The Dark Triad Moderates the Association Between Orthorexia Nervosa and Relationship (Dis)Satisfaction

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Abstract

Purpose

Past research has revealed a link between orthorexia nervosa (ON) and relationship dissatisfaction, which has in turn been found to be correlated with the Dark Triad traits. The current study investigated the association ON has with seeking out relationships and with relationship satisfaction, while also assessing a potential moderating effect of the Dark Triad.

Method

Recruited from Reddit forums, 788 adults completed an online survey with scales assessing ON symptomology, relationship satisfaction, relationship seeking, and the Dark Triad.

Results

Greater ON symptomatology was associated with greater levels of all aspects of the Dark Triad (Machiavellianism, narcissism, and psychopathy), as well as with lower levels of relationship satisfaction (among those in committed romantic relationships) and a lower likelihood of seeking new romantic relationships (among single participants). A regression analysis revealed that the Dark Triad moderated the association between ON and relationship satisfaction, whereby this association was not significant at high levels of the Dark Triad.

Conclusion

The current research highlights that at low and medium levels of the Dark Triad, greater ON symptomology is associated with lower levels of satisfaction in romantic relationships.

Level of evidence

Level V, descriptive cross-sectional study

Introduction

Healthy diets have a direct effect on our well-being, fitness, and physical development; not only are they important for our overall health, but they also promote healthy immune systems [1]. However, too much focus on healthy eating and an overconcentration on quality of food may actually be unhealthy, as is the case with orthorexia nervosa (ON).

First defined by Steven Bratman in 1997, ON is a theorized condition that involves a pathological obsession or fixation on eating only biologically pure and healthy food [2, 3]. Although acceptable foods can vary by individual, for nearly all people with ON, their dietary restrictions include eliminating processed foods (i.e., foods with added preservatives, artificial flavoring or coloring, sugars, fats, and more), and their dietary restrictions gradually become more numerous and intense over time. As those

restrictions grow, essential nutrients are often entirely omitted which leads to insufficient diets and ultimately malnutrition [4, 5]. Additionally, oftentimes any type of deviation from those restrictions is paired with shame, guilt, and even more rigorous diets [6, 7]. Thus, while healthy eating itself is usually good for most people, individuals with ON exhibit extremely restrictive dietary behaviors that may lead to malnutrition and be accompanied by significant emotional distress, making ON a debilitating condition [1, 8].

ON could logically be associated with impaired functioning in both platonic and romantic relationships for multiple reasons. For example, people with ON likely avoid restaurants and social events involving food (e.g., dinner dates) due to their overly strict and restrictive dietary regime, ultimately leading to social isolation [9]. Moreover, ON has been associated with greater levels of obsessive-compulsive tendencies [10], narcissism [11], and neuroticism [12], all of which have been associated with relationship dissatisfaction [13]. A study on romantic relationships found that, for participants who were in a committed relationship, ON symptomatology was indeed correlated with relationship dissatisfaction [13]. For participants who were single and not dating anyone, however, ON symptomatology was unrelated to their self-reported level of happiness about being single, suggesting that ON symptomatology may not be a predictor of either avoiding or seeking out a relationship when single.

In another study on relationships and ON, researchers found that greater ON symptomatology was associated with both fearful and dismissing attachment styles [14]. Fearful attachment involves personal distrust and fear of rejection, whereas dismissing attachment involves downplaying the importance of attachment and maintaining distance in their personal relationships [15]. While these associations were weak in magnitude, they are consistent with previous research showing these same insecure attachment styles in both anorexia nervosa and bulimia nervosa [16, 17]. Regardless, these associations could indicate that people with ON may be less satisfied with the current relationships or, if single, less inclined to seek out a new relationship.

Relationship dissatisfaction has also been linked to the Dark Triad, which is composed of three socially aversive traits known as Machiavellianism, narcissism, and psychopathy [18]. Machiavellianism is characterized by manipulation of others, absence of morality, and unemotional callousness; narcissism is characterized by egotism, pride, and a lack of empathy; and psychopathy is characterized by impulsivity, selfishness, and remorselessness [19]. Relevant to ON, one study found that ON symptomatology was associated with narcissism, likely due to the fact that individuals with ON take extreme pride in their self-control and their adherence to a diet that they find to be superior to the diets of others [11]. Although no studies have yet investigated whether ON is related to either Machiavellianism or psychopathy, past research indirectly supports this research. Namely, the personality dimension of agency, which involves personal ambition and a desire to be independent of others, has been associated with both ON [13] and with each of the Dark Triad dimensions [20]. Due to these secondary links and overlap, it is likely that any association between ON and relationships will be affected by the Dark Triad, specifically narcissism.

