Exploring the relationship between physical activity, gender, social media and orthorexia nervosa in university students

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Abstract

Objective. The present study aimed to explore associations between *physical activity* (PA), *social media*, *gender* and *orthorexia nervosa* (ON) in university students. ***Method.*** Two hundred thirty-two international students (M_{age}=21.52, *SD*=2.52; 193 female and 39 male) participated in this study, recruited through convenience sampling. Participants completed a cross-sectional online survey with emphasis on socio-demographic data, physical activity and social media. In addition, the *International Physical Activity Questionnaire Short-Form (IPAQ-SF), ORTO-15 questionnaire* and *Exercise Addiction Inventory (EAI)* were used to assess PA, ON- and *exercise addiction* (EA) tendencies. ***Results.*** The prevalence of ON was 69.4% (*N*=184) and 7.3% (*N*=17) for EA. PA was significantly associated with EA and ON tendencies. Further, there were gender differences in ON; males had higher ON tendencies than females. Moreover, social media content about PA was significantly associated with ON. ***Conclusion.*** PA and social media are critical factors regarding ON. This study shows that these factors are associated with ON-related symptoms in university students. Implications of ON as a mental health concern are further discussed.

Keywords: physical activity, gender, social media, orthorexia nervosa, exercise addiction

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Introduction

In modern societies, healthy nutrition not only became a behaviour but also established itself as a way of life. Many individuals strive for a healthy lifestyle since it has a crucial impact on well-being (Katz & Meller, 2014). An overall healthy lifestyle, characterised by non-smoking, being physically active and following a healthy diet, proved to reduce the total mortality risk of adults (Ford et al., 2012). A healthy diet yields several benefits, such as a reduced risk for the development of chronic diseases as well as an overall higher life expectancy (Katz & Meller, 2014). Regular *physical activity* (PA) has psychological and physical benefits and improves individuals' psychological well-being (Kim et al., 2012). Being physically active has been associated with experiencing lower symptoms of mental health concerns such as depression or anxiety and demonstrated its effectiveness to improve individuals' self-esteem (Biddle & Asare, 2011; Parker et al., 2016). The World Health Organization (WHO) recommends at least 150-300 minutes of *moderate* (i.e. hiking, double tennis) or 75-150 minutes of *vigorous* (i.e. running) PA per week as beneficial for mental and physical health (WHO, 2020). In particular, research has shown that interventions involving PA are particularly effective in reducing symptoms of depression in students (McFadden et al., 2017). Moreover, PA is often used as a stress management strategy (Kirsh et al., 2016). In recent years, many people have adopted healthy lifestyles into their daily lives in various ways, exemplified by a significant increase in the use of smartphone apps to monitor calorie intake or general daily food diaries (Boyce, 2014).

The amount of information available online, such as on social media platforms (i.e. Instagram, Facebook, YouTube), regarding health-related content, is considerable and increasing (Ramírez et al., 2013; Syed-Abdul et al., 2013). Notably, individuals in the age group of 18 to 29 are the most active on social media platforms, with around 90% using at least one platform (Tankovska, 2021). Social media content potentially influences individuals' behaviour (i.e. food choices) (Smit et al., 2020). Hawkins, Farrow and Thomas (2020) revealed that exposure to eating behaviours are significant predictors of food consumption. More specifically, other Facebook users' perceived fruit and vegetable intake influenced participants' eating behaviour and resulted in a higher intake of these foods (Hawkins et al., 2020). From nonclinical and media sources, online information seeking about behaviours associated with a healthy lifestyle has been found to influence and predict individuals' PA and nutrition positively, leading to increased vegetable consumption and exercise (Ramírez et al., 2013). These findings highlight the causal relationship between social media and the behaviours associated with a healthy lifestyle. However, these platforms

also present downsides (i.e. negative feelings) that require attention (Cavazos-Rehg. et al., 2020; Mento et al., 2021).

The impact of social media is evident through a dominant trend over the last few years on Instagram, one of the largest social media platforms nowadays, called "*fitspiration*", thereby combining two terms, fitness and inspiration (Carrotte et al., 2017). Fitspiration intends to motivate individuals to engage in a healthier lifestyle, involving exercising and following healthy nutrition. More specifically, content related to this trend often shows a thin, athletic woman demonstrating the "ideal" body and lifestyle by performing prolonged PA and following a healthy diet (Carrotte et al., 2017). The drawbacks of fitspiration content, such as images or videos, are various. A study revealed that posting fitspiration content was associated with a higher *drive for thinness* alongside maladaptive exercising behaviour (Holland & Tiggemann, 2017). Moreover, viewing fitspiration content was discovered to increase *body dissatisfaction* in women (Fardouly et al., 2018).

Several studies reported an influence of social media platforms on individuals' nutrition, such as adopting eating or exercising behaviour communicated through social media, which may facilitate the development of mental health conditions (i.e. bulimia, compulsive exercise) (Dumas & Desroches, 2019; Holland & Tiggemann, 2017). Instagram is well-known for users sharing content related to nutrition or exercising, such as photos or videos about food consumption in real-time (De Choudhury et al., 2016; Prichard et al., 2020). However, online information (i.e. videos) displaying health-related content, often accessed by millions of viewers, frequently promote misinformation (Syed-Abdul et al., 2013). A study investigating the influence of pro-anorexia videos, such as videos presenting extreme thin individuals promoting dieting behaviour, pointed out how fundamental it is to inform individuals of the credibility and source of information spread online and especially concerning healthy lifestyle (Syed-Abul et al., 2013). Pro-anorexia websites are harmful due to the promotion of disordered eating habits and information regarding ways to become or stay thin (Mento et al., 2021; Wilson et al., 2006). Study results emerged from investigating video pro-anorexia content on YouTube, which highlights the necessity to examine in more detail the influence exerted by other platforms (i.e. Instagram) on individuals' behaviour (Syed-Abdul et al., 2013).

Orthorexia nervosa

Healthy eating-related behaviours can lead to a mental health condition where nutrition negatively impairs the quality of life, namely '*orthorexia nervosa'* (ON) (Strahler &

Stark, 2020). ON was first mentioned by Steven Bratman in 1997 to describe individuals who displayed a fixation with healthy food, possibly resulting in negative long-term consequences, such as malnutrition (Dunn & Bratman, 2016). “Orthos” is derived from the Greek and means “correct” as well as “orexis”, translated to “appetite” and “hunger” (Bratman & Knight, 2000).

