Bachelor's Thesis

Does Social Networking Sites Exposure Mediate the Relationship Between Obsessive-Compulsive Disorder and Orthorexia Nervosa in University Students?

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Table of Contents

Abstract

The present study investigated the mediational effect of social networking sites (SNS) exposure on the relationship between symptoms of obsessive-compulsive disorder (OCD) and orthorexia nervosa (ON) in university students. Previous research has demonstrated that the increased SNS exposure has implications for the expression of OCD and ON symptoms. However, ambiguous judgements have been made regarding the association between OCD and ON. Although these mental health concerns have been found to share similar cognitive and behavioural symptoms, it remains unclear whether there is a causal link between them. Therefore, to investigate the relationship between OCD and ON and the role of SNS use in it, a cross-sectional online survey was employed. The survey included the Y-BOCS and DOS instruments and items concerning socio-demographics and SNS exposure. Overall, N = 334 participants were recruited via convenience sampling, with the total sample consisting of N = 242 individuals (*Mage* = 21.45, *SD* = 2.55). The data were analysed with the mediation analysis using the PROCESS software with SPSS running as administrator. Results indicated a significant causal relationship between OCD and ON, where the increase in OCD symptoms resulted in a stronger ON tendency. In addition, higher levels of OCD led to a longer time spent on SNS. In contrast, increased SNS exposure predicted a lower level of ON symptoms. In general, it was concluded that OCD and SNS differently affect ON. While OCD predicts higher ON symptoms, SNS exposure has a reverse effect. Further research is required to validate these findings and identify the mechanism through which SNS exposure affects ON. In addition, a more diverse sample with participants of different races, nationalities, and the LGBTQ+ community must be recruited.

Keywords: orthorexia nervosa, obsessive-compulsive disorder, social networking sites, social media

Does Social Networking Sites Exposure Mediate the Relationship Between Obsessive-Compulsive Disorder and Orthorexia Nervosa in University Students?

In recent years increased attention has been drawn to the beauty ideals of male muscularity, female thinness, and adherence to a healthy lifestyle (Varga et al., 2013). The desire of an individual to meet these societal standards expands a greater control over one's diet, which in turn, may result in a fixation on healthy eating, named in the literature orthorexia nervosa (ON) (Eriksson et al., 2008; Varga et al., 2013). ON can be characterised by perfectionism, excessive meal planning but also intrusive thoughts about health (Bratman, 1997). These symptoms are common for one of the existing mental health disorders as well, namely, obsessive-compulsive disorder (OCD) (Koven & Abry, 2015). OCD is defined as "a long-lasting disorder in which a person has uncontrollable, reoccurring thoughts (obsessions) and/or behaviours (compulsions) that he or she feels the urge to repeat over and over" (National Institute of Mental Health, NIMH, 2019, Overview).

Furthermore, another important similarity shared by OCD and ON is their relationship with social networking sites (SNS) exposure. The symptoms of both mental health concerns have been found to either influence SNS use or be influenced by it. For instance, according to Boepple et al. (2016), online platforms that promote a healthy lifestyle, named "fitspiration" websites, often overemphasise the role of physical appearance and restraint from certain types of food. The constant exposure to such content might lead to an unhealthy pattern of eating in young adults, facilitating the risk for ON (Rodgers et al., 2019). In regard to OCD, the study by Fontes-Perryman and Spina (2022) illustrated that higher levels of OCD symptoms lead to compulsive use of SNS. Current research has focused on the relationship between SNS and ON, ON and OCD, and OCD and SNS. Thus, the mechanism of interaction between all three variables remains unclear.

Orthorexia Nervosa

Orthorexia Nervosa (ON) was first mentioned by Bratman (1997), who, using the Greek words "orthos" (accurate) and "orexis" (hunger), defined it as "pathological fixation on eating proper food". Individuals with ON experience an intense preoccupation regarding the quality and nutritional value of food while displaying significant distress towards unhealthy eating patterns (Donini et al., 2004; Varga et al., 2013). Even though ON has not been included in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5;

American Psychiatric Association, APA, 2013), various attempts have been made to identify its underlying mechanisms and causes.

The early stage of ON development, "healthy orthorexia", is focused on following a diet in an attempt to overcome a disease, enhance physical health, or obtain control over one's disorganised life (Bratman, 1997). Research has shown that individuals who pursue a healthy lifestyle express high self-discipline and feel superior to those who consume unhealthy food (Bratman, 1997; Donini et al., 2004). Therefore, individuals may become more preoccupied with their "healthy diets" over time and develop symptoms associated with ON (Bratman, 1997). Namely, the underlying ON mechanisms involve a significant amount of time dedicated to planning, buying, and eating food perceived as "healthy" (Bratman, 1997; Donini et al., 2004). For example, food can be evaluated as "healthy" based on its 1) quality (e.g., organic, no additives), 2) ethical issues (e.g., concerns about the environment) and 3) contribution to a healthy body (e.g., low fat) (Cheshire et al., 2020). Having such strict control over one's eating habits may become rewarding and reinforce avoidance or restriction of foods perceived as "unhealthy" (Dunn & Bratman, 2016).

Previous studies emphasised that ON-related mechanisms involve an excessive amount of time thinking and planning a healthy dietary lifestyle, which may negatively impact one's daily functioning (Arusoğlu et al., 2008; Donini et al., 2004). Several consequences of ON-related tendencies were depicted, such as malnutrition, weight loss, social isolation, and transferring eating routines to family members (Costa et al., 2017; Varga et al., 2013) but also heart failure in severe cases (Cartwright, 2004; Moroze et al. 2015). According to Dunn and Bratman (2016), other areas of impairment could be one's identity and self-worth becoming solely dependent on the adherence to routine eating behaviours. When unable to comply with their routines, individuals experience significant stress, guilt, and feelings of failure, which strengthens their adherence to eating tendencies (Cartwright, 2004; Cheshire et al., 2020).

