Bachelor Thesis

Does the use of social media mediate the relationship between bulimia nervosa and orthorexia nervosa in university students?

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Abstract

Orthorexia nervosa (ON) is a newly emerging mental health condition concerning the pathological preoccupation with healthy eating. This study aimed to investigate whether the time spent on Social Networking Sites (SNS) mediates the relationship between bulimia nervosa (BN) and ON in university students, thereby gaining new insights into the determinants of ON. 242 students participated in this cross-sectional study. The participants completed an online survey including questions referring to their socio-demographic data and SNS usage, as well as the subscale for BN from the second version of the Eating Disorder Inventory (EDI-2) and the Düsseldorf Orthorexia Scale (DOS). A mediation analysis was conducted using PROCESS in SPSS as an administrator. The results showed a significant positive correlation between BN and the time spent on SNS as well as a significant positive correlation between symptoms of BN and symptoms of ON. A significant negative correlation was found between the time spent on SNS and ON. Moreover, the indirect mediation effect was significant but negative. The findings confirm the correlation between BN and ON and suggest the existence of a causal relationship between the two conditions. Thus, BN is a possible determinant of the development of ON. Moreover, the time spent on SNS was found to decrease symptoms of ON which showed that SNS usage not necessarily reduces mental health and well-being. Finally, it was concluded that the time spent on SNS partially mediates the relationship between BN and ON in university students. However, the mediation might have been inconsistent. Therefore, additional research is needed to clarify the relationship between the time spent on SNS and ON.

Keywords: Orthorexia nervosa, bulimia nervosa, Social Networking Sites, university students.

Does the use of social media mediate the relationship between bulimia nervosa and orthorexia nervosa in university students?

In the current society, it becomes increasingly important to have a healthy lifestyle with an emphasis on healthy eating patterns. However, next to healthy eating, also pathological eating patterns become more prevalent. Galmiche et al. (2019) indicated a high prevalence of eating disorders between 2000 and 2018 highlighting that eating disorders represent a public health concern. Next to known eating disorders focusing on the quantity of food, a new mental health condition emerged during the last years which might represent an eating disorder concerning the quality of food, rather than its quantity. The physician Steven Bratman first described this pathological fixation on healthy food in 1997 and termed it orthorexia nervosa (ON), based on the Greek words "ortho" and "orexi" which can be translated to "correct" appetite (Bratman, 1997). Despite the growing body of literature regarding ON, there is still uncertainty about the positioning of the condition within the spectrum of mental health disorders (Łucka et al., 2019). Thus, this study aimed to gain new insights into the determinants of ON. Therefore, its relationship to eating disorders and social media usage was explored.

Orthorexia Nervosa

In his original article, Bratman (1997) described ON as a pathological preoccupation with "proper" food. The notion of proper or "pure" food concerns the source, processing, and packaging of food, for example, whether it was exposed to pesticides or whether any artificial flavouring was added (Koven & Abry, 2015). According to Hanganu-Bresch (2019), within the context of healthism, ON is a preoccupation with health, particularly healthy eating habits. Thus, the intake of only pure and right food is described as self-medication which might be used additional to alternative therapies such as yoga (Hanganu-Bresch, 2019). Koven and Abry (2015) further strengthened that the fixation on food quality, which includes the above-explained purity of food as well as its nutritional value, is often caused by the wish to increase physical and mental health.

Nevertheless, the onset of this lifestyle to overcome minor health issues or aiming at overall health may facilitate the development of pathological eating patterns and may have detrimental health effects (Hanganu-Bresch, 2019). Specifically, nutritional deficiencies may lead to medical complications such as osteopenia, anaemia, or testosterone deficiency (Koven & Abry, 2015). Bratman (2017) further strengthened that people who develop ON experience personal

consequences based on the diets they hold. In particular, he named that diets based on the purity of food may lead to feelings of personal impurity and shame, or diets concerning balance may accentuate loss of control. Moreover, the condition may lead to reduced quality of life and may negatively impact relationships as the entire life of affected individuals is dominated by healthy eating (Koven & Abry, 2015).

Dunn and Bratman (2016) conducted a literature review and proposed diagnostic criteria for ON which summarize the characteristics of the condition as well as its detrimental effects. The first criterion concerns the description of the mental health condition as an "obsessive focus on healthy eating" (Dunn & Bratman, 2016, p. 16), defined by a) affirmative and restrictive dietary practices, b) emotional distress related to the violation of these and c) the escalation of the diet over time. The second ON criterion examines the effects of the condition, including a) physical consequences such as malnutrition, weight loss and medical complications, b) intrapersonal distress related to the impairment of social, academic, or vocational functioning, as well as c) an identity, self-worth and body-image which are completely dependent on the dietary eating behaviour (Dunn & Bratman, 2016).