To date, ON is not included in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM–5; American Psychiatric Association, 2013). There is debate about whether ON should be considered an independent disorder under the spectrum of a *feeding and eating disorder (FED)* or as *obsessive-compulsive disorder (OCD)*-related disorder due to overlapping symptoms and comorbidity (Altman & Shankman, 2009; Koven & Abry, 2015). Research revealed that individuals concurrently displayed obsessive-compulsive symptoms and higher ON tendencies (Arusoğlu et al., 2008; Koven & Abry, 2015). Hence, it is argued that individuals with a healthy diet obsession may be diagnosed with OCD instead of an eating disorder (Mathieu, 2005). Contrary to other disorders, no commonly accepted diagnostic criteria are available (Almeida et al., 2018; Chaki et al., 2013; Rodgers et al., 2021).

However, several *diagnostic criteria* are associated with the clinical picture and symptoms of ON. Based on a literature review by Cena et al. (2019), three main diagnostic criteria were “(a) obsessional or pathological preoccupation with healthy nutrition; (b) emotional consequences (e.g. distress, anxieties) of non-adherence to self-imposed nutritional rules; (c) psychosocial impairments in relevant areas of life as well as malnutrition and weight loss.” (p. 1). Individuals with ON focus enormously on a healthy diet perceived as correct, perhaps resulting in unhealthy behaviours (Bratman & Knight, 2000). In general, ON unfolds itself in two stages (Bratman, 2017). First, individuals alter their diet with the primary intention to eat healthier, treat or prevent certain diseases (i.e. cancer, diabetes) by reducing the total amount of fat, sugar or chemicals. Subsequently, in the second stage, this eating pattern may develop into an obsession and is characterised by pathologic compulsive, restrictive and self-punishing behaviour resulting in unhealthy nutrition (Bratman, 2017; Oberle et al., 2017).

Often, obsessions and compulsions concerning the quality of food they consume and overall health over a long time are displayed (Donini et al., 2005; Moroze et al., 2014). ON patients use a considerable amount of time thinking, planning, acquiring, preparing, and eating food regarded as healthy. This eating behaviour is perceived as inferior to other individuals' lifestyle and eating habits (Donini et al., 2005).

The nutritional value, such as vitamins and minerals in food, is more important than other aspects, for instance, taste (Varga et al., 2013). Since a healthy diet and adherence to the rules are considered highly important, individuals impose themselves dietary restrictions. More specifically, they follow self-imposed nutritional rules about which type of food is judged to be healthy and thus appropriate for consumption, and in contrast, avoid foods perceived as unhealthy (Barthels et al., 2015; Moroze et al., 2014). Frequently, feelings of guilt result if the self-imposed nutritional rules are not adhered to (Borgida, 2011). Some individuals with ON prefer to refrain from eating anything rather than consuming food perceived as unhealthy, possibly causing a risk to overall health (Donini et al., 2004). This behavioural pattern originates from the anxiety to develop an illness after the consumption of food considered unhealthy and the belief that current physical or mental disorders and their symptoms can be cured by a healthy diet (Barthels et al., 2015; Bratman & Knight, 2000; McGovern et al., 2020).

ON is associated with various negative consequences, predominantly physical, social and psychological. Over time, the number of self-imposed rules progressively expands, often resulting in a small variety of foods accepted in the diet. Consequently, the risk of malnutrition increases in the longer term due to nutrient deficiencies of essential vitamins and minerals needed (Bratman & Knight, 2000). Malnutrition due to strict nutritional rules leads to weight loss and possible underweight, which may, in extreme cases, even cause death (Oberle et al., 2017).

The obsessive and compulsive eating patterns associated with ON interfere with social life, leading to social isolation or interpersonal conflicts (Dunn et al., 2017; Varga et al., 2013). Often, specific rituals concerning food preparation, such as using a particular utensil to prepare vegetables or specific materials to prepare the food, are applied (Brytek-Matera, 2012). Due to the fear of certain types of food, individuals' urge to avoid food perceived as harmful and the anxiety that specific rituals cannot be exhibited when eating outside the home may eventually lead to social isolation (Borgida, 2011). Spending a considerable amount of time planning, purchasing, preparing or eating, results in less time for socialization (Douma et al., 2021; Oberle et al., 2017). These obsession and compulsion-related behaviours impair and diminish the overall quality of life (Strahler & Stark, 2020). In addition, individuals with ON are at a higher risk of being stigmatized in their social environment because of their behaviour. This stigmatization is at a similar level when compared to other eating disorders listed in the DSM-5, such as anorexia nervosa (AN) (Simpson & Mazzeo, 2017).

Some factors have been discovered to be associated with the aetiology and ON-related symptoms, namely *gender*, *social media* and *PA*. Prior research revealed a considerable relationship between ON aetiology, symptoms and gender (Arusoğlu et al., 2008; Rodgers et al., 2021). Higher prevalence was found in males by exhibiting more ON-related symptoms (Donini et al., 2004; Fidan et al., 2010). However, other studies revealed a significantly higher risk, symptoms and prevalence of ON amongst females (Keller & Konradsen, 2013; Sanlier et al., 2016). Additional studies reported no significant gender differences and prevalence rates which illustrates the inconsistency regarding the relationship between gender and ON (Bosi et al., 2007). These mixed findings may result from a lack of research conducted with ON individuals and the fact that this mental health condition has not been included in the DSM-5 (Oberle et al., 2017).

The impact of social media and physical activity on orthorexia nervosa (ON)

A strong predictor of ON is *social media* through the portrayal of body images and ideals (i.e. thin, muscular), thereby facilitating the internalisation of these ideals, resulting in individuals aiming to reach this ideal, for example, through exercising or dieting (Hawkins et al., 2020; Tóth-Király et al., 2019). Overall, comparisons through social media platforms influence *body dissatisfaction* and eating behaviour and increase the risks for symptoms of eating disorders (i.e. overeating) (Smith et al., 2013). A study using a questionnaire to detect ON-tendencies (ORTO-15) reported that Instagram use had the utmost influence on ON-related symptoms and Twitter the least (Turner & Levefre, 2017). Other social media platforms (i.e. Facebook, Pinterest, Google+, Tumblr, LinkedIn) were not found to have a significant effect on ON-related symptoms (Turner & Levefre, 2017). In contrast, empirical evidence showed that social comparisons via Facebook had the strongest association with eating disorders compared to other platforms (e.g. Snapchat, Instagram) (Saunders & Eaton, 2018). Further, time spent on any social media platform is significantly associated with higher symptoms related to eating disorders (Santarossa & Woodruff, 2017). Nevertheless, it remains unclear whether general social media use, particular platforms or specific content displayed are causal factors of ON.