According to different epidemiological studies conducted in several countries, the prevalence of ON is estimated to range from 1% (in the US) up to 57.6% in the general population (Dunn et al., 2017; Ramacciotti et al., 2011). Additionally, research has demonstrated that certain groups of individuals are more prone to develop ON-related symptoms, namely, dieticians, athletes, bodybuilders, university students, and artists (Dunn et al., 2016). However, there is inconsistency in the data regarding gender differences. Arusoğlu et al. (2008) found that ON is more prevalent in females, while Donini et al. (2004) and Fidan et al. (2010) found a higher ON tendency in males. Finally, Cena et al. (2019) proposed the

following personality characteristics as factors associated with an excessive focus on a healthy diet: impulsivity, low self-esteem, perfectionism, and poor emotional regulation.

Finally, because of an overlap between symptoms of ON and other mental health concerns, there is an ongoing debate on whether it might be a subtype of another disorder or should be considered a distinct psychopathological entity (Brytek-Matera, 2012). Researchers noted that ON, as well as feeding and eating disorders (FED), may involve weight loss, food intake restriction, social isolation, malnutrition, and perfectionism among others (Turner & Lefevre, 2017; Varga et al., 2013). However, unlike the underlying mechanisms of anorexia nervosa (one of the FED subtype), which involves food intake restriction as its core mechanism, ON is concerned with the quality of food to achieve health (Dunn & Bratman, 2016; Varga et al., 2013). Additionally, ON has been compared to Avoidant Restrictive Food Intake Disorder (ARFID), described as a lack of interest in nutrition, avoidance of food based on certain criteria (e.g., colours), and a fear of aversive eating consequences (e.g., vomiting) (Kreipe & Palomaki, 2012). Unlike ON, individuals with ARFID do not experience anxiety due to the preoccupation with a healthy diet. Instead, their anxiety is associated with an aversive (e.g., constipation) or traumatic experience (e.g., choking) (Kreipe & Palomaki, 2012). In addition to the similarities between FED and ON, there is a growing body of literature emphasizing the common underlying mechanisms between obsessive-compulsive disorder (OCD) and ON (Koven & Abry, 2015; Koven & Senbonmatsu, 2013; Vaccari et al., 2021).

Obsessive-Compulsive Disorder

OCD is defined as a mental health disorder in which one performs ritualistic behaviours (compulsions) and experiences intrusive thoughts, images, or impulses (obsessions) (Mancebo et al., 2005; NIMH, 2019; Stein, 2002). For example, it can involve thoughts about harming self or others (obsessions) and consequent washing and checking (compulsions) (Grant, 2014; Leckman et al., 2001). Individuals who experience OCD feel the need to respond to their obsessions by performing repetitive behavioural patterns or mental acts (e.g. counting) and suppressing their intrusive thoughts (APA, 2013). The lifetime prevalence of OCD is estimated to be 2.3-2.5% in the general population, and no considerable differences between males and females were found (Karno et al., 1988; Ruscio et al., 2010; Stein, 2002).

OCD and ON share several similarities, namely, perfectionism, obsessive meal planning, weighting and measurement of food, repetitive behaviours, and intrusive thoughts about impurity, health, and eating (Bratman, 1997; Koven & Abry, 2015). Due to an

excessive amount of time spent on eating rituals and thoughts, individuals with ON, similarly to those with OCD, experience interference with their daily practices and unpleasant interactions with others (Donini et al., 2004). Furthermore, Koven and Senbonmatsu (2013) found several neuropsychological patterns in both mental health concerns, one of which is set-shifting impairment. It can be defined as "flexible problem-solving and the ability to move freely from one situation to another" (Koven & Senbonmatsu, 2013, pp. 2017-2018). In ON, it is reflected in devoting a significant amount of time and energy to adhering to the rules and avoiding any situations preventing one to follow their rituals. Such behaviours might contribute to the decline in stimulating daily activities, thereby decreasing set-shifting skills. In addition, the experience of OCD and ON may involve self-monitoring ability. Because the attention of individuals with ON is usually diverted towards their health, it may be challenging to focus on social interactions. Similarly, people with OCD experience cognitive self-consciousness (constant monitoring of one's thoughts) and increased self-reflectiveness (rumination about oneself) (Koven & Senbonmatsu, 2013).

Regardless of the overlap in symptoms, the direct link between OCD and ON remains unclear. First, there are substantial differences in manifestations of both mental health conditions. Individuals with OCD are aware that their behaviour is unreasonable, aim to keep their actions unnoticed by others, and experience obsessions and compulsions concerning not only health and eating (Vaccari et al., 2021). In comparison, people with ON consider their behaviours and thoughts related to food appropriate and prompt others to perform their rituals (Vaccari et al., 2021). Second, researchers have different perspectives regarding how each mental health condition influences the other. For example, Arusoğlu et al. (2008) found that with an increasing number of OCD symptoms and unhealthy eating attitudes, the tendency toward ON grows. Moroze et al. (2015) suggested that obsessions with health presented in OCD may be a potential cause for later ON development. In contrast, Łucka et al. (2019) concluded there is no relationship between the two factors. Thus, further investigation of the association between OCD and ON is needed.

Social Networking Sites Exposure

Another concept relevant for studying mental health is the implication of Social Networking Sites (SNS). Merriam-Webster (n.d.) defined it as "forms of electronic communication (such as websites for social networking and microblogging) through which users create online communities to share information, ideas, personal messages, and other content (such as videos)". In February 2020, it was estimated that more than 60% of the

global population had accounts on platforms such as Facebook and YouTube, while 48% and 36% used Instagram and Twitter (Statista, 2022a). The average time spent daily on SNS was approximated to be 145 minutes (Statista, 2022b). Although these platforms enable convenient communication with and support from others, increased use of SNS may be detrimental to one's mental health.

SNS exposure was found to be associated with the development of different mental health concerns in young adults and adolescents, such as depression, anxiety, insomnia, or stress (Carrotte et al., 2015; Forest & Wood, 2012; Lee-Won et al., 2015; Mabe et al., 2014; Mohammadbeigi et al., 2016; Pantic et al., 2012). In this case, *how* an individual uses an SNS platform may be more important than the time they spend there (Berryman et al., 2017). In particular, using SNS, individuals might expose themselves to the constant comparison between themselves and others, which occurs when persons attempt to evaluate their own opinions and abilities (Chrisler et al., 2013; Festinger, 1954; Tiggemann & Slater, 2013). Seeing and comparing oneself to unrealistic and curated images of people living a fulfilling and happy life might lead to feelings of distress, social isolation, and envy (Shensa et al., 2016; Sujarwoto et al., 2019).

