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A Brief Overview: Symptoms of Eating Disorder, Anxiety, Depression, Suicidal Risk and Self-esteem in Italian University Students

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Abstract. *Objective*: This study aimed to investigate the interconnections among symptoms of eating disorders (EDs), suicidal ideation, symptoms of depression and anxiety, and the perceived quality of family functioning in a cohort of university students aged 19 to 67 years (N = 211). *Methodology*: Symptom assessment was conducted using the Suicide Behaviors Questionnaire-Revised, Rosenberg Self-Esteem Scale, Depression Anxiety Stress Scales Short Version, and Eating Disorder Examination Questionnaire. We employed network analysis to explore the relationships between these domains. *Results*: Within the current network, Shape Concern, Weight Concern, Stress, and Depression symptoms exhibited the highest centrality. *Discussion:* Our findings underscore the significant roles played by stress and depression symptoms in the manifestation of EDs symptoms among university students. These results offer novel insights to enhance early interventions aimed at mitigating symptoms and risk factors associated with EDs. A deeper comprehension of these intricate associations and the influence of familial variables could bolster the efficacy of interventions, both in clinical and educational settings.

Keywords: Eating Disorder, Suicide, Self-esteem, Students.

Introduction

The prevalence of eating disorders in Italy is steadily increasing. It's estimated that there are actually 8 new cases per 100,000 people in a year in the female gender and up to 1.4 new cases in the male gender (Ministero della Salute, 2023).

Eating disorders commonly co-occur with psychiatric symptoms, encompassing anxiety, diminished self-esteem, and depression (Black-Becker et al., 2014; Cruz et al., 2015; Murga et al., 2022; Ruiz Lázaro et al., 2022), along with other adverse consequences such as suicide-related behaviors (Smith, Zuromski, & Dodd, 2018) and suicide mortality (Chesney et al., 2014).

These associations are commonly observed both in university students with eating disorders (Goel et al., 2018) and in those at risk for developing eating disorders (Chang et al., 2015). Furthermore, Lipson and Sonneville (2020) found that recent weight loss and body dysmorphia were linked to suicidal ideation in college students, while Nascimento et al. (2019) observed a higher proneness to attempt suicide in students at risk for eating disorders or with symptoms suggestive of depression.

A promising approach to investigate these associations is network analysis (Levinson et al., 2022; Monteleone & Cascino, 2021). However, prior network studies analyzing eating disorders symptoms have mainly focused on connections with anxiety, stress, and depressive symptoms (Levinson et al., 2017; Smith et al., 2018), and few studies have been conducted on Italian populations whit network analysis, especially in non-clinical and university samples (e.g., Bastianelli et al., 2011; Monteleone & Cascino, 2021).

Considering the high prevalence of eating disorders among university students (Fitzsimmons-Craft et al., 2019; Murga et al., 2022) and the necessity for new insights to enhance prevention strategies (Murga et al., 2022), our objective is to examine the associations between eating disorders symptoms, anxiety, depressive symptoms, suicidal risk, and self-esteem in a sample of Italian university students.

Consistent with previous findings (Monteleone et al., 2019; Murga et al., 2022), we hypothesize (*H1*) that general distress symptoms (e.g., stress, anxiety, and depression) will play central roles in the overall network. Furthermore, we hypothesize (*H2*) that self-esteem will be linked to eating disorders symptoms (e.g., lower self-esteem is associated to possible eating disorder problems).

Participants and Procedure

A total of 211 participants (age 19 to 67 years, Median= 25.5, Mean= 30.50, SD= 11.60) volunteered to take part in the study via an online survey posted in Italian online forums and social network communities (e.g., *Facebook, WhatsApp, Telegram*). The online survey took around 10–15 min to complete. Data collection occurred from 10 July to 31 August 2023. Inclusion criteria for volunteers were being (*i*) at least 18 years old

(*ii*) be a university student and (*iii*) Italian-speaking citizens. All the participants completed the survey anonymously and gave their informed online consent. Participant response data is stored in an encrypted online drive accessible only to the authors of this study.

