Bachelor's Thesis

To What Extent Does Social Media Exposure Mediate the Relationship Between Self-Esteem and Orthorexia Nervosa in University Students?

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Abstract

In the past decades, a growing interest in health movements could be observed on social media platforms. However, taking the interest in healthy food too far can lead to unhealthy eating habits. Orthorexia nervosa (ON) is described as a continuous and excessive preoccupation on healthy nutrition, characterized by restrictive eating habits to promote optimal health. The consequences of these restrictive eating patterns can be various, including psychological and physical concerns, such as depression and malnutrition. Not much is known about the causing factors of ON. Psychological concepts such as self-esteem that are shown to influence various mental health concerns are suggested to also have an impact on the development of ON and are currently investigated. The present study investigated the underlying mechanisms of ON with emphasis on the mediational effect of social media exposure regarding the causal relationship between self-esteem and ON. European university students (N=242) were included in the cross-sectional study to measure whether their time spent on social media influences the relationship between self-esteem and tendencies for ON. The Düsseldorf Orthorexia Scale (DOS) and the Rosenberg Self-Esteem Scale (RSE) were used to assess ON-related symptoms and the level of self-esteem. Social media exposure was measured by the daily time (in hours) spent on social media. Results revealed that social media exposure did not have a mediating effect on the relationship between self-esteem and ON. Nonetheless, a direct positive relationship between self-esteem and ON was displayed, indicating that higher self-esteem positively influences the risk for developing ON. The findings were explained by the increased interest in engaging in a healthy lifestyle by individuals with higher self-esteem which can lead to ON. In addition, adhering to self-imposed dietary rules that are typical for ON is believed to increase the level of self-esteem, maintaining the ON-related tendencies.

Keywords: orthorexia nervosa, ON, DOS, self-esteem, RSE, social media, SNS

To What Extent Does Social Media Exposure Mediate the Relationship Between Self-Esteem and Orthorexia Nervosa in University Students?

A solid body of literature indicates that healthy eating habits are an important factor for overall health (Croll et al., 2001; Roberto & Gorski, 2015; Traill et al., 2010). It is known that regular physical activity and healthy dietary habits have a positive impact on individuals' general health status and well-being by reducing the risk of disease, such as cardiovascular diseases or diabetes (Malmborg et al., 2017). The positive trend towards healthy eating behaviours is also evident on social media platforms. In the growing movement of healthy eating communities, users support a replacement of processed food with more fruits and vegetables (Turner & Lefevre, 2017). However, concerns are rising regarding the definition of "healthy eating" on social media, promoting unrealistic and unhealthy eating behaviours. Studies have indicated that the increasing use of social media among young adults in particular, may have a negative impact on eating behaviours, resulting in unhealthy and unsustainable eating patterns, such as Orthorexia Nervosa (ON) (Turner & Lefevre, 2017; Zemlyanskaya et al., 2021). ON is described in the literature as a continuous and excessive preoccupation on healthy nutrition, characterized by restrictive eating habits to promote optimal health (Koven & Abry, 2015). The consequences of these restrictive eating patterns can be various, including psychological and physical concerns, such as depression, anxiety, or malnutrition (Chaki et al., 2013).

In the development and maintenance of ON, psychological concepts such as self-esteem may have important implications that affect eating behaviours in young adults. Low self-esteem has been shown to be a risk factor in the development of other mental health concerns, such as eating disorders (ED) (Fairburn et al., 1999; Gual et al., 2002), as well as obsessive-compulsive disorder (OCD) (Bartel et al., 2020). However, it is still unclear whether self-esteem also affects the development of ON and what role social media plays in this possible relationship. To further address the gap in research, this study focuses on the relationship between self-esteem, social media usage, and ON among young adults, represented by university students.

Orthorexia Nervosa

To maintain a healthy lifestyle, researchers and dieticians suggest a dietary lifestyle based mostly on vegetables and fruits while reducing the intake of fats, sugar, and carbohydrates (Norum, 2005). For the past decade, this healthy lifestyle has become a trend, also visible on social media platforms with the growing movement of healthy eating

communities (Turner & Lefevre, 2017). However, concerns are rising due to the increasing development of excessive preoccupation on food that is considered healthy, defined as ON (Dunn & Bratman, 2016). The term was first described by Steven Bratman in 1997 based on his own experience of overcoming health issues with a healthy diet, resulting in extreme and strict dietary behaviours (Bratman, 1997, 2017). Characteristics of ON are a continuous and excessive preoccupation with healthy food intake, including a categorization of processed food as "dangerous" and unprocessed fresh food as "healthy" (Donini et al., 2004). While a healthy diet can contribute to overall well-being, ON can lead to significant and unhealthy dietary practices due to inflexible eating rules and contamination concerns (Cena et al., 2018; Dell'Osso et al., 2017). Individuals experiencing ON focus primarily on the production methods of food to avoid manufactured processed food (Dunn & Bratman, 2016). According to Bratman & Knight (2001), the symptom criteria for ON are: (1) spending more than 3 hours per day on thinking about and preparing food, (2) feeling superior to people with different eating habits, (3) following strict dietary rules, (4) increased self-esteem regarding adherence to the diet, and (5) eating properly becomes the main interest in life.