Furthermore, social comparison may be a mechanism contributing to unhealthy eating behaviour (Rodgers, 2016). Because of the experienced social pressure to meet the beauty standards (of thinness for females or muscularity for males) and willingness to be validated by peers, users may start restricting their diet (Hendrickse et al., 2017; Varga et al., 2013). In addition, individuals might engage in binge eating to boost their self-esteem after having negative social interactions, either online or offline (Rieger et al., 2010). Smith et al. (2013) established that after four weeks of maladaptive Facebook usage (being involved in social comparison and experiencing unpleasant social evaluations), overeating tendencies and bulimia-related symptoms among undergraduate females increased.

In the study of Turner and Lefevre (2017), a positive effect of Instagram use on symptoms of ON was established. The authors suggested that, on this SNS platform, individuals with ON mainly follow accounts posting healthy food-related images, meaning that they might believe that healthy eating is more common than it is (an "echo chamber effect"). Additionally, health professionals noted that when a person with ON has a strong sense of belongingness to a healthy eating movement, they may prefer to consider the internet the primary source of information instead of their practitioner (Cheshire et al., 2020). Thus, constant exposure to healthy eating content on SNS combined with a strong identity with the healthy eating community may result in the perceived demand to adhere to a strict diet

(Cheshire et al., 2020; Turner & Lefevre, 2017). Other studies also confirmed the relationship between prolonged and consistent use of SNS and ON (Douma et al., 2021; McComb & Mills, 2019).

Next to the link with ON, SNS exposure has been associated with OCD symptoms. For example, in the study by van Bennekom et al. (2018), two relevant cases of individuals with OCD were presented. One case report of a female participant indicated a fear of posting shameful content and being judged by others because of it, which led to the persistent monitoring of SNS profiles. In the second case, a participant was using phone screen recording to verify that they had not entered any inappropriate content or encouraged people to commit a crime via a message on SNS (van Bennekom et al., 2018). Additionally, Fontes-Perryman and Spina (2022) established a causal link between OCD and SNS. They found that increased OCD symptoms predict both social media fatigue and compulsive social media use. In addition, they established that the relationship between OCD and both factors is mediated through fear of missing out (Fontes-Perryman & Spina, 2022). Fear of missing out can be defined as "pervasive apprehension that others might be having rewarding experiences from which one is absent" (Przybylski et al., 2013, p. 1841)

Finally, since OCD might be expressed in intrusive thoughts and obsessions about health and healthy nutrition (Koven & Abry, 2015), individuals may increasingly seek health-related posts on SNS. These posts may contain harmful advice and potentially worsen the existing symptoms. Following the acquired information, persons may modify their diets to pursue a "healthy lifestyle routine", and such symptoms as obsessive meal planning, weighting, and measurement of food (which are associated with ON as well) (Bratman, 1997; Koven & Abry, 2015) may be developed or intensified.

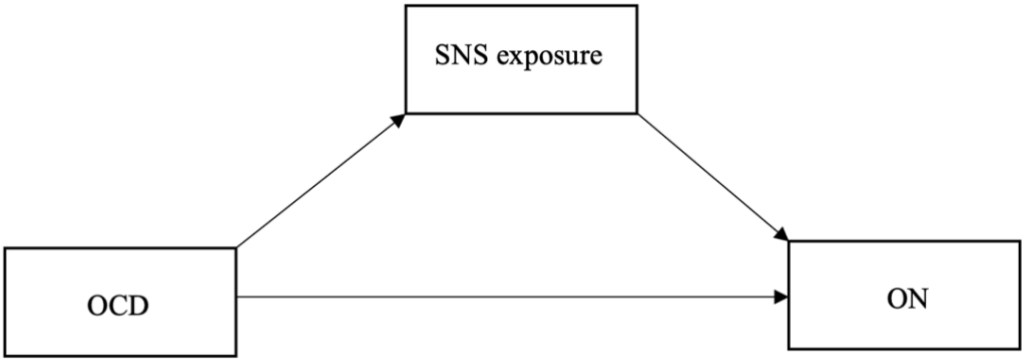
The Present Study

There is a lack of research regarding the interplay between SNS, ON and OCD. Therefore, the current study aims to examine the mediating role of SNS exposure regarding the causal relationship between OCD (causing variable) and ON (outcome variable) (see Figure 1). It tackles the research gap and is based on a previous study conducted at the University of Twente by Ghiţă et al. (in press). To address the goal of the study the following research question has been formulated:

RQ: To what extent time spent on social networking platforms mediates the relationship between obsessive-compulsive disorder and orthorexia nervosa in university students?

Figure 1

The Simple Mediation Model



Methods

Design

A quantitative, non-experimental research design with a cross-sectional survey was employed. The survey was a part of a larger research, therefore, not all collected variables were used in the analyses of the current study. In this study, the relationship between the independent variable OCD and the dependent variable ON mediated by SNS was investigated. All participants were recruited via convenience sampling, with the researchers posting an invitation link to the survey on their social media platforms (Instagram, Facebook, WhatsApp).

Participants

Initially, N = 334 individuals were invited to participate in the study, with the final sample consisting of N = 242 participants. The inclusion criteria for participating were a good command of English, being enrolled as a student at a university or hogeschool, and the age of 18 years. Following the exclusion criteria, N = 92 respondents were excluded from the data analysis due to not finishing the survey (N = 84), not accepting the informed consent (N = 4), not having an account or not spending any time on SNS (N = 2), and providing unrealistic measures of height and weight (e.g. height of 3 meters) (N = 1) or time spent on SNS (e.g. 86 hours daily) (N = 1). Thus, the response rate of the study was 72.5%.

The age of participants ranged from 18 to 34 (M = 21.45, SD = 2.55), with 76.4% of them being female, 21.9% male, and 1.7% non-binary or third gender. Most students had German nationality (58.7%), while others were Dutch (12.4%), Latvian (9.5%), or had a different nationality (19.4%). In regards to the education level, 32.6% of them were

hogeschool students, 60.3% - Bachelor students, 6.2% - Master students, and 0.8% were PhD students. Socio-demographic data from the participants can be appreciated in Table 1.