The prevalence of ON varied in previous research as there is no standardized tool for diagnosis, but several scales exist to measure symptoms of the condition (Bundros et al., 2016). Especially studies using the ORTO-15 questionnaire show large variations in the prevalence, which might be due to psychometric limitations of the scale (Luck-Sikorski et al., 2019). For example, a prevalence of 6% was found in a sample from the general population in Italy. On the other hand, a sample of nutritionists in Brazil indicated a prevalence of 89% (Dunn & Bratman, 2016). The Düsseldorf Orthorexia Scale (DOS) is another scale to measure the prevalence of ON with better psychometric properties. Thus, Luck-Sikorski et al. (2019) used the DOS to determine the prevalence of ON in a representative sample of the German population and found a prevalence of 6.9%.

Studies on the determinants of developing ON show inconsistent results. In particular, some studies emphasized a relationship between ON and the body mass index (BMI) of affected individuals, while other studies found no correlation between the two variables (Surała et al., 2020). Recently, Guglielmetti et al. (2022) strengthened that lifestyle-related factors such as physical exercise might be associated with the development of ON and dieting might be one of the main determinants of the condition. However, Bratman (2017) emphasized that ON needs to

be distinguished from dieting or healthy eating in general. Thus, additional research is needed on the determinants of ON to resolve the inconsistencies in previous results.

ON is currently not included in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM–5; American Psychiatric Association [APA], 2013), but there is an ongoing debate whether the condition should be added within the spectrum of feeding and eating disorders (FED) or within the obsessive-compulsive disorder (OCD) cluster or whether ON is a separate clinical entity (Łucka et al., 2019). Since there is an overlap of ON-related symptoms with both FED and OCD, additional research is needed to position the condition clearly within the spectrum of mental health disorders (Łucka et al., 2019). Specifically, previous studies focused on the similarities between ON and anorexia nervosa (AN) or OCD, but less is known about the relationship between ON and other prominent FED-related disorders, like bulimia nervosa (BN) or binge eating disorder (BED) (Koven & Abry, 2015).

Bulimia Nervosa

BN is an eating disorder within the spectrum of the FEDs characterized by recurrent periods of binge eating which are followed by harmful compensatory behaviour (Van Hoeken et al., 2009). Binge eating is described as the excessive and uncontrolled consumption of a large amount of food during a short period of time (Ferriter & Ray, 2011). In BN, these episodes (named binges) usually occur as a reaction to stress or fasting periods and are followed by negative emotions (Mitchell et al., 2012). Due to the fear of gaining weight, the affected individual then compensates for the high calory intake during the binge episode through different compensatory behaviours such as vomiting, fasting, or over-exercising (Castle & Kreipe, 2007). According to the *DSM-5* (APA, 2013), there are two forms of BN, the purging (BN-P) and the non-purging (BN-NP) conditions. The BN-P subtype includes self-induced vomiting or misuse of laxatives or diuretics as compensation while the BN-NP subtype includes other compensatory behaviours such as fasting or excessive exercise (APA, 2013).

The prevalence of BN increased during the last years (Van Eeden et al., 2021). Galmiche et al. (2019) found that most affected individuals were female, with a lifetime prevalence varying between 0.3% to 4.6% in females and 0.1% to 1.3% in males. Moreover, BN is highly prevalent in adolescence as the onset of the disease is mostly before the age of 24 (Galmiche et al., 2019). Specifically, the highest incidence was found between 15 and 29 years (Van Eeden et al., 2021). Despite higher prevalence at an earlier age, Van Eeden et al. (2021) emphasized that BN is

prevalent in males and females of all age groups worldwide and is related to increased mortality risk.

The underlying mechanisms of BN are dominated by a preoccupation with shape and weight. Particularly, desired weight loss and the over-evaluation of shape and weight are the main symptoms of BN, the latter is also a crucial factor causing the development and maintenance of BN (Forrest, et al., 2018). Individuals experiencing BN may have overweight or extreme weight variations (Castle & Kreipe, 2007). In addition, individuals with BN may have other health concerns such as fatigue, muscular pain, menstrual irregularities, or dental erosion due to purging episodes (Castle & Kreipe, 2007; Rosten & Newton, 2019).

The psychopathology of BN is also associated with depressive and anxious symptoms and individuals might suffer from social and sexual impairment (Lydecker et al., 2022; Quadflieg & Fichter, 2003). Moreover, affected individuals often show strong self-criticism, a need for approval from others, and their self-esteem is highly dependent on their weight (Castle & Kreipe, 2007). Additionally, Steinhausen and Weber (2009) identified that crossover to other mental health conditions including pathological eating patterns can be a possible outcome of BN, which may suggest that BN is a possible determinant for the development of ON.

Relationship between Bulimia Nervosa and Orthorexia Nervosa

Several research findings support a relationship between BN and ON. Bratman (1997) stated already in his original article that ON shares common mechanisms with AN and BN regarding the excessive role food bears in the life of affected individuals. Moreover, Parra-Fernández et al. (2018) found that BN and ON share behavioural and psychological aspects, such as bulimia-related symptoms, body image attitude, and perfectionism. This notion was further supported by Bussata et al. (2021) who concluded that ON is strongly related to the psychopathology of the eating disorders AN and BN. Orthorexic tendencies might be especially strong in the acute phase of BN and AN, as the affected individuals display a persistent concern with food during this phase, rather than at the end of therapy (Bussata et al., 2021).

