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

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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 Reduced Form (QPF-R), and the Eating Disorder Risk Composite (EDRC) from 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 body 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 prevalence 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 sensations and ED.
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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. The final sample was composed of 317 female high school students (M = 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 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 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. 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 was 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.

**Data Analysis**

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.

**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 (e.g., “I notice how my body changes when I am angry”). Body Listening assesses the ability to control psychological distress by consciously attending to body sensations (e.g., “I notice how my body changes when I am angry”). Body Listening assesses the ability to control psychological distress by consciously attending to body sensations (e.g., “I notice how my body changes when I am angry”). Emotional Awareness is the interrelation of emotions and body sensations (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 (e.g., “I notice how my body changes when I am angry”). 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, 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 of 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].

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**Table 1:** Frequency table of age distribution.

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>3</td>
<td>0.9</td>
</tr>
<tr>
<td>15</td>
<td>30</td>
<td>9.5</td>
</tr>
<tr>
<td>16</td>
<td>67</td>
<td>21.1</td>
</tr>
<tr>
<td>17</td>
<td>99</td>
<td>31.2</td>
</tr>
<tr>
<td>18</td>
<td>87</td>
<td>27.4</td>
</tr>
<tr>
<td>19</td>
<td>31</td>
<td>9.8</td>
</tr>
<tr>
<td>Total</td>
<td>317</td>
<td>100</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>EDI-3</th>
<th>M (SD)</th>
<th>95% CI</th>
<th>LL</th>
<th>UL</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive for Thinness</td>
<td>6.60 (8.05)</td>
<td>5.71</td>
<td>7.49</td>
<td>3.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulimia</td>
<td>6.03 (5.56)</td>
<td>5.42</td>
<td>6.65</td>
<td>7.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>13.23 (10.17)</td>
<td>12.11</td>
<td>14.36</td>
<td>14.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ED risk</td>
<td>21.10 (19.39)</td>
<td>21.37</td>
<td>27.99</td>
<td>10.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


### 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, consistent with the most recent literature on the issue [21], the enteric psychosomatic symptoms and the low presence of sympathetic body listening, and ED risk. And then, consistently with the most recent literature on the issue, the enteric symptoms and the low presence of sympathetic body listening, and ED risk. 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 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.

### References


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Table 3: Multiple linear regression analyses summary.

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R-Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>F change</th>
<th>DF</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.735</td>
<td>0.54</td>
<td>0.525</td>
<td>13.36</td>
<td>0.54</td>
<td>35.96</td>
<td>10</td>
</tr>
</tbody>
</table>

### Table 4: Regression coefficients of predictors of ED risk.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>14.969</td>
<td>6.965</td>
<td>2.149</td>
<td>0.032</td>
</tr>
<tr>
<td>Body listening</td>
<td>4.403</td>
<td>0.826</td>
<td>0.246</td>
<td>5.33</td>
</tr>
<tr>
<td>Not-Distracting</td>
<td>-1.084</td>
<td>1.022</td>
<td>-0.047</td>
<td>-1.061</td>
</tr>
<tr>
<td>Not-Worrying</td>
<td>0.462</td>
<td>0.783</td>
<td>0.026</td>
<td>0.59</td>
</tr>
<tr>
<td>Attention regulation</td>
<td>-0.733</td>
<td>1.061</td>
<td>-0.042</td>
<td>-0.691</td>
</tr>
<tr>
<td>Self Regulation</td>
<td>-2.068</td>
<td>0.932</td>
<td>-0.12</td>
<td>-2.219</td>
</tr>
<tr>
<td>Emotional awareness</td>
<td>-1.437</td>
<td>1.088</td>
<td>-0.098</td>
<td>-1.321</td>
</tr>
<tr>
<td>Noticing</td>
<td>1.398</td>
<td>1.171</td>
<td>0.099</td>
<td>1.194</td>
</tr>
<tr>
<td>Trusting</td>
<td>-4.597</td>
<td>0.945</td>
<td>-0.318</td>
<td>-4.866</td>
</tr>
<tr>
<td>Enteric symptoms</td>
<td>1.05</td>
<td>0.111</td>
<td>0.411</td>
<td>9.422</td>
</tr>
<tr>
<td>Sympathetic symptoms</td>
<td>-0.286</td>
<td>0.074</td>
<td>-0.161</td>
<td>-3.847</td>
</tr>
</tbody>
</table>


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**MAIA**

- **Noticing**: 2.23 (1.37)
- **Not Distracting**: 2.67 (0.84)
- **Not Worrying**: 2.81 (1.10)
- **Attention Regulation**: 2.36 (1.11)
- **Emotional Awareness**: 2.29 (1.31)
- **Self Regulation**: 2.65 (1.13)
- **Body Listening**: 1.96 (1.08)
- **Enteric Symptoms**: 29.24 (7.5)
- **Sympathetic Symptoms**: 22.23 (10.91)

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