Although the reason for an ON typical eating behaviour is to promote optimal health, it can have significant physical and psychological consequences (Brytek-Matera et al., 2017). Individuals may feel guilty when they do not adhere to their diet and feel only satisfied when they can adhere (Bratman & Knight, 2001). Thus, self-imposed and inflexible dietary rules facilitate an attention bias resulting in great distress if these rules cannot be met (Chaki et al., 2013; Hanganu-Bresch, 2019). Further, the time-consuming preoccupation with food may impair an individual's social behaviour, affect social relationships, and may lead to social isolation (Kalra et al., 2020; Valente et al., 2019). Reasons for this are the excessive amount of time that is spent on preparing meals and the feelings of uneasiness when eating in the presence of others (Brytek-Matera et al. 2015). Physical consequences of ON are malnutrition and unintentional weight loss due to the exclusion of certain food types (Brytek-Matera et al., 2017).

Despite being introduced in the late 1990s already, there is still an ongoing debate regarding the classification of ON as a mental health condition. As Koven and Abry (2015) claim, ON-related symptoms show similarities to both mental health conditions the obsessive compulsive disorder spectrum (OCD) and eating disorders (ED) (e.g., anorexia nervosa (AN)). Similar to individuals experiencing OCD, ON-related symptoms are displayed by intrusive thoughts about food and eating rituals in an obsessive-compulsive manner (Bratman & Knight, 2001; Kinzl et al., 2006). In addition, adhering to strict eating habits takes most of

the time and hinders individuals to engage in other daily life routines (Donini et al., 2004). Regarding similarities to AN, those affected by ON mainly aim at adhering to certain dietary rules with adhering perceived as achievement and not adhering as a lack of self-control and failure (Koven & Abry, 2015). It was further claimed that individuals experiencing either AN or ON often deny being impaired in any kind which shows a lack of insight into their mental health condition (Bratman & Knight, 2001). In contrast, other researchers suggest a classification of ON as an avoidant/restrictive food intake disorder (ARFID) due to its restrictive nature that leads to avoiding eating specific types of food that are labelled as unhealthy (Dunn & Bratman, 2016; Kreipe & Palomaki, 2012). Thus, there are currently attempts to classify ON under the different spectrums of mental health conditions.

Regarding its prevalence, the literature reveals that ON-related symptoms show a rising tendency among young adults (Dell'Osso et al., 2017). It is suggested that the increasing use of social media by young adults is associated with this trend due to the growing movement of health communities (Turner & Lefevre, 2017). Especially females seem to be more affected compared to males (Hanganu-Bresch, 2019; Dell'Osso et al., 2017). However, estimates of exact prevalence rates vary widely. According to Dunn and Bratman (2016), prevalence studies conducted usually show rates varying from 30% to 70% in the general population. Yet these findings were perceived challengeable due to the lack of standardized diagnostic tools for ON (Bundros et al., 2016, Dunn & Bratman, 2016). For example, it was stated that data obtained by the Düsseldorf Orthorexia Scale (DOS) reveal a significantly lower but more realistic prevalence compared to other assessment tools, such as the ORTO-15 (Barthels & Pietrowsky, 2012). Thus, no clear prevalence rates are currently available in literature.

Self-Esteem

As research regarding ON is rising, so is the investigation of possible determinants to understand which factors might influence the development of ON. As shown in the symptom criteria, a feeling of superiority to others with different eating habits and an increased self-esteem regarding adherence to the diet are typical for ON (Bratman & Knight, 2001). Thus, one possible determinant of ON that has been investigated in research lately is self-esteem. The term self-esteem was first described by William James in 1890 (Mruk, 2010). James claimed that self-esteem can be measured by an individual's successes in relation to their own pretensions (Suls & Marco, 1990). Today, self-esteem is defined as a psychological concept that describes how individuals evaluate themselves as worthy and able to achieve their own

aspirations (Ackerman et al., 2010; Robson, 1988). The concept of self-esteem is thought to be built of self-awareness and self-knowledge and shows the level of an individual's self-respect and acceptance (Minev et al., 2018; Srivastava & Agarwal, 2013).