Even though previous studies proved a relationship between BN and ON, there is research missing regarding the causal effect between the two conditions (Bussata et al., 2021; Parra-Fernández et al., 2018). Thus, the relationship between BN and ON needs to be further explored to gain new insights into the determinants of ON. Moreover, new insights may help to solve the debate concerning the position of ON within the spectrum of mental health disorders. Therefore,

it was especially important to focus on BN in this research, as many studies so far focused on the relationship between AN-related symptoms and ON. Finally, Parra-Fernández et al. (2018) concluded that future research should examine other variables which possibly lead to the development of FEDs and ON. One such variable might be the usage of social media platforms, which receives growing interest from the community of researchers and clinicians (Holland & Tiggemann, 2016; Sharma et al., 2020).

The Impact of Social Media

As the usage of different social media platforms continuously increases, so does their impact on the life of the users, particularly young adults (Sharma et al., 2020). Especially important for this study were social media platforms on which the user establishes a personal profile and social network, such as Instagram or Facebook (Holland & Tiggemann, 2016). These have been defined as Social Networking Sites (SNS) and are named accordingly in the remainder of this study.

Due to the increasing impact on the life of the users, SNS also affect their mental health. Particularly, Bashir and Bhat (2017) found a relationship between SNS usage and mental health concerns in adolescents and young adults, such as depression, stress, loneliness, or emotion suppression. This was also supported by Sharma et al. (2020), who concluded that SNS usage has a strong impact on different components of an individual's mental health, such as self-perception, mood, and social relationships. Moreover, SNS may influence adolescents' food choices, which implicitly indicates the correlation between the usage of SNS and ON-related symptoms (Kucharczuk et al., 2022). This was further supported by the results of Turner and Lefevre (2017), emphasizing the influence of SNS usage on psychological well-being. The authors found that higher Instagram use is linked to increased symptoms of ON. In the case of ON, especially influential are the healthy eating communities on SNS which encourage users to engage in healthy dieting, thereby possibly leading to a continuous preoccupation with healthy food (Turner & Lefevre, 2017).

Furthermore, a previous study found a correlation between Instagram usage and Drive for Thinness in university students (Ghita et al., in press). Drive for Thinness is a crucial factor for the development of FEDs. Moreover, the study was part of a larger research project which examined the relationship between different variables related to the FEDs, SNS, and ON. The results of this previous research support a correlation between SNS and ON-related symptoms

(Ghita et al., in press). Thus, this research expanded on their previous work by examining the relationship between BN and ON and whether SNS usage mediates this relationship.

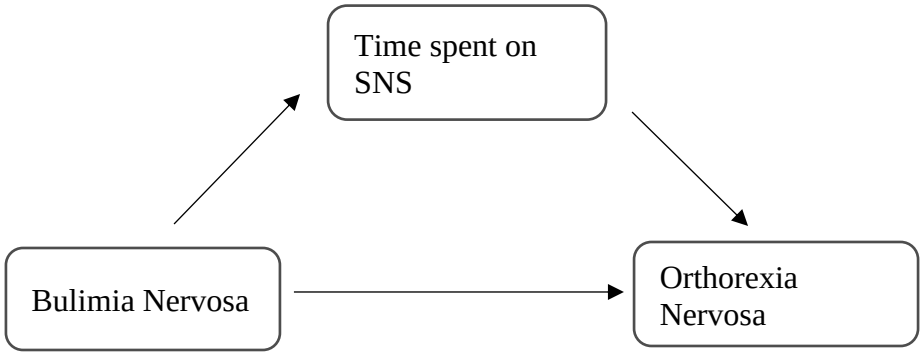
This Study

The aim of the current study was to examine whether the usage of SNS mediates the relationship between symptoms of BN and symptoms of ON in university students. Considering the fact that there was inconsistency in previous research regarding the determinants of ON, the objective of this study was to clarify the relationship between BN, SNS use, and ON through a mediation analysis. To address the objective of this study, a research question was proposed as follows:

RQ: To what extent does the time spent on SNS mediate the relationship between symptoms of Bulimia Nervosa and Orthorexia Nervosa in university students?

Figure 1

Visualization of the Research Quesiton



Method

Study Design

This study used a quantitative cross-sectional online survey to collect data. The survey was part of a larger research project including several researchers. However, in this section, only the methods relevant for the above-named research question including the independent variable symptoms of BN, the dependent variable symptoms of ON, and the mediator variable time spent on SNS were emphasized. Moreover, as part of the larger research project, some variables have been collected which were not further analysed in this study but were merely used as descriptive data of the sample. As a sampling method, convenience sampling was used as participants were recruited via the social media accounts of the researchers.

