund Freud University Ethics Commission approved the study based on the principles of the Declaration of Helsinki.

Measures

Multidimensional Assessment of Interoceptive Awareness (MAIA)

The MAIA [14] is a 32-item questionnaire that assesses body awareness by combining eight scales: Noticing, Not-Distracting, Not-Worrying, Attention Regulation, Emotional Awareness, Self-Regulation, Body Listening, and Trusting. Answers are given on 6-point Likert-type scales ranging from 0 (never) to 5 (always) (range from 0 to 80). The scales have been shown to have adequate to excellent internal consistency, with Cronbach's alphas from .66 to .87, and above .70 for five of the eight scales [14]. The Noticing scale assesses the awareness of comfortable, neutral, and uncomfortable body sensations (e.g., "When I am tense, I notice where the tension is located in my body"). Not-Distracting refers to not ignoring or distracting oneself from uncomfortable body sensations such as pain (e.g., "I do not notice physical tension or discomfort until they become more severe"). The Not Worrying scale assesses worrying or feeling emotionally distressed in response to uncomfortable body sensations (e.g., "When I feel physical pain, I become upset"). Attention Regulation is the ability to maintain and regulate attention to body sensations (e.g., "I can pay attention to my breath without being distracted by things happening around me"). Emotional Awareness is the interrelation of emotions and body sensations. (e.g., "I notice how my body changes when I am angry"). Self-Regulation is the ability to control psychological distress by consciously attending to body sensations ("When I feel overwhelmed I can find a calm place inside"). Body Listening assesses the tendency to actively listen to the body for insight (e.g. "I listen for information from my body about my emotional state"). Trusting assess the experience of one's body as safe and trustworthy (e.g., "I am at home in my body").

Eating Disorder Inventory (EDI-3)

The EDI-3 [22] is a 91-item self-report questionnaire including 12 scales: Drive for thinness, bulimia, body dissatisfaction, low self-esteem, personal alienation, interoceptive deficits, interpersonal insecurity, interpersonal alienation, emotional dysregulation, perfectionism, asceticism, and maturity fears. Three scales are specific to an eating disorder: drive for thinness, bulimia, body dissatisfaction, while other scales are related to general psychological features. Items are rated on a 6-point Likert-type scale from "always" to "never", but scores are calculated using a 0-4 scale, with higher scores representing more severe symptoms. The drive for thinness scale (7 items) assesses the desire to be thinner (dieting, preoccupation with weight) and has been considered an essential criterion for diagnosis (range from 0 to 28). The bulimia scale (8 items) assesses concerns about overeating and eating during worry emotional state (range from 0 to 32). The body dissatisfaction scale (10 items) assesses discontentment with the overall shape and with the size of a particular region of the body (e.g., hips, stomach, and buttocks) (range from 0 to 40). Based on the EDI-3 version, these three scales constitute a composite score o risk, the Eating Disorder Risk Composite ranging from 0 to 100 [22,23]. For this study, the drive for thinness, bulimia, and body dissatisfaction scale was calculated to obtain the ED risk score.

Psychophysiological Questionnaire Reduced Form (QPF/R)

The QPF/R is a 30-item self-report questionnaire assessing the severity of psychophysiological symptoms on a scale from 1 (not at all) to 4 (very much) (range from 30 to 120). The QPF-R includes two subscales based on the type of symptoms: enteric symptoms (e.g., "I vomit easily") and sympathetic symptoms (e.g., "I suffer from nervous tics). The scale has adequate psychometric properties [24].

Data Analysis

The mean and standard deviation for each dimension were calculated. A multiple linear regression analysis was performed with the following independent variables: the overall score of the QPF-R and the scores obtained at the subscales of the MAIA to analyze the relationship between MAIA variables and ED risk as to the dependent variable. All analyses were performed using SPSS (version 24).

Results

The frequency distribution of participants according to age is included in (Table 1). Descriptive statistics for all the variables included in statistical analysis are given in (Table 2). Multiple linear regression was performed to investigate the predictive value of interoceptive awareness and psychosomatic symptoms toward ED risk (Tables 3&4). The subscales of MAIA and QPF-R were included as the independent variable, while the composite index of risk of the EDI-3 was included as the dependent variable. Enteric psychosomatic items (β=.411, p<.001) and sympathetic psychosomatic items (β=-.161; p<.001) of QPF-R show significance as ED risk, while, contrary to expectations, the following dimension of MAIA were not significant predictors of ED: Not-Worrying (β=.026, p=.555), Attention Regulation (β=-.042, p=.49), Not distracting (β=-.047, p=.29), Emotional Awareness (β=.098, p=.187), and Noticing (β=.099, p=.233). Furthermore, the Self Regulation subscale of MAIA (β=-.120, p=.027), Trusting dimension of MAIA (β=-.318, p<.001) and Body Listening of MAIA (β=.246, p<.001) showed a significance as ED risk predictors.

Table 1: Frequency table of age distribution.

Age	n	%
14	3	0.9
15	30	9.5
16	67	21.1
17	99	31.2
18	87	27.4
19	31	9.8
Total	317	100

Table 2: Descriptive statistics of the variables of interest in the overall sample (n=317).

