# Early identification of risk for eating disorders in Italian secondary school students: a cross-sectional study

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**Summary. Aim.** Eating disorders are major illnesses that primarily affect adolescents and young adults and seriously threaten public health. Early identification of at-risk individuals and timely initiation of treatment is crucial to improve outcomes. The Inside Out Institute Screener (IOI-S) is a rapid self-administration screening tool for high-risk and early-stage eating disorders. This study aimed to investigate the risk of having an eating disorder in a sample of Italian students by testing the Italian version of the IOI-S. **Methods.** A multicentre cross-sectional study was conducted in a population of students aged 12-19 years; validity and reliability of the IOI-S$_{ita}$ were investigated. **Results.** Four-hundred and ninety-one (81.97%) students were enrolled, 24.85% of whom were found to be at "very high risk" of an eating disorder, according to IOI-S$_{ita}$. Younger ($p<0.001$) and female ($p<0.001$) students had higher risk scores. The EFA confirmed the original monodimensional structure of the tool, S-CVI=0.95%. The Content Validity Index of the scale (S-CVI) was 0.95, $\omega$ coefficient was 0.927. **Discussion and conclusions.** This research confirms the need to screen for eating disorders in Italian youth adequately; the psychometric properties of the IOI-S$_{ita}$ confirm it as a valid and reliable tool for screening high-risk and early-stage eating disorders.

**Key words.** Eating disorders, Inside Out Institute Screener, risk, screening.

*Identificazione precoce del rischio di sviluppare disturbi alimentari negli studenti italiani della scuola secondaria di secondo grado: uno studio trasversale.*

**Riassunto. Obiettivo.** I disturbi alimentari costituiscono un gruppo di disordini che colpiscono principalmente adolescenti e giovani adulti e rappresentano un serio problema di salute pubblica. L'identificazione precoce dei soggetti ad alto rischio o in fase iniziale di malattia e l'inizio tempestivo del trattamento terapeutico sono aspetti fondamentali per il miglioramento degli outcome clinici. L'Inside Out Institute Screener (IOI-S) è uno strumento di self-reporting in grado di identificare precocemente il rischio di sviluppare disturbi alimentari. Lo scopo di questo studio è stato quello di indagare il rischio di sviluppare un disturbo alimentare in un campione di studenti italiani testando le proprietà psicometriche della versione italiana della scala IOI-S. **Metodi.** È stato condotto uno studio trasversale multicentrico arruolando un campione di studenti di età compresa tra i 12 e i 19 anni; sono state indagate la validità e l'affidabilità dell'IOI-S$_{ita}$. **Risultati.** Sono stati arruolati 491 studenti (tasso di risposta 81,97%), il 24,85% dei quali è risultato a "rischio molto elevato" per lo sviluppo di un disturbo alimentare, secondo la IOI-S$_{ita}$. Gli studenti più giovani ($p<0,001$) e di sesso femminile ($p<0,001$) hanno mostrato punteggi di rischio più elevati. L'analisi fattoriale esplorativa (EFA) ha confermato la struttura monodimensionale originale dello strumento, l'omega di Mcdonald's ($\omega$=0,927) l'ottima consistenza interna, il Content Validity Index (CVI-S=0,95) la soddisfacente validità di contenuto. **Discussione e conclusioni.** Questo studio ha confermato la dimensione del problema e la necessità di effettuare un adeguato screening dei disturbi alimentari nei giovani in Italia; la IOI-S$_{ita}$ si è dimostrata valida e affidabile per lo screening dei disturbi alimentari ad alto rischio e in fase iniziale.

**Parole chiave.** Disturbi alimentari, Inside Out Institute Screener, rischio, screening.

## Background

Eating disorders (EDs) are serious medical conditions increasingly becoming a worldwide public health concern[1]. Principal reasons include: (a) growing prevalence rates – an estimated 70 million people worldwide suffer from EDs, a typical onset in the 15-19 age group, but with a trend towards a lower average age[2]; (b) they could affect an individual's physical, psychological, and social well-being, with high impact and burden and thus on the individual's quality of life[3]; (c) barriers and delays in diagnosing and beginning treatment that may contribute to the risk of chronic disease trends, hence the effects on physical comorbidities can be protracted and associated in turn with higher rates of disability, but also death[4,5]. Indeed, people diagnosed with an ED, especially Anorexia (AN) and Bulimia Nervosa (BN), have a 5-10

times higher risk of death than the general population[6,7].