Participants

In total, 334 persons participated in the study. However, several participants had to be excluded from the analysis. Thus, the final sample of this study included 242 university students (M_{age} = 21.5, SD_{age} = 2.6) who participated voluntarily based on their written informed consent (Appendix A). The sample was mixed, consisting of 76.4% female and 21.9% male participants. Most of the participants were German, Dutch, or Latvian, other nationalities included Belgian, Russian, or Moldavian. Inclusion criteria for participation were to have sufficient English skills and to be enrolled at a university or hoogeschool. Moreover, persons were excluded if they did not finish the survey (N = 84) or did not answer all questions regarding the demographic information (N = 4). Additionally, participants who indicated that they did not have an active SNS account, spent zero hours on SNS, or gave an unrealistic number of hours were excluded (N = 4).

Materials

Socio-Demographic Data

At the beginning of the survey, several questions were asked regarding the socio-demographic data of participants (Appendix B). Specifically, participants were asked for their age, nationality, gender, the current level of education, mental health history, as well as their weight and height to calculate their BMI.

Time Spent on SNS

Additionally, ad-hoc items were asked to measure the SNS usage of participants: 1) Whether they had at least one active account on a social media platform and 2) How much time they spent on social media platforms daily.

Orthorexia-Related Concerns

The Düsseldorf Orthorexia Scale (DOS) was used to measure symptoms of ON. The results of Chard et al. (2018) emphasized the good psychometric properties of the English version of the DOS, with excellent construct validity and internal consistency (α = .88). The scale consisted of ten items measuring the healthy eating behaviour of participants as well as their thoughts and emotions attached to dieting and healthy nutrition (Appendix C). Example items were "*I can only enjoy eating foods considered healthy*" or "*I feel upset after eating unhealthy food*". The items were answered on a four-point Likert scale ranging from *this does not apply to me (1)* to *this applies to me (4)*. Thus, higher scores indicated a higher tendency towards

symptoms of ON. The maximum score was 40, and the cut-off score to indicate the presence of ON symptoms was ≥ 30 (Niedzielski & Kaźmierczak-Wojtaś, 2021). In this study, the Cronbach's alpha of the DOS was α = .84.

Bulimia-Related Concerns

Additionally, the subscale for BN from the second version of the Eating Disorder Inventory (EDI-2) was used to measure symptoms of BN (Appendix D). The scale showed good psychometric properties. Specifically, excellent reliability (α = .90 - .97; test-retest *r* = .98) and good convergent and discriminant validity have been found (Clausen et al., 2011). Good discriminant validity was also found for the subscale of BN (Schoemaker et al., 1997). The subscale included seven questions referring to the eating behaviour of participants with regards to binge eating and compensatory behaviours. Items were for example *"I think about bingeing (overeating)"* or "*I have the thought of trying to vomit in order to lose weight*". The items were answered with a six-point Likert scale ranging from *never (1)* to *always (6)*. Higher scores indicated higher BN symptomatology with a maximum score of 42 per participant. A cut-off score of ≥ 13 was used to indicate the presence of BN-related symptoms, as this showed the highest specificity and good sensitivity according to Clausen et al. (2011). The Cronbach's alpha of the subscale for BN from the EDI-2 was α = .88 in this study.

Procedure

First of all, the study was approved by the ethics committee of the BMS Faculty at the University of Twente (approval number: 220321). The study was then published from the 30th of March 2022 to the 14th of April 2022. Thus, the data collection took about two weeks. Next to distributing the survey via social media, the participant management software "Sona-System" of the University of Twente was used to maximise the number of respondents. As a result of their participation in this study, students gained additional academic credits.

As the study comprised an online survey from the software Qualtrics, all participants needed a device with internet access to participate. At the beginning of the survey, general information about the aim of the study as well as the contact information of the researchers was presented and participants filled out the informed consent form (Appendix A). Then, the above-named socio-demographic questions and the questions regarding the SNS usage were answered. Afterwards, the different scales which the researchers needed to answer their research questions were presented to the participants in randomized order. For this study, only the DOS and the

subscale for BN from the EDI-2 were relevant. After completing the survey, participants were thanked for their participation and the contact information of the researchers was presented again in case any questions emerged during the study.

Statistical Analysis

The 27th version of the Statistical Package for Social Sciences (SPSS) was used for data analysis. First of all, the socio-demographic data of the participants were analysed through descriptive statistics. Moreover, the DESCRIPTIVES command was used to calculate the mean scores, standard deviations, and maximum and minimum scores of the DOS, BN subscale from the EDI-2 and the time spent on SNS. Then, the Shapiro-Wilk test was conducted to test for data normality and Q-Q plots were analysed with the EXAMINE command in SPSS.

To answer the research question, mediation analysis was conducted. The mediation model which can be seen in the visualisation of the research question (Figure 1) included three regression analyses. These analyses were used to estimate the equations needed to indicate the total effect of BN on ON as well as the indirect effect through the time spent on SNS. Specifically, two simple regression analyses showed the direct effect of BN on ON without the mediator and the effect of BN on the time spent on SNS. Next, a multiple regression analysis in which ON was predicted by BN and the time spent on SNS displayed both, the effect of BN on ON when controlling for the mediator, as well as the effect of SNS usage on ON. Lastly, to estimate the effect of BN through the time spent on SNS on ON, the coefficients of the two paths needed to be multiplied. To analyse the data, PROCESS in SPSS was used as an administrator. The statistical significance level was set at $p < .05$.