Instruments

Respondents filled in a survey using the web-based software Qualtrics. The questionnaire consisted of open-ended, "Yes/No", multiple-choice questions, and questions requiring an answer using a four-point Likert scale.

Individual Items

Demographics. With the open and multiple-choice questions, participants were asked to provide information about their age, nationality, education, and gender.

Body Mass Index (BMI). Furthermore, respondents indicated their weight and height. Based on these data, BMI was calculated following the formula from the World Health Organisation (WHO, 2010): weight (in kilograms) divided by height (in meters) squared. The result was further used to identify the BMI levels of individuals, i.e. their nutritional status (healthy/unhealthy).

SNS. For the SNS exposure, two items were included in the survey. The first item aimed to collect information on whether the respondents had an active account on SNS, and the second item concerned the time they spent on SNS daily. To answer the question, participants were asked to type in the number of hours they spend daily on social media platforms.

Personal Mental Health History. Finally, to investigate whether participants had been diagnosed with a mental health concern, they had to answer one "Yes/No" question. In addition, they indicated whether they sought treatment for any mental health condition. In each question, respondents could specify the disorder/concern, if applicable. All individual items can be appreciated in Appendix A.

The Düsseldorf Orthorexie Scale (DOS)

The English version of the DOS was selected to investigate participants' tendencies associated with ON (Appendix B). Initially, the survey was developed for German-speaking individuals but was further translated into English (Niedzielski & Kaźmierczak-Wojtaś, 2021). The self-reported questionnaire exists in two versions: 10-item and 21-item. Nevertheless, in this study, the former was employed. The questionnaire included such questions as: "I can only enjoy eating foods considered healthy" and "I have the feeling of being excluded by my friends and colleagues due to my strict nutrition rules" etc. To answer the items of the DOS, a 4-point Likert scale is used, with the lowest point being "this does not

apply to me" (1 point) and the highest "this applies to me" (4 points). The higher the score of a participant, the stronger their tendency towards ON. The maximum score is 40 points, and the cut-off point is ≥ 30 points (Niedzielski & Kaźmierczak-Wojtaś, 2021). In addition, the scores of 25-29 indicate that individuals are at-risk for ON (Barthels et al., 2016).

The DOS was proven to have high internal consistency [Cronbach's alpha = .84 (German version) and Cronbach's alpha = .88 (English version)] and high retest reliability (r = 0.67–0.79, p = .001 between three points in time) (Barthels et al., 2015; Niedzielski & Kaźmierczak-Wojtaś, 2021). Nevertheless, both English and German DOS have poorly fitted goodness-of-fit indicators (Barthels et al., 2015; Chard et al., 2019). In this study, the internal consistency of the scale was good (Cronbach's alpha = .84).

Yale Brown Obsessive-Compulsive Scale (Y-BOCS)

To assess OCD tendencies, the Y-BOCS questionnaire was administered (Appendix C). The questionnaire was initially created to assess symptom severity, the existence of OCD tendencies, and treatment response in individuals with diagnosed OCD and can be used for adults, children, or adolescents (Kim et al., 1992; Scahill et al., 1997). The Y-BOCS contains 10 items, where items 1 to 5 represent obsessions and items 6 to 10 – compulsions (López-Pina et al., 2015). The following represent examples for both item categories: "How much control do you have over your obsessive thoughts?" (obsessions) and "How much time do you spend performing compulsive behaviours?" (compulsions). All items are answered with a 4-point Likert-type scale, and the total score is derived by summing the score of 10 items, with 40 being the maximum score (López-Pina et al., 2015). Additionally, there are several score clusters displaying the severity of the symptoms: mild (0-13), moderate (14-25), moderate-severe (26-34), and extreme (35-40) (Storch et al., 2015).

The psychometric properties of the Y-BOCS are the following: interrater reliability is good (N = 40, interclass correlation coefficients for total score = .98, $p < .05$), a mean internal consistency is .89 among 4 raters, and a test-retest reliability is r = 0.81-0.97 (Goodman et al., 1989; Kim et al., 1990). In the current study, the internal consistency of the Y-BOCS scale was evaluated as good (Cronbach's alpha = .83).

Procedure

The present study was ethically approved by the Ethics committee of the Behavioural, Management and Social sciences (BMS) faculty of the University of Twente (Requestnr. 220321). Before taking part in the study, students from the University of Twente were

informed about the opportunity to fill in the survey in the test subject pool system SONA to receive 0.25 credits for participation. The data collection period was from 30.03.2022 until 14.04.2022.

When respondents followed the link to the questionnaire, they were informed about the risks, discomforts, or potential benefits associated with the study, protection of their confidentiality, and voluntariness of participation (Appendix D). Individuals participated in this study based on their written informed consent (Appendix D). First, they were asked to fill in their socio-demographic information as well as height and weight. Then, individual data in relation to social networking sites exposure and history of previous diagnoses and treatment were collected. Next, students were asked to fill out the DOS and Y-BOCS questionnaires. Finally, they were thanked for taking part in the survey and provided with the email addresses of the researchers once again in case any questions arise.

Data Analysis

The data were analysed using the statistical software IBM SPSS (Version 27). First, the screening of the data was performed. All participants who did not fulfil the inclusion criteria and did not take part seriously in the study were excluded from the analyses. Second, a number of new variables were created: a numerical variable BMI (using “height” and “weight” to calculate the value); a BMI variable with categories “underweight”, “healthy weight”, “overweight” and “obese”; numerical variables for the DOS and Y-BOCS scales (with the sum scores of each participant on the items of a scale); and two other categorical variables for the classification of individuals’ scores on Y-BOCS (with categories “no ON”, “at-risk”, and “ON”) and the DOS (with categories “none”, “moderate”, “moderate-severe”, “extreme”). Additionally, another categorical variable was created for daily time spent on SNS with categories “low to medium” and “high” and the cut-off score of 3 hours (Karmila et al., 2020).

