

Orthorexia Nervosa and Substance Use for the Purposes of Weight Control, Conformity, and Emotional Coping

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Research Article

Keywords: Orthorexia nervosa, Smoking, Alcohol, Drugs, Substance use

Posted Date: March 12th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-283732/v1>

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Version of Record: A version of this preprint was published at Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity on April 18th, 2021. See the published version at

<https://doi.org/10.1007/s40519-021-01190-9>.

Abstract

Purpose: Orthorexia nervosa (ON), characterized by extreme behaviors driven by the goal of eating only healthy and pure foods, could plausibly be associated with avoidance of nicotine, alcohol, and illicit drugs. However, findings from the limited research on these relationships are mixed, and other eating disorders are associated with greater substance abuse.

Method: An online survey was completed by 471 participants (86% women, mean age = 20) recruited from undergraduate courses and through an Instagram advertisement. The questionnaires assessed ON symptomatology; frequency of smoking, alcohol consumption, and illicit drug use; abuse of these substances; and motivations for using these substances.

Results: ON scores were not significantly related to the level of use or abuse of nicotine, alcohol, or most illicit drugs. Yet, ON scores were positively correlated with frequency of using illicit depressant drugs. Further, among substance users, ON scores were positively associated with smoking or vaping for the purpose of weight control, and with consuming alcohol and using illicit drugs for the purposes of conformity and coping with such negative emotions as anxiety and depression.

Conclusion: Although people who are high in ON symptomatology may be at least partly driven by a strong desire to be as healthy as possible, they are not less likely to use potentially harmful drugs. Instead, many of them may even turn to certain drugs for the same weight-control and emotional-coping motives that guide the behaviors of individuals with other eating disorders.

Level of evidence: Level V, descriptive cross-sectional study

Introduction

Orthorexia nervosa (ON) refers to a condition characterized by (a) mental and behavioral preoccupation with healthy eating that includes rigidly following a very restrictive diet believed to be healthy and pure, (b) significant emotional distress experienced in response to any violations of their diet, (c) physical impairments due to nutritional deficiencies or malnutrition resulting from their overly restrictive diet, and (d) corresponding psychosocial impairments that negatively impact their interpersonal relationships and/or their vocational/academic work [1-5]. Considering their obsessive behaviors and mental preoccupation with healthy nutrition, people with ON may conceivably also be driven to follow other healthy lifestyle rules, such as not smoking, not consuming alcohol, and not using other addictive drugs. However, as revealed in the literature review below, the findings on such relationships are mixed.

Cigarette Smoking

Whereas one study did indeed find that ON symptomatology is significantly greater in non-smokers than smokers [6], two studies found the opposite relationship with ON symptomatology being significantly greater in smokers than non-smokers [7, 8]. Additionally, seven studies found no relationship between ON

symptomatology and smoking status [9-15]. It should be noted, however, that all but two of these studies used the ORTO-15 (or briefer ORTO-11), which suffers from inadequate reliability and validity [2, 15-22]. Moreover, half of these studies used limited-generalizability samples including medical/nutrition professionals or students [7-9], fitness participants [10], and performance artists [11]. The current study will reassess this relationship between ON symptomatology and smoking status with a large, more generalizable sample of participants completing a reliable and valid measure of ON based on the four theorized diagnostic criteria discussed previously.

Regarding hypotheses, whereas commitment to a healthy lifestyle would explain the possibility of ON symptomatology being greater in non-smokers than smokers, some other relevant past research may explain the possibility of the opposite relationship. Namely, past research reveals that smoking prevalence is greater in people with concerns about their weight than people without such concerns [23, 24] and is greater in people intentionally trying to lose weight than people without a history of trying to lose weight [25-27]. In some cases, ON may develop out of concerted efforts to lose weight by individuals with relatively higher body fat who turn to healthy eating with the goal of achieving an optimal weight to improve their physical health. In fact, ON symptomatology has been positively correlated with both overweight preoccupation [28, 29] and drive for thinness [14], and a recent study of people self-diagnosing with ON revealed that most of them actively tried to lose weight for health reasons [30]. Perhaps some of these individuals smoked as a means of appetite suppression to help with weight loss. Such a possibility is further consistent with clinical research showing that smoking prevalence is greater in people with eating disorders (especially bulimia) than healthy controls [31-34]. The current study, in addition to asking participants about their smoking status and level of dependence, will ask smokers about their reasons for smoking (e.g., weight control, tension reduction, pleasure) to help explain the reasoning behind a potential relationship between ON symptomatology and smoking.