The magnitude of EDs is increasing worldwide; globally, the lifetime prevalence rates of AN might be up to 4% among females and 0.3% among males. For the other main diagnosis, BN, up to 3% of females and more than 1% of males suffer from this disorder[7]. The Italian National Institute of Health (ISS) reports a 0.2-0.8 per cent prevalence for Anorexia Nervosa and 1-5 per cent for Bulimia Nervosa. However, the lack of up-to-date and accurate epidemiological data in Italy makes it difficult to assess the real impact of these disorders in this country[8].

The described scenario was further worsened by the Covid-19 pandemic, which rapidly led to drastic changes in the lifestyle of the global population, especially of younger generations[9]. Physical distancing, reduced social interactions, remote schooling, isolation from friends, and re-organization of home living spaces exacerbate pre-existing conditions or trigger serious illnesses[10,11]. The Italian Society for the Study of Eating Disorders estimated a 30% increase in new cases and a 50% growth in first consultation requests for EDs since the early stages of the pandemic[12].

Early identification and treatment, especially in the early years of the illness, are essential for recovery, while worse outcomes are associated with delayed action. This is especially relevant for children and adolescents with early disease onset, who have been found to have the longest mean duration of untreated disease[13].

Adequate knowledge and awareness of symptoms positively influence early recognition by affected individuals and family members, thus providing a crucial step towards seeking help[14,15]. Despite a critical growth in the extent of the problem, the general public's knowledge needs to be improved, and poor information is widespread, even among those diagnosed with an ED[16].

Healthcare providers report greater awareness of diagnostic criteria for AN and BN compared to other EDs, i.e. Binge Eating Disorder (BED) and Other Specified Feeding or Eating Disorders (OSFED)[17]. Hence, improving clinical knowledge of different ED behaviours and symptoms, both in healthcare professionals and the general population, is necessary to ensure appropriate diagnosis, assessment and access to treatment by diagnostic subtype[18].

Limited screening procedures and tools represent a further obstacle to early intervention for people with ED and result in even high-risk groups not being screened. As a result, early symptoms not being detected[19-23]. To date, the identification of eating disorders is performed routinely through time-consuming self-report or physician-administered diagnostic tools, which may not be appropriate for other healthcare professionals and different clinical settings[24].

Furthermore, few available instruments can reliably detect the broader manifestations of eating disorders. The most commonly used screening tool, the SCOFF questionnaire[25], only typically identifies traditional presentations of AN and BN, and there is no evidence to support utilizing this tool for screening for the range of DSM-5 eating disorders in primary care and community-based settings.

The Inside Out Institute Screener "IOI-S"[24] was recently proposed as a valid and reliable tool for assessing the general population's ED risk and subthreshold illness.

The instrument, created in 2021 by "InsideOut", Australia's National Institute for Research, translation and clinical excellence in eating disorders, showed high internal consistency ($\alpha=0.908$, $\omega=0.910$) and test-retest reliability (0.968, 95% CI 0.959-0.975; $p \leq 0.1$); also it accurately distinguished probable eating disorders with a sensitivity of 82.8% and a specificity of 89.7%[24].

The additional value of this tool is the ability to investigate the clinical characteristics of different presentations of EDs as defined by the latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5)[26], beyond Anorexia Nervosa and Bulimia Nervosa. Moreover, the IOI-S gives both individuals and healthcare practitioners a reliable screening option adapted for self-administration and is designed to be integrated into any healthcare setting.

## Aim

This study aimed to (a) investigate the risk for eating disorders in a sample of Italian students in the 12-19 age group and (b) validate the Italian version of the IOI-S.

## Methods

### DESIGN AND SETTINGS

A multicentre cross-sectional study was conducted in a population of 12-19 years in six secondary schools across two Italian regions, Lombardy and Emilia-Romagna. The data collection was carried out during the 2022/2023 academic year.

