Associations Between Social Media Use and Disordered Eating Behaviors Among Adolescents

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Abstract

Social media use often increases during adolescence, and facilitates social comparison practices, which can increase the risk for the development of disordered eating behaviors. Adolescence is a vulnerable period for the development of eating disorders such as Bulimia Nervosa and Binge Eating Disorder. Early recognition of subclinical symptoms in adolescents is of great importance in the prevention of a clinical diagnosis. This study aims to investigate associations between social media use and the presence of four subclinical disordered eating behaviors: 1) emotional eating, 2) uncontrolled eating, 3) compensatory behaviors, and 4) binge eating symptoms. A sample consisting of 1729 adolescents aged between 12 and 16 years old (M_{age} = 13.81) from the Generation R cohort study based in Rotterdam was used to examine these associations. Results showed positive associations between increased social media use and emotional eating, uncontrolled eating and compensatory behaviors. Gender was a significant moderator only in the association between social media use and subclinical binge eating symptoms. Girls showed an increase in binge eating after increased social media use, while boys showed a decrease. This study showed that social media use does not only lead to an increase in earlier researched eating behaviors characterizing Anorexia Nervosa, but also in disordered eating behaviors characterizing Bulimia Nervosa and Binge Eating Disorder. The results also added to previous research by showing the associations to exist not only for girls, but for boys as well.

Keywords: Bulimia Nervosa, Binge Eating Disorder, social media use

Associations Between Social Media Use and Disordered Eating Behaviors Among Adolescents

Eating disorders are psychological disorders with severe somatic consequences, such as dangerous weight loss, obesity, high blood pressure and heart rhythm disorders (GGZ Standaarden, 2020). Eating disorders are considered the most lethal of all mental illnesses (Saunders & Eaton, 2018). There are different types of eating disorders, depending on the kind of disordered eating behavior a patient displays. The two most common eating disorders are Bulimia Nervosa (BN) and Binge Eating Disorder (BED) (American Psychiatric Association, 2013). In their lifetime, 1-2% of all women receive a clinical BN diagnosis. For BED, the prevalence is higher, namely 1-4% (GGZ Standaarden, 2020). While there are no notable gender differences in BED prevalence, with 1-3% of men receiving this diagnosis in their lifetime, BN is much less common in men, with a prevalence of 0.1-0.5% (GGZ Standaarden, 2020).

According to the DSM-V, BN is an eating disorder characterized by binge eating episodes, during which an individual consumes an amount of food that is larger than what most people would eat during a short period of time. During this episode, they experience feelings of loss of control over eating and they feel guilty and ashamed afterwards. They consequently feel a need to dispose of the food they ate to prevent weight gain. To achieve this, these individuals display compensatory behaviors, such as self-induced vomiting, taking laxatives or diuretics, fasting or exercising excessively. Their weight often fluctuates because of these binge episodes and following compensatory behaviors, and weight and body shape take on a central role in their self-image (American Psychiatric Association, 2013).

BED is characterized by the same binge eating episodes that characterize BN, where an individual loses control over their eating, eats faster, and does not stop eating when they feel satiated. Individuals with BED prefer to eat alone, because they feel ashamed of their

eating behavior. Similar to BN, individuals feel guilty after such an episode, but in contrast, they do not display compensatory behaviors The combination of weight gain and the negative feelings accompanying the binge episodes leads to an overall increase in negative affect (American Psychiatric Association, 2013).

Both of these eating disorders know severe consequences if not dealt with in time (Keski-Rahkonen & Mustelin, 2016). BN can lead to the stomach stretching out due to the binge episodes, the esophagus can become damaged from self-induced vomiting, and an individual can develop a chronic shortage of vitamins and minerals (Keski-Rahkonen & Mustelin, 2016). BED can also lead to the stomach stretching out, and individuals often develop obesity, which can have damaging consequences in itself. For example, obesity can result in breathing problems and heart and vascular diseases (Keski-Rahkonen & Mustelin, 2016).

Besides physical consequences, BN and BED can have a large impact on an individual's social life and mental state. Patients often do not want to eat when other people are present because they feel ashamed or are afraid of losing control in front of others (Keski-Rahkonen & Mustelin, 2016). Obesity can also impact your ability to exercise or participate in social gatherings. Clinical patients display a multitude of comorbid symptoms, such as depression, obsessive-compulsive symptoms, paranoia, psychoticism and even symptoms of borderline personality disorder (Bunnell et al., 1990; Keski-Rahkonen & Mustelin, 2016).

The symptoms named above are all clinical symptoms that are needed in order to receive a clinical diagnosis, but more common are subclinical symptoms. Subclinical symptoms of eating disorders mostly present themselves as clinical symptoms, only not displayed frequently or severely enough to meet the criteria for clinical diagnosis and treatment. If subclinical symptoms are not noticed and treated in time, they can evolve into much more serious issues and turn into clinical eating disorders. Getting treated for clinical

disorders is a longer and more difficult process than receiving help for subclinical symptoms (Bunnell et al., 1990). For this reason, early detection of subclinical symptoms of eating disorders is of great importance, seeing as young people engaging in these practices may develop more serious disorders later in life.

Subclinical symptoms of BN and BED are most prevalent in adolescence (Holt & Ricciardelli, 2002). Individuals with symptoms that do not meet full clinical criteria are often younger than clinical patients, suggesting that subclinical symptoms can emerge at a young age and evolve into clinical diagnosis (Holt & Ricciardelli, 2002). Previous research suggests that risk factors for developing eating disorder symptomatology escalate during early adolescence, identifying age 14 as a key developmental timepoint to intervene (Rohde et al., 2015).

Given the increased pressure on physical appearance during adolescence, which has only increased since the emergence of social media, this is a vulnerable period for experiencing body dissatisfaction (Rohde et al., 2015). The impulsive nature of adolescents makes them more vulnerable for behaving in response to this dissatisfaction, which can lead to unhealthy ways of weight loss (Rohde et al., 2015). During adolescence, the boundaries between clinical eating pathology and normal dietary practices and beliefs are often unclear and can easily be confused with each other (Holt & Ricciardelli, 2002). Many studies have found strong associations between body dissatisfaction and the development of disordered eating behaviors such as restrictive eating or purging in adolescence (Holt & Ricciardelli, 2002).

In the current study, the focus will be on subclinical disordered eating behaviors. For prevention of clinical eating disorders to be most effective and harmful physical and psychological consequences to be prevented, knowledge about subclinical eating behaviors should increase, given that these precede clinical diagnosis. Specifically, this study will

examine eating behaviors characteristic of BN and BED, which include emotional eating, uncontrolled eating, subclinical binge eating symptoms, and compensatory behaviors.

Emotional eating can be defined as 'the tendency to overeat in response to negative emotions such as anxiety or irritability' (Adriaanse et al., 2010). The concept of emotional eating is derived from psychosomatic theory, stating that emotional eaters are unable to differentiate hunger from the physiological state accompanying negative emotions. Whereas normally negative emotions would result in loss of appetite, since emotions induce physiological changes similar to that of satiety, emotional eaters respond to negative emotions by eating (Adriaanse et al., 2010). Uncontrolled eating refers to 'a tendency to overeat, accompanied by a feeling of being out of control' (Anglé et al., 2009). Subclinical binge eating can be seen as a broader definition of binge eating disorder, where participants display binge eating symptoms, but do not meet the frequency criteria (Touchette et al., 2011). As mentioned before, compensatory behaviors are displayed in BN, often after a binge eating episode or consumption of a large meal. Compensatory behaviors can include a multitude of symptoms, such as self-induced vomiting, fasting, taking diuretics or laxatives, and exercising excessively (Lydecker et al., 2017). This study will research associations between these subclinical disordered eating behaviors and social media use during adolescence.

Social Comparison Theory

As mentioned before, adolescence is a vulnerable period for the development of disordered eating behaviors (Rohde et al., 2015). A method by which adolescents decide what their ideal appearance and weight status would be, is by comparing themselves to others. The female body ideal oftentimes consists of being thin and having long hair, while boys are tall and muscular (Grogan, 2016). Indeed, a study supported this idea and stated that a similar number of boys and girls are dissatisfied with their bodies, and it may manifest differently for

each gender (Holt & Ricciardelli, 2002). Not only in real life, but also while watching movies and television series, adolescents are confronted with these stereotypes. Because these stereotypes are everywhere, this ideal becomes internalized and a goal to work towards (Jones, 2001).

The process of comparing oneself to others is called social comparison. Leon Festinger first described the social comparison theory in 1954, in which he described social comparison as 'evaluating our own abilities or characteristics by comparing them to those of others' (Festinger, 1954). There are two methods of social comparison, namely downward and upward. Downward social comparison occurs when an individual compares him- or herself to someone relatively worse or less than themselves on a certain domain, which often leads to an increase in self-esteem and positive affect (Festinger, 1954). The other type of social comparison is upward, which occurs when an individual compares him- or herself to someone relatively better than them on a domain, which often leads to an increase in negative affect and feelings of insecurity (Festinger, 1954). This second type of social comparison can be used by adolescents to compare themselves to other individuals for appearance inspiration.