A study by Orth and Robins (2014) revealed that the level of self-esteem varies throughout life, stating that young adults show a lower level of self-esteem which increases over time. It is stated that self-awareness, as part of self-esteem, is most active during adolescence when learning about own personal traits due to social interactions (Minev et al., 2018). Social comparison to peers in this transitional time is highly promoted by social media usage and assumed to influence how young adults see and accept themselves (Brytek-Matera et al., 2018; Vogel et al., 2014; Wagner et al., 2013). This highlights that adolescence and young adulthood are crucial for the development of self-esteem as it is marked by the adaptation to new roles and greater independence (Lenz, 2001). This becomes even more important as self-esteem is expected to be a predictor of a person's adaptation to their social environment and later life success outcomes (Cheung et al., 2014; Orth & Robins, 2014). For example, it was shown that low self-esteem can promote antisocial behaviour and substance abuse in early adulthood (Donnellan et al., 2005; Flory et al., 2004), as well as anxiety and depression (Leary et al., 1995; Orth et al., 2008).

Also affected by the level of self-esteem is the successful development of healthy eating habits when young adults start to take responsibility for themselves and explore their increasing independence (Deshpande et al., 2009; Nelson et al., 2008; Socarrás & Martínez, 2014). Research revealed that high self-esteem is associated with engaging in a healthy lifestyle, including physical activity and healthy eating habits, resulting in greater mental wellbeing (Knox & Muros, 2017). Thus, the development of self-esteem in young adults seems especially important.

A link was also displayed between self-esteem and ED. Studies revealed that low self-esteem was found to be associated with bulimia nervosa (BN) and AN (Baird & Sights, 1986; Baumeister et al., 2003). It was suggested that both mental health conditions are dependent on the perceived body image, thus influencing the level of self-esteem (Cash & Brown, 1987). However, individuals experiencing ON are mainly interested in the quality of food rather than their body image, hence why a direct relation between self-esteem and ON could not be confirmed (Özenoğlu & Ünal, 2016). Another link was found between self-esteem and OCD, showing that adults experiencing OCD show a significantly lower level of self-esteem compared to healthy individuals (Husain et al., 2014). In sum, despite being shown that low self-esteem is a significant predictor of ED (Silverstone, 1992; Button et al., 1996) and

related to OCD (Husain et al., 2014), study findings regarding a direct relationship between ON and self-esteem are mixed (Bóna et al., 2021; McComb & Mills, 2019; Oberle et al., 2017). It was suggested by Bratman and Knight (2001) that the level of self-esteem seems to be associated with the perceived success in adhering to self-induced diets, which has also been shown for individuals experiencing ON. Therefore, since there are inconsistent data regarding the role of self-esteem in ON the current study will address this relationship.

The Impact of Social Media

With the exponential growth of social network sites (SNS) over the past decades, the impact on users' lives and mental health status has become an important subject of research (Sharma et al., 2020). According to Verduyn et al. (2020), social comparison has increased in accordance with the continuous rise of SNSs, affecting individuals' wellbeing. Especially among young adults, increased social media usage has been found to be significantly related to mental health concerns, such as depressive symptoms, anxiety, body dissatisfaction and lower self-esteem (Bashir & Bhat, 2017; Sharma et al., 2020). Social comparison in this age group may facilitate the development of psychological distress and lower self-esteem (Pantic, 2014). Reasons for this are the increased vulnerability to peer pressure and limited capacity for self-regulation regarding social media usage (Keles et al., 2019). SNS users may feel inferior to others because they compare themselves to the content that is often perfected and unrealistic (Cingel et al., 2022; Vogel et al., 2014). This can lead to self-doubts and affect the individual's feeling of worthiness (Liu & Baumeister, 2016).

The phenomenon of social comparison and pressure on social media can also be found in relation to eating behaviours. While the overall rise of a healthy eating community on social media platforms promotes health and facilitates information exchange, it also increases the social pressure due to the self-determined selective exposure of content (Holland & Tiggemann, 2016; Turner & Lefevre, 2017). This is especially concerning as many contents related to diet routines lack scientific evidence and may have serious consequences, such as unhealthy and restrictive eating habits that are considered healthy as to be seen in ON (Cinquegrani & Brown, 2018; Qutteina et al., 2019). A study by Turner and Lefevre (2017) supports these findings and shows a significant relationship between the use of Instagram and higher risks for ON among young adults. The authors explain these findings based on the selective exposure of content that can lead to the assumption that a specific behaviour is more prevalent than it is, leading to a greater perceived social pressure (Turner & Lefevre, 2017). Thus, it is assumed that social media exposure regarding perceived healthy

eating habits might have an impact on those who are affected by social peer pressure in regard to their self-esteem as well as engaging in trending eating patterns, such as ON.