Measures

Socio-demographics Parameters: Questions concerning socio-demographic aspects of the participants (e.g., age, gender) were included in the online survey.

Suicide Behaviors Questionnaire-Revised (*SBQ-R)****:*** To assess the risk of suicide, the study employed the Suicide Behaviors Questionnaire-Revised SBQ-R; Rueda-Jaimes et al., 2017). The questionnaire comprising four items (e.g. "*Have you ever thought about or attempted to kill yourself?*") inquires about distinct aspects of suicidal behavior: lifetime ideation and attempts, recent frequency of ideation, suicide threats, and self-perceived likelihood of future suicidal actions. Respondents rate these four items using Likert scales of different lengths, which ultimately yield total scores ranging from 3 to 18, with elevated scores indicating an increased risk of suicide. Although there is (to the authors' knowledge at the time of writing this article) no validation of the tool for the Italian language, the SBQ-R has been successfully used in other published Italian research (e.g. Veronese et al., 2021). Cronbach alphas (α=0.83) and McDonald's Omega (ω=0.84) in the present study were very good.

Rosenberg self esteem scale: The 10-item RSES (Rosenberg, 1965; Italian version: Prezza et al. 1997) was employed to evaluate self-esteem. Each item, such as "Overall, I am content with myself," was rated on a four-point scale ranging from 0 (strongly disagree) to 3 (strongly agree). Scores on this scale fall within the range of 0 to 30, with higher scores indicating a stronger sense of self-esteem. Cronbach alphas (α=0.88) and McDonald's Omega (ω=0.89) in the present study were very good.

Depression Anxiety Stress Scales Short Version *(DASS-21):* The DASS-21, a questionnaire containing 21 items (DASS-21, Henry & Crawford, 2005; Italian version: Bottesi et al., 2015), was employed to evaluate psychological distress experienced in the previous week. Respondents indicated their level of distress on a four-point scale ranging from 0 (not at all) to 3 (very much) across three constructs: depression (e.g., feeling a lack of anticipation), anxiety (e.g., nearing a panic attack), and stress (e.g., struggling to unwind). Each subscale's scores vary from 0 to 21, while the aggregate score ranges from 0 to 63, reflecting overall distress as the sum of the three subscales. Higher scores on individual subscales indicate increased levels of depression, anxiety, and stress, respectively. Cronbach

alphas (α=84) and McDonald's Omega (ω=84) in the present study were very good.

Eating Disorder Examination Questionnaire *(EDE-Q 6.0):* The EDE-Q 6.0 is a comprehensive 28-item measurement tool Fairburn & Cooper, 1993). This questionnaire employs a 7-point likert scale, compulsory-choice rating scale (ranging from 0 to 6), where scores of 4 or above indicate the clinical range (e.g. "*Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight? ")* Both subscale and global scores gauge the intensity of eating disorder-related psychopathology. For subscale scores, the ratings assigned to relevant items are summed and then divided by the total number of items constituting that subscale. If ratings are accessible for only a portion of the items, but the count surpasses half of the total, a score is computed by dividing the cumulative sum by the number of rated items. A "global" score emerges from adding the four subscale scores together and dividing the sum by the number of subscales (i.e., four). Cronbach alphas (α=0.96) and McDonald's Omega (ω=0.96) in the present study were very good.

Statistical Analyses

Descriptive statistics

Before performing data analysis, the univariate normality of the data was checked using the guidelines proposed by Kim (2013) and Muthèn and Kaplan (1985), ensuring that all items had skewness and kurtosis in the range of +1.5 to -1.5 or the Shapiro-Wilk test must be non-significant ($p >$ 0.05). Statistical analyses were performed including: (i) descriptive statistics of the main test used (ii) descriptive statistics of the study sample (iii) reliability analyses of the main tests used. The chosen significance level was $p <0.05$.