Positive associations have been found between upward social comparison and disordered eating outcomes (Saunders & Eaton, 2018). Upward appearance comparison has been associated with more negative affect, body dissatisfaction, and thoughts of dieting and exercising compared to downward comparison in women (Crowther & Ciesla, 2011). Adolescence is a vulnerable period for self-esteem, with an intensified presence of social comparison as a mechanism for self-knowledge and self-evaluation (Van der Aar et al., 2018). For girls especially, westernized culture places a greater emphasis on the importance of physical appearance, which may explain why girls generally seek more reinforcement on their appearance than boys (Grogan, 2016).

Studies have suggested that the transition into adolescence often coincides with increased exposure to media images of ideal stereotypes (Sidani et al., 2016). Individuals have more opportunities to compare themselves because they are not limited to their direct environment, but can compare themselves to one another online as well. Combined with the increased susceptibility to social comparison, this could lead to an increased discrepancy between these ideal online images and their realistic offline selves, and thus result in more negative self-evaluations in the physical domain (Van der Aar et al., 2018).

Social Media

Since the introduction of social media platforms such as Facebook, Instagram and Snapchat, there has been debate about the possible negative effects these platforms may have on people's wellbeing, thoughts, behavior and perception of the world and themselves (Vossen & Valkenburg, 2016). These concerns are not ungrounded, given that many people spend a lot of time on social media. For adolescents especially, social media takes up a large part of their lives (Pelletier et al., 2020). 3.5 billion people worldwide have at least one social media account, meaning 45% of the world population (Pelletier et al., 2020). Additionally, social media is the fastest growing media with an expected growth of 18.7% through 2022, compared to 1.3% growth for television and a drop of 27% in print advertising (Pelletier et al., 2020).

Social media users can selectively allow content onto their profiles, post pictures and describe themselves in ways that best represent their ideal self-views (Vogel et al., 2014). The importance of physical appearance during adolescence, coupled with people's tendencies to present the best version of themselves on social media, may make engaging in upward social comparison on social media particularly damaging among adolescents compared to other age groups (Toma & Hancock, 2010).

Many studies have researched the consequences of social media use and have found negative effects on multiple domains. For instance, social media use has been shown to be associated with an increase in mood and anxiety disorders among adolescents (Allen et al., 2014; Keles et al., 2020). Adolescents often feel the need to experience a sense of social connectedness with their peers, while still having a yearning to create their own sense of identity and individuality. The gap between social connectedness and being your own person may lead to feelings of loneliness (Allen et al., 2014). Social media has been shown to provide a platform for cyberbullying, and it has been reported to directly cause stress, low self-esteem and suicidal ideations among adolescents (O'Reilly et al., 2018).

Most of these relationships however, are too complex for straightforward conclusions, given that the impact of social media use seems to be multifactorial (Keles et al., 2020). Perceived social support, rumination, insomnia and other sleep-related factors are most frequently reported as mediators in the association between social media use and its negative consequences (Keles et al., 2020). Studies have also shown the benefits of enabling people to express their thoughts and feelings and to receive social support online to be positive consequences of social media (Saunders & Eaton, 2018). Social media has also been shown to potentially improve cognitive and affective empathy among adolescents (Vossen & Valkenburg, 2016).

In conclusion, there are negatives and positives associated with the use of social media. The ease by which information is shared can play an important role in the increase of empathy adolescents show and experience. At the same time, the possible associations with depression, anxiety, and feelings of loneliness can have long-lasting consequences (Allen et al., 2014).

Disordered Eating Behaviors and Social Media Use

The etiology of eating disorders is multifactorial and exposure to social media has been suggested to be a contributor (Sidani et al., 2016; Aparicio-Martinez et al., 2019). Newly emerging social media platforms combine many aspects of traditional media with technology-facilitated peer interaction. The propagation of stereotypes through visual images among peers may be linked to increased risk for eating concerns (Sidani et al., 2016). Previous research has examined associations between social media use and disordered eating behaviors. In a cross-sectional study by Sidani et al. (2018), significant positive linear associations were found between social media use frequency and duration and disordered eating behaviors such as uncontrolled eating and inconsistent eating patterns in women between 19 and 32 years old.

A study by Fardouly et al. (2015) showed that women who spent more time on Facebook per day reported increased negative affect and body dissatisfaction compared to control groups. However, this study consisted of a relatively small sample size of 112. Another study, by Aparicio-Martinez et al. (2019) found a significant positive linear association between social media use, body image and body ideals in 168 adult women, a relatively small sample as well. The thin-idealization was found to be associated with food restriction and body dissatisfaction, both leading to disordered eating behaviors (Aparicio-Martinez et al., 2019).

Emotional eating has been shown to be an important factor in the association between social media use and disordered eating behaviors. A study by Sanchez-Ruiz et al. (2017) for example, found emotional eating to be a mediator in the association between media pressure and eating disorders. A study by Jones (2001) showed that weight comparisons to both peer and model targets were correlated with body dissatisfaction among 80 adolescents. This study

found gender differences indicating that girls overall reported more social comparison practices than boys.

Lastly, a study by Wilksch et al. (2020) showed that greater time spent daily on Instagram was associated with more disordered eating behaviors among 13-year-old boys and girls, of which compensatory behaviors such as strict exercise and meal skipping were reported as the most common disordered eating behaviors. Additionally, a greater number of social media accounts was associated with higher disordered eating scores for both genders. In addition to disordered eating, another reported dysfunctional cognition was the over-evaluation of body shape and weight (Wilksch et al., 2020).

While eating disorders most commonly emerge during late adolescence (18 to 21 years old), risk factors that predict the onset of eating disorders may emerge earlier and escalate during adolescence (13 to 16 years old) (Rohde et al., 2016). Understanding body dissatisfaction and eating disorder symptomatology during adolescence, especially in the context of social media use, is critical for the development of effective preventions and to identify risk factors among adolescents that contribute to the development of clinical eating disorders.

Even though multiple studies have researched the associations between social media use and disordered eating behaviors, gaps still remain. Most previous studies have focused on a specific social media platform, such as Facebook or YouTube, while less research has been done looking at broader social media use. As of recently, adolescents use a plethora of social media platforms, oftentimes within the same timeframe. Because of this, it is important to focus on social media in general, and include all platforms. This study will therefore measure social media use in terms of the number of social media apps participants use. Studies have also focused mainly on adult women, while much less attention has been given to boys and the adolescent age group in general. A third point of attention is the small sample size in some

of the previous studies, which makes the results less representative of the population. With the present study, the aim is to fill some of these gaps by including both boys and girls, focusing on 14-year-old adolescents, and having a sample that is diverse and representative of the current multicultural society.

Two research questions have been devised for the current study. The main research question is: 'Is social media use, measured by the number of apps used, associated with disordered eating behaviors in adolescence?'. The second research question is: 'Does the association between social media use, measured by the number of apps used, and disordered eating behaviors differ for boys and girls?'. Corresponding with these research questions, three hypotheses have been postulated. The first hypothesis corresponds with the main research question and states: 'Social media use has a positive association with the following disordered eating behaviors: emotional eating, uncontrolled eating, subclinical binge eating, and compensatory behaviors'. This hypothesis is based on the beforementioned theoretical background and previous positive associations found between the use of social media and disordered eating behaviors.

For the second research question, two hypotheses have been postulated. Considering that men and women have a similar BED prevalence, but women have a higher BN prevalence, the first hypothesis is: 'The association between social media use and disordered eating behaviors characterizing binge eating disorder (subclinical binge eating symptoms, uncontrolled eating and emotional eating) is similar for boys and girls.' The second hypothesis is: 'The association between social media use and compensatory behaviors is different for boys and girls, in that girls will show a stronger association.'.

Method

Study Design and Population

The data used in the current study comes from the Generation R study. This is a population based prospective cohort study from fetal life onwards. This study was designed to identify early environmental and genetic causes and pathways leading to normal and abnormal growth, development and health from fetal life, childhood and young adulthood (Kooijman et al., 2017). Results from the Generation R study contribute to the development of strategies for optimizing health and healthcare for pregnant women and their children. All pregnant women living in Rotterdam with an expected delivery date between April 2002 and January 2006 were invited to participate in the Generation R study, with a participation rate of 61%. Written informed consent was obtained from all participants and The Medical Ethical Committee of the Erasmus Medical Center approved the study. The specific study design has been explained in more detail in Kooijman et al. (2017).

Participants were included in the current sample for data analysis if information was available on the relevant disordered eating behaviors and their social media use around age 14. These criteria resulted in a total sample of 1729 adolescents whose data was used in the current study. The sample consisted of 47.7% boys (N = 824) and 52.3% girls (N = 905). The participants' age ranged from 12.61 to 16.60 years old (M_{age} = 13.81).