Results

Descriptive Data

All socio-demographic data of the participants are presented in Table 1. The BMI of the participants was calculated based on their weight and height and the participants were grouped according to the four categories of the BMI that were consistent with underweight (7.9%), healthy weight (76.4%), overweight (13.2%), and obesity (2.5%) (World Health Organization, WHO, 2022). Furthermore, 25.2% of the sample indicated that they have sought treatment for a mental health concern in the past and 14.9% indicated that they have been diagnosed with a mental health condition. Most of these participants named anxiety, depression, and eating

disorders as specific mental health concerns they received treatment for or have been diagnosed with. Moreover, categorical variables were created for the time spent on SNS with a cut-off score of three hours distinguishing between low to moderate duration and high duration (Karmila et al, 2020). Accordingly, 59.5 % reported a high duration. In addition, 16.6% of the participants were scored as at risk for ON or high on ON, while 46.7% scored high on BN.

Table 1

Socio-demographic Data of the Sample (n=242)

Characteristic	n	Percentage	Mean	SD	Min	Max
Age			21.5	2.6	18	34
Gender						
Female	185	76.4				
Male	53	21.9				
Non-binary/ Other	4	1.7				
Education						
Hoogeschool	79	32.6				
Bachelor	146	60.3				
Master	15	6.2				
PhD	2	0.8				
Nationality						
German	142	58.7				
Dutch	30	12.4				
Latvian	23	9.5				
Other	47	19.4				
BMI						
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				
Time spent on SNS			3.1	1.5	0.2	10
Low to moderate duration	98	40.5				
High duration	144	59.5				

Characteristic	n	Percentage	Mean	SD	Min	Max
ON total score on DOS			18.8	5.7	10	34
No ON	202	83.5				
At-risk	27	11.2				
ON	13	5.4				
BN total score on EDI-2			14.8	6.3	7	42
No BN	129	53.3				
BN	113	46.7				

Note. In the table the following abbreviations were used: BMI, body mass index; SNS, Social Networking Sites; ON, orthorexia nervosa; DOS, Düsseldorf Orthorexia Scale; BN, bulimia nervosa; EDI-2, second version of the Eating Disorder Inventory; SD, standard deviation; Min, minimum score; Max, maximum score.

Normality

Before the mediation analysis was conducted, the Shapiro-Wilk test was performed to determine data normality by outlining the distribution of the three variables included in the analysis. The results showed that the data deviated from a normal distribution for the total score on the BN-subscale of the EDI-2, W = .87, $p < .001$, the total score on the DOS, W = .95, $p < .001$, and the time spent on SNS, W = .93, $p < .001$. However, when visually inspecting the Q-Q plots, only insignificant data deviations were detected. Therefore, parametric tests were conducted to answer the research question as the central limit theorem states that parametric tests result in higher statistically correct statements than non-parametric tests and as a skewed distribution does not have a large effect if the sample size is larger than n = 30 (Kwak & Kim, 2017). Moreover, PROCESS used bootstrapping for the mediation analysis, which is a non-parametric alternative to significance testing (Preacher & Hayes, 2008).

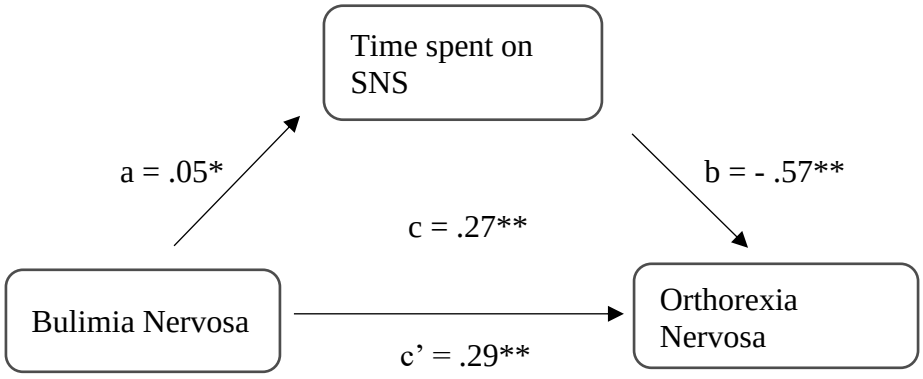
Mediation Analysis

To investigate whether the time spent on SNS mediated the relationship between symptoms of BN and ON in university students, a simple mediation analysis was performed using PROCESS and SPSS as an administrator. The coefficients for the regression analyses between the independent variable symptoms of BN, the mediator time spent on SNS, and the dependent variable symptoms of ON can be found in Figure 2. A significant positive correlation was found between BN and time spent on SNS, $B = .05$, $SE = .02$, $t(240) = 2.98$, $p = .003$ (path a in Figure 2), as well as for the direct effect between BN and ON, $B = .29$, $SE = .06$, $t(239) = 5.23$,

$p < .001$ (path c' in Figure 2). A significant negative correlation was found between the time spent on SNS and ON, $B = -.57$, $SE = .24$, $t(239) = -2.39$, $p = .018$ (path b in Figure 2). The total effect was also significant, $B = .27$, $SE = .06$, $t(240) = 4.82$, $p < .001$ (path c in Figure 2). Lastly, the indirect mediation effect of symptoms of BN on symptoms of ON was found to be statistically significant, $B = -.03$, $SE = .02$, 95% C.I. (-0.064, -0.003).