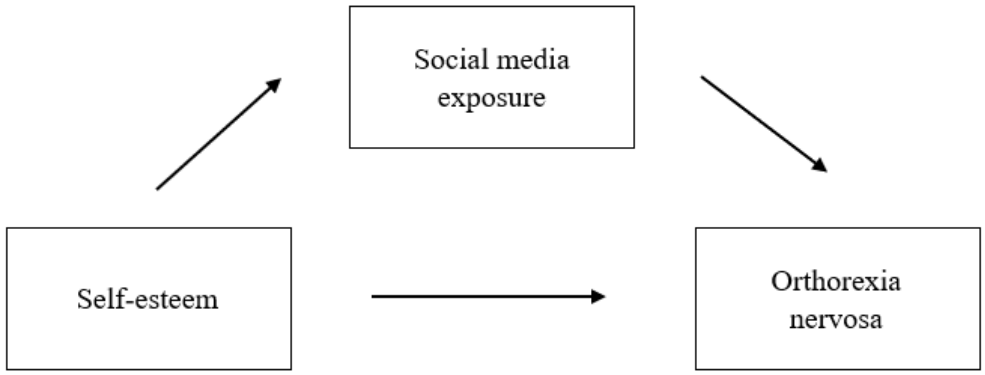
Objective of the Study

Since the literature indicates inconsistent results regarding the implications of social media exposure and its relationship between self-esteem and ON, the objective of this study is to further explore the relationship between these three variables. Due to a higher prevalence of ON in young adults, which is also a critical period in life regarding the development of self-esteem, and as main users of social media platforms, university students are most representative for this study. The objective of the study is to explore the mediational role of time spent on social media regarding the relationship between self-esteem and ON. For an overview of the mediation model, see Figure 1. Therefore, the following research question (RQ) has been formulated:

RQ: To what extent does the time spent on social media mediate the relationship between self-esteem and orthorexia nervosa in university students?

Figure 1

The Mediation Model Between Self-esteem, Social Media Exposure, and ON



Methods

Design

A non-experimental, cross-sectional design was employed. A convenience sampling method was used to explore the mediating role of *social media exposure* in the relationship between the independent variable *ON* and the dependent variable *self-esteem*.

Participants

A total of 334 participants were initially invited to take part in this study. Of these, data from 242 participants was used. The sample included 53 (21.9%) male, 185 (76.4%) female and 4 (1.7%) participants that identified as non-binary/third gender from age 18 to 34. From all participants, 79 (32.6%) were enrolled in hoogeschool, 146 (60.3%) in a Bachelor's degree, 15 (6.2%) in a Master's degree and 2 (0.8%) in a PhD programme. In addition, 61 (25.2%) participants indicated to have previous experiences with psychological/or pharmacological treatments (e.g., psychotherapy) and 36 participants (14.9%) received a mental health diagnosis before (e.g., depression, anxiety, and eating disorder). For a complete overview of the socio-demographic information, see Table 1. Inclusion criteria for participation in this study were being a university student, English-speaking, aged 18 years or older, and having at least one active social media account. The participation was voluntary and based on written informed consent. Reasons for the exclusion of data were disagreement to the consent form (n = 4), participants did not have at least one active social media account or indicated to spend no time at all on social media (n = 2) or did not complete the survey (n = 84). Two participants were excluded for giving unrealistic answers (e.g., height of 3 meters or time spent on social media of 86 hours/day). Participants were recruited through the opportunity sampling method by distributing the survey on social media platforms and via the SONA system. The SONA system is a test subject pool of the BMS faculty in which students gain credits as a reward for their participation in a study.

Material

To investigate the relationship between all three variables self-esteem, ON, and social media exposure among university students, an online survey was conducted which was created in Qualtrics.

Socio-Demographic Data

The survey entailed nine questions to gather socio-demographic data, such as age, gender, nationality, current educational level, weight and height, social media usage, and previous experiences with mental health concerns and diagnoses. Based on the weight and height, the Body Mass Index score (BMI) was calculated with the formula $BMI = \frac{\text{weight(kg)}}{\text{height(m)}^2}$ (World Health Organization, WHO, 2022) for each participant. For social media usage, participants had to indicate whether they had at least one active social media account and an estimation of their daily time spent on them (in hours). For possible mental health concerns in the past,

participants were asked to indicate whether they sought professional treatment before and whether they have been diagnosed with a mental health problem before.