Network Analysis

Network Analysis (NA) is a methodological framework for data analysis, as clarified by Borgatti et al. (2009), oriented towards the mapping and visual representation of intricate relational architectures in the domain of psychological variables. Within the purview of psychology, NA has found diverse applications spanning psychopathology, psychometrics, and clinical psychology. In this analytical paradigm, the holistic dataset is exploited to discern possible interrelationships between nodes simultaneously, while subjecting all other nodes to examination. The fundamental constituents of networks comprise nodes, each symbolized as circular entities, and edges, which embody the interconnecting conduits linking nodes. Noteworthy is the fact that edge thickness emblemizes the robustness of the connections forged between nodes, with denser lines denoting heightened interconnectivity between said nodes. To find out the propensity of nodes to trigger the development of other nodes, a calculation of centrality indices is performed, as prescribed by Borsboom & Cramer

(2013). These indices, as expounded by Fried et al. (2017), furnish insights into the pivotal import of nodes within a network. Following the recommendations posited by Bringmann et al. (2019), the focus resides on the potency centrality index, which gauges the immediate linkage between nodes, as formalized by Mullarkey et al. (2018). In a bid to rectify the distortion induced by antagonistic node associations, a supplementary computation is executed in the form of expected influence analysis, as advocated by Heeren et al. (2018) and Robinaugh et al. (2016). To further amplify analytical rigour, the correlation stability (CS) coefficient is employed to examine the interpretability coefficient of centrality indices, with CS values above 0.50 indicating robust interpretability, CS values above 0.25 deemed acceptably informative, and CS values below 0.25 denoting insufficient stability for meaningful elucidation, as established by Epskamp et al. (2017). It is noteworthy, however, that despite the increasing popularity of network analysis in the field of psychology, a persistent current of contestation in the use of network analysis in psychology persists, as can be seen in the meticulous exposition of Bringmann et al. (2019). Consequently, the ascription of significance to nodes and centrality indices warrants judicious consideration. The operationalization of network analysis, alongside its concomitant centrality metrics, is effectuated utilizing the JASP software (JASP Team, 2020), while the evaluative benchmarks for model congruence, encapsulated as Goodness of Fit (GoF) indices, are computed employing the R package, as delineated by Epskamp (2021) and R Core Team (2021).

Results

Sample Characteristics

Most of the sample in this study was female (n=185, 83.7%). Regarding educational qualification, were university students attending the three-year degree (n=100, 45.2%), followed by university students attending the master's degree (n=87, 39.4%) and finally university students attending a Phd course (n=24, 10.9%). With regard to the main test (SBQ-R and EDE-Q 6.0) results of the study participants, it was found that, the mean in the Global EDE test (4 subscales) was higher than the community norms of the original test (mean=1.404, SD= 1.130) and that, taking the cut-off of 2.8 (Velkoff et al., 2023) for screen for eating disorders (ED) as a reference, 86 (of 211, 40.4%) participants were at risk of developing an eating disorder. Regarding the SBQ-R test, it was indicated (Osman et al., 2001) that a total score >=7 represents a significant risk of suicidal behavior. In the sample of participants in the present study, 23 (of 211, 10.09%) had a score of 7 or higher. In Table 1, the main results of the tests used are illustrated. As far as the normality of the data is concerned, the Shapiro-Wilk test is significant (p <0.05) on all tests used, showing that the data are distributed in a non-normal manner. Table 3 summarizes the main correlations between the main tests employed.

Table 1. Descriptive Statistics of the main test used

	Median	Mean	Std. Deviation	IQR*
General Distress	50.00	51.52	24.29	40.50
Stress	21.00	19.98	8.93	14.00
Anxiety	14.00	15.48	8.20	13.00
Depression	14.00	16.05	8.63	13.00
Suicide	3.00	3.88	2.24	1.00
Global Score EDE-Q	2.03	2.32	1.66	2.90
Eating Concern	0.80	1.52	1.59	2.60
Weight Concern	2.20	2.48	1.87	3.40
Shape Concern	3.12	3.03	1.86	3.37
Restraint	2.00	2.23	1.82	3.00
Self-esteem	19.00	18.65	6.97	11.00

Note: *= Interquartile Range.