### PARTICIPANTS

All students (n=599) enrolled in the three-year junior high school program and the five-year major high school program of the involved schooling institutions were invited to participate. Because this is the first study to examine students' risk with the IOI-S in the Italian setting, sample size estimation was based

on previous work by Mensi et al.[27], in which 481 Italian students were enrolled. Based on its findings, a minimum of 480 students was initially assumed.

## DATA COLLECTION

For every school, a research team member was identified to organize the study presentation and data collection, which lasted three months during the 2022/2023 academic year. They also explained to school directors and staff in charge of instructing students the study objectives and how to respond to the IOI-S.

At the end of the study presentation, the research team member sent a web link generated via the online application Google Forms to the student's e-mail address, which included the Italian version of IOI-S (IOI-S$_{ita}$) and Information sheet, declaration of consent to participate and students' details (age, gender, school attended).

## VALIDATION PROCESS AND TOOL DESCRIPTION

The back translation technique translates the Italian version of IOI-S (IOI-S$_{ita}$) according to the World Health Organisation's method[28]. The tool was translated into Italian independently by two nurses with certified knowledge of English (level C2); they agreed on a final version, comparing their translations. The scale was then retranslated into English by a professional language teacher who had not seen it before. The final version was sent to the author of the original scale, who approved it.

The IOI-S$_{ita}$ was administered to 6 nurses with more than five years of clinical experience in mental health to assess its face and content validity; each nurse received a statement regarding the purpose of the study, and the scale was translated into Italian; for each item, the relevance was assessed by assigning a score from 1 ("totally irrelevant") to 10 ("totally relevant"); this allowed the determination of the Content Validity Index of every single item (I-CVI) and of the Content Validity Index of the instrument (S-CVI). In agreement with international literature, I-CVI scores ≥0.80 and an S-CVI score ≥0.90 were considered satisfactory[29].

An additional question was created to allow the personnel involved to state their perception about the existence of further aspects not included in the tool and to provide an overall assessment of its clarity and completeness. Eighty students were asked to fill out the tool again one week after the first time to test the stability of the Italian version of the IOI-S.

As shown in table 1, the instrument is composed of 6 items covering six facets of eating pathology: individual relationship with food, the impact of weight and body shape on self-worth, intensity of preoccupation with food and weight anxiety and discomfort in maintaining control, loss of control over eating, compensatory behaviour. Items 1-3 investigate behaviours shared across all ED diagnoses; item 4 investigates AN, BN and OSFED (Other Specified Feeding or Eating Disorders) dimensions. Item 5 explores BN, OSFED and BED (Binge Eating Disorder) dimensions and finally, item 6 explores AN-BP (Anorexia- binge-eating/purging type), BN, Purging Disorder and OSFED symptom dimensions. The tool is rated on a 5-point Likert scale, with one being "never" and five being "always", except for item 1, where 1 is "Worries and stress-free", and five is "full of worries and stress". All item scores are then added to yield a total score between 6 and 30 points, with 6 points representing the lowest level of risk and 30 points the highest level of risk.

Overall scores between 6 and 12 identify a low-risk level ("currently the risk of developing an eating disorder is low"); scores between 13 and 15 identify a medium-risk level ("you may be affected by symptoms experienced by people with eating disorders"); scores between 16 and 18 identify a high-risk level ("experienced symptoms experienced by people with eating disorders"), and scores >18 a identify a very high-risk level ("experienced symptoms typical of people with eating disorders").

## STATISTICAL ANALYSIS

Continuous variables were described with medians and quartiles, as they were not normally distributed (Shapiro-Wilk test: $p < 0.05$ for all analyses) and compared with groups (e.g. school, gender) using Mann-Whitney's U-tests (in the case of two-level categorical variables) and Kruskal-Wallis pairwise comparisons (variables with more than two levels). The correlation was assessed with Spearman's rho coefficient. Categorical variables were described with frequencies. Internal consistency was tested by calculating Cronbach's alpha coefficient and eliminating individual variables; the original authors, despite the one-dimensionality of the instrument, had also calculated McDonald's omega and the same analysis was performed. The exploratory factorial analysis (EFA) was conducted with minimum residual extraction and Oblimin rotation. The eigenvalues of the correlation matrix were retained using Kaiser's method. Bartlett's sphericity test was performed before the analysis, and the Kaiser-MeyerOlkin sample adequacy measure was calculated. Finally, the model's goodness of fit was verified with the chi-square test. The significance threshold for all analyses was set at 5%. All calculations were performed with R version 4 for MacOS.

