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Feast Your Eyes: Testing the Effect of Junk Food Images on Body Image Dissatisfaction, Mood, and Cravings in Lebanese University Students By

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A thesis
Submitted in partial fulfillment of the requirements for the degree of
Master of Science in Nutrition for the degree

School of Arts and Sciences

August 2021

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Lebanese American University

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Dedication Page

“Social media is a dangerous place to seek affirmation, acceptance, identity and security”

Cornelius Lindsey

ACKNOWLEDGMENTS

Thank you to my advisor, Dr. Nadine Zeeni, for your constant guidance and patience throughout the duration of my studies, it was a valuable educational experience and I appreciate the time you spent mentoring me.

I am also thankful to committee members Dr. Lama Mattar and Dr. Myriam El Khoury Malhame for their time, expertise, and advice. Your combined input greatly improved the study and helped me become a better researcher.

I would also like to raise a huge thank you to Dr. Maya Bassil, Dr. Berna El Rahi, and Dr. Hussein Hassan all of whom I spent time with and learned so much over the course of my Master's and Research Assistantship.

Finally, to my sister and parents, for staying with me during such hard circumstances just so I could finish my studies.

Feast Your Eyes: Testing the Effect of Junk Food Images on Body Image Dissatisfaction, Mood, and Cravings in Lebanese University Students

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ABSTRACT

Background: Time spent on social networking sites and the images trolling may have variable effects on physical and mental well-being including changes in perception of body image (BI) and dietary behavior. Particularly, junk food photos are highly popular on Instagram. Exposure to this type of content may have a negative effect on eating behavior by potentially setting an altered standard for food quantities and preferences.
Aim: The present study aimed to assess the effects of junk food-related content exposure on Instagram on BI dissatisfaction (BID), state BI, mood, and cravings.
Method: A randomized crossover experimental design was used. Sixty-three university students filled out an online baseline survey assessing baseline BID, physical activity, healthy eating, and social media use. They were then asked to browse either a control Instagram account feed or junk food account for 15 minutes, after which they filled out a short survey on state BI, mood, and cravings. After a washout period of 1 week, participants were exposed to the other type of account and asked to fill out the same short survey. A focus group of 9 participants was conducted after data collection to understand the level of awareness of participants on the effect of social media exposure on BID, mood, and cravings.
Results: Results indicated significantly higher scores of state BID, reported feelings of stress, sadness, hunger, and exhaustion as well as higher salty, savory, and fatty food cravings when participants were exposed to junk food content as compared to control content exposure. Participants reported higher cravings of junk food (burger and pizza) and lower cravings of healthy foods (whole grain turkey bagel and chicken salad) when exposed to the junk food content as compared to the control content. Regression analyses revealed that cravings for junk food was mediated by state BID and feelings of hunger after being exposed to junk food content on Instagram. Qualitative analysis revealed that young adults are aware that junk food content can increase their cravings and sometimes cause them to feel negatively about their body.
Conclusion: The present study revealed that SNS junk-food related content may negatively affect BID as well as mood and cravings. The results shed light on the need for interventions to increase community awareness such as social media literacy programs that provide technical, cognitive, and emotional competencies for mindful SNS use and reduce the negative impact of certain types of social media content.
Keywords: Body Image Dissatisfaction, Social Media, Social Networking Sites, Mood and Anxiety, Junk Food Craving, Food Porn.

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Terms and Abbreviations

ATLS-Q	Arab Teen Lifestyle (Questionnaire)
BI	Body Image
BID	Body Image Dissatisfaction
BISS	Body Image State Scale
BMI	Body Mass Index
BSQ	Body Shape Questionnaire
DSM-5	Diagnostic and Statistical Manual of Mental Disorders
ED	Eating Disorders
MM	Mass Media
PSMU	Problematic Social Media Use
SNS	Social Networking Sites
VAS	Visual Analogue Scale

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Chapter One
Background

1.1. Social media use

Traditional media, also known as Mass Media (MM) has known to be an outlet for communicating and advertising to the public. However, the major paradigm shift to a heavy reliance on technology and social media has allowed everything from instant messaging to shopping to be transmitted quicker and instantaneously through social media platforms. Social media is defined by Obar and Wildman (2015) as "an array of user-centric spaces with user generated content, along with a diverse set of opportunities for linking these spaces together to form virtual social networks (Obar & Wildman, 2015). Essentially, it follows a social and business perspective and bridges users together and to businesses. Currently, the most popular social networking sites (SNS) include Facebook, Youtube, Whatsapp, Instagram, and Tiktok (Statista, 2021). Recent statistics indicate adolescents spending an average of 6–9 hours per day on digital media and 2–4 hours per day on social media (Shafi et al., 2021a; Crone & Konijn, 2018; Carson et al., 2018). This creates a major cause for concern, as social media use has been characterized similarly to other addictive disorders. (Shafi et al., 2021a). Although it has not been categorized in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, Arlington, 2013), experts suggest that the compulsivity, withdrawal, and impaired functioning resemble other addictions (also referred as a "discrete" addiction) and can be detrimental to the health and development of adolescents (Shafi et al., 2021b; Bányai et al., 2017).