Variable		95% CI			
		M (SD)	LL	UL	IQR
EDI-3	Drive for Thinness	6.60 (8.05)	5.71	7.49	3
	Bulimia	6.03 (5.56)	5.42	6.65	7
	Body Dissatisfaction	13.23 (10.17)	12.11	14.36	14
	ED risk	25.85 (19.39)	23.71	27.99	10

MAIA	Noticing	2.23 (1.37)	2.08	2.38	2
	Not Distracting	2.67 (0.84)	2.59	2.77	1
	Not Worrying	2.81 (1.10)	2.69	2.93	1
	Attention Regulation	2.36 (1.11)	2.24	2.49	1.57
	Emotional Awareness	2.29 (1.31)	2.15	2.44	2.25
	Self Regulation	2.65 (1.13)	2.53	2.78	2
	Body Listening	1.96 (1.08)	1.84	2.08	1.5
	Enteric Symptoms	29.24 (7.5)	28.41	30.08	6
	Sympathetic Symptoms	22.23 (10.91)	21.03	23.44	13.5

Note: CI=Confidence Interval; M=Mean; SD=Standard Deviation; LL=Lower Limit; UL=Upper Limit; IQR= Interquartile Range.

Table 3: Multiple linear regression analyses summary.

Model Summary									
Model	R	R-Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F change	Df_1	Df_2	Sig. F Change
1	0.735	0.54	0.525	13.36	0.54	35.96	10	306	0

Table 4: Regression coefficients of predictors of ED risk.

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
(Constant)	14.969	6.965		2.149	0.032
Body listening	4.403	0.826	0.246	5.33	0
Not-Distracting	-1.084	1.022	-0.047	-1.061	0.29
Not-Worrying	0.462	0.783	0.026	0.59	0.555
Attention regulation	-0.733	1.061	-0.042	-0.691	0.49
Self Regulation	-2.068	0.932	-0.12	-2.219	0.027
Emotional awareness	-1.437	1.088	-0.098	-1.321	0.187
Noticing	1.398	1.171	0.099	1.194	0.233
Trusting	-4.597	0.945	-0.318	-4.866	0
Enteric symptoms	1.05	0.111	0.411	9.422	0
Simpathetic symptoms	-0.286	0.074	-0.161	-3.847	0

Source: a. Dependent variable: ED risk.

Discussion

The present study extended prior research on ED risk and the relationship between ED risk and interoceptive awareness and psychosomatic symptoms among an adolescents female sample. Our most important finding is the relationship between specific interoceptive awareness domain: low self-regulation, low trusting and high body listening, and ED risk. And then, consistently with the most recent literature on the issue [21], the enteric psychosomatic symptoms and the low presence of sympathetic psychosomatic symptoms are a risk factor for ED. Contrary to our hypotheses, the Not distracting dimension of interoceptive awareness is not significantly related to ED risk. A possible reason for the lack of findings regarding the not distracting domain could be consistent with the results concerning psychosomatic symptoms and the other findings mentioned above. Adolescents with the most significant ED risk do not tend to distract themselves from their unpleasant bodily sensations (e.g., pain) but only from some specific one. Participants with a higher ED risk reported high scores on the psychosomatic symptoms of the enteric area and therefore seem to listen heavily on body sensations from the gastrointestinal tract (e.g., nausea, swelling). Moreover, participants with a higher ED risk seem to pay less attention to non-gastrointestinal body sensations (e.g., headaches). Therefore, the result could be interpreted as a dysfunctional, hyper-concentration of ED risk participants on some specific body sensations at others' expense. Furthermore, this focus on the gastrointestinal tract is so strong that it leaves individuals with the belief of being concentrated on unpleasant messages from their bodies.

Specific bodily signals, such as a sense of hunger and/or satiety, are distorted in ED [25]. People with ED usually do not trust their hunger body signals because they are interpreted as threats, and this fact could explain why a relationship between trusting dimensions of interoceptive awareness and ED risk has been found. Moreover, about self-regulation, it has been shown that not feeding when the body sends signals of hunger amplifies psychological distress [26]. Therefore, people with ED or ED risk avoid interrupting this psychological distress by not trusting their body hunger signal and shifting the attentional focus away from that signal. Concluding, it is assumed that it is the attention to be the critical dimension for the distinction between adaptive and maladaptive forms of body awareness. The results of the present study are indications of possible planning of interventions aimed at preventing ED. There is evidence that interoceptive function can be modified by treatment [6,11], and educate one's attention in specific ways may be a key feature of body awareness [27]. The insertion of therapeutic and educational protocols focused on body attention could help guide young individuals in the development of functional body listening. Programs of this type would help prevent the onset of ED. In the literature, several techniques and protocols effectively increase body awareness [28-30]. First of all, a third-wave Cognitive-Behavioral Therapy (CBT) protocol, mindfulness (through non-judgmental acceptance, sense of self grounded in the present moment in one's body, and sense of embodiment) is an effective attention regulation training and could be used as a group therapeutic protocol in schools for prevention. Some limitations of the present study have to be acknowledged. Since subclinical ED occurs in adolescence at alarming rates, and even more males show ED from early adolescence on [1,2], it would have been appropriate to include male students in our study. Moreover, having considered ED as a single category does not allow to study the relationship between different eating symptoms [31-33]. It would, therefore, be considered appropriate in future studies to investigate the factors related to specific eating symptom clusters (e.g., restriction, self-esteem connected to one's body image, compensatory behavior, binge eating). Finally, it might be appropriate to evaluate a pre-post intervention and follow-up aimed at adequate attention to the body, to assess whether adequate interoceptive awareness can influence psychosomatic symptoms and represent a protective factor for ED [34].

Conclusion

To sum up, this work is the first study that explores the relationship between multidimensional interoceptive awareness, psychosomatic symptoms, and ED risk [35,36]. Despite the above-mentioned limitations, the present study showed that adolescents with low emotional awareness as well as those adolescents who report low body trusting (interoceptive awareness), high body listening (interoceptive awareness), and high scores in enteric psychosomatic symptoms scale, show higher ED risk [37-39].

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent

Informed consent was obtained from all individual participants included in the study and from their parents.

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