## ETHICAL CONSIDERATIONS

All data were collected anonymously; the collected data was processed in compliance with cur-

**Table 1.** Italian version of IOI-S (IOI-S$_{ita}$)

| Them | Item |
|---|---|
| Relationship with food[a] | 1. How is your relationship with food? *(For example: is food and eating worry-free or full of worry and stress?)* |
| Body & self-worth[a] | 2. Does your weight, body, or shape make you feel bad about yourself? *(For example, the number on the scale, the shape of your body or a part of your body)* |
| Preoccupation with food or weight[a] | 3. Do you feel food, weight, or body shape dominates your life? *(For example: experiencing constant thoughts about food, weight or your body)* |
| Anxiety and distress[b] | 4. Do you feel anxious or distressed when you do not control your food? *(For example: when others cook or prepare food for you or when eating out)* |
| Loss of control[c] | 5. Do you ever feel like you will not be able to stop eating or have lost control of food? *(For example: feeling that you have no control around food, that you binge eat or fear that you will binge eat)* |
| Compensatory behaviour[d] | 6. When you think you have eaten too much, do you do anything to compensate for it? *(For example: skipping the next meal, going light on the next meal, working it off with exercise, purging via vomiting or taking laxatives, diuretics or diet pills)* |

[a]relates to all presentations; [b]relates to AN, BN and OSFED presentations; [c]reates to BN, BED, and OSFED presentations; [d]relates to AN-BP, BN, Purging Disorder and OSFED presentations.

rent Italian legislation in this regard and accordance with the Declaration of Helsinki principles. The participants gave explicit consent to participate after being informed about the methods and purposes of the data collection. The required authorizations were obtained from the directors of the schools involved; informed consent was obtained from the parents/legal representatives of all underage participants.

The University of Milan Ethics Committee approved the study.

## Results

### PARTICIPANT CHARACTERISTICS

Four-hundred and ninety-one out of 599 students (81.97%) responded; 307 were female (62.53%), and 178 were male (36.26%), whereas 6 (1.22%) reported "other gender". The median age of the sample was 16 IQR [15;17] years. Four-hundred and fifty students (91.65%) attended a major high school, and 41 (8.35%) a junior high school.

### IOI-S$_{ITA}$ PSYCHOMETRIC PROPERTIES

All six items of the IOI-S$_{ita}$ scored an I-CVI>0.80, and no requests for changes were indicated. The S-CVI was 0.95; all items were clear and comprehensible.

The EFA confirmed the one-dimensional nature of the scale, as stated by the original authors; all factorial loadings were higher than Stevens' cutoff. The percentage of variance explained by the model was 68.10%, higher than the value obtained in the validation study (63.11%). The internal consistency analy-

sis showed a McDonald's ω value of 0.927; the value achieved is higher than in the original study (ω=0.910). The omega score remained between 0.907 and 0.924, even after removing one item at a time (table 2).

As in the original validation study, internal consistency was also determined by calculating Cronbach's alpha coefficient, which was 0.925 (minimum value 0.916 even after removing the items individually). Concerning test-retest stability, there were no statistically significant differences in the median scores of the students one week after the first administration (rho=0.93, p=0.231).

### RISK OF EATING DISORDER: IOI-S$_{ITA}$ SCORES

The risk score calculated using the Italian version of the Inside Out Institute Screener "(IOI-S$_{ita}$) was Me=11[8;18] (min=6 max=30) on a theoretical score ranging from 6 to 30.