Due to the aspects of ON that lead to social isolation and insecure attachment styles, this study aims to analyze the relationship between ON and seeking out relationships (platonic and romantic) and relationship satisfaction while also assessing a potential moderating effect of the Dark Triad.

Methods

Participants

Participants were recruited using the Reddit forums, specifically the subreddit r/EatingDisorders. As incentive, participants were able to enter their email address if they chose at the end of the survey for the chance to win a \$50 Amazon gift card. The participants ($n = 788$) were predominantly female (74%), White (67%), and between the ages of 25-30 years (63%; see Table 1.)

Materials and Procedure

For this study, participants completed an online survey that included a demographic questionnaire and the measures described below.

Table 1 *Participant Demographics*

Variable	Percent
Gender	
Female	74%
Male	25%
Transgender or non-conforming	1%
Age	
18-24 years	13%
25-30 years	63%
31-40 years	22%
41+ years	2%
Race	
White	67%
Hispanic or Latino	25%
Black	4%
Other	4%
Eating disorder history	
None	66%
Anorexia nervosa	16%
Bulimia nervosa	10%
Avoidant/restrictive food intake disorder	5%
Binge eating disorder	3%
Diet	
Non-vegetarian	45%
Semi-vegetarian	47%
Vegetarian or vegan	8%
Relationship status	
Single, not dating anyone	14%
Casually dating	22%
In committed relationship	15%

Orthorexia Nervosa Inventory. The Orthorexia Nervosa Inventory (ONI) was used to address ON symptomology [21]. The ONI consists of statements on healthy eating behaviors (e.g., “I strictly avoid all foods I feel are unhealthy”), physical impairments (e.g., “The stricter I become with my diet, the more I seem to experience one or more physical symptoms such as fatigue, faintness, heart racing, nausea, diarrhea, pain, etc.”), psychosocial impairments (e.g., “My healthy eating is a significant source of stress in my relationships”), and emotional distress (e.g., “I feel much guilt or self-loathing when I stray from my healthy diet”). Participants respond to each statement using a 4-point Likert scale ranging from 1 (*not at all true*) to 4 (*very true*). With the data collected from the current study, Cronbach’s α was .95.

Relationship Assessment Scale. The Relationship Assessment Scale (RAS) was completed only by participants who indicated they were in a committed romantic relationship [22]. The RAS consists of seven questions assessing relationship satisfaction (e.g., “In general, how satisfied are you with your relationship?”) and using a 5-point Likert scale with varying response options that pertain to the specific questions. With the data collected from the current study, Cronbach’s α was .82.

Relationship Seeking Questions. Two questions asked participants about their proclivity to seek out new relationships. The first question, “How likely are you to seek out a romantic partner?” was presented only to participants indicating they were single. The second question, “How likely are you to seek out new friendships?”, was presented to all participants. Both questions utilized a 5-point Likert scale ranging from 1 (*highly unlikely*) to 5 (*highly likely*).

Short Dark Triad. The Short Dark Triad Scale (SD3) was used to assess three socially adverse traits Dark Triad traits [20]. The SD3 consists of nine statements relevant to Machiavellianism (e.g., “It’s wise to keep track of information that you can use against people later”), nine statements relevant to narcissism (e.g., “I insist on getting the respect I deserve”), and nine statements relevant to psychopathy (e.g., “Payback needs to be quick and nasty”). Participants respond to each statement using a 5-point Likert scale ranging from 1 (*disagree strongly*) to 5 (*agree strongly*). With the data collected from the current study, Cronbach’s α was .83 for the entire scale, .84 for the Machiavellianism subscale, .54 for the Narcissism subscale, and .83 for the Psychopathy subscale.

Statistical Analyses

Upon downloading the Qualtrics data as an SPSS Statistics 28 file, the data were removed for respondents who did not complete the survey, who did not pass the periodic attention checks, or who had a bot-detection score below .50 suggesting that “the respondent is likely a bot” (www.qualtrics.com), leaving 788 respondents for the study. Items were then reverse scored as needed, and sum scores were computed for the scales: RAS, ONI, SD3 Total, SD3 Machiavellianism, SD3 Narcissism, and SD3 Psychopathy. Pearson correlation analyses were first conducted to assess the relationships among these variables, as well as the Likert responses for the questions asking about romance seeking (from participants who indicated that they were single, not currently dating anyone) and friendship seeking. As

will be seen, ONI scores were significantly correlated with RAS scores and with the romance-seeking Likert ratings. To determine whether these two relationships were moderated by the dark triad, two regression analyses were conducted. For each, the ONI and SD3 predictor variables were first mean centered and then multiplied to create the interaction term. The regression assumptions were tested via examination of the tolerance and VIF values (to verify absence multicollinearity), the predicted x residual scatterplot (to verify homoscedasticity), the partial regression plots (to verify linearity), the normal P-P plot (to verify that residuals were normally distributed), the Durbin-Watson statistic (to verify that residuals were independent), and the Cook's Distance statistic (to verify that no influential cases biased the model). In the case of a significant interaction, a simple slopes analysis was conducted.