Alcohol Consumption

Although one study found that ON symptomatology is significantly greater in those who do not drink alcohol than those who do [15], five studies found no relationship between ON symptomatology and alcohol consumption [9-13]. As with the smoking literature, however, all but two of these studies used the ORTO-15 (or briefer ORTO-11) that suffers from inadequate reliability and validity, and half of these studies used the limited-generalizability samples previously mentioned. The current study will reassess this relationship with a large representative sample and a reliable and valid ON measure.

Pertaining to hypotheses, although commitment to a healthy lifestyle would explain the possibility of ON symptomatology being greater in non-drinkers than drinkers, other research may explain the possibility of the opposite relationship. Most notably, alcohol abuse and dependence have been shown to be greater in people with eating disorders (including bulimia and anorexia) than healthy controls [35-37], findings that may partially be attributed to the comorbid depression and anxiety experienced by people with eating disorders [38-40]. Relevant to orthorexia, ON symptomatology has been positively correlated with levels of both depression [12, 41-43] and anxiety [13, 43], which may lead some individuals to turn to alcohol as a

means of trying to cope with their negative emotions. The current study, in addition to asking participants about their drinking behaviors, will ask about their reasons for consuming alcohol (e.g., coping, conformity, enhancement) to shed light on the reasoning behind a potential relationship between ON symptomatology and alcohol consumption.

Illicit Drug Use

To the best of our knowledge, only two studies have investigated whether ON symptomatology is associated with use of illicit drugs, and both found no relationship [10, 13]. However, these researchers only asked a yes-no question pertaining to participants' illicit drug use, not accounting for which types of drugs they used, their level of dependence on the drugs, or their reasons for using the drugs. Regarding what we might expect, as with smoking and alcohol consumption, commitment to a healthy lifestyle would explain the possibility of ON symptomatology being greater in non-users than users, but other research may explain the possibility of the opposite relationship. Specifically, illicit drug abuse and dependence have been shown to be greater in people with eating disorders (including bulimia and anorexia) than healthy controls [35-37]. The reasons underlying these relationships may depend on the particular drugs being used. For instance, stimulant use in people with eating disorders may be associated with a desire to lose weight [44], whereas the use of other drugs such as opioids and cannabis, whose dampening effects are comparable to alcohol, may be associated with the comorbid depression and anxiety experienced by people with eating disorders [38-40].

Purpose of the Current Study

In summary, because a defining feature of ON is a mental and behavioral preoccupation with eating only what is believed to be healthy and pure, we might expect that the avoidance of unhealthy foods would also entail the avoidance of unhealthy substances including nicotine, alcohol, and illicit drugs. However, the majority of studies failed to find relationships between ON symptomatology and use of these substances. As mentioned previously, these findings may partly be due to most of these studies using an ON measure lacking in reliability and validity, and/or using limited-generalizability samples such as health professionals. Another possibility, though, is that people with higher levels of ON symptomatology are driven not only by the desire to be physically healthy but also by other motivations that include the desire to lose weight (associated with use of nicotine and other stimulant drugs) and/or the desire to overcome negative emotions (associated with use of alcohol and other depressant drugs). The current study sought to use a large representative sample and an ON measure established to be reliable and valid, in addition to assessing the prevalence and frequency of using these substances (i.e., nicotine, alcohol, and illicit drugs), the level of dependence on these substances, and the reasons for using these substances. Such data will allow for a better exploration of potential relationships between ON symptomatology and substance use/abuse, including the reasons underscoring those relationships.

Method

Participants

Participants were recruited from undergraduate courses (in nutrition, exercise science, athletic training, and psychology) at a large university in the southern region of the United States, as well as through an Instagram advertisement with the audience interests set to target healthy eaters (e.g., “healthy eating,” “clean eating,” “paleo”). Of the 471 participants who completed the survey, the majority were women (86%; 13% men, 1% non-binary), were White (48%; 28% Hispanic or Latinx, 9% Black, 5% Asian American, 9% biracial or multiracial), and had some college without a degree at the time (59%; 4% Bachelor’s degree, 6% Associate’s degree, 25% high school diploma, 5% no high school diploma). Their ages ranged from 18 to 46 years ($M = 19.98$, $SD = 3.56$), and body mass index (BMI) ranged from 15.45 to 48.25 kg/m² ($M = 24.77$, $SD = 5.67$).