Furthermore, descriptive statistics were computed to analyse the sample. Mean item scores, standard deviations, minimum and maximum values were calculated for continuous variables, whereas frequencies were calculated for categorical variables. Additionally, using $p > 0.5$ as an indicator, normal distribution of the data was assessed with Shapiro-Wilk test (Kwak & Kim, 2017). Finally, a mediation analysis was conducted using PROCESS software (Hayes, n.d) with DOS total score variable as predictor, continuous variable time spent on SNS as mediator, and Y-BOCS total score as the outcome variable.

Results

Socio-Demographic Data

The descriptive statistics for each variable can be appreciated in Table 1. According to the calculated BMI, in the current study, 7.9% of individuals had data consistent with the category "underweight", 76.4% - "healthy weight", 13.2% - "overweight", and 2.5% - "obese". Additionally, 25.2% of participants indicated they received treatment for a mental health concern. The examples of the mentioned mental health conditions were depression, anxiety, and anorexia nervosa. Next to that, 14.9% of individuals had been diagnosed with a mental health disorder (e.g., depression, anorexia nervosa, or panic disorder).

Following the total scores on the DOS (M = 18.81, SD = 5.65), 83.5% of participants had no ON, 11.2% were at risk, and 5.4% had scores indicating a possibility of ON. In regard to the total scores on the Y-BOCS (M = 21.50, SD = 4.26), 9.9% participants had scores belonging to the category "no symptoms of OCD", 62.8% - "moderate OCD symptoms", 26.9% - "moderate-severe OCD symptoms", and 0.4% - "severe OCD symptoms". Finally, the daily time spent on SNS (M = 3.13, SD = 1.48) indicated that 40.5% of individuals had low to moderate exposure to SNS (less than 3 hours), whereas 59.5% had high exposure (more than 3 hours).

Table 1

Socio-demographic data of the participants (N=242)

	N	%	Mean	SD	Min	Max
Age			21.45	2.55	18.00	34.00
Nationality						
German	142	58.7				
Dutch	30	12.4				
Latvian	23	9.5				
Other	47	19.4				
Gender						
Male	53	21.9				
Female	185	76.4				
Non-binary/third gender	4	1.7				
Education						
Hoogeschool	79	32.6				
Bachelor	146	60.3				
Master	15	6.2				
PhD	2	0.8				

BMI			22.29	4.26	14.69	56.43
Underweight	19	7.9				
Healthy Weight	185	76.4				
Overweight	32	13.2				
Obese	6	2.5				
Mental Health Treatment						
Yes	61	25.2				
No	181	74.8				
Mental Health Diagnosis						
Yes	36	14.9				
No	206	85.1				
Daily Time on SNS			3.12	1.48	0.16	10.00
Low to moderate	98	40.5				
High	144	59.5				
ON (Total scores DOS)			18.81	5.65	10.00	34.00
No ON	202	83.5				
At-risk	27	11.2				
ON	13	5.4				
OCD (Total scores Y-BOCS)			21.50	4.26	10.00	37.00
None	24	9.9				
Moderate	152	62.8				
Moderate-severe	65	26.9				
Extreme	1	0.4				

Note. BMI = Body Mass Index. SNS = social networking sites. ON = orthorexia nervosa. OCD = obsessive-compulsive disorder.

Data Normality

The Shapiro-Wilk normality test was conducted to examine the distribution of continuous variables. The results indicate that the data are not normally distributed for the variables “DOS total score” ($p < .05$), “Y-BOCS total score” ($p < .001$), and “SNS exposure” ($p < .001$). However, the inspection of Q-Q plots did not reveal any significant deviations. Thus, following the central limit theorem, a parametric test was conducted to answer the research question. The theorem implies that, regardless of population’s distribution, the larger sample size approximates normally distributed data (Kwak & Kim, 2017).

Mediation Analysis

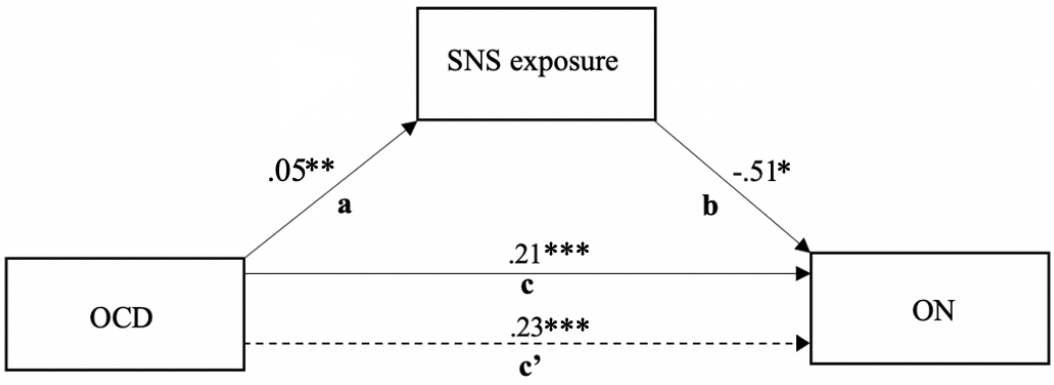
To investigate whether SNS exposure mediated the relationship between OCD and ON, a simple mediation analysis was performed. Following the mediation model, results indicated that OCD positively affected SNS exposure [$B = .05$, $SE = .02$, $t(240) = 2.98$, $p < .01$] (path *a* on Figure 2), and SNS exposure in turn, negatively affected ON [$B = -.51$, $SE = .24$, $t(239) =$

-2.11, $p < .05$] (path *b* on Figure 2). In addition, the direct effect of OCD on ON was positive and significant [$B = .23$, $SE = .06$, $t(239) = 3.92$, $p < .001$] (path *c'* on Figure 2).

Furthermore, the result of the total effect revealed that OCD positively predicted ON [$B = .21$, $SE = .06$, $t(239) = 3.56$, $p < .001$] (path *c* on Figure 2), indicating a causal relationship between the two variables. Finally, the negative indirect effect of OCD on ON [$B = -.02$, $SE = .01$, 95% C.I. (-.0582; -.0006)] displayed the mediational effect of SNS exposure on the relationship between OCD and ON.