Although being physically active and simultaneously following a healthy diet has several advantages for individuals' overall health, PA, performed with the primary motivation and goal to improve one's health, could be a possible ON indicator (Almeida et al., 2018; Lovelady et al., 2003). More specifically, existing research revealed significant correlations between exercising and symptoms associated with ON. An extreme amount of exercising has

the potential to develop into a pathological and unhealthy behaviour with obsessive characteristics, described as '*exercise dependence'* (Griffiths et al., 2005; Hausenblas & Symons Downs, 2002). In a study of adult Portuguese gym members, the ORTO-15 was applied in conjunction with additional questions (i.e. the amount of exercising per week) to investigate differences between individuals with and without ON tendencies (Almeida et al., 2018). Study results revealed a significant association amongst regular exercising and ON tendencies with the most substantial relationship for individuals exercising more than three times a week (Almeida et al., 2018). Besides, the data revealed a positive relationship between individuals with ON tendencies and dissatisfaction with one's body image, feelings of guilt when not exercising as often as wanted and refusing other activities due to rigid meal and exercise schedules. A limitation of the study could be the participants' interest in exercise and health (Almeida et al., 2018).

Research analysing the relationship between *exercise addiction (EA)* and ON in a sample composed of male and female active fitness members revealed a positive correlation between a German scale used to evaluate ON, namely the *Düsseldorfer Orthorexie Skala (DOS)* as well as the *Exercise Addiction Inventory (EAI)* (Rudolph, 2018). Furthermore, a significant group from the study sample showed concurrent addiction to exercising and experiencing ON-related symptoms. Therefore, these results suggest a positive relationship between exercising and ON, although no causal relationship was found (Rudolph, 2018).

Overall, the evidence regarding the relationship between PA, social media content, gender and ON tendencies is limited and often contradictory. The findings demonstrate the necessity for additional exploration to determine the role of PA (i.e. exercising) on ON (McComb & Mills, 2019). Future research has to be conducted with a population-representative sample consisting of physically active versus inactive individuals.

The present study

This study aims 1) to investigate the relationship between self-reported levels of PA, EA and ON-related symptoms in university students, 2) to explore the impact of gender and ON tendencies amongst university students and 3) to analyse the association between watching social media content about PA and ON-related symptoms in university students.

The research questions (RQ) and hypotheses (H) of the present study are the following:

RQ_1: To what extent does university students *self-reported time of PA* affect symptoms related to ON?

H_1: There is a statistically significant relationship between university students' self-reported time of PA and ON-related symptoms.

RQ_2: Is there an association between *self-reported time of PA* and *exercise addiction* amongst university students?

H_2: More physically active university students display more symptoms of exercise addiction.

RQ_3: What is the relationship between *exercise addiction* and *ON-related symptoms* amongst university students?

H_3: University students with exercise addiction tendencies concurrently display ON-related symptoms.

RQ_4: Are there significant *gender differences* regarding symptoms of *ON* amongst university students?

H_4: There are significant gender differences concerning ON-related symptoms.

RQ_5: Is watching *social media content about PA* related to *ON* symptoms in university students?

H_5: Watching social media content about PA is related to ON symptoms amongst university students.

Methods

Design

The present study employed a quantitative, non-experimental research design using a cross-sectional online survey (see Appendix A).

Participants

Inclusion criteria were being a university student and good command of the English language. A total of 338 individuals participated in the survey. One hundred six participants had to be excluded due to non-completion of the survey, being no student, non-agreement to the informed consent or other reasons, resulting in a response rate of 73%. The final study sample was 232 international students aged 17 to 38 (M_{age}=21.52 *SD*=2.52; 193 female and 39 male). 86% (*N*=199) were Bachelor; 5% (*N*=12) Master students and 9% (*N*=21) with another degree (i.e. PhD, Hogeschool). Participants were mostly German (77.6%) and Dutch (10.8%). Other nationalities (11.6%) in the sample were Italian, Romanian or Finnish.

Instruments

Participants had to fill out a survey using the online survey software Qualtrics (Qualtrics, Provo, UT). This survey was composed of several ad-hoc open- and closed-ended questions with answers on a Likert scale, 'Yes/No' questions, and items participants had to rank choices based on their preference. Participants were asked to provide data about their demographic characteristics, social media use, PA and lifestyle. An example question is: "Please indicate your current education." In addition, three validated scales were applied, namely the *International Physical Activity Questionnaire-Short Form (IPAQ-SF), Exercise Addiction Inventory (EAI)* and *ORTO-15 questionnaire*.

Ad hoc-items

Additional items were used for data analysis, assessing participants to indicate their self-perception of PA (i.e. "In general, I am physically active") and social media use in general, daily amount (measured in minutes) and preferred content watched. Given choices for the social media platforms were Facebook, Twitter, Instagram, Snapchat and YouTube. Example items are: "How much time do you spend on Facebook daily (on average in minutes)?" and "I often watch social media content related to PA (i.e. posts, videos about fitness, exercising plans)." A 5-point Likert scale from 1 (*strongly agree*) to 5 (*strongly disagree*) was used.

International Physical Activity Questionnaire-Short Form (IPAQ-SF)

The IPAQ-SF was applied to assess participants' level of PA (Craig et al., 2017). This standardised self-report questionnaire can be used for individuals aged between 15 and 69 and across several nations due to its availability in English and other languages. The short form is composed of seven items in total. It assesses individuals PA during the last seven days through open- and closed-ended questions about time spent sitting, walking, moderate as well as vigorous PA (Craig et al., 2017). An example is, "During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking." Depending on the item, participants need to indicate the frequency, measured in days per week or duration, assessed in minutes and hours per day of PA (IPAQ Research Committee, 2005). The present study focused on participants' self-reported time of moderate and vigorous PA per week, measured in minutes. Metabolic equivalent of task (MET) minutes per week were used to compute a continuous variable. METs represent the expended energy during PA, with moderate PA being 4 METS and

vigorous PA 8 METS (Forde, 2018). Overall, the validity and reliability of the IPAQ-SF proved to be adequate when compared to similar measurement instruments for PA. IPAQ-SF illustrated high reliability ($\alpha = 0.80$), thus sufficient test-retest stability (Craig et al., 2017). Criterion validity was found to be 0.30 (Craig et al., 2003). The scale is displayed in Appendix B.