Procedure

For this study, which was approved by Texas State University’s Institutional Review Board, participants provided informed consent and then completed an online survey through Qualtrics. The survey began with a demographic questionnaire, followed by measures of ON, frequency of substance use, level of dependence or substance abuse, and reasons for using these substances.

Materials

ON was assessed with the Orthorexia Nervosa Inventory (ONI) [12] that is comprised of 24 statements about eating, to which participants use a 4-point Likert rating to indicate how true each statement is for them based on their current eating habits. This inventory produces scores on three different scales. First, the ONI Behaviors scale includes nine items on obsessive behaviors and preoccupation with healthy eating (e.g., “I strictly avoid all foods I feel are unhealthy”). Second, the ONI Impairments scale includes ten items on either psychosocial impairments (e.g., “My healthy eating is a significant source of stress in my relationships”) or 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.”) resulting from their oftentimes extreme behaviors. Third, the ONI Emotions scale includes five items on emotional distress resulting from violations of their strict dietary rules (e.g., “I feel much guilt or self-loathing when I stray from my healthy diet”). For all scales, higher scores represent higher levels of ON symptomatology. Regarding internal consistency, with data from the current study, Cronbach’s alpha was .93 for the total ONI, and ranged from .86 to .89 for its three scales.

Frequency of substance use was assessed as both a dichotomous categorical variable (i.e., users vs. non-users) and a continuous variable. For the categorical variables, three yes-or-no questions asked whether the participants smoke cigarettes or vape, whether they drink alcoholic beverages, and whether they have ever consumed or used a non-prescribed illicit/illegal drug. For the continuous variables, seven questions, each with five response options, asked how much they smoke or vape per day (with responses ranging from “0-5 cigarettes or comparable vaping” to “30+ cigarettes or comparable vaping”), how often they have a drink containing alcohol (with responses ranging from “Never” to “4+ times a week”), and how many times they used the following non-prescribed illicit drugs during the past 12 months (with

responses ranging from “Not at all” to “More than 20 times”): stimulants such as amphetamines, methamphetamine, or cocaine; depressants such as barbiturates, benzodiazepines, or rohypnol; opiates such as heroin, fentanyl, or vicodin; hallucinogens such as PCP, LSD, or ecstasy; and marijuana/cannabis.

Substance dependence or abuse was assessed with the Cigarette Dependence Scale-5 (CDS-5) [45], the Alcohol Use Disorders Identification Test (AUDIT) [46], and the UNCOPE [47]. First, the CDS-5 includes five Likert-response questions that were slightly modified for the current study to include vaping along with cigarette smoking (e.g., “How would you rate your addiction to cigarettes/vaping on a scale of 0-100?”). Second, the AUDIT includes ten Likert-response questions asking about problematic drinking behavior (e.g., “How often during the last year have you found that you were not able to stop drinking once you had started?”). Finally, the UNCOPE includes six yes-or-no questions asking about drug abuse or dependence (e.g., “Have you ever neglected some of your usual responsibilities because of using drugs?”). For all scales, higher scores represent higher levels of substance dependence or abuse. With data from the current study, Cronbach’s alpha was .94 for the CDS-5, .83 for the AUDIT, and .86 for the UNCOPE.