Düsseldorf Orthorexia Scale (DOS)

The English version of the DOS was used to measure participants' eating behaviour regarding ON-related symptoms. For the complete DOS, see Appendix C. The self-reported questionnaire entailed ten items (e.g., "I have certain nutrition rules that I adhere to"). All items were answered with a four-point Likert scale, ranging from "this does not apply to me" (1 point) to "this applies to me" (4 points). The total maximum score on the DOS was 40, with higher scores showing a stronger tendency towards ON. A cut off score of ≥30 indicated the presence of ON (Chard et al., 2018). Scores between 25 and 29 (95th percentiles) were used as an indicator for being at risk of developing ON (Barthels et al., 2016). The DOS showed a high internal consistency (α = .88), as well as a high retest reliability (r = 0.67-0.79, p = .001 between three points in time) (Chard et al., 2018). Cronbach's alpha of this study was .84, showing a good internal consistency.

Rosenberg Self-Esteem Scale (RSE)

The RSE was used to measure self-esteem. The scale contained ten items that evaluated the individuals' self-worth considering negative and positive feelings about the self (e.g., "I take a positive attitude towards myself"). For an overview of all items of the RSE, see Appendix D. All items of the RSE used a four-point Likert scale ranging from "strongly agree" (1 point) to "strongly disagree" (4 points). Items 2, 5, 6, 8, 9 were reversed coded. Thus, "strongly agree" was given four points and "strongly disagree" was given one point. The maximum score was 40 points, with a higher score indicating a higher level of self-esteem. The RSE demonstrated an excellent internal consistency with a Guttman scale coefficient of reproducibility of .92 and an excellent stability retest reliability (r = 0.85-0.88) over a period of two weeks (Avison & Rosenberg, 1981). The Cronbach's coefficient of .88 in this study showed a good internal consistency.

Procedure

Before starting the data collection, the study was approved by the Ethical Committee of the Faculty of Behavioural, Management and Social sciences (BMS) of the University of Twente with the approval number 220321. The data collection phase took place from the 30th of March 2022 to the 23rd of April 2022. Participants for the survey were recruited either via social media or the SONA system. The survey was administered using Qualtrics. In the

beginning, each respondent was informed about the purpose of the study and the duration of the survey (10-20 minutes). All participants were further assured confidentiality and the possibility to withdraw at any time. For an overview of the information provided and the content form, see Appendix A. Then, the demographic data of the participants were recorded, including information about their social media usage. For an overview of the demographic questions, view Appendix B. In the next step, participants answered items of the DOS and the RSE. After finishing the survey, participants were thanked for their participation and contact information of the researchers were presented for any further questions regarding the study.

Data Analysis

Data was analysed using the Statistical Packages for Social Sciences (SPSS) software version 26. First, a descriptive analysis of the participants' demographics was conducted. For this, the mean scores (M), frequencies, standard deviations (SD), minimum (min) and maximum (max) scores for the *DOS*, *RSE*, and *time spent on social media* were displayed. In addition, the Shapiro Wilk test and a Q-Q plot were used to inspect the data normality.

To investigate the data further, seven new variables were created. First, for the DOS the total scores were calculated by summing up all scores of the items. Another variable was created to categorize the answers, indicating the tendency of ON (no ON (<25), at-risk of ON (25-29), and ON (≥30) following the guidelines from previous research (Chard et al., 2018). Second, an additional variable was created with the total scores from the RSE. Third, the BMI of each participant was calculated, based on their weight and height. In addition, one variable to categorize the BMI (underweight (< 18.5), healthy weight (18.5 - 24.9), overweight (25-29.9), obese (>30)) was added (WHO, 2022). Forth, a variable was created with a cut off score of 3 on the time spent on social media (low to moderate social media duration 1-3 hours/ day vs. high social media duration >3 hours/day) (Karmila et al., 2020). These descriptive data can be seen in Table 1 in the results section.

To test this relationship, a mediation analysis was conducted with *self-esteem* as independent variable, *ON* as dependent variable, and *social media exposure* as mediator. For the analysis, the PROCESS software was employed in SPSS.

Results

Descriptive Statistics

Of the 334 participants who completed the survey on Qualtrics, a final total of 242 participants were included in the analysis meeting the pre-determined inclusion criteria to answer the research question.

For the three main variables, mean and standard deviations were displayed by descriptive statistics. The independent variable *self-esteem* showed a mean score of 21.4 (*SD* = 5.3). The dependent variable *ON* showed a mean score of 18.8 (*SD* = 5.7). For the mediator variable social media exposure, a mean score of 3.1 (*SD* = 1.5) was displayed. It was further shown that 202 (83.5%) participants did not show ON-related symptoms, 27 (11.2%) were at-risk of ON, and 13 (5.4%) showed ON-related symptoms. Table 1 shows a complete overview of the demographical information.