**Table 2.** Factorial loadings from EFA and internal consistency.

| Items | Factor loadings | McDonald's Omega |
|---|---|---|
| Item 1 | 0.791 | 0.918 |
| Item 2 | 0.859 | 0.910 |
| Item 3 | 0.886 | 0.907 |
| Item 4 | 0.884 | 0.907 |
| Item 5 | 0.787 | 0.919 |
| Item 6 | 0.734 | 0.924 |

Stratifying the sample by risk groups (table 3), as indicated by the creators of the instrument, showed that 24.85% were at "very high risk", i.e. "were experiencing symptoms typical of people with eating disorders".

Almost half of the respondents (n=224, 45.62%) reported that their relationship with food (item 1) does not cause them stress or worry, while 11.41% (n=56) indicated a high or maximum level of stress (table 4).

Table 5 summarises the responses to item 2,3,4,5,6; similar results were obtained in items 4,5 and 6 about the frequency with which specific attitudes and behaviours ascribable to an eating disorder are experienced; about each item, about half of the subjects never experienced the situations described, which were, however, experienced "Often" or "All the time" by more than 18% of the subjects.

On the other hand, item 3, describing how much thoughts about food, weight or body image prevail in the subject's life, shows a lower percentage (33.20%) of individuals reporting that they *"never"* experience such feelings.

Finally, item number 2 investigated to what extent weight, physical appearance or body shape makes the subject feel uncomfortable; the percentage of subjects who answered "Often" or "All the time" was 35.85%, higher than all other items on the tool.

### RISK LEVELS AND SOCIO-DEMOGRAPHIC CHARACTERISTICS

The risk scored through the IOI-$S_{ita}$ was related to the socio-demographic variables analyzed (gender, age, school): a positive, slight but statistically significant (rho=0.156, p<0.001) correlation emerged between age and overall score; a statistically significant difference emerged between the risk scores of middle school and high school students (p<0.001), with higher scores in high school (secondary school) (Me=11, IQR[7-19] vs 8[7-10]). Gender also showed significant differences with higher scores in females vs males (Me=15, IQR[9-23] vs 8[8-11], p<0.001); the six subjects who declared "other gender" reported a score of Me=10.5, IQR[8.25-21].

Table 6 shows the risk class sample stratification according to the variables "Gender" and "School".

## Discussion

The Covid-19 pandemic generated substantial lifestyle modifications that significantly impacted the general population's mental health, especially adolescents. As a result, it led to an increased need for mental health services among young people worldwide, and within this group, there was a large increase in the prevalence of ED[30]. However, although multi-

**Table 3.** Risk ranges by using IOI-$S_{ita}$.

| Risk group | n | % |
|---|---|---|
| Low | 285 | 58.04 |
| Medium | 45 | 9.16 |
| High | 39 | 7.9 |
| Very high | 122 | 24.85 |

**Table 4.** Item 1. How is your relationship with food?

| 1. Worry and stress level | n | % |
|---|---|---|
| **Worry and stress-free** | 224 | 45.62 |
| **Low** | 153 | 31.16 |
| **Medium** | 56 | 11.41 |
| **High** | 39 | 7.94 |
| **Full of worry and stress** | 17 | 3.47 |

**Table 5.** Items 2,3,4,5,6 - Frequency of specific attitudes and behaviours.

| | 2. Does your weight, body, or shape make you feel bad about yourself? | 3. Do you feel like food, weight, or body shape dominates your life? | 4. Do you feel anxious or distressed when you do not control your food? | 5. Do you ever feel like you will be unable to stop eating or have lost control of food? | 6. When you think you have eaten too much, do you do anything to compensate for it? |
|---|---|---|---|---|---|
| Frequency | n (%) | n (%) | n (%) | n (%) | n (%) |
| Never | 122 (24.85) | 163 (33.20) | 243 (49.49) | 234 (47.66) | 258 (52.55) |
| Rarely | 108 (22.00) | 158 (32.18) | 93 (18.94) | 80 (16.29) | 78 (15.89) |
| Sometimes | 85 (17.31) | 64 (13.03) | 51 (10.39) | 60 (12.22) | 65 (13.24) |
| Often | 90 (18.33) | 59 (12.02) | 48 (9.78) | 41 (8.35) | 55 (11.20) |
| All the time | 86 (17.52) | 47 (9.57) | 56 (11.41) | 76 (15.48) | 35 (7.13) |