The motivations for using substances were assessed with the Reasons for Smoking Scale (RSS) [48], the Drinking Motives Questionnaire-Revised (DMQ-R) [49], and a modified DMQ-R as described below. First, completed only by smokers or vapers ($n = 97$), the RSS is comprised of 11 statements pertaining to reasons for smoking or vaping, to which participants use a 5-point Likert rating to indicate how true each statement is for them. It includes four scales: RSS Pleasure (e.g., “I find smoking cigarettes or vaping pleasurable”), RSS Stimulation (e.g., “I smoke cigarettes or vape to stimulate me, to perk myself up”), RSS Tension Reduction (e.g., “I light up a cigarette or vape when I feel angry about something”), and RSS Weight Control (e.g., “I rely upon smoking cigarettes or vaping to control my hunger and eating”). Second, completed only by alcohol drinkers ($n = 344$), the DMQ-R is comprised of 20 reasons typically given for drinking alcohol, to which participants use a 5-point Likert rating to indicate how often they drink for each reason. It includes four scales: DMQ-R Enhancement (e.g., “Because it’s exciting”), DMQ-R Social (e.g., “To be sociable”), DMQ-R Conformity (e.g., “Because your friends pressure you to drink”), and DMQ-R Coping (e.g., “Because it helps you when you feel depressed or nervous”). Last, completed only by illicit drug users ($n = 191$), the modified DMQ-R was nearly identical to the original DMQ-R, except that “drink/drinking alcohol” was revised to “use/using drugs” throughout the instructions and questionnaire items. With data from the current study, Cronbach’s alpha ranged from .79 to .87 for the RSS scales, .85 to .90 for the DMQ-R scales, and .90 to .92 for the modified DMQ-R scales.

Statistical Analyses

Data were analyzed using the SPSS Statistics 26 software. Independent-measures *t* tests were conducted to assess group differences between users and non-users on the total ONI score and each of its scales, and Pearson correlation analyses were conducted to assess the ONI relationships with the remaining, continuous variables measuring frequency of use, level of dependence or abuse, and motivations for use. A standard alpha criterion of .05 was used to determine statistical significance. For significant group

differences, Cohen's d was calculated, with a value of .2 considered a small effect, .5 a medium effect, and .8 a large effect. For significant correlations, an r value of .1 was considered a weak relationship, .3 a moderate relationship, and .5 a strong relationship.

Results

Table 1 presents the inferential results on associations between ONI scores and levels of substance use/abuse. The only significant group differences were for the ONI Behaviors scale. The ONI Behaviors scores were greater for non-smokers ($M = 15.27$, $SD = 5.57$) than for smokers ($M = 15.27$, $SD = 5.57$; Cohen's $d = .30$), greater for those who do not consume alcohol ($M = 15.87$, $SD = 6.14$) than for those who do ($M = 14.63$, $SD = 5.01$; Cohen's $d = .22$), and greater for those who do not use illicit drugs ($M = 15.56$, $SD = 5.84$) than for those who do ($M = 14.08$, $SD = 4.44$; Cohen's $d = .29$). Similarly, ONI Behaviors scores were negatively correlated with frequency of smoking, alcohol consumption, and marijuana use. In contrast, frequency of using illicit depressant drugs was positively correlated with all ONI scores (i.e., total ONI scores and scores on each of its scales), indicating that greater use of illicit depressant drugs is associated with greater ON symptomatology. Regarding level of substance dependence or abuse, although the AUDIT and UNCOPE scores were each positively correlated with both the ONI Impairments and ONI Emotions scores, they were not significantly correlated with the ONI Behaviors scores or the total ONI scores.

Table 1 *Associations Between ON Symptomatology and Degree of Substance Use/Abuse*

Substance use variable	ONI Scale							
	Total		Behaviors		Impairments		Emotions	
Substance users vs. non-users	<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>
Smoke (<i>n</i> = 97) or not (<i>n</i> = 374)	0.10	.92	2.82	.005**	-1.37	.17	-1.37	.17
Drink (<i>n</i> = 344) or not (<i>n</i> = 127)	1.13	.26	2.03	.04*	0.55	.58	-0.26	.80
Use drugs (<i>n</i> = 191) or not (<i>n</i> = 280)	1.03	.30	3.12	.002**	-0.28	.78	-0.54	.59
Frequency of substance use (<i>n</i> = 471)	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Smoking	-.02	.73	-.10	.02*	.05	.26	.03	.49
Alcohol	-.06	.17	-.13	.007**	-.01	.78	-.01	.88
Marijuana	-.04	.39	-.11	.02*	.01	.84	.02	.69
Illicit depressant drugs	.12	.01*	.10	.03*	.10	.03*	.12	.02*
Illicit stimulant drugs	.08	.07	.06	.17	.08	.07	.07	.15
Illicit opiate drugs	.02	.67	.01	.78	.06	.24	-.02	.61
Illicit hallucinogen drugs	.02	.74	.01	.96	.05	.28	-.01	.82
Dependence or Abuse (<i>n</i> = 471)	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
CDS	-.02	.65	-.10	.03*	.06	.21	.01	.92
AUDIT	.06	.17	-.04	.45	.12	.01*	.10	.03*
UNCOPE	.06	.22	-.06	.18	.11	.02*	.13	.006**