Table 1

Descriptive Socio-Demographic Data

Characteristic	*n*	*%*	*M*	*SD*	*Min*	*Max*
Age			21.5	2.6	18.0	34.0
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			22.3	4.3	14.7	56.4
Underweight	19	7.9				
Healthy Weight	185	76.4				
Overweight	32	13.2				
Obese	6	2.5				
Previous Mental Health Treatment						
Yes	61	25.2				
No	181	74.8				
Previous Mental Health Diagnosis						
Yes	36	14.9				
No	206	85.1				
Social Media Exposure (h/daily)			3.1	1.5	0.2	10.0
Low to Moderate Duration	98	40.5				

High Duration	144	59.5				
ON			18.8	5.7	10.0	34.0
No ON	202	83.5				
At-risk	27	11.2				
ON	13	5.4				
Self-esteem			21.4	5.3	10.0	34.0

Note. BMI: Body Mass Index score. ON: orthorexia nervosa (results of the Düsseldorf Orthorexia Scale (DOS)).

Normality

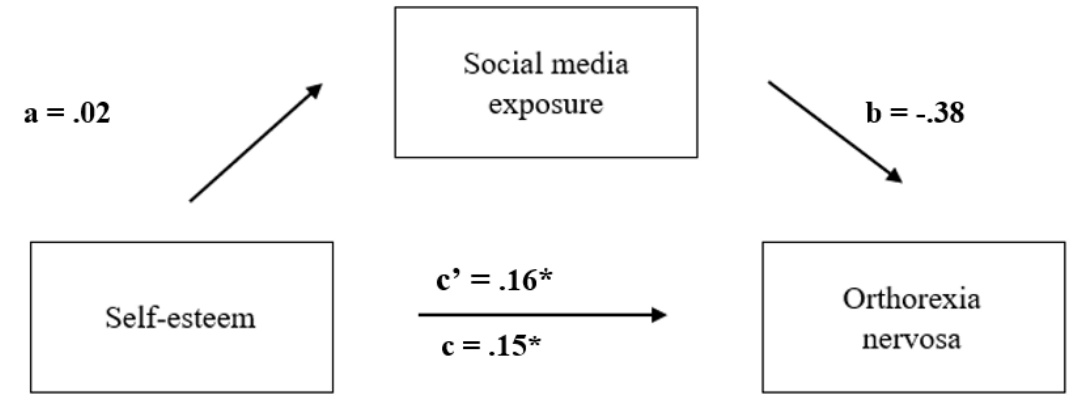
To examine the normality of the data, the Shapiro-Wilk test and a Q-Q plot of the continuous variables were conducted. The results of the Shapiro-Wilk test revealed that the total scores obtained of the DOS [$W = .95$, $p < .001$], social media exposure [$W = .93$,$p < .001$], and the RSE [$W = .99$, $p = .033$] were not normally distributed. However, the Q-Q plots of all three main variables showed only slight deviations from the normal distribution. In addition, based on the central limit theorem, parametric tests have a higher statistical power compared to non-parametric tests and the effect of a skewed distribution has a non-significant effect with a sample size larger than n = 30 (Kwak & Kim, 2017). Therefore, parametric tests were conducted to answer the research question.

Inferential Statistics

The analysis showed a non-significant effect of the predictor variable *self-esteem* on the mediator variable *social media exposure* [$B = .02$, $SE = .018$, $t(1, 240) = 1.33$, $p = .184$] (path a on Figure 2). In addition, the results did not reveal a significant effect of *social media exposure* on *ON* [$B = -.38$, SE = .24, $t(2, 239) = -1.56$, $p = .119$] (path b on Figure 2). Further, a significant total effect of *self-esteem* on *ON* was found [$B = .15$, $SE = .07$, $t(1, 240) = 2.23$, $p = .027$] (path c on Figure 2). A significant direct effect of *self-esteem* on *ON* was found [$B = .16$, $SE = .07$, $t(2, 239) = 2.36$, $p = .019$] (path c' on Figure 2). Thus, no significant mediational effect of social media was found in the relationship between self-esteem and ON, but a significant positive effect of self-esteem on ON.

Figure 2

The Mediation Analysis Between Self-Esteem, Social Media Exposure, and ON



Note. *$p<.05$

Discussion

The aim of the present study was to explore the underlying mechanisms of ON with emphasis on the mediational effect of social media exposure regarding the causal relationship between self-esteem and ON. Alongside with the growing healthy eating movement on social media, concerns are rising due to an increased development of excessive preoccupation with food that is considered healthy, described as ON (Dunn & Bratman, 2016). Especially young adults seem to be impacted by the negative influence of an increased social media usage on eating behaviours, resulting in unsustainable and unhealthy eating habits (Turner & Lefevre, 2017; Zemlyanska et al., 2021). In addition, studies suggest that self-esteem may play a critical role in the development and maintenance of ON. However, the findings regarding a relationship between self-esteem and ON are mixed (Bóna et al., 2021; Oberle et al., 2017). Thus, this study aimed at closing the research gap further by combining the findings about the impact of self-esteem and social media exposure on ON. For this purpose, the impact of social media exposure as a mediating variable in the relationship between self-esteem and ON was investigated. Together with demographic information about those considered to be most affected by the influence of social media on this relationship (i.e., young adults), a clearer picture of ON is provided.