Measures and Materials

Emotional eating and uncontrolled eating

Data on emotional eating and uncontrolled eating was collected when participants were around 14 years old, using the Three-Factor Eating Questionnaire-R21 (TFEQ-R21). The TFEQ-R21 is a self-assessment questionnaire containing 21 items constructed to measure three dimensions of human eating behavior: cognitive restraint, uncontrolled eating, and

emotional eating (Stunkard & Messick, 1985). The TFEQ-R21 has well-established psychometric properties, including good convergent and discriminant validity (Anglé et al., 2009; Cappelleri et al., 2009) and minimal bias across genders (Duarte et al., 2018).

Emotional eating was measured by using the three items of the emotional eating subscale from the TFEQ-R21. An item on this subscale looks like 'When I'm feeling lonely, I comfort myself by eating'. The two other items are similar, but regarding feelings of sadness and fear. The participants scored these items on a 4-point scale from 'completely untrue' to 'completely true'. Item sum scores for the subscale were calculated, resulting in one mean score for emotional eating.

Uncontrolled eating was measured using the uncontrolled eating subscale from the TFEQ-R21. An example of a question corresponding to uncontrolled eating is 'When I start eating, it feels like I am unable to stop'. These items were scored on the same scale as emotional eating. Participants were included if less than 25% of the items was missing, and their scores were corrected for the missing amount. Mean item-scores were calculated for all participants, resulting in one mean score for uncontrolled eating.

Subclinical binge eating symptoms

Subclinical binge eating was measured using the Development and Well-Being Assessment (DAWBA). The DAWBA is a questionnaire regarding multiple domains of psychological development, including eating behavior, for children aged 5-16 years old (Goodman et al., 2000). The DAWBA has well-established psychometric properties, including good reliability for both internalizing and externalizing disorders (Aebi et al., 2012) and good discrimination between community and clinical samples (Goodman et al., 2008).

The DAWBA contains relevant subclinical binge eating items that were used to measure this variable. These items include two questions about ever having experienced

overeating, and two questions about feeling loss of control during this. This variable was given a score of 0 to 3, with 0 indicating 'no symptoms', 1 indicating 'overeating', 2 indicating 'loss of control' and 3 indicating 'binge eating', meaning having experienced both of these symptoms. In this way, the items have been combined into one score.

Compensatory behaviors

Compensatory behaviors were measured using the DAWBA, which included eight items corresponding to it. The question for compensatory behaviors was: 'In the last three months, did you do one of the following things to lose weight or ensure you did not gain weight?'. This question was followed by eight compensatory behaviors, including eating less, meal skipping, self-induced vomiting, and taking medication or pills to lose weight. These behaviors can be scored 'no', 'seldom', 'once a month' and 'once a week'. A sum-score was calculated for the behaviors, where participants were included in analysis if they answered at least 6 out of the 8 items. The scores were corrected for the amount of answered items, and this resulted in one sum-score for compensatory behaviors.

Social media use

Social media use was measured by collecting data on how many social media platforms the participants used. This was measured using a general questionnaire that collected data on multiple domains, including social media use. Participants could check off on a list of social media platforms what apps they used at the moment, with answer options including Facebook, Instagram, Snapchat, Twitter and WhatsApp. The social media variable consisted of the number of apps participants have on their mobile phone, with a range from 0 to 6.

Covariates

The following covariates were considered as possible confounders in the association between social media use and disordered eating behaviors: participant's age, sex and ethnicity, maternal education level and net household income per month. Participant's BMI and emotional and behavioral problems at nine years old were also considered as covariates, because these could possibly influence their social media use and eating behaviors at fourteen years old. Lastly, an interaction variable between gender and social media use was created to examine the possible moderating influence of gender on the associations.

Participant's age, sex and ethnicity, and maternal education level were derived from their general information. Ethnicity was scored as Dutch (1), other-western (2) or non-western (3). In analysis, Dutch was the comparison category. Net household income per month was scored < 1600 (low, 0), 1600-4000 (medium, 1), or > 4000 (high, 2). Maternal education level was scored as low (no education, high school, 0), medium (lower vocational education, MBO, 1), or high (higher vocational education, HBO, university, 2). For these two variables, low was the comparison category in analysis. Regarding BMI as a covariate, participants' BMI at age 9 was standardized by age and gender for effect-size comparison purposes to use in the current analysis.

Emotional and behavioral problems were measured using the Child Behavior Checklist (CBCL), a widely used parent-report measure of multiple issues, including anxiety, attention deficit/hyperactivity, and affective problems (Achenbach, 1991). The CBCL scales have been shown to have a strong reliability, as well as convergent and discriminative validity (Nakamura et al., 2008). In this case, the main caregiver of the participant reported on the CBCL, and scores for the internalizing and externalizing subscales have been calculated.

Procedure

Participants of the Generation R study were expected to visit the research center at multiple timepoints in their life. Relevant timepoints for this study were the mid-childhood visit (6-11 years old) and the adolescence visit (12-16 years old). Questionnaires were sent to the participants' homes, where they were able to fill them out in their own time and send them back to the research center, or they could fill out the questionnaires during their visit to the research center. BMI and CBCL scores from the mid-childhood visit were used as covariates. Data from the adolescence visit and questionnaires was used for social media use and the disordered eating behaviors. Data on gender, sex, ethnicity, maternal education level and net household income per month were retrieved from earlier collected general information.

Statistical Analysis

To analyze the collected data, IBM SPSS version 25 (IBM SPSS Statistics for Windows, Version 25.0) was used. Linear regression analyses were executed to research the associations between social media use and both uncontrolled eating and compensatory behaviors. Associations between social media use and subclinical binge eating and emotional eating were analyzed using logistical regression analyses. Before analysis, all necessary assumptions were checked. Firstly, the sample was checked for outliers and impossible values. Outliers were checked by considering them to be values that lie beyond the -3 and 3 range of standardized residuals.

For all analyses, the assumption of linearity was checked by creating a Q-Q plot. Then, the assumption of normality was checked by creating a boxplot. The assumption of independent errors was checked using the Durbin Watson test, which should have a value between -2 and 2 for the assumption to be met. For the linear regression analyses, more assumptions needed to be met before analysis could start. The assumption of

homoscedasticity was checked by creating a scatterplot of residual and predicted values. Lastly, the assumption of multicollinearity was checked by reviewing the Pearson correlations and ensuring no correlations higher than .80 were found between variables.

While checking if all assumptions were met, it was noticed that for uncontrolled eating the assumption of normality was not met, because this variable was skewed to the right. This resulted in having to execute a square root transformation to use the data in analysis. After this transformation, the standardized values of the variable were saved, and this was the final variable used in analysis. The emotional eating variable was skewed to the right as well, which resulted in having to transform the scores. The score 0 corresponded with the lowest 20% of the scores, and a score of 1 corresponded with the highest 80% of the scores, resulting in the final variable. Lastly, there were multiple covariates with missing values, which resulted in having to execute a multiple imputation analysis. Five multiple imputation sets were created and added to the original data, which resulted in having the ability to analyze the data by using 'pooled results', which made up for the missing scores.

To start data analysis, sample characteristics were analyzed, including percentages for categorical variables and means and standard deviations for continuous variables. The sample characteristics were determined before the execution of multiple imputation, and were thus based on the original data. Pearson correlations were calculated to examine preliminary associations between continuous variables. A one-way between subjects ANOVA was conducted to compare the preliminary effect of social media use on the categorical variable subclinical binge eating symptoms.

A linear regression analysis was executed to examine the association between social media use and compensatory behaviors, and between social media use and uncontrolled eating as well. A simple logistic regression analysis was executed to examine the association between social media use and emotional eating. The association between social media and

subclinical binge eating symptoms was researched using a multinomial logistic regression analysis. In the analyses for compensatory behaviors, uncontrolled eating and emotional eating, two models were created. The first model included the main association and the covariates gender and age. The second model additionally added all other covariates and the interaction variable. This was done to examine the main association on its own, and see the possible influences of the covariates and moderating influence of gender in the second model.

The analysis for binge eating symptoms is the only one in which no covariates besides age and gender were included in the analysis. A very small portion of participants displayed a high score on this variable, which led to invalid degrees of freedom when including Model 2 into the multinomial regression analysis. The category ‘no symptoms’ was elected as the reference category which the other categories will be compared to in analysis, because a majority of the sample received this score.

Results

Descriptive Statistics

Before analyzing the data, descriptive statistics were examined for all variables (Table 1). 65.9% of participants had a Dutch ethnicity (*N* = 1130), 25.1% had a non-western ethnicity (*N* = 431), and 9.0% had an other-western ethnicity (*N* = 155). 68.3% of the participants' mothers had a high educational level (*N* = 1085). 24.4.% had a medium educational level (*N* = 387) and 7.4% had a low educational level (*N* = 117). Lastly, 47.1% had a medium household income per month (*N* = 721). 42.5% had a high household income per month (*N* = 650) and 10.5% had a low household income per month (*N* = 160).

The second part of Table 1 regarding the continuous variables shows a mean score of 2.20 for social media use. Table 2 shows a more detailed distribution of the number of social media apps the participants reported using. Most participants used either 2 or 3 apps, with only a small percentage (3.4%) using either 5 or 6 apps. When comparing the distribution by gender, girls on average used 2.6 social media apps, while boys used 1.6 social media apps on average.