Network Analysis results

A partial correlation network (bootstrap = 5000) was estimated using the EBICglasso estimator (non-parametric method). The result of the estimated network (visible in Figure 1) has the following characteristics: Number of nodes=9, Number of non-zero edges= 22 / 36, sparsity= 0.40, Mean weight: 0.077. The stability coefficient (CS) was 0.75 (for both Strength and Expected Influence index) and the edge-weight bootstrap shows that there is substantial overlap among the 95% CIs of edge weights, making our results interpretable (Image 3).

The highest item relationships (positive in blue, negative in red, 0.25 or higher in absolute value) are between: Shape Concern and Weight Concern (0.70), Eating Concern and Restraint (0.30), Depression and Stress (0.4), Anxiety and Stress (0.48), Depression and Anxiety (0.28), Depression and Self-esteem (-0.29). Other connections are absent, for instance between Node 1 (Suicide) and Node 6 (Weight Concern); this implies that these symptoms can be statistically independent when conditioning on all other symptoms (their partial correlation is zero) or that there was not sufficient power to detect an edge between these symptoms (Epskamp et al., 2018).

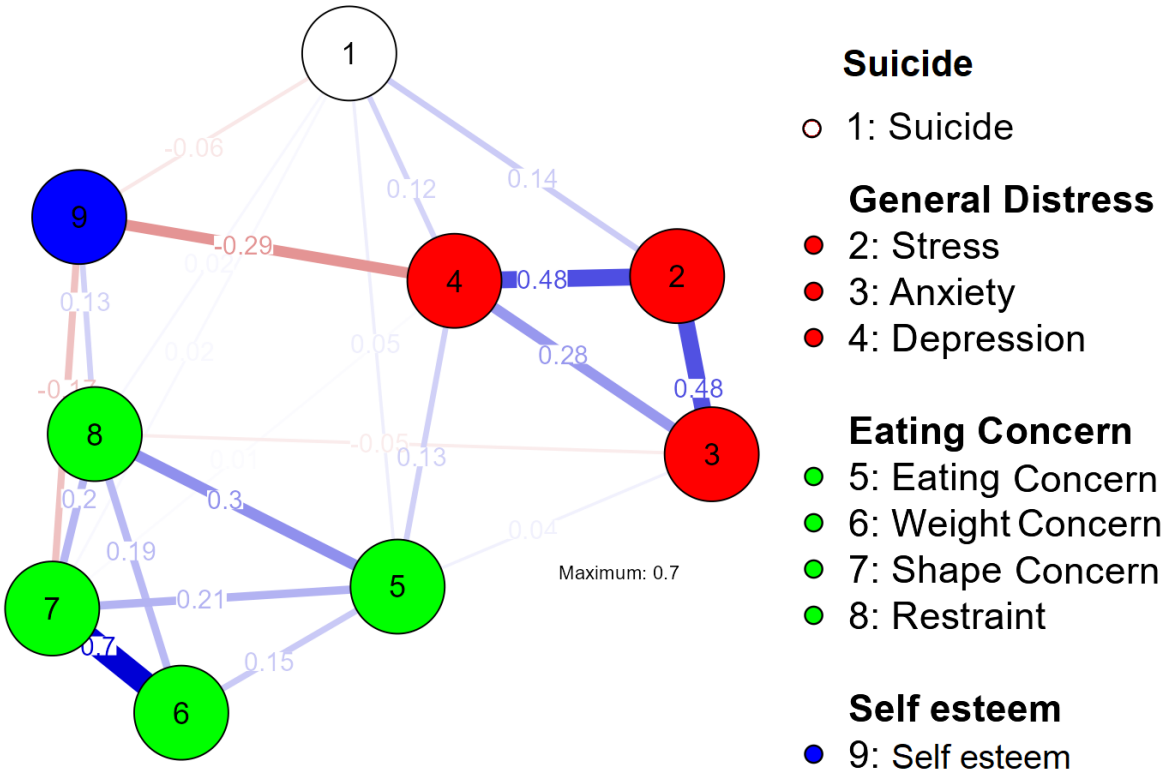

Image 1. Network Structure

Strength Centrality and Expected Influence index

With regard to the "Strength" centrality index, the highest positive influence is given by Shape Concern and Depression (no significant differences were found between the nodes, Epskamp et al., 2016). Inspecting the centrality index "Expected Influence", the highest positive influence is given by Stress, followed by Weight Concern and Shape Concern. See Table 2 and Figure 2 for deails.

Table 2. Centrality measures per variable

Variable	Network			
	Betweenness	**Closeness**	**Strength**	**Expected influence**
Suicide	-0.74	-1.93	-1.79	-0.84
Stress	-0.55	0.59	0.55	0.89
Anxiety	-0.74	-0.30	-0.30	0.13
Depression	2.12	1.42	1.29	0.11
Eating Concern	0.02	0.05	-0.21	0.41
Weight Concern	-0.74	-0.46	0.33	0.75
Shape Concern	0.59	0.19	1.25	0.60
Restraint	-0.74	-0.62	-0.15	0.23
Self-esteem	0.78	1.05	-0.96	-2.30