Demographics

Regarding the BMI, it was shown that most participants scored in the range of healthy weight with about 15% showing data consistent with underweight, overweight or obesity. Similar results have been found in a study of ON-related symptoms in nursing students by

Aktürk et al. (2019), indicating that these scores are common among students in this age range. In addition, 25% indicated to have sought mental health treatment (e.g., psychotherapy) prior to their participation in this study and about 15% have been diagnosed with a mental health condition (e.g., depression or anxiety). Literature supports these findings by pointing out that especially health-related anxiety can promote the development of ON to achieve overall health (Koven & Abry, 2015). It was further shown that most participants' data showed scores of high social media usage (≥3h/daily). This is in line with research suggesting that duration of social media usage tends to be high among university students with an average time of 3 hours daily online (Karmila et al., 2020). Moreover, it was claimed by Yılmazel (2021) that students who show a tendency for developing ON also show a higher risk of social media addiction. However, the duration of exposure was only one aspect of measuring addiction in Yılmazel's (2021) study. Results for measuring ON revealed that most of the participants (83.5%) would be categorized as not showing ON-related symptoms. Previous studies vary highly in the prevalence rates depicted, with Turner and Lefevre (2017) showing a prevalence of 90% and Donini et al. (2004) with a rate of 6.9%. These variations highlight the importance of developing standardized and reliable assessment tools to be able to detect ON-related symptoms more precisely. Regarding self-esteem, considering a maximum score of 40, a total mean of 21 on RSE can be interpreted as moderate self-esteem. This is similar to findings of Bóna et al. (2021) in a study about the effect of self-esteem on ON. In contrast, a study by Karpowicz et al. (2009) of individuals experiencing AN displayed a significantly lower average level of self-esteem among the participants. The same was stated in a study by Toledano et al. (2020) who investigated the relationship between self-esteem and OCD-related symptoms. Thus, it can be hypothesized that lower levels of self-esteem are more related to AN and OCD instead of ON.

Mediation Model

The results did not demonstrate a mediating effect of social media exposure on the relationship between self-esteem and ON. What could be shown, nonetheless, was a significant positive direct relationship between self-esteem and ON.

The mediating effect was primarily assumed because studies indicated that social media usage is significantly related to lower levels of self-esteem (Bashir & Bhat, 2017; Sharma et al., 2020). In addition, various researchers stated that social comparison, amplified by social media usage, has a negative impact on the self-esteem of young adults due to the often perfected content provided and the peer pressure to adapt to it (Cingel et al., 2022;

Keles et al., 2019; Pantic, 2014; Vogel et al., 2014). Also, the increasing use of social media among young adults was hypothesized to negatively affect eating behaviours (Zemlyanskaya et al., 2021). A study by Turner and Lefevre (2017) revealed a significant positive effect of social media usage on the risk of developing ON among young adults due to the growing movement of health communities on SNS. However, the daily time spent on social media was not related to participant's eating behaviour in this study. A possible explanation for the different findings is the set-up of the study. While Turner and Lefevre (2017) determined different types of SNS in their study and thus differentiated specific functions of the SNS, this study did not focus on the type of SNS. Even more important, the authors used the ORTO-15 to assess ON-related symptoms, which has been shown to generate higher prevalence rates compared to the DOS and lower reliability and internal consistency (Depa et al., 2016). Thus, the findings of both studies must be compared with caution.

Regarding the direct relationship between self-esteem and ON, previous studies showed mixed findings. A study by Bóna et al. (2021) showed lower levels of self-esteem being associated with higher tendencies for ON-related eating behaviour. The authors explain these findings by the societal pressure on individuals experiencing ON to adhere to health behaviour that may affect the level of self-esteem. Yet, it was not noted how self-esteem would then change if they managed to adhere to these health behaviours. In contrast, a meta study by McComb and Mills (2019) on risk factors of ON did not reveal any link between self-esteem and ON, indicating that self-esteem is not a determinant of ON. It was suggested that this was due to the limited number of studies that included self-esteem as a possible determinant factor. Out of 54 correlational studies, only two studies focused on self-esteem and ON (McComb & Mills, 2019), highlighting the importance for further research.