Table 1

Descriptive Sample Characteristics Based on Original Data

Categorical Variable	*N*	%
Gender	*1729*	
Boy	824	47.7
Girl	905	52.3%
Ethnicity Child	1716	
Dutch	1130	65.9
Non-Western	431	25.1
Other-Western	155	9.0
Maternal Education Level	1589	
High	1085	68.3
Medium	387	24.4
Low	117	7.4
Household Income	1531	
High	650	42.5
Medium	721	47.1
Low	160	10.5
Binge Eating Symptoms in the Past 3 Months	1729	
No Symptoms	1491	86.2
Overeating Only	53	3.1
Loss of Control Only	141	8.2
Binge Eating	44	2.5

Continuous variable	*N*	Minimum	Maximum	Mean	Std. Deviation
Age	1729	12.61	16.70	13.81	.518
Emotional Eating	1729	3.00	12.00	3.62	1.339
Uncontrolled Eating (Z-score)	1729	-1.496	4.141	.002	1.000
BED Symptoms past 3 months	1729	.00	3.00	.27	.716
Compensatory Behaviors	1729	8.00	27.00	10.42	3.364
Social Media	1729	.00	6.00	2.20	1.202
CBCL Internalizing score	1481	.00	37.00	4.59	4.776
CBCL Externalizing score	1482	.00	38.00	3.56	4.393
BMI Standardized score	1565	-3.71	3.26	.13	.985

Table 2

Frequency Table Social Media Apps

Social Media Apps	Frequency	Valid Percent
0	162	9.4%
1	277	16.0%
2	628	36.3%
3	442	25.6%
4	166	9.6%
5	47	2.7%
6	7	.4%
Total	1729	100.0%

Table 3

Preliminary Pearson Correlations for Continuous Variables

	Mean	Std. Deviation	Social Media	Emotional Eating	Uncontrolled Eating	Compensatory Behaviors
Social Media	2.20	1.202	1	.155**	.093**	.142**
Emotional Eating	3.62	1.339	.155**	1	.351**	.229**
Uncontrolled Eating	.002	1.000	.093**	.351**	1	.182**
Compensatory Behaviors	10.42	3.364	.142**	.229**	.182**	1

**= $p < .01$ (2-tailed)

Table 4

Preliminary One-way ANOVA Results Between Social Media and Binge Eating Symptoms

	Mean	Std. Deviation	Df	F	Sig.
Binge Eating	.270	.716			
Between Groups			6	2.85	.009
Within Groups			1722		
Total			1728		

To examine all preliminary correlations between the continuous variables, Pearson correlations were calculated (Table 3). Social media use had the strongest correlation with emotional eating ($r = .155$), followed by compensatory behaviors ($r = .142$). Results of the one-way ANOVA between social media use and subclinical binge eating symptoms (Table 4)

showed a significant preliminary effect ($F(6, 1722) = 2.85$, $p = .009$). These preliminary results indicate that adolescents in the different binge eating categories show significant differences in social media use.

Assumptions

All the necessary assumptions have been checked to ensure the validity of data analysis. Firstly, the sample was checked for outliers and impossible values. Some outliers were found, but were decided not to be outliers of influence and were not removed from the data. Because this sample mainly consists of 'average' adolescents, a large part of the sample displays low scores, leading to some higher scores to be seen as outliers, which they are not. In short, no outliers were detected. Additionally, no impossible values were found.

For all analyses, the assumption of linearity was checked. There was no perfect linearity found, given the nature of the sample, but there were no notable divergent shapes in the linearity, so overall this assumption was met. The assumption of normality was checked for all variables as well, and was overall met, except for uncontrolled eating and emotional eating. After transformation of these variables, the assumption of normality was met.

The assumption of independent errors was checked for all variables, and was overall met. Some small dependence was found, but this could be attributed to the overall skewed distribution of the sample due to its nature of 'average' adolescents. For the linear regression analyses with compensatory behaviors and uncontrolled eating, the assumption of homoscedasticity was checked and no divergent shapes were found, so this assumption was met. Lastly, the assumption of multicollinearity was checked for these linear regression analyses and this assumption was met, given that no correlations above .80 were found between variables.

Compensatory Behaviors

A linear regression analysis has been executed to examine the relationship between social media and compensatory behaviors (Table 5). An increase in social media apps was significantly associated with an increase in compensatory behaviors, when correcting for age and gender (p = .001, B = .234, 95% CI = [.091, .377]). Both age and gender were significantly related to compensatory behaviors as well (respectively, p < .001, B = .803, 95% CI = [.504, 1.103]; p < .001, B = .863, 95% CI = [.518, 1.208]) (Model 1).

When covariates were added into the analysis (Model 2), the association between social media use and compensatory behaviors remained significant (p = .003, B = .203, 95% CI = [.068, .339]). Age and gender remained significant as well (respectively p < .001, B = .546, 95% CI = [.255, .836]; p < .001, B = .971, 95% CI = [.646, 1.296]). The second model included the interaction variable between gender and apps, but this did not result in a significant association, so gender was not a moderator for the association between social media use and compensatory behaviors and was removed from the second model (p = .094). Regarding the covariates, BMI was a significant positive covariate, and also having a non-western ethnicity compared to a Dutch ethnicity was a significant positive covariate in the model.

Table 5

Linear Regression Analysis Between Social Media Use and Compensatory Behaviors

Model		B	Std. Error	*T*	95% CI	Sig.
1*	(Constant)	-2.496				
	Social Media	.234	.073	3.202	[.091, .377]	.001
	Gender	.863	.176	4.908	[.518, 1.208]	.000
	Age	.803	.153	5.260	[.504, 1.103]	.000
2**	(Constant)	-.113				
	Social Media	.203	.069	2.943	[.068, .339]	.003
	Gender	.971	.166	5.850	[.646, 1.296]	.000
	Age	.546	.148	3.688	[.255, .836]	.000
	CBCL Internal	.036	.021	1.711	[-.006, .077]	.093
	CBCL External	.022	.021	1.094	[-.018, .063]	.275
	BMI	1.074	.083	12.910	[.910, 1.237]	.000
	Ethnicity Other-Western	.539	.269	2.004	[.012, 1.066]	.045
	Ethnicity Non-Western	.799	.202	3.960	[.403, 1.194]	.000
	Education Medium	.710	.348	2.039	[.021, 1.400]	.044
	Education High	.736	.362	2.035	[.014, 1.459]	.046
	Income Medium	-.259	.394	-.658	[-1.104, .585]	.521
	Income High	-.236	.396	-.596	[-1.058, .585]	.557

*R^2 = .048

**R^2 = .172

Uncontrolled Eating

To examine the relationship between social media use and uncontrolled eating, a linear regression analysis was executed (Table 6). After controlling for age and gender, there was a significant positive association between social media use and uncontrolled eating (p = .020, B = .051, 95% CI = [.008, .095]). Both age and gender were significantly related to uncontrolled eating as well (respectively, p < .001, B = .163, 95% CI = [.073, .254]; p = .011, B = .135, 95% CI = [.031, .239]) (Model 1).

When adding the covariates into the analysis (Model 2), the association between social media use and uncontrolled eating remained significant (p = .011, B = .056, 95% CI = [.013, .099]). Gender and age remained significant as well (respectively, p = .009, B = .140, 95% CI = [.035, .245]; p = .001, B = .149, 95% CI = [.058, .241]). The interaction variable between gender and social media use was included in the analysis, but did not result in a significant effect (p = .392). Girls and boys did not show different associations between social media use and uncontrolled eating. Regarding covariates, the internalizing subscale of the CBCL and BMI were significant covariates in the association between social media use and uncontrolled eating (respectively p = .007, B = .017, 95% CI = [.005, .030]; p = .001, B = .082, 95% CI = [.032, .132]).

Table 6

Linear Regression Analysis Between Uncontrolled Eating and Social Media Use

Model		B	Std. Error	*T*	95% CI	Sig.
1*	(Constant)	-2.572				
	Social Media	.051	.022	2.336	[.008, .095]	.020
	Gender	.135	.053	2.536	[.031, .239]	.011
	Age	.163	.046	3.546	[.073, .254]	.000
2**	(Constant)	-2.599				
	Social Media	.056	.022	2.531	[.013, .099]	.011
	Gender	.140	.053	2.624	[.035, .245]	.009
	Age	.149	.047	3.203	[.058, .241]	.001
	CBCL Internal	.017	.006	2.728	[.005, .030]	.007
	CBCL External	.008	.007	1.090	[-.006, .022]	.279
	BMI	.082	.026	3.207	[.032, .132]	.001
	Ethnicity Other-Western	.046	.085	.546	[-.120, .212]	.585
	Ethnicity Non-Western	-.004	.065	-.058	[-.132, .124]	.954
	Education Medium	.099	.104	.949	[-.106, .304]	.343
	Education High	.236	.109	2.161	[.020, .453]	.032
	Income Medium	-.072	.093	-.766	[-.256, .113]	.445
	Income High	-.164	.097	-1.689	[-.354, .026]	.091

*R^2 = .019

**R^2 = .042

Emotional Eating

To examine the relationship between social media use and emotional eating, a logistic regression analysis was executed (Table 7). When controlling for age and gender, an increase in social media use was significantly associated with an increase in emotional eating (p = .013, OR = 1.138, 95% CI = [1.027, 1.261]). Age and gender were significantly related to emotional eating as well (respectively $p < .001$, OR = 1.456, 95% CI = [1.188, 1.784]; $p <$ .001, OR = 2.781, 95% CI = [2.154, 3.591]) (Model 1).