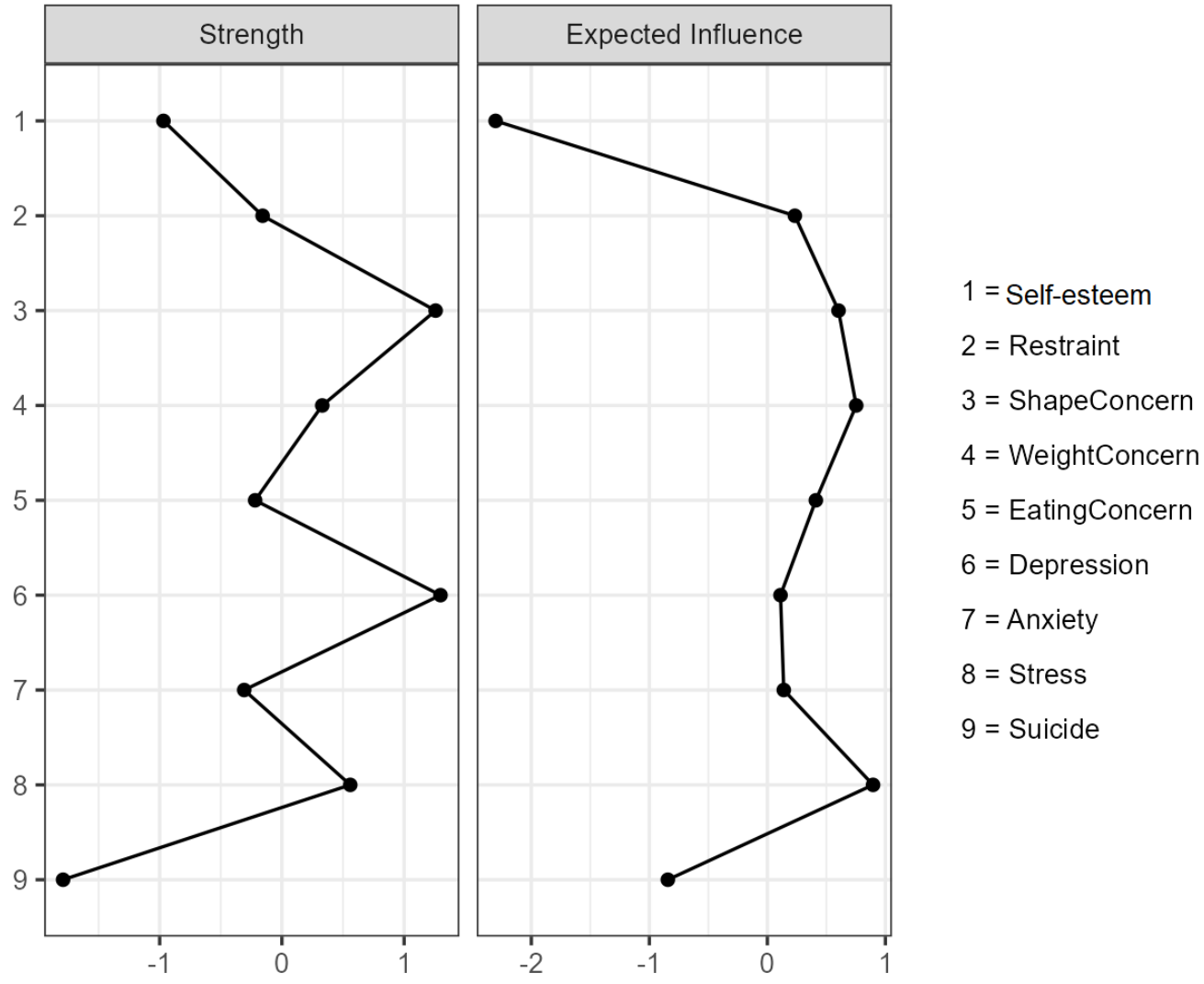

Image 2. Centrality indices

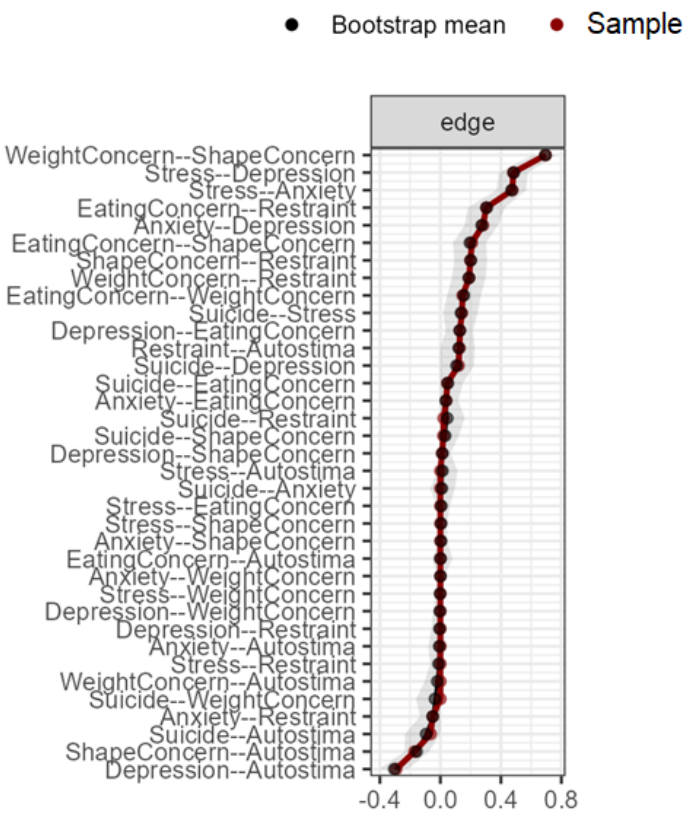

Image 3. Network Edge Stability

Table 3. Sperman's rho correlation among the main tests used.