Exercise Addiction Inventory (EAI)

The EAI was used to investigate participants' attitude towards PA, established as a short and straightforward scorable screening tool for exercise-dependent behaviour (Griffiths et al., 2005). The six statements can be answered through a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Statements assess, for instance, individuals general belief and subjective importance or the effects on mood through exercising. An example statement is: “Exercise is the most important thing in my life” (Griffiths et al., 2005). Scores of the six statements were computed and could range from 6 to 30. Then, sum scores were used to assess individuals at risk of EA, with higher scores indicating increased risk. *Cut-off scores* for the sum scores are 24 and higher (=*being at risk for EA*), 13-23 (=*symptoms of EA*) and 0-12 (=*asymptomatic individual*) (Terry et al., 2004). The EAI illustrated good psychometric properties, thus proving a valid and reliable screening tool to identify individuals at a higher risk or suffering from EA tested with a sample composed of 200 male and female exercisers. Concurrent, construct and criterion validity were found to be good and a high test-retest reliability ($r = 0.85$). Internal consistency of the EAI was established as sufficient with a Cronbach’s Alpha of 0.84 (Terry et al., 2004). The scale is displayed in Appendix C.

ORTO-15 questionnaire

In the present study, the ORTO-15 questionnaire (see Appendix D) was used to assess university students with ON tendencies because it is the most widely used and validated instrument for the diagnostic of ON (Donini et al., 2005). It consists of fifteen multiple-choice items, such as “When eating, do you pay attention to the calories of the food?” and can be answered with a 4-point Likert scale from 1 (*Always*) to 4 (*Never*). Depending on the total sum score, potentially ranging from 15 to 60, individuals with ON tendencies are characterised using a scoring form. Test scores below 40 are classified as at a higher risk for ON, hence considered as the orthorexia risk factor (ORF) (Stochel et al., 2015). A cut-off score of 40 results in the highest validity; hence, this threshold was used in the present study

(Donini et al., 2005). Reliability is acceptable, with Cronbach's Alpha ranging from 0.7 to 0.9 in a sample with individuals aged 15 to 21 (Stochel et al., 2015). Five items displayed remarkable (Cohen's Kappa 0.81 – 1.00) and ten adequate repeatability (Cohen's Kappa 0.61 – 0.80) of the responses (Stochel et al., 2015). However, psychometric properties significantly differ because it is a relatively novel measurement instrument (Koven & Senbonmatsu, 2013). Besides, an unstable factorial structure and different results emerged when applied across distinctive groups (Missbach et al., 2015; Rogoza & Donini, 2020). Hence, a review of the questionnaire should be conducted by, for instance, excluding several items to compensate for psychometric weaknesses and potential overestimation of ON prevalence rates (Missbach et al., 2015; Rogoza & Donini, 2020).

Procedure

Data collection

The Ethics committee approved the present study of the Behavioural, Management and Social sciences (BMS) faculty of the University of Twente on 15.03.2021. University students were invited to participate in this study voluntarily by convenience sampling. Researchers themselves distributed the invitation link to the survey via social media platforms. Besides, the link was included in the platform 'SONA' of the University of Twente (UT), and UT students received 0.25 credit points as compensation for participation in the study. Data were collected from 26.03. to 09.04.2021 employing the online survey software Qualtrics. After opening the link, participants were directed automatically to the Qualtrics website with the survey. Students participated in this study based on their written informed consent. The first part of the survey asked participants about demographic information, such as age, gender, pursued degree, and nationality. Two questions were asked about previous diagnosis and pharmacological or psychological treatment because of mental health conditions. Besides, participants had to indicate their social media usage and PA. Next, students had to answer the IPAQ-SF, EAI and ORTO-15 questionnaire. After survey completion, participants were thanked for participation, and a remark about the recording of their response was given. In addition, the contact details of the researcher were provided if further questions arise.

Data analysis

Quantitative study data were analysed using the statistical software IBM SPSS Statistics version 23.0. First, ad-hoc items were recoded (1=*strongly disagree* to 5= *strongly*

agree) to facilitate the interpretation of the results. Then, descriptive statistics were computed to analyse the sample. Mean time spent on social media was computed by summing up participants' daily time spent on social media platforms into one variable. A *cut-off score* of 60 min per day was chosen for frequency analysis. Sum scores of participants' answers for two ad-hoc items ("I often watch social media content related to PA (i.e. posts, videos about fitness, exercising plans)." and "In general, I am physically active.") were converted into a total score, resulting in the variables *'social media content PA'* and *'self-perceived PA'*. Normal distribution of the data was assessed using the Shapiro-Wilk test, with $p>.05$ as an indicator of a normally distributed sample and Q-Q plots (Field, 2013). Further, approximately normally distributed data result from a large sample size; hence parametric tests were chosen to address the hypotheses (Kwak & Kim, 2017). Then, total scores were computed by summing up the given answers on the EAI and ORTO-15 questionnaire items, resulting in the variables *'EAI'* and *'ON'*. Next, variables *'moderate PA'* and *'vigorous PA'* were computed based on 1) total minutes per day and 2) PA days during the last seven days, indicated in the IPAQ-SF. Subsequently, both variables were combined to get a continuous variable for the overall PA score, namely *'IPAQ-SF'*. Pearson correlation coefficients were used to investigate relationships between variables. Statistical significance was set at $p<.05$. Lastly, gender differences (1=Male; 2=Female) regarding the ORTO-15 questionnaire scores as the continuous dependent variable were assessed using the Independent-Samples T-test.

Results

Descriptive statistics of the sample

Descriptive data (means and standard deviations) are displayed in Table 1. Overall, participants reported to be physically active on three days for moderate vs two days for vigorous PA. Consequently, the average daily and weekly PA amount in minutes was higher for moderate than vigorous activities (daily $M_{minModerate}$= 44.32 vs $M_{minVigorous}$=38.19 and weekly $M_{minModerate=}$150.86 vs $M_{minVigorous}$=121.01). Frequency analysis showed 69.4% (N=184) of the sample is at a *higher risk for ON* with a cut-off score of <40; the average score of the ORTO-15 was 37.51 (SD=3.83); scores ranged from 27 to 47. Males had, on average, higher sum scores than females (M_{Males}=36.15 vs $M_{Females}$=37.39).