The positive relationship found in this study disagrees with both lines of the argumentations and even indicates that a higher self-esteem is related to a higher risk for developing ON. A possible explanation for this is that high self-esteem is associated with engaging in a healthy lifestyle, including physical activity and healthy eating habits (Knox & Muros, 2017). However, in some cases, the intended healthy eating habits can turn into an extreme preoccupation with healthy food and increase the risk for developing ON (Koven & Abry, 2015). Thus, it is possible that a higher level of self-esteem leads to the development of ON. Regarding the maintenance of ON, self-esteem also seems to be an important factor. It was suggested by Bratman and Knight (2001) that the level of self-esteem is tightly related to the perceived success individuals with ON experience when adhering to self-induced diets that are at core of ON. They add that self-esteem is negatively affected if individuals do not

adhere to their strict dietary rules, leading to decreased mental wellbeing (Bratman & Knight, 2001). Moreover, it was pointed out that individuals experiencing ON might feel superior to those who they would perceive as less healthy (i.e., eating unhealthy food) (Greville-Harris et al., 2019). As Varga et al. (2013) explain, those affected by ON experience a feeling of control which adds to the perceived superiority over others who do not engage in their diets. Therefore, it can be assumed that individuals with a higher self-esteem are more likely to develop a tendency for ON as it gives them a feeling of success and control that in turn boosts their self-esteem.

Strengths and Limitations of the Study

An important strength of this study was the usage of the DOS and RSE as both assessment tools show good psychometric qualities (Avison & Rosenberg, 1981; Chard et al., 2018). Especially the DOS was meant to increase the reliability in assessing ON-related symptoms among the participants compared to the ORTO-15 in past studies. As mentioned before, the ORTO-15 tends to overestimate the prevalence of ON, which was avoided by using the DOS (Depa et al., 2016). Another important strength of the study is that self-esteem as a determinant of ON as noted in previous studies could be confirmed. This adds to the growing knowledge of ON and might help to treat patients more effectively. By understanding the causing factors of the development of ON, tailored strategies for recovery and prevention can be developed.

A possible limitation of the study is the length of the survey. The results showed that participants left out whole blocks (i.e., subscales of the different determinants) of the survey, leading to the exclusion of data. In addition, the study was not representative for a larger population as only European university students were included. Moreover, the LGBTQIA+ community was not represented as this was not taking into consideration in the study. Lastly, the results revealed a gender imbalance, indicating that more than 75% of participants were female. To make more general inferences, a more balanced sample should be achieved.

Implications for Further Research

To gain more knowledge about possible determinants of ON, investigating the role of social media in the development of ON should be extended. As shown by Turner and Lefevre (2017), Instagram has been the only platform found to be related to ON, indicating that the type of SNS might be meaningful. The authors claim that due to its image-focused nature and selective content exposure, users are more prone to unhealthy eating behaviours that are reinforced by the growing healthy eating community (Turner & Lefevre, 2017). Taken

together, it is advisable to conduct a new study considering the role of different image based SNS and using the DOS as an assessment tool for ON to see whether the results of Turner and Lefevre (2017) can be replicated. Regarding the concept self-esteem as a determinant, it should be examined which aspects are contributing to the relationship to ON. As perceived control is assumed to increase self-esteem in individuals experiencing ON when successfully adhering to diet rules (Bratman & Knight, 2001), this aspect should be included in future studies. By doing so, it can be examined whether the feeling of control or the lack thereof might contribute to the development of ON. This might help those affected by investigating if and how they can develop a feeling of control aside from ON-related eating habits. Overall, more research regarding the risk factors of ON must be conducted to gain a clearer picture of its causes to be able to develop successful treatment for those suffering from negative effects of ON.

In conclusion, no significant mediation effect of social media exposure on the relationship between self-esteem and ON was found. Despite of that, important insight into the causing factors of ON were revealed by a positive, direct relationship between self-esteem and ON that indicates higher levels of self-esteem being associated with a higher risk of developing ON.

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Appendices

Appendix A

Information Sheet and Informed Consent

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.

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 Information

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

The Düsseldorf Orthorexia Scale (DOS)

	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

The Rosenberg Self-Esteem Scale (RSE)

	Strongly Agree (1)	Agree (2)	Disagree (3)	Strongly Disagree (4)
On the whole, I am satisfied with myself. (1)	○	○	○	○
At times I think I am no good at all. (2)	○	○	○	○
I feel that I have a number of good qualities. (3)	○	○	○	○
I am able to do things as well as most other people. (4)	○	○	○	○
I feel I do not have much to be proud of. (5)	○	○	○	○
I certainly feel useless at times. (6)	○	○	○	○
I feel that I'm a person of worth, at least in an equal plane with others. (7)	○	○	○	○
I wish I could have more respect for myself (8)	○	○	○	○
All in all, I am inclined to feel that I am a failure. (9)	○	○	○	○
I take a positive attitude toward myself. (10)	○	○	○	○