Figure 2

The Simple Mediation Model with Regression Coefficients



Note. *** $p < .001$, ** $p < .01$, * $p < .05$

Discussion

The objective of this study was to examine the extent to which time spent on social networking platforms mediates the relationship between obsessive-compulsive disorder and orthorexia nervosa in university students. Following the increased attention to the importance of physical appearance and restrictive diets emphasised on SNS, individuals (especially young adults) may become prone to developing fixation on healthy eating, i.e., ON (Boepple et al., 2016; Varga et al., 2013). Therefore, researchers have focused on identifying factors that may be involved in the development of this mental health concern.

For example, previous studies examined the relationship between OCD and ON, which led to inconclusive judgement. While Arusoğlu et al. (2008) and Vaccari et al. (2021) found that OCD symptoms were associated with a higher tendency toward ON, Łucka et al. (2019) concluded that there was no connection between the two variables. Additionally, the association between SNS and ON was tested, with only one study establishing a positive link

between the two factors (Turner & Lefevre, 2017). Furthermore, SNS has been connected to OCD as well. Fontes-Perryman and Spina (2022) found that greater levels of OCD symptoms led to compulsive use of SNS. Nonetheless, no studies have examined the interaction between the three variables (OCD, SNS, and ON), which is novel in this study. Thus, following the ambiguous findings of previous research, the causal relationship between OCD and ON with the mediating role of SNS was tested in this study.

Socio-Demographic Data Interpretation

In the current study, the DOS questionnaire was used to evaluate levels of ON symptoms in the participants. As measured by DOS, the prevalence of ON in the sample was 5.4%. This percentage is more than twice as high as the estimated ON prevalence in German students (2.5%) (Rudolph et al., 2017) and almost twice as low compared to the prevalence in Spanish students (10.5%) (Parra-Fernández et al., 2019). However, it must be noted that the sample of the current study included individuals of multiple nationalities studying in different countries. For instance, some nationalities were German, Dutch, Latvian, Belgian, Russian, Moldavian, French, etc.

Furthermore, symptoms of OCD were measured with the Y-BOCS questionnaire. The data from most individuals represented the category of moderate levels of symptoms (62.8%), which is in line with the finding that students are a vulnerable group to developing OCD (Costa & Hardan-Khalil, 2019; Zheng et al., 2020). In fact, university and college students can experience significant stress associated with transitioning into a new environment and other study-related activities, which may result in the development of mental health disorders, including OCD (Huang et al., 2018). Moreover, the mean age of the sample was 21, which corresponds to the finding that young adults are more likely to experience symptoms of OCD than older adults (Fawcett et al., 2020)

Finally, the nutritional status of individuals was tested using the BMI indicator. Following the mean score of all participants (22.3), the overall nutritional status of the sample falls into the category of “normal weight” (18.5–24.9) (WHO, 2010). This score does not deviate significantly from the mean BMI scores found in other studies examining ON (Barthels et al., 2016; Brytek-Matera et al., 2015; Dell’Osso L et al., 2018; Turner et al., 2017). For example, in the study by Barthels et al. (2016), the mean BMI score was 21.83, whereas Turner et al. (2017) found a score of 22.14.

Mediation Analysis Implications

The mediation analysis confirmed that there is a causal relationship between OCD and ON; increased OCD symptoms predicted a stronger tendency toward ON. The connection between these two variables may be reflected in the similarity of symptomatology. Cognitive and behavioural symptoms such as obsessive meal planning, measuring and weighing of food, perfectionism, and intrusive thoughts about eating and health represent the similar underlying mechanisms of both disorders (Bratman, 1997; Koven & Abry, 2015). Thus, individuals with OCD can develop symptoms associated with ON, which indicates that these might be considered comorbid mental health concerns, the proposition provided in the study by Costa and Hardan-Khalil (2019). Furthermore, the relationship between OCD and ON found in this study is consistent with the finding from Arusoğlu et al. (2008). In their study, the researchers established that increased OCD symptoms were associated with a higher tendency towards ON. However, the current study made use of the DOS questionnaire to measure ON, while Arusoğlu et al. (2008) integrated another instrument, ORTHO-15. Particularly, whereas the former has been evaluated as a more reliable and accurate instrument for measuring ON, the latter tends to overestimate symptoms of ON (Meule et al., 2020; Missbach et al., 2015). Thus, when comparing the findings of both studies, one should be aware of this difference.

Furthermore, a positive relationship between OCD and SNS was found. In other words, a greater level of OCD symptoms leads to higher SNS exposure. There are several possible explanations concerning the nature of this relationship. First, individuals with OCD symptoms can express fear of missing important information on social media (Fontes-Perryman and Spina, 2022). Thus, they may experience the constant need to check their profiles and news feed, thereby increasing their SNS exposure (Fuster et al., 2017; Przybylski et al., 2013). Second, OCD may involve obsessions related to the use of SNS. For example, it may be expressed in fear of posting inappropriate content and being rejected by other people because of it (Bennekom et al., 2018). Such obsessions may provoke individuals with OCD to compulsively expose themselves to SNS (Bennekom et al., 2018). Finally, the causal relationship established in this study corresponds to the findings from Fontes-Perryman and Spina (2022), who found that OCD leads to compulsive social media use.

Next to that, it was established that with an increase in SNS exposure, a tendency toward ON decreased. A possible explanation could involve the echo-chamber effect – an "environment in which the opinion, political leaning, or belief of users about a topic gets

reinforced due to repeated interactions with peers or sources having similar tendencies and attitudes" (Cinelli et al., 2021, p. 1). For instance, research has shown that the perception of peers frequently eating sweet pastries increases the individual's consumption of these (Robinson et al., 2016). Therefore, if one encounters a greater number of posts with users consuming junk food compared to healthy food, their belief that eating junk food is acceptable will be reinforced. As a result, they may be less influenced by the "fitspiration" content and have a lower risk of developing ON.

On the other hand, the decrease in ON tendency may result from the influence of online communities on individuals. For instance, in the study by Valente et al. (2022), individuals with ON symptoms agreed that posts and communication on Instagram, followed by the feeling of belongingness to the "orthorexia community", encouraged them to become aware of their unhealthy patterns. Moreover, it was established that users post content to recover, bring awareness, and assist others in their recovery from ON (Valente et al., 2022). Similar conclusions have been made by Santarossa et al. (2019), who found that the ON community on Instagram consisted of a small group of individuals who focused on supporting each other and recovering from unhealthy eating rituals.