Concerning the EAI, the whole sample had an average value of 18.87 (SD=4.7) with sum scores ranging from 6 to 30. Frequency analysis indicated that 7.3% (N=17) were *at risk for EA*, 75% (N=174) *display symptoms,* and 17.7% (N=41) were *asymptomatic*. Overall, 17.2% (N=40) of the sample reported a current or past mental health condition such as

depression or eating disorders. Further, 76.7% (*N*=178) of the sample agreed, vs 9.5% (*N*=22), disagreed with being physically active. Regarding the purpose of PA, 43.5% (*N*=101) indicated to be physically active to improve their appearance; 51.3% (*N*=119) to feel healthy.

Participants' mean time spent on social media was 199.52 minutes (*SD*=92), with the lowest being zero minutes and the highest of 540 minutes reported total time per day. 26.3% (*N*=61) of the sample indicated spending at least 60 minutes a day on any social media platform. 58.2% (*N*=135) of the sample indicated to agree vs 28.9% (*N*=67) disagree to the item "I often watch social media content related to physical activity".

Table 1

Descriptive statistics of the sample (N=232)

Characteristic	*N*	*Percentage*	*Mean*	*SD*	*Min*	*Max*
Gender						
Female	193	83.2				
Male	39	16.8				
Age	232		21.52	2.52	17	38
Education						
Bachelor	199	86				
Master	12	5				
Other degree	21	9				
Nationality						
German	180	77.6				
Dutch	25	10.8				
Other	27	11.6				

Physical activity (IPAQ-SF), orthorexia (ON) and exercise addiction (EA) tendencies

Correlations between the scales are displayed in Table 2. Cut-off scores for the effect size were set to r ± .10, indicating a weak correlation, r ± .30 a moderate correlation and r ± .50 a strong correlation (Field, 2013). Pearson correlation indicated a significant negative relationship between variables 'IPAQ-SF' and 'ON' ($r(230)= -.18$, $p <.001$), confirming H_1. Additionally, variables 'moderate PA' and 'vigorous PA' were both significantly correlated to 'ON' ($r_{moderatePA}(230)= .-13$, $p=.04$ vs. $r_{vigorousPA}(230)= -.14$, $p=.04$). As predicted with H_2, the variable 'IPAQ-SF' was significantly correlated to the variable 'EAI' with a moderate effect ($r(230)= .42$, $p<.01$). Further, a significant positive correlation was found for variables

'vigorous PA' and 'EAI' ($r(230)=.47$, $p<.01$). In contrast, no significant correlation was found for 'moderate PA' and 'EAI'. Variables 'EAI' and 'ON' had a negative significant correlation ($r(230)= -.19$, $p<.01$), confirming H_3.

Table 2

Means, Standard deviations and Correlations of the variables (N=232)

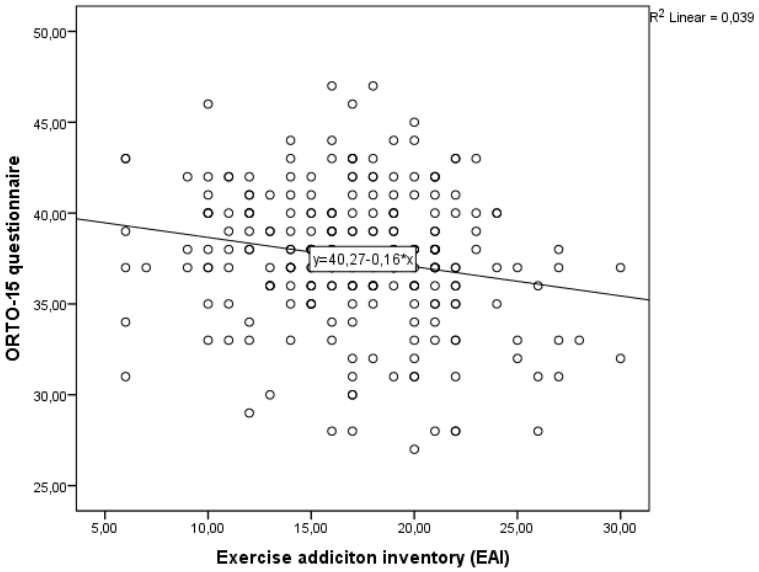
Scales	*M*	*SD*	*IPAQ-SF*	*Moderate PA*	*Vigorous PA*	*EAI*	*ON*
IPAQ-SF	—	—	1	—	—	.42**	-.18**
Moderate PA	—	—	—	1	—	.01	-.13*
Vigorous PA	—	—	—	—	1	.47**	-.14*
EAI	18.87	4.7	.42**	.01	.47**	1	-.19**
ON	37.51	3.83	-.18**	-.13*	-.14*	-.19**	1

Note. ** Correlation is significant at the 0.01 level. p<.01, two-tailed.

* Correlation is significant at the 0.05 level. p<.05, two-tailed.

Figure 1

Relationship between ON and EA



Note. This figure demonstrates the relationship between ON (ORTO-15) and EA (EAI) tendencies.

Gender, social media content PA and orthorexia (ON) tendencies

Independent-Samples T-test indicated a statistically significant difference of ON-related symptoms for males (M=36.15, SD=3.52) vs. females (M=37.39, SD=3.84); $t(230)$= -2.45, p<.05) confirming H_4. Finally, there was a significant relationship between variables 'social media content PA' and 'ON' ($r(230=)$= -.204, p<.05); hence, H_5 was accepted.

Discussion

This study aimed to investigate associations between *social media*, *physical activity (PA), gender* and *orthorexia nervosa (ON)* amongst *university students*. Especially concerning the relationship between PA and ON, clarification was required (McComb & Mills, 2019). To do so, a cross-sectional online survey was applied using both validated questionnaires (i.e. *IPAQ-SF, EAI, ORTO-15 questionnaire*) and several ad-hoc open- and closed-ended questions. The data revealed three main results. First, university students reporting more time of PA displayed higher ON and exercise addiction (EA) tendencies. Secondly, significant gender differences in terms of ON were observed, whereby males illustrated higher ON tendencies. Lastly, the present study found a significant relationship between watching social media content about PA (i.e. fitspiration content, exercising plans) and ON-related symptoms. In sum, findings provide additional support concerning the associations between PA, gender, social media and ON.