When including the covariates in the analysis (Model 2), the significant association between social media use and emotional eating remained (p = .017, OR = 1.135, 95% CI = [1.023, 1.259]). Gender and age both remained significant as well (respectively $p < .001$, OR = 2.938, 95% CI = [2.258, 3.823]; p = .001, OR = 1.453, 95% CI = [1.177, 1.793]). The interaction variable between gender and apps was included, but generated no significant influence (p = .408, OR = .913) and was removed. No gender differences were found in the association between social media use and emotional eating. Furthermore, the internalizing subscale of the CBCL was a significant covariate in the association between social media use and emotional eating (p = .001, OR = 1.047, 95% CI = [1.019, 1.076]).

Table 7

Simple Logistic Regression Analysis Between Emotional Eating and Social Media Use

Model		OR	Sig.	95% CI
1*	Social Media	1.138	.013	[1.027, 1.261]
	Gender	2.781	.000	[2.154, 3.591]
	Age	1.456	.000	[1.188, 1.784]
2**	Social Media	1.135	.017	[1.023, 1.259]
	Gender	2.938	.000	[2.258, 3.823]
	Age	1.453	.001	[1.177, 1.793]
	CBCL Internal	1.047	.001	[1.019, 1.076]
	CBCL External	1.005	.776	[.972, 1.039]
	BMI	1.271	.000	[1.122, 1.440]
	Ethnicity Other-Western	1,249	.161	[.915, 1.705]
	Ethnicity Non-Western	1.360	.179	[.869, 2.131]
	Education Medium	.546	.031	[.315, .947]
	Education High	.899	.508	[.655, 1.234]
	Income Medium	1.381	.188	[.853, 2.235]
	Income High	1.008	.956	[.764, 1.330]

*R^2 = .097

**R^2 = .130

Subclinical Binge Eating Symptoms

To examine the association between social media use and subclinical binge eating symptoms, a multinomial logistic regression analysis was executed (Table 8). When comparing ‘overeating only’ with ‘no symptoms’ no significant association was found (p = .977, OR = .996, 95% CI = [.774, 1.283]). When comparing ‘loss of control only’ with ‘no symptoms’, again no significant association was found (p = .114, OR = 1.136, 95% CI = [.970, 1.331]). For both the categories ‘overeating’ and ‘loss of control’ no significant influence of the interaction variable between gender and social media was found (respectively p = .575, OR = 1.164; p = .230, OR = 1.217).

In the comparison between ‘no symptoms’ and ‘binge eating’, the interaction variable between gender and social media use was a significant moderator in the association between social media use and binge eating (p = .004, OR = 2.679). When comparing ‘no symptoms’ and ‘binge eating’ without this interaction variable, no significant effect was found (p = .232, OR = 1.181, CI = [.899, 1.552]), so the association only existed through the moderating influence of gender.

Because gender is a significant moderator in the association between social media use and binge eating, the analysis for this category was executed again, but stratified by gender, to examine the different associations for boys and girls (Table 9). For boys, the association between social media use and binge eating was not significant (p = .067, OR = .579, 95% CI = [.323, 1.038]). For girls however, a positive significant association was found, indicating that girls who use one more social media app have 1.553 greater odds of experiencing subclinical binge eating symptoms (p = .009, OR = 1.553, 95% CI = [1.114, 2.111]).

Table 8

Multinomial Regression Analysis Between Subclinical Binge Eating Symptoms and Social Media Use, Reference Category 'No Symptoms'

Value*		OR	Sig.	95% CI
Overeating Only	Social Media	.996	.977	[.774, 1.283]
	Gender = Boy	.580	.088	[.311, 1.084]
	Gender = Girl	-	-	-
	Age	1.521	.063	[.977, 2.367]
Loss of Control Only	Social Media	1.136	.114	[.970, 1.331]
	Gender = Boy	.992	.968	[.676, 1.456]
	Gender = Girl	-	-	-
	Age	.958	.807	[.681, 1.349]
Binge Eating**	Social Media	1.181	.232	[.899, 1.552]
	Gender = Boy	.462	.037	[.224, .995]
	Gender = Girl	-	-	-
	Age	1.408	.176	[.857, 2.313]

*R = .018

**Analysis without interaction variable

Table 9

Multinomial Regression Analysis Stratified by Gender

Value	Gender		OR	Sig.	95% CI
Binge Eating	Boy	Social Media	.579	.067	[.323, 1.038]
		Age	1,154	.802	[.375, 3.553]
		Gender	-	-	-
	Girl	Social Media	1.553	.009	[1.114, 2.111]
		Age	1.581	.108	[.904, 2.762]
		Gender	-	-	-

Discussion

The aim of this study was to investigate the associations between social media use and the development of subclinical disordered eating behaviors among adolescents. Specifically, the focus was on emotional eating, uncontrolled eating, subclinical binge eating symptoms and compensatory behaviors. Two research questions were formulated: 1) Is social media use associated with disordered eating behaviors in adolescence, and 2) Does the association between social media use and disordered eating behaviors differ for boys and girls?

Principal Findings

Regarding the first research question, the hypothesis is confirmed. Results show that increased social media use is associated with increased scores for all subclinical disordered eating behaviors, even though for binge eating the association only exists through the moderating influence of gender. An increase in social media use was shown to lead to an increased score for compensatory behaviors. Increased use of social media was shown to lead to an increase in scores for uncontrolled eating. This same association was found for increased social media use and an increase in emotional eating scores. In short, participants who used more social media apps were more likely to have higher scores for uncontrolled eating, emotional eating and reported more compensatory behaviors.

Regarding the second research question, subclinical binge eating symptoms becomes a variable of interest. The interaction variable for gender and social media use emerged as significant in the association between binge eating and social media use. Results showed that while there was no gender difference for loss of control or overeating only, for girls, an increase in social media use led to an increase in binge eating, while for boys this was not observed. The associations between emotional eating, uncontrolled eating and compensatory behaviors did not show gender differences.

Previous Research

These patterns of results are overall consistent with the previous literature. As discussed before, social media use has been associated with different disordered eating behaviors and related dysfunctional cognitions and beliefs (Sidani et al., 2016; Schmuck et al., 2019; Fardouly et al., 2015; Aparicio-Martinez et al., 2019). Firstly, our findings regarding subclinical binge eating are in line with previous research. A study by Lonergan et al. (2020) which included similarly aged adolescents, showed a positive association between social media use and binge eating symptoms, and described an investment in others' 'selfies' to be associated with higher odds of meeting these criteria.

One finding that did not find confirmation in previous research is the gender difference that was found. Boys and girls were hypothesized to show different associations between social media use and compensatory behaviors, because these are a characteristic of BN, for which women have a higher prevalence than men (GGZ Standaarden, 2020). This was not the case, given that gender was not a significant moderator in this association. However, gender was a significant moderator in the association between social media use and binge eating, for which men and women have a similar prevalence (GGZ Standaarden, 2020).

It has been stated that girls are more likely to have poorer self-esteem about their appearance and a worse perception of their weight, and that boys use social media more to expand their social network than to compare themselves to others (Padín et al., 2021). However, this does not explain why gender was only a moderating factor for subclinical binge eating and not for the other disordered eating behaviors. The current study also did not include specific thought patterns or self-esteem beliefs, which makes it hard to confirm that these might be the cause for this difference.

The current study found an increase in social media use to be associated with an increase in scores for emotional eating. Previous research has shown emotional eating to be an

important factor in the association between social media use and other disordered eating behaviors, while this study included emotional eating as a separate disordered eating behavior. A study by Sanchez-Ruiz et al. (2017) for example, found emotional eating to be a mediator in the association between media pressure and the development of eating disorders in university students. Emotional eating has thus been proven to be a mediator in these associations for university students, but according to the current study, a direct association between social media use and emotional eating exists as well, at least in adolescents.

Furthermore, A recent study investigated social media use during Covid-19 lockdowns, and found that heavy social media exposure could lead to emotional overeating (Gao et al., 2021). This is a unique and stressful situation, and anxiety does play a moderating role, but this association reflects the fact that an increase in social media use can lead to emotional eating. Thus, the current results are in some agreeance with previous research about an existing association between social media use and emotional eating. However, it seems interesting to direct future research to the question of the specific role of emotional eating.

Not much research has been done on the association between social media use and uncontrolled eating on its own, instead of as a symptom of BED. A study by Coulthard et al. (2021) did not investigate social media specifically, but looked at associations between heightened emotions and uncontrolled eating in adults. This study found uncontrolled eating to be part of a wider set of maladaptive coping mechanisms, which can worsen in times of emotional distress (Coulthard et al., 2021). We might extrapolate this finding to assume that the negative emotions social media can cause (Allen et al., 2014; Keles et al., 2020) could result in uncontrolled eating being triggered as a coping mechanism. However, since this study included adults instead of adolescents, and there is no direct research supporting this concept, it is only an assumption that this applies to the current study.