Nonetheless, the relationship between SNS and ON found in this study contradicts the findings from Turner and Lefevre (2017), who concluded that Instagram exposure increased ON. In addition, they found that compared to Instagram use, other social media platforms did not have the same effect on ON (Turner & Lefevre, 2017). Therefore, because the current study did not discriminate between different SNS, it is unclear to what extent the results can be compared to the findings from Turner and Lefevre (2017).

To conclude, this study illustrates a causal relationship between OCD and ON, where higher levels of OCD symptoms lead to a stronger tendency towards ON. In addition, compared to the effect of OCD, the relationship between SNS exposure and ON is reversed. That is, higher SNS exposure predicts a weaker tendency towards ON. Therefore, by decreasing symptoms of ON, SNS exposure mediates the positive effect of OCD, indicating the differing direction of the influence that SNS exposure and OCD have on ON. Furthermore, the direct impact of OCD on ON without SNS exposure as a mediator was higher than the effect with its inclusion. According to MacKinnon et al. (2007), this may indicate that SNS exposure acts as a suppressor variable in the relationship between OCD and ON. In other words, SNS exposure may weaken the relationship between the two variables by decreasing the initial effect of OCD. Thus, following this interpretation, individuals who have

both high levels of OCD symptoms and high exposure to SNS may have a lower tendency toward ON than those who only have increased OCD symptoms.

Strengths, Limitations, and Further Research Recommendations

The current study has several important strengths. First, the study tested how the three variables (OCD, ON, and SNS exposure) interact together, while previous research focused mainly on the relationships between two variables (e.g., ON and OCD). Second, compared to previous research findings where the correlation between two variables was explored, the current study tested the causal effect of OCD on ON. This finding is valuable for understanding the underlying mechanisms and potential treatment strategies for ON. Additionally, the study made use of two validated questionnaires to measure OCD and ON symptoms: Y-BOCS and DOS. In comparison with this study, previous research employed a less reliable and valid questionnaire for measuring ON symptoms, the ORTHO-15. Both self-report questionnaires used in the current study were proven to have excellent psychometric properties, which implies that the results can be considered accurate and reliable (Barthels et al., 2015; Goodman et al., 1989; Kim et al., 1990; Niedzielski & Kaźmierczak-Wojtaś, 2021).

Nevertheless, the study should be viewed in light of the two limitations. First, the sample is not representative of the target population. Specifically, more than 75% of participants who filled in the survey were females. Such gender imbalance could have resulted from females being more involved in the topic than males and non-binary/third gender individuals and the overall tendency of females to be more interested in research participation. Furthermore, the application of the convenience sampling method led to the unequal representation of nationalities and races, with most individuals being Europeans. Additionally, in this study, no data were collected to analyse the percentage of participants who belonged to the LGBTQ+ community. This leads to the concern of whether the findings can be generalised to individuals of other nationalities, races, and the LGBTQ+ community. Therefore, future research should focus on recruiting a more diverse sample to resolve the issue of gender imbalance and the generalisability of results. In addition, questions regarding nationality, race, and belongingness to the LGBTQ+ community should be included in the survey.

Another limitation is related to the criticisms of the Y-BOCS. Although Y-BOCS has been granted excellent psychometric properties, Deacon et al. (2005) found that its control and resistance items have poor validity, which leads to underestimation of the severity of OCD symptoms. Namely, according to Woody et al. (1995), individuals with formal OCD

diagnosis experience difficulties distinguishing between attempts to resist the expression of their symptoms and success in taking control over them. In addition, due to the high comorbidity of OCD with depression, the Y-BOCS has been found to have low discriminant validity with depression (Nestadt et al., 2001; Taylor, 1995). Therefore, the answers of participants who had been diagnosed or treated for depression may reflect a higher tendency toward symptoms of depression and not OCD.

Finally, following a lack of research to support the negative relationship established between SNS exposure and ON, further research should focus on disclosing the mechanism through which SNS exposure decreases ON tendencies. More detailed information should be gathered from participants regarding their SNS use. For example, data can be collected regarding which content individuals seek on SNS, which SNS they expose themselves to the most, or how they spend time there (e.g., post pictures, read news, or follow their friends and relatives). Then, one should test the causality accounting for the new data to shed light on the context in which the relationship between SNS and ON exists.

Conclusion

Current research demonstrated the causal relationships between OCD on ON and the role of SNS exposure in this relationship. Following the growing interest in ON as a serious mental health concern and a potential new diagnosis in the DSM-5, close attention must be paid to the factors promoting its development. Thus, it was established that, with the increase of OCD symptoms, the tendency towards ON becomes stronger, which is consistent with the findings of previous research. Nonetheless, it was the first study to demonstrate that, with the account of SNS exposure as an intervening variable, OCD was found to increase the SNS exposure and, in turn, decrease ON-related experiences. Although the nature of the effect of SNS exposure remains indefinite, this finding adds new insights into the existing body of research. It demonstrates the implications of SNS regarding the relationship between OCD and ON.

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Appendix A

Individual-Level Items

Q4 Please indicate your age in numbers.

_____

Q5 Please indicate your nationality.

_____

Q6 Please indicate your gender.

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

Q7 Please indicate your current level of education.

- ○ Hoogeschool (1)
- ○ Bachelor (2)
- ○ Master (3)
- ○ PhD (4)

Q8 Please indicate the following measures:

- ○ Weight (in kg) (1) _____
- ○ Height (in cm) (2) _____

Q10 Please indicate whether you have at least one active account on the following social media platforms: Instagram, Facebook, Twitter, Snapchat, YouTube, TikTok.

- ○ Yes (1)
- ○ No (2)

Q11 Please indicate in **hours** how much time you spend **daily** on social media platforms (e.g., 3 hours).

_____

Q12 Have you ever sought psychological or pharmacological treatment for any mental health concerns (e.g., anxiety, depression, eating disorders)? If yes, please mention.