**Table 6.** Risk class sample stratification according to the variables "Gender" and "School".

| Low n (%) | | Risk group | | | |
|---|---|---|---|---|---|
| | | Low n (%) | Medium n (%) | High n (%) | Very high n (%) |
| **Gender** | Male (n=178) | 161 *(90.45)* | 7 *(3.93)* | 7 *(3.93)* | 3 *(1.69)* |
| | Female (n=307) | 120 *(39.09)* | 38 *(12.38)* | 32 *(10.42)* | 117 *(38.11)* |
| | Other (n=6) | 4 *(66.67)* | 0 | 0 | 2 *(33.33)* |
| **School** | Junior high school (n=41) | 33 *(80.49)* | 5 *(12.20)* | 1 *(2.44)* | 2 *(4.88)* |
| | Major high school (n=450) | 252 *(56.0)* | 40 *(8.89)* | 38 *(8.44)* | 120 *(26.27)* |

ple reports[31] from different countries have shown an increase in the incidence of ED-related behaviour or diagnoses since the start of the Covid-19 pandemic, systematic screening studies in youth are lacking.

The median risk score obtained with the IOI-S$_{ita}$ was moderate (Me=11[8;18]). However, stratification by risk groups revealed that almost a quarter of the sample was at "very high risk".

In keeping with previous studies[13,32], female respondents were more likely to experience ED symptomatology, which is not unexpected given the well-known female predominance in all diagnostic subgroups. Of note, approximately 10% of males presented a 'medium' or higher level of risk. This finding aligns with the available literature on the emergence of EDs as an increasing health risk for male youth[33].

Despite a very limited number of individuals who reported belonging to other genders, one-third presented considerable median scores. Further research is needed to fill the gaps in the literature examining eating disorders among young people of gender minorities[34].

The finding that approximately 20% of the students attending junior high school had an 'average' or higher risk confirms the trend of a progressive tendency to reduce the age of symptom presentation[35,36]; this result supports the need for healthcare and educational systems to consider preventive programmes in schools as soon as possible.

The examination of the IOI-S$_{ita}$ item scores independent of the overall scoring of the scale makes it possible to capture the characteristic behavioural pattern of different clinical diagnoses; this is certainly very helpful for health professionals as it can provide support in the targeted identification of the various presentations of an eating disorder beyond the typical AN and BN.

As a second objective, we tested the psychometric properties of the Italian Version of the IOI-S. The tool showed excellent characteristics in identifying high-risk and early-stage eating disorders; the CVI-S$_{ita}$ score obtained through the expert nurses' group consultation confirmed the scale's content validity, which was also found to be easy, unambiguous, and comprehensible. As its original version, the IOI-S$_{ita}$ provides a monodimensional view of the construct. Moreover, the excellent Cronbach's α values and McDonald's ω value confirmed the internal consistency of the tool. No significant differences in students' median scores one week after the first administration were detected, confirming the tool's stability. However, the validation process must be completed by calculating concurrent and convergent validity as well as the sensitivity and specificity levels of the tool, which were very promising in the original study.

Our study presents some limits. First, although we enrolled a large sample with a high-response rate, we cannot generalize our findings to the entire Italian population because respondents were from Northern Italy; moreover, the relationship between IOI-S$_{ita}$ scores and variables such as BMI, ethnicity, positive family history of ED were not explored.

## Conclusions

Although treatment and prevention of eating disorders in youth are effective, many adolescents are reached late in the disease trajectory.

Within the scientific community, substantial controversy exists about the stringency of existing criteria for the full-blown syndrome of major eating disorders. This may exclude or preclude individuals at an early phase of the disease from receiving appropriate treatment. This strengthens the importance of detecting early and sub-threshold cases, which may have significant implications for individual disease trajectory, overall health burden and mortality rates. The Italian version of the IOI-S has shown to be a valuable, practical and easily deployable self-administered screening tool for this purpose and should be extensively used.

*Declarations of interest*: each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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