Previous research has shown social media use to lead to an increase in compensatory behaviors. For example, a study by Saunders and Eaton (2018) found positive associations between use of Snapchat, Instagram and Facebook and body dissatisfaction, purging and dietary restraint in women aged 18-24 years old. Significant associations were also found for excessive exercise, which were strongest for Facebook and Instagram specifically. This might be explained by the exercise status updates or fitness-focused pictures that are posted more on Facebook and Instagram than other social media platforms (Saunders & Eaton, 2018).

Current results are in accordance with this previous research, since similar associations have been found between increased social media use and compensatory behaviors, and the results extend to include boys and the younger age group of adolescents as well. In this study, compensatory behaviors were not investigated separately, so the specific association between each compensatory behavior and social media use remains unclear. However, the results show that in general, social media use is associated with an increase in compensatory behaviors.

Explanations of the Findings

Previous research often showed an association between social media use and disordered eating behaviors to be explained, at least partially, by negative affect (Schmuck et al., 2019). The presence of negative affect may lead to a different approach to social media or may lead to different consequences of social media use (Zhao & Zhou, 2020). People already experiencing negative affect may be more likely to apply upward social comparison, because they perceive themselves as worse than others in that moment due to these negative feelings (Saunders & Eaton, 2018). As has been mentioned, upward social comparison can increase the negative consequences social media use can have by leading to worse self-esteem and more feelings of jealousy and envy, which could lead to unhealthy eating behaviors (Saunders & Eaton, 2018).

However, contradictory to these earlier findings, the results of this study show the association between social media use and disordered eating behaviors to remain significant after adding CBCL internal scores as a covariate. This means that even when controlling for internalizing issues, such as negative affect, the association between social media use and disordered eating behaviors remains significant and other underlying mechanisms might play a larger role. This is an interesting finding, given that we may need to look at further possible explanations for this association, instead of the often-named negative affect.

Different theories aim to explain the associations often found between social media use and its consequences for self-esteem, body dissatisfaction and following disordered eating behaviors. The sociocultural theory of body image suggests that the media communicates information about what body shapes and sizes are ideal (Morrison et al., 2004). This theory suggests that when individuals compare their perceived appearance with an idealized person, anxiety over their personal body image occurs (Hsien-Jin, 2000). This anxiety can be seen as negative affect, which has been proven to be associated with disordered eating behavior (Cruz-Sáez et al., 2020). This theory then posits further proof for the role negative affect can play in this relationship. This association can be seen in this study as well, where CBCL internal scores are associated with disordered eating scores, even though this does not seem to be the full underlying mechanism, given the remaining significant main association.

Another theory, the Social Cognitive Theory of Mass Communication (SCTMC), provides a conceptual framework for understanding how exposure to media can impact personal development (Bandura, 2001). This theory suggests that human interaction with media is an active process and a source of observational learning. Communications systems are said to operate through two pathways. In the direct pathway, they promote changes by informing, motivating and guiding participants. In the socially mediated pathway, media

influences link participants to social networks that provide natural incentives and personalized guidance for desired change (Bandura, 2001).

This theory suggests that these thin-ideals continuously seen on social media can influence the direct communications pathway to become a motivating and guiding factor in people's behavior, possibly leading to the unhealthy eating behaviors seen in this study. Social media users are comparing their real-life selves to the idealized online versions of others, and this mismatch can lead to an increase in body dissatisfaction and following disordered eating behaviors (Schmuck et al., 2019). This can be seen in the current study as well, given that an increased number of social media apps might mean increased time spent on observational learning and internalization of these ideals. This might lead to an increase in the motivating and guiding role these thin-ideals play in both behavior and attitudes, and lead to disordered eating behaviors.

The cultivation theory posits that increased media exposure causes people to believe that these ideal bodies portrayed in the media exist regularly in the real world, and people are likely to forget that these pictures are often unrealistic or not even real (Saunders & Eaton, 2018). The theory suggests that people who are regularly exposed to social media are more likely to perceive the world's realities as they are presented by the media they consume, which affects their attitudes and behaviors. If people do not realize these bodies are either photoshopped or very hard to attain, they might turn to unhealthy eating behaviors when eating healthier and working out does not result in their ideals being achieved. This can be seen in this study as well, as participants who use more social media apps show increased disordered eating scores, so their behavior might be altered by this increased time they spend on social media.

Sociocultural pressures and the internalization of the thin-ideal through social media have consistently emerged as robust predictors of disordered eating outcomes in women

(Crowther & Ciesla, 2011; Saunders & Eaton, 2018), and the same may apply for younger girls and boys in cases of emotional eating, uncontrolled eating and compensatory behaviors according to the results of the current study. These pressures increase social-cognitive processes focused on appearance, such as body-related comparisons and an attention bias toward thinness which can result in disordered eating behaviors (Saunders & Eaton, 2018). During the vulnerable period of adolescence, subclinical disordered eating behaviors can be normalized and even glamorized (Syed-Abdul et al., 2013). Because of this, adolescents often do not even realize their behavior is unhealthy or abnormal, because their friends or online idols may be behaving similarly (Syed-Abdul et al., 2013). Since they themselves do not see a problem with their behavior, a large number of adolescents do not seek help in time (Bunnell et al., 1990).

Considering these existing theories regarding social media and disordered eating behaviors, it seems plausible that the thin-ideal shown in social media could emotionally motivate adolescents to alter their food intake or take compensatory measures to attain this ideal body (Crowther & Ciesla, 2011). Restriction of food can eventually lead to overeating and binge eating episodes because of hunger, which then triggers purging and compensatory behaviors to counteract this food intake (Crowther & Ciesla, 2011). Compensatory behaviors often go hand in hand with negative affect and internalizing issues (Allen et al., 2014; Keles et al., 2020), which can result in displays of emotional eating. It seems to be a vicious cycle that can be extremely difficult to escape once you are trapped inside it.

Strengths and Limitations

A first strength of this study is the generalizability and representativeness of the sample. This sample contains adolescents from different ethnic backgrounds, different maternal education levels, and with different household incomes. The sample is very large as

well, increasing the representativeness to the larger population. In addition, this study includes both boys and girls. This is not something that is done often in the research field of disordered eating and increases the generalizability of the results.

Another strength of this study is the inclusion of disordered eating behaviors other than restrictive eating, which is a characteristic of Anorexia Nervosa (AN). Associations between social media use and following restrictive eating have been examined often, and less attention has been paid to other disordered eating behaviors, characterizing different eating disorders, as done in this study. By doing this, it has been proven that social media does not only have a damaging effect on dietary restraint, but also on other disordered eating behaviors characterizing BN and BED.

Although the sample has multiple strong points, it is important to recognize several limitations to this study. Firstly, the sample consists of adolescents living in Rotterdam, a very urban area. Growing up and living in an area like this can come with its own risk factors and characteristics that might increase the risk for developing these disordered eating behaviors, such as increased social stress and social pressure (Lederbogen et al., 2011) These results might therefore be generalizable to other urban areas like Rotterdam, but might not be representable for more rural areas where these factors are not as prevalent.

A second limitation concerns the methods of this study, namely the use of self-reports for the measurement of disordered eating behaviors. It might be assumed that participants give truthful answers, but a social desirability bias may be present. A study by Tilgner et al. (2004) for example, found social desirability scores to be significantly correlated with body dissatisfaction, drive for thinness, bulimic tendencies, and intention to diet for girls. This indicates that girls who experience these issues are more like to give socially desirable answers, which might thus be the case for this study. This is a problem that exists naturally within self-reports, but is important to keep in mind when interpreting the scores, seeing as

they might even be higher than the participants reported. A way this bias might be prevented in future research is by trying to measure these disordered eating behaviors by having personal contact with the participant, for example through a personal interview. This way, the participant might feel more comfortable telling a real person about their issues, and might also feel less comfortable lying.

Another limitation concerns the measurement of social media use. In this study, social media use was represented by the number of social media apps participants used. The measurement used in the current study has no proven empirical validity, but previous studies have shown the number of social media platforms used to be a good predictor of social media use and its consequences. For instance, significant positive associations have been found between the number of social media platforms used and the development of anxiety and mood disorders in young adults (Primack et al., 2017). However, the specific frequency or duration of social media use were not included in the study, while this might be argued to be more representative of actual social media use. For future research, using frequency and/or duration of social media use might be more representative of actual social media use.

A last limitation concerns the cross-sectional design of the study. A primary limitation of this type of design is that the temporal link between the dependent and independent variables cannot be determined because both are examined at the same time (Solem, 2015). No direct causal associations can be made from this type of design, only correlational. It is impossible to determine whether the increased use of social media is the direct causal factor for the found increases in disordered eating behaviors, following this study design. The only thing that can be determined from a cross-sectional design is that an association exists between increased social media use and the disordered eating scores researched in this study.