1.2. The emergence of Instagram as a main social media platform

Since its debut in 2010, Instagram became the second most popular social media platform with over 1 billion active monthly users mainly in the age group of 17-34 years (Salva, D. 2019). The nature of this social media platform is photo-centric (as comparted to other platforms such as Facebook and Twitter) and a study conducted by Engeln et al (2020) experimentally tested the effect of using two popular social media platforms (Facebook and Instagram) on college women's mood and body dissatisfaction. Similar to previous research (de Vries, et al, 2016; Saiphoo & Vahedi, 2019) social media use was reported to influence body dissatisfaction, and that Instagram may be a harmful platform when assessing body image because of its focus on images over text (Engeln, R. et al, 2020).

Chapter Two

Literature Review

2.1. Body Image

2.1.1. Body Image definition

Body image is a multifaceted construct and is defined as one's perception, thoughts, and attitudes towards one's physical appearance (Sarwer, D., & Cash, T., 2008; Cash, et al, 2004). An additional definition of body image perception was added by the Eating Disorders Awareness and Prevention (EDAP) and includes "how you feel in your body not just about your body" (National Eating Disorders Association, 2018). Also, body image dissatisfaction (BID) has not only been limited to body shape, but also muscle tone, hair and other personal characteristics (Fletcher B, 2009). Body image perception has been studied as a multidimensional construct, with numerous studies investigating the effects of societal ideal body standards on disordered eating behaviors in adolescents and young adults as well as the risk factors for BID (Sarwer, D., & Cash, T., 2008; Alebachew, F., & Ashagrie, M., 2017; Shoraka, H., Amirkafi, A., & Garrusi, B., 2019; Saiphoo, A. N., & Vahedi, Z., 2019; Holt & Lyness, 2007; Stice, E., & Whitenton, K., 2002; Hoffmann, S., & Warschburger, P., 2019). Four components of BI have been identified: (1) perceptual BI, which is the perceived BI and not the true state of one's body, (2) affective BI which is the way one feels about their body including satisfaction or dissatisfaction about one's shape, weight, and individual body parts, (3) cognitive BI or one's thought about their BI which can lead to preoccupation with body weight and shape and (4) behavioral BI which is the engagement in certain behaviors as a result of BI. For example, if a person is dissatisfied with their BI, they may display negative behaviors such as self-isolation, overexercising, or dietary restraint to change and conceal their physical appearance (Yamamotova, A., Bulant, J., Bocek, V., & Papezova, H., 2017; Hosseini SA, Padhy RK, 2020).

2.1.2. Prevalence of Body Image Dissatisfaction

BID has become a global concern (Hosseini SA & Padhy RK, 2020). Studies observed the highest levels of body dissatisfaction in adolescence and early adulthood, specifically in women, where BI misperception was reported up to 50%, while the reported rate of body dissatisfaction is between 30-75% (de Vries, D.A., Peter, J., de Graaf, H. *et al*, 2016; Shoraka H. et al, 2019; Hosseini SA & Padhy RK, 2020). Based on cross-sectional studies, the prevalence of BID can be as high as 71% among adolescents while other cross-sectional surveys from the United States, Canada, Europe, Pakistan, Korea, and China indicate that approximately 45% of children and adolescents experience body image-related concerns (Al Sabbah H et al, 2009; Moehlecke M et al, 2020; Hosseini SA & Padhy RK, 2020). Due to the increase in attention and research on BID, researchers have explored the effect of BID on dietary behavior and its negative impact on overall health.

2.1.3. Body Image and the Media

Body image has always had a large role in measuring one's success due to cultural stereotypes of physical appearance comparison. This originally emerged from western culture through media by globally depicting a certain ideal standard of 'beauty' (Pop, C., 2016). The influence of mass media, including television advertisements, magazines and billboards on body image disturbance has been studied extensively. Research has shown that exposure to these traditional media influences both males and females (Barlett, Vowels, & Saucier, 2008; Grabe, Ward, & Hyde, 2008; Saiphoo, A. N., & Vahedi, Z., 2019).

A trilateral model of BI perception was identified by Keery, H., van den Berg, P., & Thompson, J. K. (2004) called the Tripartite Influence Model of BID and eating disturbance (Shroff & Thompson, 2006). The model includes three main influences on BI and eating problems: peers, parents and media. These influences are mediated by two mechanisms: the first is the internalization of societal ideals (both the thin or muscular ideal) and the second is appearance-based social comparison (Thompson, Heinberg, Altable, & Tantleff-Dunn, 1999). Because SNS content is self-curated, the longer the exposure, the higher the internalization of the content seen and the higher the social comparison (Bennett et al., 2019). This model was evaluated in various populations consistently showing that media and peers influenced BID more than parents (Keery et al., 2004a; Yamamiya et al., 2008; van den Berg et al., 2002; Keery et al., 2004b).