Physical activity (PA), exercise addiction (EA) and orthorexia nervosa (ON) tendencies

First of all, in line with previous research, the results showed a significant association of PA and ON tendencies in university students. More specifically, participants reporting more time of PA, measured with the IPAQ-SF, displayed higher ON tendencies, visible through ORTO-15 sum scores. These findings are consistent with the evidence of Rudolph (2018) and Almeida et al. (2018), confirming the relationship between PA (i.e. frequent exercising) and ON. Furthermore, Barnes & Caltabiano (2016) illustrated a significant relationship between a strong focus on one's bodily appearance and ON. More specifically, this intense focus on physical appearance may lead individuals to develop a need to follow a strict schedule of exercise and dieting to maintain health (Barnes & Caltabiano, 2016). Thus, present findings indicate that university students might develop a pathological pattern with problematic characteristics, in this case, ON, resulting from this focus on the body. The results build on existing evidence of Malmborg et al. (2017), illustrating higher ON tendencies in university students, particularly those with a general health focus and more

physically active (i.e. exercise science students) when compared to students from other study programs (i.e. business science), which might explain the present findings. However, in this study, participants were asked about their pursued degree (i.e. Bachelor, Master) but not for the study specialisation. Future research could address this to replicate the findings of Malmborg et al. (2017).

Secondly, the results of the present study provide supportive evidence for the relationship between PA and EA. The sample consisted of active (76.7%) and inactive (9.5%) students. Students reported an average of 150 minutes of moderate PA per week. This is in line with the World Health Organization (WHO) (2020) recommended duration of at least 150 minutes moderate PA per week to be beneficial for overall well-being (World Health Organization, 2020). Accordingly, findings support the positive effect of moderate PA on students' health. Bray & Born (2004) showed that regular PA improves students physical and mental health and significantly reduces the risk of mental health concerns, such as depression (Parker et al., 2016). Further, McFadden et al. (2017) illustrated a reduction of depressive symptoms through PA interventions in students. Hence, the current findings support previous research illustrating the benefits of moderate PA for mental and physical health (Herbert et al., 2020).

However, the results of this study support the association between vigorous PA and EA. Surprisingly, the relationship of PA and EA was only significant for participants who indicated engaging in vigorous PA (i.e. fast bicycling, heavy lifting), implying that there was no significant association between moderate PA (i.e. bicycling at a regular pace) and EA tendencies. This pattern is consistent with the findings of Hagströmer et al. (2005), illustrating stronger correlations for vigorous-intensity PA, assessed with the IPAQ. More specifically, more physically active university students showed substantial EA tendencies, and 75% displayed symptoms of exercise dependence, according to the results of the EAI. As indicated by Szabo & Griffiths (2007), PA is associated with a healthy lifestyle and improves, according to Kim et al. (2012) individuals' psychological well-being. A possible explanation for the findings could be that students often use sport as a coping mechanism for their demanding everyday life, according to Kumar & Bkuhar (2013). Hence, the findings support the potential of regular exercise as a stress-related coping mechanism to develop into a mental health concern (i.e. exercise dependence) without being recognized (Freimuth et al., 2011).

Also, compared to typical addictive behaviours (i.e. excessive alcohol consumption), PA is considered a healthy lifestyle and beneficial for individuals health, thus accepted at an individual and societal level and encouraged by the social environment (Lichtenstein, 2017).

Consequently, current findings are interpreted as suggesting that participants may receive compliments and social approval (i.e. for exercising and resulting weight loss) from relatives, thus not perceiving excessive exercising as a pathological behaviour. Therefore, outcomes confirm research by Griffiths et al. (2005) and Hausenblas & Symons Downs (2002) illustrating that regular PA may develop into a pathological behaviour, such as 'exercise dependence'.

Moreover, a significant association was found in the sample regarding EA and ON, meaning that participants with higher EA tendencies displayed simultaneously more ON tendencies. The present results were consistent with Freimuth et al. (2011), emphasizing the comorbidity of EA and disturbed eating behaviour in 39-48% of the individuals. Similarly, Di Lodovico et al. (2018) showed that active individuals (runners) at higher risk for developing an eating disorder (ED) were also at higher risk for EA than individuals who were not at risk for ED. Also, present results were expected based on previous findings of Rudolph (2018), which revealed concurrent EA and ON-related symptoms in active fitness members using a German scale (DOS) to detect ON. Remarkably, in contrast to the study by Rudolph (2018), this study used the ORTO-15 questionnaire as a measurement tool for ON and detected significant associations.

Furthermore, results are in line with research by Rudolph (2018), illustrating that PA (i.e. exercising) and high emphasis on nutrition might result in pathological behaviour, such as ON. Also, results support research by Weltzin (2012), demonstrating exercising as a common eating disorder element (i.e. ON) with a substantial factor to be former dieting associated with a higher incidence of ON in athletes (Segura-García, 2012). These findings highlight the association between exercising and nutrition. Therefore, it is suggested, that students, especially those with an extensive focus on health (i.e. athletes), are aware of the influence of nutrition when aiming for an ideal weight, body type or higher performance (Bonci et al., 2008). It could be that university students initially attempt to improve physical and mental health through PA (i.e. exercising). This assumption is supported by the findings of Oberle et al. (2017), who show a link between ON and EA due to the development of a compulsive need for excessive exercise rather than the initial drive to improve health. More specifically, normal exercising behaviour and following a healthy diet resulted in the development of EA and ON, confirmed by Weltzin et al. (2012), which displayed that physical activities, especially those leading to weight loss, are risk factors for maladaptive expressions of exercising and dieting.

In brief, university students might incorporate both nutrition and PA in their lifestyle,

initially for stress reduction or health benefits. Ultimately, this behaviour leads to higher EA and ON tendencies, which explains the associations found in the present study. However, as the present results stem from a cross-sectional study design, future studies should examine causality. The associations were discovered in university students, highlighting the added value in contrast to previous research conducted with active gym exercisers revealing higher risks for EA, for example, in the study of Lichtenstein (2017).

Taken together, the findings of this study, in combination with previous research, confirm the relationship between PA and ON, with the most significant association found for higher levels of PA. Moreover, the results confirm the association between EA and ON. In addition, findings support the association between exercise dependence, body image internalizations and ON, in male college students investigated by White (2020). Subsequently, results of the present study confirm previous research conducted by Oberle and Lipschuetz (2018), performed with a similar sample composed of students, revealing a significant relationship between PA, such as with the primary aim to improve physical or mental health and ON-related symptoms. Further, outcomes support the assumption of Lovelady et al. (2003), denoting PA being a possible predictor of ON.