Implications and Directions for Future Research

The results of this study have important implications for prevention purposes. The finding that many adolescents show at least subclinical disordered eating behaviors is very concerning, and early recognition and prevention should be improved. The results could even be turned around, implicating that a decrease in social media use might lead to a decrease in the risk for developing disordered eating behaviors. It has been made clear that adolescents can be affected by social media in such a negative way that they turn to unhealthy eating behaviors, with possible health risks as a consequence. It is important that adolescents as well as their parents gain a greater awareness about the impact social media use can have on both their mental and physical health. A possible way to increase this awareness could be through educational talks at schools about the multitude of negative effects social media has, including these disordered eating behaviors, how to use social media in a more responsible and safe way, and how to ask for help when experiencing these dysfunctional thoughts about eating.

However, the research field of disordered eating is far from complete. For instance, more research is needed to explore why for subclinical binge eating specifically the results show a gender difference in its association with social media use, while this is not the case for the other eating behaviors. It also might be interesting to direct future research to the question of the specific association between social media use and emotional eating. Is emotional eating more a mediating variable between social media use and other eating behaviors, or should it be researched as its own association, because evidence exists for both. It would also be interesting to examine the specific social media platforms used by participants, to see if different associations can be found for different types of social media, such as text-based of photo-based platforms.

A last interesting direction for future research is the moderating role of negative affect and other possible explanatory mechanisms. This study did find negative affect to be

associated with disordered eating behaviors, but not to be the most important underlying mechanism in the association. There is a need to look at further possible explanations for the association between social media use and disordered eating behaviors, instead of the often-named negative affect, since this does not seem to be sufficient.

All in all, the results indicate that increased social media use is associated with an increase in emotional eating, uncontrolled eating, compensatory behaviors, and an increase in subclinical binge eating for girls as well. The results extend earlier research by proving these associations to exist not only for women, but for the adolescent age group and boys specifically as well. Another important addition to the field is the finding that social media use not only has an effect on restrictive eating, a characteristic of AN, but on eating behaviors more characteristic of other eating disorders such as BED and BN as well. This is an important finding with implications for both mental and physical health care services. These results have important implications for prevention purposes as well, because when awareness about the negative consequences of social media is increased, and subclinical disordered eating behaviors are recognized early and awareness about the dangers is greater, the path to recovery will be easier. With increased awareness about the dangers of heavy social media use and earlier recognition of disordered eating behaviors in adolescents, the hope is that many harmful consequences will be prevented.

References

Achenbach, T. M. (1991). *Manual for Child Behavior Checklist 4-18, 1991 Profile.* Department of Psychiatry, University of Vermont.

Adriaanse, M. A., de Ridder, D. T. D., & Evers, C. (2010). Emotional Eating: Eating When Emotional of Emotional About Eating? *Psychology & Health, 26*(1), 23-39. https://doi.org/10.1080/08870440903207627

Aebi, M., Kuhn, C., Metzke, C. W., Stringaris, A., Goodman, R., & Steinhausen, H. (2012). The Use of the Development And Well-Being Assessment (DAWBA) in Clinical Practice: A Randomized Trial. *European Child & Adolescent Psychiatry, 21*(10), 559-567. https://doi.org/10.1007/s00787-012-0293-6

Allen, K. A., Ryan, T., Gray, D. L., McInerney, D. M., & Waters, L. (2014). Social Media Use and Social Connectedness in Adolescents: The Positives and the Potential Pitfalls. *The Australian Educational and Developmental Psychologist, 31*(1), 18-31. https://doi.org/10.1017/edp.2014.2

American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Mental Disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Anglé, S., Engblom, J., Eriksson, T., Kautiainen, S., Saha, M., Lindfors, P. Lehtinen, M., & Rimpelä, A. (2009). Three Factor Eating Questionnaire-R18 as a Measure of Cognitive Restraint, Uncontrolled Eating and Emotional Eating in a Sample of Young Finnish Females. *International Journal of Behavioral Nutrition and Physical Activity, 6*(1), 1-7. https://doi.org/10.1186/1479-5868-6-41

Aparicio-Martinez, P., Perea-Moreno, A., Martinez-Jimenez, M. P., Redel-Macías, M. D., Pagliari, C., & Vaquero-Abellan, M. (2019). Social Media, Thin-Ideal, Body Dissatisfaction and Disordered Eating Attitudes: An Exploratory Analysis. *International Journal of Environmental Research and Public Health, 16*(21), 1-16. https://doi.org/10.3390/ijerph16214177

Bandura, A. (2001) Social Cognitive Theory of Mass Communication. *Media Psychology, 3*(3), 265-299. https://doi.org/10.1207/S1532785XMEP0303_03

Bunnell, D. W., Shenker, I. R., Nussbaum, M. P., Jacobson, M. S., Cooper, P. (1990). Subclinical Versus Formal Eating Disorders: Differentiating Psychological Features. *International Journal of Eating Disorders, 9*(3), 357-362. https://doi.org/10.1002/1098-108X(199005)9:3<357::AID-EAT2260090313>3.0.CO;2-Z

Cappelleri, J. C., Bushmakin, A. G., Gerber, R. A., Leidy, N. K., Sexton, C. C., Lowe, M. R., & Karlsson, J. (2009). Psychometric Analysis of the Three-Factor Eating Questionnaire-R21: Results from a Large Diverse Sample of Obese and Non-Obese Participants. *International Journal of Obesity, 33*(6), 611-620. https://doi.org/10.1038/ijo.2009.74

Coulthard, H., Sharps, M., Cunliffe, L., & Van den Tol, A. (2021). Eating in the Lockdown During the Covid-19 Pandemic: Self-Reported Changes in Eating Behavior, and Associations with BMI, Eating Style, Coping and Health Anxiety. *Appetite, 161*. https://doi.org/10.1016/j.appet.2020.105082

Cruz-Sáez, S., Pascual, A., Wlodarczyk, A., & Echeburúa, E. (2020) The Effect of Body Dissatisfaction on Disordered Eating: The Mediating Role of Self-Esteem and Negative Affect in Male and Female Adolescents. *Journal of Health Psychology, 25*(8), 1098-1108. https:/doi.org/10.1177/1359105317748734

Duarte, P. A. S., Palmeira, L., & Pinto-Gouveia, J. (2018). The Three-Factor Eating Questionnaire-R21: A Confirmatory Factor Analysis in a Portuguese Sample. *Eating and Weight Disorders – Studies on Anorexia, Bulimia and Obesity*, *25*(1), 247-256. https://doi.org/10.1007/s40519-018-0561-7

Fardouly, J., Diedrichs, P. C., Vartanian, L. R., & Halliwell, E. (2015). Social Comparisons on Social Media: The Impact of Facebook on Young Women's Body Image Concerns and Mood. *Body Image*, *13*, 38-45. https://doi.org/10.1016/j.bodyim.2014.12.002

Festinger, L. (1954). A Theory of Social Comparison Processes. *Human Relations*, *7*(2), 117-140. https://doi.org/10.1177/001872675400700202

Gao, Y., Ao, H., Hu, X., Wang, X., Huang, D., Huang, W., Han, Y., Zhou, C., He, L., Lei, X., Gao, X. (2021). Social Media Exposure During COVID-19 Lockdowns Could Lead to Emotional Overeating via Anxiety: The Moderating Role of Neuroticism. *Applied Psychology: Health and Well-Being*, 1-17. https://doi.org/10.1111/aphw.12291

GGZ Standaarden (December 30, 2020). *Specifieke Omschrijving Eetstoornissen*. Retrieved February 13, 2021, from https://www.ggzstandaarden.nl/zorgstandaarden/eetstoornissen/specifieke-omschrijving-eetstoornissen

Goodman, R., Ford, T., Richards, H., Gatward, R., & Meltzer, H. (2000). The Development and Well-Being Assessment: Description and Initial Validation of an Integrated Assessment of Child and Adolescent Psychopathology. *Journal of Child Psychology and Psychiatry*, *41*(5), 645-655. https://doi.org/10.1111/j.1469-7610.2000.tb02345.x

Grogan, S. (2016). *Body Image: Understanding Body Dissatisfaction in Men, Women and Children* (3rd ed.). Routledge.

Holt, K., & Ricciardelli, L. A. (2002). Social Comparisons and Negative Affect as Indicators of Problem Eating and Muscle Preoccupation Among Children. *Journal of Applied Developmental Psychology, 23*(3), 285-304. https://doi.org/10.1016/s0193-3973(02)00108-9

Hsien-Jin, T. (2000). Sociocultural and Developmental Theories as Explanations of Body Image Dissatisfaction Amongst Secondary School Girls. *Malaysian Journal of Psychiatry, 8*(1), 15-21.

IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.