- ○ Yes (1) _____
- ○ No (2)

Q13 Have you ever been diagnosed with a mental health condition? If yes, please mention.

- ○ Yes (1) _____
- ○ No (2)

Appendix B

DOS Questionnaire

Q18 In the next part you will be asked several questions about your eating behaviour.

Q14 Please indicate how much the following statements concerning nutrition apply to you:

	This does not apply to me (1)	This does not really apply to me (2)	This somewhat applies to me (3)	This applies to me (4)
Eating healthy food is more important to me than indulgence/ enjoying the food. (1)	○	○	○	○
I have certain nutrition rules that I adhere to. (2)	○	○	○	○
I can only enjoy eating foods considered healthy. (3)	○	○	○	○
I try to avoid getting invited over to friends for dinner if I know they do not pay attention to healthy nutrition. (4)	○	○	○	○
I like that I pay more attention to healthy	○	○	○	○

nutrition than other people. (5)				
If I eat something I consider unhealthy, I feel really bad. (6)	○	○	○	○
I have the feeling of being excluded by my friends and colleagues due to my strict nutrition rules. (7)	○	○	○	○
My thoughts constantly revolve around eating healthy nutrition and I organize my day around it. (8)	○	○	○	○
I find it difficult to go against my personal dietary rules. (9)	○	○	○	○
I feel upset after eating unhealthy foods. (10)	○	○	○	○

Page Break

Appendix C

Y-BOCS Questionnaire

Q21 Now you will be asked several questions about obsessions. Obsessions are unwanted ideas, images or impulses that intrude on thinking against your wishes and efforts to resist them. They usually involve themes of harm, risk and danger. Common obsessions are excessive fears of contamination; recurring doubts about danger, extreme concern with order, symmetry, or exactness; fear of losing important things

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Q28 How much time do you spend on obsessive thoughts?

- ○ None (1)
- ○ 0-1 hrs/day (2)
- ○ 1-3 hrs/day (3)
- ○ 3-8 hrs/day (4)
- ○ More than 8 hrs/day (5)

Q30 How much do your obsessive thoughts interfere with your personal, social, or work life?

- ○ None (1)
- ○ Mild (2)
- ○ Definite but manageable (3)
- ○ Substantial interference (4)
- ○ Severe (5)

Q31 How much do your obsessive thoughts distress you?

- None (1)
- Little (2)
- Moderate but manageable (3)
- Severe (4)
- Nearly constant, Disabling (5)

Q32 How hard do you try to resist your obsessions?

- Always try (1)
- Try much of the time (2)
- Try some of the time (3)
- Rarely try. Often yield (4)
- Never try. Completely yield (5)

Q33 How much control do you have over your obsessive thoughts?

- Complete control (1)
- Much control (2)
- Some control (3)
- Little control (4)
- No control (5)

Q26 The next several questions are about your compulsive behaviors. Compulsions are urges that people have to do something to lessen feelings of anxiety or other discomfort. Often they do repetitive, purposeful, intentional behaviors called rituals. The behavior itself may seem appropriate but it becomes a ritual when done to excess. Washing, checking, repeating,

straightening, hoarding and many other behaviors can be rituals. Some rituals are mental. For example, thinking or saying things over and over under your breath.

Q34 How much time do you spend performing compulsive behaviors?

- None (1)
- 0-1 hrs/day (2)
- 1-3 hrs/day (3)
- 3-8 hrs/day (4)
- More than 8 hrs/day (5)

Q35 How much do your compulsive behaviors interfere with your personal, social, or work life?

- None (1)
- Mild (2)
- Definite but manageable (3)
- Substantial interference (4)
- Severe (5)

Q37 How anxious would you feel if you were prevented from performing your compulsive behaviors?

- None (1)
- Little (2)
- Moderate but manageable (3)
- Severe (4)
- Nearly constant, Disabling (5)

Q38 How hard do you try to resist your compulsive behaviors?

- Always try (1)
- Try much of the time (2)
- Try some of the time (3)
- Rarely try. Often yield (4)
- Never try. Completely yield (5)

Q39 How much control do you have over your compulsive behaviors?

- Complete control (1)
- Much control (2)
- Some control (3)
- Little control (4)
- No control (5)

Appendix D

Informed Consent

Information sheet for Participation in a Survey - The University of Twente -

Description of the survey and your participation

You are invited to participate in a survey conducted by Monique Höber, Anastasija Minina, Janna-Marie Esser, Julia Fleischmann and Mia Wiesmann supervised by Alexandra Ghita. The purpose of this survey is to gain further insights into your personal experiences with the use of social media in relation to your physical and mental health. We would like to investigate the relationship between eating behaviour, social media use and health in the life of university students.

The survey will last approximately 15 minutes. The survey will be anonymous so no information can be traced back to your person.

Risks and discomforts

There are no known risks associated with this survey.

Potential benefits

There are no known benefits to you that would result from your participation in this survey. This survey may help us to gain adequate knowledge to have more insight into today's lifestyle of university students.

Protection of confidentiality

Your identity will not be revealed in any publication resulting from this survey. We will interpret your data and use it to analyze overall results, but your answers are completely anonymous. The data will not be used for any other purpose than for our study.

Voluntary participation

Your participation in this survey is voluntary. You may withdraw at any moment.

Q2 **Consent Form for Survey**

I have read and understood the study information, or it has been read to me. I consent voluntarily to be a participant in this survey and understand that I can refuse to answer questions and I can withdraw from the questionnaire at any time, without having to give a reason. Furthermore, I understand that taking part in the study involves interpreting my data anonymously.

Risks associated with participating in the study

I understand that taking part in the study involves no risks.

Use of the information in the study

I understand that information I provide will be used for the study and to gain adequate knowledge by interpreting my results and data. I understand that personal information collected about me that can identify me, such as [e.g. my age], will not be shared beyond the study team. I agree that my information can be quoted in research outputs.

Contact information

If you have questions or concerns about your participation in this survey, please contact

Alexandra Ghita (alexandra.ghita@utwente.nl) or Mia Wiesmann (m.wiesmann@student.utwente.nl)

Q3 I have accurately read out the information sheet and agree to participate voluntarily in this survey.

- ○ Yes (1)
- ○ No (2)