Gender, social media and orthorexia nervosa (ON) tendencies

In the present sample, significant gender differences in ON-related symptoms were discovered, whereby males showed higher ON tendencies than females, measured by the ORTO-15 questionnaire. Interestingly, findings are in line with the study conducted with a similar sample by Malmborg et al. (2017), revealing a higher proportion of ON tendencies in male students. Further, results confirm other studies demonstrating higher ON tendencies in males but are contrary to research showing that females are more affected by ON (Donini et al., 2004; Fidan et al., 2010; Sanlier et al., 2016). In this sample, males displayed higher ON tendencies visible through lower scores on the ORTO-15. However, this should be interpreted with caution as males were underrepresented in the sample, which may have influenced the results. Consequently, future studies should be conducted with a sample with equally sized groups to conclude whether ON tendencies are generally higher in males. Therefore, the present results confirm the inconclusiveness concerning the relationship between gender and ON (Bosi et al., 2007). Remarkably, the prevalence of ON (69.4%) and the average score on the ORTO-15 questionnaire was considerable when selecting a cut-off score of <40. The high prevalence can be interpreted with research demonstrating that university students may be a vulnerable population developing concerns about healthy nutrition (Lavender et al., 2010).

Additionally, Bosi et al. (2007) illustrated an association between knowledge about nutrition and concerns regarding healthy food. This could explain the high prevalence in this sample resulting from high social media use and consequently a lot of, often incorrect, available information, possibly influencing individuals' nutrition knowledge (Dumas & Desroches, 2019; Syed-Abdul et al., 2013; Tankovska, 2021).

The final objective of the present study was to investigate the association between social media content about PA (i.e. fitspiration content, exercising videos) and ON. As hypothesized, a significant relationship was discovered. More specifically, students indicating a higher agreement to the statement 'I often watch social media content about PA' scored lower on the ORTO-15 questionnaire and vice versa, implying that watching social media content about PA and ON tendencies are linked. This pattern displays the possible influence of information (i.e. online) on individuals' behaviour and confirms previous research that demonstrated an association between online information concerning nutrition and disturbed eating patterns (Cheshire et al., 2020; Goldberg & Sliwa, 2011; Tudoran et al., 2009).

Current results are in line with previous research and can be explained as follows: First of all, the *'human capital theory of learned effectiveness'* serves as a practical explanation, as educated individuals (i.e. university students) particularly use information from various sources to create a healthy lifestyle (Mirowsky & Ross, 1998). In addition, Ramírez et al. (2013) demonstrated that general online information seeking (i.e. from media sources such as social media platforms) is confirmed as a potential predictor of certain behaviours, such as changing one's diet. Also, Fardouly et al. (2018) and Holland & Tiggemann (2017) illustrated that social media content, specifically about PA (i.e. fitspiration), is associated with body dissatisfaction, drive for thinness as well as maladaptive exercising behaviour. This influence of information on social media platforms leads to a behaviour change, which might emerge into a mental health condition, such as ON (Dumas & Desroches, 2019). Present outcomes suggest that students have difficulties validating accurate information (i.e., nutrition, exercising) as the amount of incorrect health-related online information is considerable (Syed-Abdul et al., 2013). Donini et al. (2004) supported this explanation, who revealed that individuals with ON tendencies rarely verify the information's credibility and origin. Consequently, based on the results, it is suggested that students might internalize the misleading information, (i.e. thin body ideals, diet plans), leading to higher ON tendencies. This interpretation is in line with White et al. (2020), who reported associations between thin and muscular body internalizations and ON and confirms the impact of social media and individuals behaviour (Dumas & Desroches, 2019).

Limitations and directions for future research

Although the results of the present study confirmed the hypotheses and previous research, some limitations should be noted that could be addressed in future research:

1. Even though the survey included measurement instruments with good psychometric properties, some items were self-constructed by the researchers and, thus, not validated, resulting in different interpretations that possibly influenced the answers. For this reason, results should be considered, taking this subjective interpretation into account.
2. Due to the convenience sampling method used in the study, male participants were underrepresented, and 76.7% of the participants were physically active, which affects the generalisation of the results. To compensate for this limitation, future studies should be conducted with an evenly distributed sample of male and female and active and non-active participants to clearly determine the association and influence of gender and ON.
3. The present sample was mainly composed of German university students (77.6%). Therefore, nationalities were not balanced and thus, possibly influenced the results. This should be addressed in future studies to investigate if socio-cultural factors influence the prevalence of ON and to allow generalization of the results.
4. Even though the ORTO-15 is widely applied to assess ON, psychometric properties vary significantly across studies (Koven & Senbonmatsu, 2013). Internal consistency (Cronbach's alpha) values were found to range from α=.14 to α=.83, confirming the suggestion of revising the measurement instrument (i.e. exclusion of items) (Missbach et al., 2015; Oberle et al., 2017; Opitz et al., 2020; Rogoza & Donini, 2020).

Hence, the current results should be interpreted carefully since the instrument's validity is still under review across different populations (Rogoza & Donini, 2020). Future research could be conducted using a different cut-off score for ON tendencies or a revised version of the ORTO-15 questionnaire, as suggested by Missbach et al. (2015) and Rogoza and Donini (2020), to improve psychometric properties. Also, overall scoring and interpretation of the ORTO-15 should be conducted, taking the individual scoring for several items and a correspondingly lower sum score to higher ON tendencies into account. Lastly, future research would be helpful to extend the findings with a longitudinal study to examine cause and effect relationships and predictors of ON (Carlson & Morrison, 2009).

Conclusions

Current research demonstrated significant associations between PA, gender, social media and ON in university students, hence expanded the literature. PA and healthy nutrition are beneficial for individuals' mental and physical health and well-being. However, this study confirmed existing research and demonstrated significant associations between behaviours considered as healthy (i.e. exercising, following a healthy diet) and pathological patterns, such as higher tendencies for ON and EA. In addition, this research illustrated how common these patterns are in university students and should be taken seriously, highlighting the importance of future research on this topic. The remarkably high prevalence rate (69.4%) of university students being at risk for ON reflects the necessity to include ON as a disorder into the new diagnostic manuals (i.e. DSM-V, ICD-10) to enable and facilitate the development of prevention and treatment for this mental health concern. Moreover, this research added new information to the literature regarding the association between viewing social media content about PA (i.e. fitspiration content) and ON, as previous research was sparse. More specifically, the results highlight and confirm the effects of social media on an individuals' behaviour.

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Appendices

Appendix A

Cross-sectional online survey

Social media, eating behaviour, physical activity and healthy lifestyle

Information sheet for Participation in a Questionnaire

- The University of Twente –

Description of the questionnaire and your participation

You are invited to participate in a questionnaire conducted by Marie Geise, Adriana Bülter, Svenja Gabriel and Greta Grewe, supervised by Alexandra Ghita and Teuntje Elfrink. The purpose of this questionnaire is to gain insight into your personal experiences with the use of social media in relation to your bodily and mental health. We would like to know more about the relationship between physical activity, nutrition, social media use and health in the life of university students. The questionnaire will last approximately 25 minutes. **The questionnaire will be anonymous so no information can be returned back to your person.**

Risks and discomforts

There are no known risks associated with this questionnaire.