Results

Correlation Results

The zero-order correlations among the variables are provided in Table 2. As may be seen in the table, ONI scores were positively correlated with all three SD3 scales: Machiavellianism, Narcissism, and Psychopathy. ONI scores were negatively correlated both with RAS scores for participants who were in a committed relationship and with the romance-seeking Likert ratings for participants who were not in a committed relationship. Finally, ONI scores were not correlated with the friendship-seeking Likert ratings.

Table 2 *Correlations Among the Study Variables*

Variable	<i>n</i>	1	2	3	4	5	6	7
1. ONI	788	—	.42**	.11**	.51**	-.20**	-.24*	.06
2. SD3 Machiavellianism	788		—	.24**	.55**	-.08	-.09	.16**
3. SD3 Narcissism	788			—	.08**	.21**	.18	.01
4. SD3 Psychopathy	788				—	-.38**	-.01	.21**
5. RAS	504					—	N/A	-.20**
6. Romance seeking	110						—	.61**
7. Friendship seeking	788							—

Note. ONI = Orthorexia Nervosa Inventory; SD3 = Short Dark Triad; RAS = Relationship Assessment Scale, only completed by participants in a committed relationship; romance-seeking question only completed by participants who indicated they were single.

* $p < .05$. ** $p < .01$.

Regression Results with RAS Scores

For the first regression analysis predicting RAS scores, the assumptions of the regression analysis were met. First, the tolerance values (ranging from .71 to .99) were above .2 and the VIF values (ranging from 1.01 to 1.42) did not exceed 10, such that multicollinearity was not present. Second, the partial regression plots revealed that linearity was not violated, and because the predicted x residual scatterplot did not have an obvious pattern, homoscedasticity was not violated either. Third, the residuals remained close to the line on the normal P-P plot, indicating that they were normally distributed. Fourth, the Durbin-Watson value (1.73) was not below 1 or above 3, indicating that residuals were independent. Finally, the Cook's Distance values (ranging from 0 to 0.19) were below 1, indicating that no influential cases biased the model.

The results of this analysis, presented in Table 3, indicated that RAS scores were negatively associated with ONI scores, such that, as ONI scores increased, relationship satisfaction decreased. However, RAS scores were found to be unrelated to SD3 scores. More importantly, though, the analysis revealed a significant interaction between ONI and SD3 scores in predicting RAS scores. A follow-up simple slopes analysis revealed that the negative association between ONI and RAS scores was significant only at the low and medium SD3 levels (see Table 4). Thus, participants who did not readily relate to examples of Machiavellianism, narcissism, and psychopathy, and exhibited more symptomology of ON, had lower levels of relationship satisfaction. At the high levels of SD3, ONI and RAS scores were not significantly associated.

Table 3 *Regression Results with Relationship Satisfaction as the Dependent Variable*

Variable	<i>B</i>	<i>SE</i>	LLCI	ULCI	β	<i>t</i>	<i>p</i>
ONI	-.047	.014	-.076	-.019	-.169	-3.283	.001
SD3	-.023	.017	-.057	.011	-.068	1.314	.189
ONI x SD3	.002	.001	.001	.004	.140	3.205	.001

Note. ONI = Orthorexia Nervosa Inventory; SD3 = Short Dark Triad.

Table 4 *Association Between Orthorexia and Relationship Satisfaction at Different Dark Triad Levels*

Levels	<i>B</i>	<i>SE</i>	LLCI	ULCI	β	<i>t</i>	<i>p</i>
Low SD3 levels	-.075	.023	-.120	-.031	-.241	-3.329	.001
Medium SD3 levels	-.082	.033	-.146	-.017	-.200	-2.509	.013
High SD3 levels	-.013	.020	-.053	.027	-.049	-0.639	.523

Note. SD3 = Short Dark Triad.

Regression Results with Romance-Seeking Ratings

For the second regression analysis predicting romance-seeking ratings, the assumptions of the regression analysis were also met. First, the tolerance values (ranging from .93 to .99) were above .2 and the VIF values (ranging from 1.01 to 1.07) did not exceed 10, such that multicollinearity was not present. Second, the partial regression plots revealed that linearity was not violated, and because the predicted x residual scatterplot did not have an obvious pattern, homoscedasticity was not violated either. Third, the residuals remained close to the line on the normal P-P plot, indicating that they were normally distributed. Fourth, the Durbin-Watson value (1.83) was not below 1 or above 3, indicating that residuals were independent. Finally, the Cook's Distance values (ranging from 0 to 0.24) were below 1, indicating that no influential cases biased the model.