Note. ONI = Orthorexia Nervosa Inventory [12]; CDS = Cigarette Dependence Scale [45]; AUDIT = Alcohol Use Disorders Identification Test [46]; UNCOPE = UNCOPE screening for drug abuse [47].

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

Table 2 presents the inferential results on associations between ONI scores and motivations for using these substances. Among smokers or vapers, the RSS Weight Control scores were positively correlated with all ONI scores. Next, among those who consume alcohol, the DMQ-R Coping and DMQ-R Conformity scores were each positively correlated with all ONI scores. Finally, among those who use illicit drugs, the modified DMQ-R Coping and modified DMQ-R Conformity scores were each positively correlated with all ONI scores except for the ONI Behaviors scores.

Table 2 *ON Symptomatology and Motivations for Substances Use*

Substance use motivations scale	ONI Scale							
	Total		Behaviors		Impairments		Emotions	
RSS (smoking; <i>n</i> = 97)	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Pleasure	.11	.30	.03	.78	.11	.23	.12	.23
Stimulation	.08	.45	.05	.64	.15	.16	.09	.37
Tension Reduction	.06	.55	.01	.92	.04	.73	.11	.28
Weight Control	.29	.004**	.23	.03*	.22	.04*	.27	.008**
DMQ-R (alcohol; <i>n</i> = 344)	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Enhancement	.07	.12	.01	.93	.09	.10	.12	.03*
Social	.06	.25	.01	.81	.05	.34	.11	.04*
Conformity	.25	.001***	.24	.001***	.19	.001***	.21	.001***
Coping	.29	.001***	.13	.01*	.31	.001***	.33	.001***
Modified DMQ-R (illicit drugs; <i>n</i> = 191)	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Enhancement	.08	.30	.03	.65	.07	.35	.10	.16
Social	.14	.06	.11	.14	.09	.20	.16	.03*
Conformity	.17	.02*	.13	.06	.15	.03*	.16	.03*
Coping	.20	.007**	.01	.86	.21	.003**	.29	.001***

Note. ONI = Orthorexia Nervosa Inventory [12]; RSS = Reasons for Smoking Scale [48]; DMQ-R = Drinking Motives Questionnaire-Revised [49].

p* < .05. *p* < .01. ****p* < .001.

Discussion

The past research surrounding the relationships between ON and substance use is limited and with mixed conclusions. One perspective is that the ON preoccupation with pure and healthy eating would coincide with the practice of other health-driven behaviors, therefore lowering the likelihood of engaging in substance use. Conversely, previous research into eating disorders overall suggests that eating disorder pathology may coincide with a greater likelihood to use and abuse substances. The present study sought

to further investigate relationships between ON and substance use, assessing ON symptomology with a more reliable and valid ON measure, as well as inquiring about the motivations behind substance use in this population. Furthermore, this study aimed to address issues of generalizability in previous research through a larger and more representative sample.

Regarding smoking (of traditional, electronic, or vapor cigarettes), smoking prevalence, frequency, and level of dependence were each negatively associated with healthy eating behaviors as measured with the ONI Behaviors scale in the current study. These findings seemingly support the hypothesis that the avoidance of unhealthy foods among those with relatively high levels of ON symptomatology also extends to the avoidance of unhealthy cigarettes. However, none of these three smoking variables were significantly correlated with the total ONI score that additionally reflects the more serious aspects of ON, including physical and psychosocial impairments and emotional distress. These results are consistent with those of multiple studies not finding a relationship between ON symptomatology and smoking status [9-15]. Thus, in the more severe or pathological cases of ON, behaviors are likely driven by something beyond a commitment to optimal physical health. In regard to reasons for smoking, the only motivation that was correlated with ON symptomatology in the current study was weight control. Perhaps the smokers with relatively high levels of ON symptomatology smoked as a means of appetite suppression either to help lose weight with the goal of achieving a healthier weight [30] or to help maintain a healthy weight and do everything possible to avoid becoming overweight [28, 29], even if using an unhealthy means to achieve or maintain this healthy weight.