Variable	Suicide	General Distress	Stress	Anxiety	Depression	Global Score EDE-Q	Eating Concern	Weight Concern	Shape Concern	Restraint	Self-esteem
General Distress	0.52 ***	—									
Stress	0.53 ***	0.95 ***	—								
Anxiety	0.44 ***	0.93 ***	0.85 ***	—							
Depression	0.52 ***	0.94 ***	0.87 ***	0.82 ***	—						
Global Score EDE-Q	0.32 ***	0.46 ***	0.41 ***	0.39 ***	0.48 ***	—					
Eating Concern	0.38 ***	0.53 ***	0.48 ***	0.47 ***	0.57 ***	0.90 ***	—				
Weight Concern	0.26 ***	0.43 ***	0.38 ***	0.37 ***	0.45 ***	0.96 ***	0.82 ***	—			
Shape Concern	0.31 ***	0.46 ***	0.42 ***	0.39 ***	0.49 ***	0.96 ***	0.83 ***	0.93 ***	—		
Restraint	0.26 ***	0.30 ***	0.28 ***	0.23 ***	0.33 ***	0.90 ***	0.77 ***	0.81 ***	0.80 ***	—	
Self-esteem	-0.41 ***	-0.63 ***	-0.55 ***	-0.55 ***	-0.71 ***	-0.45 ***	-0.48 ***	-0.45 ***	-0.49 ***	-0.27 ***	—

Discussion

The aim of this study was to examine the relationship between eating disorder symptoms and symptoms of anxiety, depression, suicidal risk, and self-esteem in Italian college students Our first hypothesis (*H1*) was partially confirmed, since in our network analysis, as far as the centrality index "Strength" is concerned, Depression plays a central role, followed by concern for the shape of one's body structure. On the other hand, regarding the centrality index "Expected Influence", the central nodes are Stress and concern for one's own weight. Overall, therefore, both Stress and Depression (which are part of General Distress) are central in the network, together with concern for one's weight and body shape. Anxiety, on the other hand, seems to have less impact within our network than Stress and Depression. Regarding our second hypothesis (*H2*), it is confirmed, as self-esteem is associated within the network with depression in a negative way, with the preoccupation with one's own body shape in a negative way and with "Containment" behaviours concerning food in a positive way. Furthermore, the correlations between self-esteem and the EDE-Q test are negative (both in total and subscales). Concerning the possibility of "Suicide", this is connected within the network in a positive way with Stress and Depression.

Regarding the other connections within the network (between the nodes), suicidal ideation is also weakly connected to self-esteem and preoccupation with one's weight, in a negative manner, and positively to preoccupation with one's body shape and restraining behaviour. Other

weak connections within the network are also present, such as between the nodes of anxiety and preoccupation with food (positively), and anxiety and restraining behaviour (positively). These findings support the idea that depressive symptoms, stress, and suicidal ideation, both comorbid conditions with eating disorder symptoms (Solmi et al., 2018; Brown et al., 2018; Conti et al., 2017)

Limitation

Firstly, this study was conducted on a moderately large sample of selected participants instead of a large clinical sample, limiting inferences on healthy people. Additionally, the research design employed in this study was cross-sectional, and the use of a convenience sample and self-reported data could have introduced certain biases, such as a content-sensitive response bias (e.g., social desirability). Despite the anonymity of the survey, participants might have felt ashamed to report problematic symptoms or behaviors accurately. Furthermore, the non-random and voluntary nature of the sample means that it cannot be considered representative of the entire Italian university student's population, thus limiting the generalizability of the findings.

Conclusion

Despite these limitations, the results are of existential value and will help Italian researchers to undertake more in-depth studies concerning the topic of eating disorders. Additional research is required to gain a more comprehensive comprehension of these initial discoveries. Approaches like the integrated relational model introduced by Erriu et al. (2020) have the potential to offer fresh perspectives on these connections.

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None

Availability of data and material

The data that support the findings of the present study are available from the corresponding author upon reasonable request.

Conflict of Interest
None.

Author's contributions

All authors significantly contributed to the research and preparation of manuscript.

Ethics Approval

The research was conducted according to the Declaration of Helsinki for medical research involving human participants and was

approved by Ethics Committee of “Istituto di Psicoterapia PsicoUmanitas”, in Rome, Italy. All participants gave their online consent to participate in the study.

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