Jones, D. C. (2001). Social Comparison and Body Image: Attractiveness Comparisons to Models and peers Among Adolescent Girls and Boys. *Sex Roles, 45*(9/10), 645-664. https://doi.org/10.1023/a:1014815725852

Keles, B., McCrae, N., & Grealish, A. (2019). A Systematic Review: The Influence of Social Media on Depression, Anxiety and Psychological Distress in Adolescents. *International Journal of Adolescence and Youth, 25*(1), 79-93. https://doi.org/10.1080/02673843.2019.1590851

Keski-Rahkonen, A., & Mustelin, L. (2016). Epidemiology of Eating Disorders in Europe: Prevalence, Incidence, Comorbidity, Course, Consequences, and Risk Factors. *Current Opinion in Psychiatry, 29*(6), 340-345. https://doi.org/10.1097/yco.0000000000000278

Kooijman, M. N., Kruithof, C. J., van Duijn C. M., Duijts L., Franco, O. H., van IJzendoorn, M. H., de Jongste, J. C., Klaver C. C. W., van der Lugt, A., Mackenbach J. P., Moll, H. A., Peeters, R. P., Raat, H., Rings, E. H. H. M., Rivadeneira, F., van der Schroeff, M. P., Steegers, E. A. P., Tiemeier, H., Uitterlinden, … Jaddoe, V. W. V. (2017). The Generation R Study: Design and Cohort Update 2017. *European Journal of Epidemiology*, *31*, 1243-1264. https://doi.org/10.1007/s10654-016-0224-9

Lederbogen, F., Kirsch, P., Haddad, L., Streit, F., Tost, H., Schuch, P., Wüst, S., Preussner, J. C., Rietschel, M., Deuschle, M., & Meyer-Lindenberg, A. (2011). City Living and Urban Upbringing Affect Neural Social Stress Processing in Humans. *Nature, 474*(7352), 498-501. https://doi.org/10.1038/nature10190

Lonergan, A. R., Bussey, K., Fardouly, J., Griffiths, S., Murray, S. B., Hay, P., Mond, J., Trompeter, N., & Mitchison, D. (2020). Protect me from my Selfie: Examining the Association Between Photo-Based Social Media Behaviors and Self-Reported Eating Disorders in Adolescence. *International Journal of Eating Disorders, 53*(5), 755-766. https://doi.org/10.1002/eat.23256

Lydecker, J. A., Shea, M., & Grilo, C. M. (2017). Driven Exercise in the Absence of Binge Eating: Implications for Purging Disorder. *International Journal of Eating Disorders, 51*(2), 139-145. https://doi.org/10.1002/eat.22811

Morrison, T. G., Kalin, R., & Morrison, M. A. (2004) Body-Image Evaluation and Body-Image Among Adolescents: A Test of Sociocultural and Social Comparison Theories. *Adolescence, 39*(155). https://doi.org/10.1016/j.bodyim.2009.11.003

Nakamura, B. J., Ebesutani, C., Bernstein, A., & Chorpita, B. F. (2008). A Psychometric Analysis of the Child Behavior Checklist DSM-Oriented Scales. *Journal of Psychopathology and Behavioral Assessment, 31*(3), 178-189. https://doi.org/10.1007/s10862-008-9119-8

O'Reilly, M., Dogra, N., Whiteman, N., Hughes, J., Eruyar, S., & Reilly, P. (2018). Is Social Media Bad for Mental Health and Wellbeing? Exploring the Perspectives of Adolescents. *Clinical Child Psychology and Psychiatry, 23*(4), 601-613. https://doi.org/10.1177/1359104518775154

Padín, P. F., González-Rodríguez, R., Verde-Diego, C., & Vásquez-Pérez, R. (2021). Social Media and Eating Disorder Symptomatology: A Systematic Review. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 15*(3). https://doi.org/10.5817/CP2021-3-6

Pelletier, M. J., Krallman, A., Adams, F. G., & Hancock, T. (2020). One Size Doesn't Fit All: A Uses and Gratifications Analysis of Social Media Platforms. *Journal of Research in Interactive Marketing, 14*(2), 269-284. https://doi.org/10.1108/jrim-10-2019-0159

Primack, B. A., Shensa, A., Escobar-Viera, C. G., Barrett, E. L., Sidani, J. E., Colditz, J. B., & James, A. E. (2017). Use of Multiple Social Media Platforms and Symptoms of Depression and Anxiety: A Nationally-Representative Study Among U.S. Young Adults. *Computers in Human Behavior, 69*, 1-9. https://doi.org/10.1016/j.chb.2016.11.013

Rohde, P., Stice, E., & Marti, C. N. (2015). Development and Predictive Effects of Eating Disorder Risk Factors During Adolescence: Implications for Prevention Efforts. *International Journal of Eating Disorders, 48*(2), 187-198. https://doi.org/10.1002/eat.22270

Sanchez-Ruiz, M. J., El-Jor, C., Abi Kharma, J., Bassil, M., & Zeeni, N. (2017). Personality, Emotion-Related Variables, and Media Pressure Predict Eating Disorders via Disordered Eating in Lebanese University Students. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 24*(2), 313-322. https://doi.org/10.1007/s40519-017-0387-8

Saunders, J. F., & Eaton, A. A. (2018). Snaps, Selfies, and Shares: How Three Popular Social Media Platforms Contribute to the Sociocultural Model of Disordered Eating Among Young Women. *Cyberpsychology, Behavior, and Social Networking, 21*(6), 343-354. https://doi.org/10.1089/cyber.2017.0713

Schmuck, D., Karsay, K., Matthes, J., & Stevic, A. (2019). "Looking Up and Feeling Down". The Influence of Mobile Social Networking Site Use on Upward Social Comparison, Self-Esteem, and Well-Being of Adult Smartphone Users. *Telematics and Informatics, 42*, 1-12. https://doi.org.10.1016/j.tele.2019.201240

Sidani, J. E., Shensa, A., Hoffman, B., Hanmer, J., & Primack, B. A. (2016). The Association Between Social Media Use and Eating Concerns Among US Young Adults. *Journal of the Academy of Nutrition and Dietetics, 116*(9), 1465-1472. https://doi.org/10.1016/j.jand.2016.03.021

Solem, R. C. (2015). Limitation of a Cross-Sectional Study. *American Journal of Orthodontics and Dentofacial Orthopdics, 148*(2), 205). https://doi.org/10.1016/j.ajodo.2015.05.006

Stunkard, A. J., & Messick, S. (1985). The Three-Factor Eating Questionnaire to Measure Dietary Restraint, Disinhibition and Hunger. *Journal of Psychosomatic Research, 29*(1), 71-83. https://doi.org/10.1016/0022-3999(85)90010-8

Syed-Abdul, S., Fernandez-Luque, L., Jian, W., Li, Y., Crain, S., Hsu, M., Wang, Y., Khandregzen, D., Chuluunbaatar, E., Nguyen, P. A., & Liou, D. (2013). Misleading Health-Related Information Promoted Through Video-Based Social Media: Anorexia on Youtube. *Journal of Medical Internet Research, 15*(2), 1-13. https://doi.org/10.2196.jmir.2237

Tilgner, L., Wertheim, E. H., Paxton, S. J. (2004) Effect of Social Desirability on Adolescent Girl's Responses to an Eating Disorders Prevention Program. *International Journal of Eating Disorders, 35*(2) 211-216. https://doi.org/10.1002/eat.10239

Toma, C. L., & Hancock, J. T. (2010). Looks and Lies: The Role of Physical Attractiveness in Online Dating Self-Presentation and Deception. *Communication Research, 37*(3), 335-351. https://doi.org/10.1177/00936550209356437

Touchette, E., Henegar, A., Godart, N. T., Pryor, L., Falissard, B., Tremblay, R. E., & Côté, S. M. (2011). Subclinical Eating Disorders and Their Comorbidity with Mood and Anxiety Disorders in Adolescent Girls. *Psychiatry Research, 185*(1-2), 185-192. https://doi.org/10.1016/j.psychres.2010.04.005

Van der Aar, L. P. E., Peters, S., & Crone, E. A. (2018). The Development of Self-Vies Across Adolescence: Investigating Self-Descriptions with and Without Social Comparison Using a Novel Experimental Paradigm. *Cognitive Development, 48,* 256-270. https://doi.org/10.1016/j.cogdev.2018.10.001

Vogel, E. A., Rose, J. P., Roberts, L. R., & Eckles, K. (2014). Social Comparison, Social Media, and Self-Esteem. *Psychology of Popular Media Culture, 3*(4), 206-222. https://doi.org/10.1037/ppm0000047

Vossen, H. G. M., & Valkenburg, P. M. (2016). Do Social Media Foster or Curtail Adolescents' Empathy? A Longitudinal Study. *Computers in Human Behavior, 63,* 118-124. https://doi.org/10.1016/j.chb.2016.05.040

Wilksch, S. M., O'Shea, A., Ho, P., Byrne, S., & Wade, T. D. (2020). The Relationship Between Social Media Use and Disordered Eating in Young Adolescents. *International Journal of Eating Disorders, 53*(1), 96-106. https://doi.org/10.1002/eat.23198

Zhao, N. & Zhou, G. (2020) Social Media Use and Mental Health During the Covid-19 pandemic: Moderator Role of Disaster Stressor and Mediator Role of negative Affect. *Applied Psychology: Health and Well-Being*, *12*(4), 1019-1038. https://doi.org/10.1111/aphw.12226