The results of this analysis, presented in Table 5, indicated that romance-seeking ratings were negatively associated with ONI scores, such that, as ONI scores increased, the likelihood of seeking romantic relationship decreased. However, these were unrelated to SD3 scores. In addition, the analysis revealed no significant interaction between ONI and SD3 scores in predicting romance-seeking ratings.

Table 5 *Regression Results with Romance-Seeking Ratings as the Dependent Variable*

Variable	<i>B</i>	<i>SE</i>	LLCI	ULCI	β	<i>t</i>	<i>p</i>
ONI	-.020	.008	-.035	-.005	-.254	-2.616	.010
SD3	.006	.009	-.011	.024	.070	0.724	.471
ONI x SD3	-.001	.001	-.002	.001	-.052	-0.548	.585

Note. ONI = Orthorexia Nervosa Inventory; SD3 = Short Dark Triad.

Discussion

The aim of this study was twofold: to assess if ON symptomology influenced relationship satisfaction and/or seeking, and to assess the possible moderating effect of the Dark Triad in those scenarios. Regarding the first aim, the results revealed that higher levels of ON symptomatology are associated both with lower levels of romantic relationship satisfaction among those in committed relationships and with lower levels of romantic relationship seeking among those who reported being single. Regarding the second aim, the Dark Triad moderated the association between ON symptomatology and romantic relationship satisfaction, whereby this association was significant only at low or medium levels of the Dark Triad. The Dark Triad did not moderate the association between ON symptomatology and romantic relationship seeking.

The negative correlation between ON symptomology and relationship satisfaction is consistent with previous research that found ON symptoms to be related to relationship dissatisfaction in committed relationships [13]. This relationship dissatisfaction may be especially pronounced for people with high ON symptomatology who have a partner who is not also committed to healthy eating, in which case

social isolation may occur [9]. Additionally, the negative correlation between ON symptomology and relationship satisfaction could be related to the negative (fearful and dismissing) attachment styles found among people with high levels of ON symptomatology [14]. Such personal distrust and fear of rejection (i.e., fearful attachment style), as well as downplaying the importance of attachment and maintaining distance in their personal relationships (i.e., dismissing attachment style), may further discourage single people with high ON symptomatology from seeking out new romantic relationships, as found in the current study.

As indicated previously, the Dark Triad moderated the association between ON symptomatology and romantic relationship satisfaction, whereby this association was significant only at low or medium levels of the Dark Triad. While this interaction was initially not hypothesized, ON symptomatology was positively correlated with all three components of the Dark Triad, consistent with past research linking the trait of agency to both ON [13] and the Dark Triad [20]. It is possible that the Dark Triad potentially has too profound of an effect on either ON symptomatology or relationship satisfaction, and therefore overshadows the relationship between the two. Furthermore, since the Dark Triad encompasses personality traits and ON symptoms are more behavior based, it could be argued that the Dark Triad is a precursor rather than a side moderator.

Limitations

The key limitations of this study are the source of participant recruitment, limited demographic variability, and the fact that the data were collected through a self-report online survey, all of which may have introduced response bias. Participants were recruited through the social media Reddit forums and specifically through a subreddit surrounding eating disorders. This subreddit is considered an incredibly supportive group for people who may be suffering with eating disorders (or knowing someone who does). Given tendency among those with eating disorders to deny their symptoms, some of the participants may likewise have not answered as truthfully as they could have on this survey. In addition, despite a relatively large sample size, the majority of participants were still primarily female, White, and in their late 20s. This limited demographic range could contribute to a lack of fully representative results. On a final note, the ONI is only a screening tool rather than a diagnostic tool for ON, which should be confirmed with further clinical evaluation.

What is already known on this subject?

Past research reveals that greater ON symptomology is associated with lower levels of satisfaction in romantic relationships.

What does this study add?

The current research found that greater ON symptomology is associated with greater levels of all aspects of the Dark Triad (Machiavellianism, narcissism, and psychopathy), as well as with lower levels of relationship satisfaction among those in committed romantic relationships (replicating past research)

and a lower likelihood of seeking new romantic relationships among those who are single. Moreover, the association between ON and relationship satisfaction was moderated by the Dark Triad, whereby this association was not significant at high levels of the Dark Triad.

Declarations

Conflicts of interest: The authors declare no conflicts of interest that are relevant to the content of this article.

Ethics approval: All procedures performed in this study, which was approved by the Texas State University Institutional Review Board, were in accordance with the 1964 Helsinki declaration and its later amendments.

Consent: Informed consent was obtained from all individual participants included in the study.

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