Figure 2

Results of the Mediation Analysis



Note. $^{**}p < .001$, $^{*}p < .01$.

Discussion

The objective of this study was to gain further insights into the determinants of the mental health condition ON. Previous research suggested a relationship between ON and the FED BN (Bussata et al., 2021; Parra-Fernández et al., 2018). Moreover, several studies proved that the usage of SNS influences mental health, well-being, and the eating behaviour of users (Kucharczuk et al., 2022; Sharma et al., 2020). Therefore, the relationship between ON and BN was examined, and whether the time spent on SNS mediates this relationship.

When analysing the descriptive data, some aspects need to be mentioned. For the mediator, the time spent on SNS, a mean of 3.1 hours per day was found in this study. This resembles recent data suggesting that adolescents and young adults aged 16 to 24 spend on average three hours per day on social media (Georgiev, 2022). Additionally, based on the score of the DOS, for 5.4% of the participants the data indicated the possibility of experiencing ON, similar to the prevalence found by Luck-Sikorski et al. (2019) in Germany.

Based on the cut-off score suggested by Clausen et al. (2011), 46.7 % of the participants scored high on BN. Even though the sample of this study represented the age group in which BN is most prevalent and it was predominated by females who show higher incidence than males, 46.7 % is an extreme value compared to the lifetime prevalence of BN which varies between 0.1% to 4.6% (Galmiche et al., 2019). Previous research found that university students are especially at-risk for developing FEDs, including BN (Tavolacci, 2020). Nevertheless, the high percentage found in this study might be related to the cut-off score used. Specifically, Clausen et al. (2011) developed the cut-off scores based on the norm scores for Danish people, who scored lower than other nationalities. Thus, the cut-off scores are also low. Moreover, Clausen et al. (2011) aimed for cut-off scores with high sensitivity and specificity. However, high sensitivity also leads to a higher proportion of false positives. Therefore, participants might have been classified as possibly experiencing BN based on the cut-off score but do not display many symptoms of BN. Therefore, it cannot be concluded that about 47% of the sample possibly experience BN.

Mediation Analysis

Based on the results of the mediation analysis, the research question is answered as follows: the time spent on SNS mediates the relationship between symptoms of BN and symptoms of ON in university students to some extent. This conclusion can be drawn as the indirect effect was significant. However, before interpreting the implications and strength of the indirect effect, the paths of the mediation analysis displayed in Figure 2 are analysed.

First, path a displayed a significant positive correlation between symptoms of BN and the time spent on SNS. Even though the effect was very small, this indicated that a higher presence of BN symptoms in the participants led to more time spent on SNS. In the past, much research was conducted on the relationship between the usage of SNS and BN. However, most studies focused on the effect of SNS usage on the development of BN or other FEDs (Padín et al., 2021). Less research is available on the effect of symptoms of BN on the time spent on SNS. Nevertheless, the results of this study support that the relationship between BN and time spent on SNS is reversible: higher BN symptomatology also increases the time individuals spent on SNS.

Second, path b showed a significant negative correlation between the time spent on SNS and symptoms of ON. Thus, SNS usage decreased the symptoms of ON in this study: the more time participants spent on SNS, the less ON-related symptoms they displayed. These results are

contrary to previous literature supporting that usage of SNS fosters the development of ON and unhealthy eating in general (Ioannidis et al., 2021; Turner & Lefevre, 2017). However, many of the studies that proved this relationship focused on factors such as drive for thinness which led to eating disorders concerning the quantity of food, and the preoccupation to lose weight (Ioannidis et al., 2021). Moreover, Holland and Tiggemann (2016) found that appearance-based social comparison might mediate the relationship between SNS and unhealthy eating. These factors might not equally strengthen the development of ON, as the condition focuses on the quality of food and is less concerned with the body image but more with health (Hanganu-Bresch, 2019).

Additionally, most studies exploring the relationship between SNS usage and orthorexic symptoms concluded that specific content which users consume on SNS lead to an increase in symptoms (Ioannidis et al., 2021; Turner & Lefevre, 2017). Examples of such are the "fitspiration" movement which promotes health and fitness information or healthy eating communities on Instagram (Ioannidis et al., 2021; Turner & Lefevre, 2017). However, in the current study, participants were only asked for the time they spent on SNS, and no information was available regarding the platforms they used or specific content they consumed. Thus, the participants possibly did not consume the specific contents which were found to increase symptoms of ON.