Potential benefits

There are no known benefits to you that would result from your participation in this questionnaire. This questionnaire 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 questionnaire. We will interpret your data and use it to analyse 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 questionnaire is voluntary. You may choose not to participate, and you may withdraw your consent to participate at any time. You will not be penalized in any way, in case you decide not to participate or to withdraw from this questionnaire. You are allowed to withdraw the questionnaire at any time.

Consent Form for Questionnaire about healthy lifestyle

Taking part in the questionnaire

I have read and understood the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction. I consent voluntarily to be a participant in this questionnaire 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. I understand that taking part in the study involves interpreting my data anonymous.

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 this interview, if any problems arise or if you have questions or concerns about your rights as a participant, please contact Greta Grewe (g.grewe@student.utwente.nl), Alexandra Ghita (alexandra.ghita@utwente.nl), or Teuntje Elfrink (t.r.elfrink@utwente.nl) at the University of Twente.

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

- o Yes
- o No

General information

1. Please indicate your age in numbers.

_____

2. Please indicate your gender.

- Male
- Female
- Non-binary / third gender
- Prefer not to say

3. Please indicate your current education.

- Bachelor
- Master
- PhD
- Hogeschool
- Other, namely: _____

4. Please indicate your nationality.

_____

5. Please indicate on which social media platforms you have an account.

- Facebook
- Twitter
- Instagram
- Snapchat
- YouTube
- None
- Other, namely: _____

6. How much time do you spend on Facebook daily (on average in minutes)?

_____

7. How much time do you spend on Twitter daily (on average in minutes)?

_____

8. How much time do you spend on Instagram daily (on average in minutes)?

_____

9. How much time do you spend on Snapchat daily (on average in minutes)?

_____

10. How much time do you spend on YouTube daily (on average in minutes)?

_____

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

- o Yes _____
- o No

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

- o Yes _____
- o No

Physical activity

In the next section, you will be asked several questions about your **physical activity.**.

The World Health Organization (2021) defines 'physical activity' as: *"any bodily movement produced by skeletal muscles that requires energy expenditure. Physical activity refers to all movement including during leisure time, for transport to get to and from places, or as part of a person's work. Both moderate- and vigorous-intensity physical activity improve health. Popular ways to be active include walking, cycling, wheeling, sports, active recreation and play, and can be done at any level of skill and for enjoyment by everybody."*

(Source: World Health Organization (04.03.2021). Physical activity. Retrieved from https://www.who.int/news-room/fact-sheets/detail/physical-activity)

When answering the following questions, please think about **all kinds of physical activity you engage in your daily life.**

1. In general, I am physically active.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

2. I am physically active because I want to feel healthy.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

3. I am physically active because I want to improve my physical appearance (i.e. lose weight, gaining muscles).

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

4. I often watch social media content related to physical activity (i.e. posts, videos about fitness, exercising plans).

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

5. I often watch social media content related to physical activity (i.e. posts, videos about fitness, exercising plans).

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Appendix B

International Physical Activity Questionnaire Short-Form (IPAQ-SF)

1. We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days.**

Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport. Think about all the **vigorous** activities that you did in the **last 7 days.**

Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for **at least 10 minutes** at a time.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

- Days per week _____
- No vigorous physical activities

2a. How much time did you usually spend doing vigorous physical activities on one of those days?

- Hours per day: _____
- Minutes per day: _____
- Don't know/Not sure

3. Think about all the **moderate** activities that you did in the **last 7 days.**

Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3a. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

- Days per week: _____
- No moderate physical activities

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

- Hours per day: _____
- Minutes per day: _____
- Don't know/Not Sure

5. Think about the time you spent **walking** in the **last 7 days**.

This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5a. During the **last 7 days,** on how many days did you walk for at least 10 minutes at a time?

- Days per week:_____
- No walking

6. How much time did you usually spend walking on one of those days?

- Hours per day: _____
- Minutes per day: _____
- Don't know/Not Sure

7. This question is about the time you spent **sitting** on weekdays during the **last 7 days.** Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7a. During the last 7 days, how much time did you spend sitting on a week day?

- Hours per day: _____
- Minutes per day: _____
- Don't know/Not Sure

Appendix C

Exercise Addiction Inventory (EAI)

1. Exercise is the most important thing in my life.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree

2. Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree

3. I use exercise as a way of changing my mood (e.g. to get a buzz, to escape, etc.).

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree

4. Over time I have increased the amount of exercise I do in a day.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree

5. If I have to miss an exercise session I feel moody and irritable.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree

6. If I cut down the amount of exercise I do, and then start again, I always end up exercising as often as I did before.

- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree

Appendix D

ORTO-15 questionnaire

1. When eating, do you pay attention to the calories of the food?

- Always
- Often
- Sometimes
- Never

2. When you go in a food shop do you feel confused?

- Always
- Often
- Sometimes
- Never

3. In the last 3 months, did the thought of food worry you?

- Always
- Often
- Sometimes
- Never

4. Are your eating choices conditioned by your worry about your health status?

- Always
- Often
- Sometimes
- Never

5. Is the taste of food more important than the quality when you evaluate food?

- Always
- Often
- Sometimes
- Never

6. Are you willing to spend more money to have healthier food?

- Always
- Often
- Sometimes
- Never

7. Does the thought about food worry you for more than three hours a day?

- Always
- Often
- Sometimes
- Never

8. Do you allow yourself any eating transgressions?

- Always
- Often
- Sometimes
- Never

9. Do you think your mood affects your eating behavior?

- Always
- Often
- Sometimes
- Never

10. Do you think that the conviction to eat only healthy food increases self-esteem?

- Always
- Often
- Sometimes
- Never

11. Do you think that eating healthy food changes your life-style (frequency of eating out, friends, ...)?

- Always
- Often
- Sometimes
- Never

12. Do you think that consuming healthy food may improve your appearance?

- Always
- Often
- Sometimes
- Never

13. Do you feel guilty when transgressing?

- Always
- Often
- Sometimes
- Never

14. Do you think that on the market there is also unhealthy food?

- Always
- Often
- Sometimes
- Never

15. At present, are you alone when having meals?

- Always
- Often
- Sometimes
- Never