Relevant to alcohol use, as with cigarette smoking, prevalence and frequency were negatively associated with healthy eating behaviors measured by the ONI Behaviors scale. These findings suggest that the endorsement of healthy eating habits among those with greater ON symptomatology extends to the avoidance of alcohol consumption. However, again similar to cigarette smoking, the total ONI score was not significantly correlated with prevalence, frequency, or dependence on alcohol, consistent with several previous studies that found no relationship between ON and alcohol use [9-13]. Consequently, individuals with ON symptomatology who engage in alcohol consumption behaviors most likely do so relative to factors external to the disorder. In the current study, among participants who consume alcohol, the total ONI and all subscale scores were positively correlated with motivations to drink for the purposes of coping and conformity. Concerning the relationship to coping, it is possible that drinkers who experience ON symptomatology may engage in alcohol consumption as a means of deterring the emotional distress, anxiety, and depression that are characteristic of ON [12, 13, 41-43]. Such coping motivations also underly the alcohol abuse seen in some people with other eating disorders who suffer from comorbid anxiety and depression [38-40]. Furthermore, the relationship between higher ON symptomatology and drinking to conform suggests that among more severe cases of ON, individuals prioritize evading social scrutiny and ostracization over the unhealthiness of alcohol.

Regarding illicit drug use, the ONI Behaviors score was negatively correlated with prevalence of illicit drug use and with frequency of marijuana use. These findings seem to indicate that greater endorsement of healthy eating behaviors may partly deter individuals from using illicit drugs, just as it may partly deter

them from smoking cigarettes or consuming alcohol. However, as with cigarettes and alcohol, the total ONI score was not correlated with prevalence, frequency, or dependence on illicit drugs, consistent with two other studies finding no relationship between ON and use of illicit drugs [10, 13]. The only exception was for frequency of using illicit depressant drugs, which was positively correlated with all aspects of ON symptomatology. Examination of motivations revealed that, similar to the reasons for consuming alcohol, ON symptomatology was associated with using illicit drugs for the purposes of coping and conformity, with emotional coping being the strongest predictor. This finding is consistent with several studies that found drug use to be an unhealthy coping mechanism for comorbid anxiety and depression among individuals with eating disorders [38-40].

Although the current study utilized a large sample and a more reliable and valid measure of ON, limitations should be considered. First, the recruitment for this study was aimed at health-driven groups, with many of the participants either recruited from nutrition and exercise science courses or recruited with an Instagram advertisement targeting healthy eaters. While such recruitment efforts helped to achieve a greater number of participants with higher levels of ON symptomatology, not specifically targeting substance users or individuals with more unhealthy diets may limit the generalizability of results. Second, the majority of the sample consisted of female, White, young adults, which may also affect generalizability. Third, this study used self-report measures and is therefore subject to self-report bias. Finally, the sample was a non-clinical sample, largely due to the lack of an established clinical standard for diagnosis of ON, and the subsequent difficulty in recruiting patients with such a diagnosis. Future research should aim to recruit a more behaviorally and demographically diverse sample to increase the generalizability of the results. Moreover, to further understand the underlying mechanisms of substance use among individuals with ON, future studies should aim to recruit a clinical sample of patients with an ON diagnosis, as well as to control for comorbidities that include anxiety and depression, which has been shown to be related to ON and other eating disorders.

What is already known on this subject?

Most past studies found no relationships between ON symptomatology and substance use, but they did not assess use of specific illicit drugs or the motivations underlying substance use.

What does this study add?

ON scores were positively correlated with frequency of using illicit depressant drugs. Further, among substance users, ON scores were positively associated with smoking or vaping for the purpose of weight control, and with consuming alcohol and using illicit drugs for the purposes of conformity and coping with such negative emotions as anxiety and depression.

Declarations

Conflict of interest: The authors declare no conflict of interest.

Ethical approval: All procedures performed in this study involving human participants were in accordance with the ethical standards of the Texas State University Institutional Review Board 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.

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