On the contrary, the participants possibly viewed content decreasing symptoms of ON. Several studies concluded that SNS usage cannot only stimulate symptoms of eating disorders but also aid the recovery from such (Derenne & Beresin, 2018; Valente et al, 2020). A specific example of content which likely decreases ON is provided by the #orthorexia community on Instagram. This is a platform to foster ON recovery by sharing content related to body positivity, intuitive eating, and mental health (Valente et al., 2022). Next to help people diagnosed with ON, members of the #orthorexia community aim to raise awareness of how healthy eating can become harmful (Valente et al., 2022). Thus, their posts might raise awareness of the condition in users who did not have knowledge about ON beforehand, thereby decreasing the chance of developing symptoms. Norton (2018) further supported that increased connection with others through SNS successfully reduces the harmful effects of SNS usage on pathological eating patterns. Therefore, a possible explanation for the negative relationship between the time spent on SNS and ON symptoms found in this study might be that the participants used SNS primarily to connect with others and consumed content which raises awareness of the risk of ON.

Third, path c' displayed the direct effect between symptoms of BN and symptoms of ON without taking SNS usage into account. The results showed that participants who displayed symptoms of BN more likely displayed symptoms of ON in this study. Thus, symptoms of BN increase the probability of developing symptoms of ON. This confirms previous studies emphasizing a relationship between the two conditions. Specifically, previous research found similarities between the behavioural and psychological aspects of BN and ON (Parra-Fernández et al., 2018). Additionally, Bussata et al. (2021) concluded that the underlying mechanisms of the two conditions are related.

The findings regarding the relationship between BN and ON found in this study are crucial as they not only confirm previous research but also add new insights into the determinants of ON. Specifically, based on the analysis conducted, it can be suggested that a causal relationship exists between symptoms of BN and the development of ON. This is novel compared to previous studies which only used correlational analyses to examine the relationship between ON and related concepts (Ghita et al., in press). Based on the current findings, it is proposed that the presence of BN-related symptoms is a possible determinant for the development of the mental health condition ON.

Furthermore, the findings may add to the debate concerning the positioning of ON within the spectrum of mental health disorders. In particular, previous research proved that ON is related to the FED AN (Koven & Abry, 2015). Additional to these previous findings, this study proved that ON is also related to BN. Thus, the results might suggest positioning ON closer to the FEDs in the spectrum of mental health disorders than to the OCD cluster. However, to entirely solve this debate, more extensive research is needed to examine the relationship between ON and all conditions included in the FEDs, as well as the relationship between ON and OCD.

When interpreting the results, it was further noticed that the direct effect between BN and ON is larger than the total effect including the time spent on SNS (path c in Figure 2). This supports the strength of the relationship between symptoms of BN and symptoms of ON as this effect is stronger than the total effect including the mediation through the time spent on SNS. Thus, this finding further indicates the existence of a causal relationship between BN and ON and demonstrates that symptoms of BN are a possible determinant for the development of ON-related symptoms.

As already mentioned above, the indirect effect was significant and, thus, it can be concluded that the time spent on SNS mediates the relationship between BN and ON in university students. However, the indirect effect was negative which means that symptoms of BN decrease symptoms of ON through the time spent on SNS. This might be due to the strong negative relationship between SNS usage and symptoms of ON explained above.

Moreover, the mediation was possibly inconsistent. In an inconsistent mediation, the coefficients referring to path a or b and path c' have opposite signs (MacKinnon et al., 2000). In accordance with this, there was a positive relationship between BN and ON, but a negative relationship between the time spent on SNS and ON in this study. This would infer that the mediator time spent on SNS functioned as a suppressor and changed the direction of the relationship between predictor and outcome variable. Accordingly, when SNS usage is introduced to the relationship between BN and ON, symptoms of BN and the time spent on SNS decrease ON symptomatology, as displayed in the indirect effect. Without taking SNS usage into account, symptoms of BN increase ON-related symptoms, as outlined above. Additionally, as a suppressor, the SNS usage of participants weakened the relationship between BN and ON, which would explain why the total effect was smaller than the direct effect (MacKinnon et al., 2000).

Furthermore, the results show a partial mediation effect. In a dominant mediation, BN would no longer affect ON after the time spent on SNS was introduced, which does not apply to this study (Baron & Kenny, 1986). The usage of SNS partially mediates the relationship since the path from BN to ON was reduced in absolute size but different from zero after SNS usage was introduced (Baron & Kenny, 1986). According to Baron & Kenny (1986), this indicates that next to the time spent on SNS, other factors might mediate the relationship between symptoms of BN and ON.

To summarize, the results of the mediation analysis confirm the relationship between BN and ON which was already found in previous research and suggest a causal effect between the two conditions. Thus, symptoms of BN might be seen as a determinant for developing ON. Moreover, it was found that time spent on SNS decreases symptoms of ON. This supports previous studies stating that SNS usage can both increase and decrease pathological eating patterns (Derenne & Beresin, 2018; Valente et al, 2020). Finally, it can be concluded that the time spent on SNS partially mediates the relationship between BN and ON in university students, even though the mediation was possibly inconsistent.

Strengths and Limitations

When evaluating this study, strengths and limitations have been considered. As a prominent strength, the emphasis on modern statistical analysis can be named. This is novel compared to previous research which mostly used correlational analyses to determine the relationship between ON and possible determinants such as AN (Ghita et al., in press). Furthermore, the conducted analysis enabled to formulate suggestions regarding the causal effect between BN and ON in the context of SNS usage. Thus, the study added insights into the determinants of ON. Additionally, all measures applied in this study, the DOS and the EDI-2 subscale for BN, showed very good psychometric properties, both in this sample but also in previous studies (Chard et al., 2018; Clausen et al., 2011). Therefore, it can overall be concluded that the study had a high quality with reliable and valid results.

However, this study also showed limitations. First, the sample might not have been representative of the general population of university students. On the one hand, there was a clear gender imbalance as 76.4% of the sample were female. On the other hand, the sampling method might have been problematic. Convenience sampling was used which is a non-probability sampling method, meaning that not every member of the population had the same chance of being included in the sample. Thus, the sampling was not random and there was a high chance of sampling error (Bhardwaj, 2019). Furthermore, the sample is not representative of the general population because it was not inclusive of different races or ethnicities but mostly consisted of European students. Second, another limitation is the cross-sectional design of the study. Since the data refers to only one point in time it is likely biased. Thus, there is limited explanatory power. Finally, in the survey, it was only asked about the time participants spent on SNS and no information regarding specific content was available. This is seen as a limitation as it limited the interpretation of the results and the possible conclusions regarding the effect of SNS on symptoms of ON.

Study Implications and Recommendations for the Future

Despite the limitations, the results of this study lead to several implications. First, the positive relationship between BN and ON which was already proven by previous research is strengthened and it is suggested that there is a causal effect between the two conditions (Parra-Fernández et al., 2018). Thus, BN is a possible determinant for the development of ON. Moreover, the negative relationship between the time spent on SNS and symptoms of ON shows

that SNS usage not always exerts negative effects on the mental health and well-being of users, as was concluded by most studies in the past (Bashir & Bhat, 2017; Sharma et al., 2020). On the contrary, the results support that time spent on SNS decreases the probability of developing symptoms of ON.

Nevertheless, only limited conclusions can be drawn regarding the concrete effect of SNS on the development of ON because no information regarding the content participants consumed was collected in this study. Thus, as a recommendation for future research, a longitudinal study is suggested that examines the effect of specific content from different SNS on the development of ON. This would clarify the impact of SNS usage on the development of ON and would allow for substantiated conclusions regarding the effect of different contents available on SNS. Moreover, several different platforms should be included since previous research often focused specifically on Instagram and its relationship to ON (Valente et al., 2022). Additionally, the study should be longitudinal to decrease bias in the data and strengthen the explanatory power of the results.

Finally, not only recommendations for future research but also for clinical and psychological practice can be made. Specifically, this study suggests the possibility of a risk of developing symptoms of ON while symptoms of BN are present. Clinical psychologists and psychotherapists treating clients with eating disorder symptomatology should be aware of this risk. It is recommended to raise awareness of the mental health condition ON in individuals who display symptoms of BN or other FEDs to prevent that they develop symptoms of ON during or after treatment. Additionally, a special screening for symptoms of ON might be useful in individuals suffering from FEDs to prevent them from developing ON.

Conclusion

The mental health condition ON is increasingly studied and the detrimental effects of the condition were emphasized by many studies in the past. Nevertheless, little is known about the determinants for the development of the condition. The findings of the current study suggest that BN-related symptoms are a possible determinant of ON. Thus, individuals displaying symptoms of BN should be informed about the possible risk of ON to raise awareness of the condition and prevent its development. Furthermore, the time spent on SNS was found to decrease symptoms of ON and to mediate the relationship between BN and ON. However, the mediation might have been inconsistent. This emphasizes the need for additional research to clarify the relationship between the three variables, thereby gaining further insights into the determinants of ON.

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Appendices

Appendix A: Informed Consent Form

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)

Appendix B: Demographic Questions and Social Media Use

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 C: Düssseldorf Orthorexia Scale (DOS)

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 peronal dietry rules. (9)	○	○	○	○
I feel upset after eating unhealty foods. (10)	○	○	○	○

Appendix D: EDI-2 Bulimia Nervosa Subscale

Q15 Please indicate how much the following statements apply to you:

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Usually (5)	Always (6)
I eat when I am upset. (1)	○	○	○	○	○	○
I stuff myself with food. (2)	○	○	○	○	○	○
I have done on eating binges where I felt that I could not stop. (3)	○	○	○	○	○	○
I think about bingeing (overeating). (4)	○	○	○	○	○	○
I eat moderately in front of others and stuff myself when they are gone. (5)	○	○	○	○	○	○
I have the thought of trying to vomit in order to lose weight. (6)	○	○	○	○	○	○
I eat or drink in secrecy. (7)	○	○	○	○	○	○