Similar to traditional media, social media promotes certain standards of beauty. In addition, users commonly post 'attractive' or the 'best' photo of themselves to be shared with their peers. (Shafie, Nayan, & Osman, 2012; Siibak, 2009; Rodgers & Melioli, 2016; Chua & Chang, 2016; Cohen, Newton-John, & Slater, 2018; Haferkamp & Krämer, 2011; Lee-Won, Shim, Joo, & Park, 2014). Often times, photos displayed in traditional advertisements as well as those on social media ads are known to be heavily altered and a great public health concern (McBride et al., 2019). Moreover, 'filters' have been created so that social media users can alter their photos and can instantaneously before even capturing them (Mills et al., 2018; McComb et al., 2021). Some studies assessed the effects of using disclaimers that indicate to users that photos are filter-free and enhancement-free. While one study found that under certain conditions these disclaimers may have a protective effect against BID (Tiggemann & Zinoviev, 2019), most found no effect (Frederick et al., 2016; Tiggemann et al., 2013; Fardouly & Holland, 2018).

Results from numerous studies are consistent with the trilateral influence model, showing that repeated and consistent exposure to images of thin or muscular individuals negatively influenced BI perception (Feltman & Szymanski, 2018; Brown & Tiggemann, 2016; Fardouly, Pinkus, & Vartanian, 2017; Hogue & Mills, 2019). Given the widespread display of the thin ideal female body type on social media, many women have internalized that it is a highly achievable goal and may experience an increase in BID if they are not able to achieve it (McComb et al., 2021; Cafri et al., 2006).Similarly, correlational studies have shown significant associations between time spent on social media and BID, drive for thinness, internalization of the thin-ideal, body surveillance, self-objectification, social comparison, and dieting among young adolescent female high school and undergraduate students (Tiggemann & McGill, 2004; Tiggemann & Polivy, 2010, Tiggemann et al., 2009; Fardouly, J., & Vartanian, L. R., 2016; Tiggemann, M., & Slater, A., 2013, Vandenbosch L & Eggermont S, 2012; Cohen R & Blaszczynski A, 2015; Fardouly J. et al, 2015; Fardouly J & Vartanian LR, 2015; Bair, Kelly, Serdar, & Mazzeo, 2012; Tiggemann & Miller, 2010; Tiggemann & Slater, 2013, 2014; Marengo, D. et al, 2018). Thus, the literature found highlights the importance of exposure to social media and that it can directly and indirectly affect BID.

2.1.4. Body Image Assessment

BID has been estimated by the assessment of the various aspects that affect perception of and/or attitudes toward one's body which include body shape concern, body weight, physical appearance, and muscle structure. The most studied is body shape concern, specifically body appearance, size, and silhouette (Conti et al, 2009). Body shape concern was shown to be highly influenced by psychological, cognitive, and behavioral factors (Akdemir et al., 2012; Cash & Grasso, 2005) and is more likely experienced by individuals who are susceptible to developing mental and physiological changes related to physical appearance and directly influences their daily lives (Costa & Vasconcelos, 2010; Cooper et al, 1987). Therefore, it is essential to assess the level of concern to body shape of an individual to avoid numerous health impairments and can be assessed using a psychometric scale (Yahia et al, 2011).

The most commonly used assessment tool is the Body Shape Questionnaire (BSQ) which uses a 6-point Likert-type scale to assess the level of satisfaction and concern of women toward their body shape (Cooper et al., 1987; Akdemir et al., 2012; Miranda et al., 2012). Initially, it was a one-factor structure comprising 34 self-report items however, a validation study was conducted and created 8-item and 16-item versions, while still maintaining the one factor structure (Evans and Dolan, 1993). It was further suggested that the shortened BSQ versions have more stable psychometric properties compared with the 34-item version when applied to German, American, and Spanish population samples (Pook et al, 2008; Warren et al, 2008). However, an important research finding noted an observed gender difference in the BSQ scores where 89% of the "extremely worried" students were females (Yahia et al, 2011). Other tools of assessment include the Body Appreciation scale (BAS), the Eating Disorder Examination Questionnaire (EDEQ), the Self Objectification Questionnaire (SOQ), and many other subscales each studied and validated in certain populations for research and clinical use (Rounsefell et al., 2019). The importance of assessment is to measure the prevalence and implications of BI dissatisfaction and develop possible interventions to address and reduce the prevalence of BI dissatisfaction.

2.1.5. Body Image and Health Behaviors

One of the main concerns related to BID is that it may lead to negative health behaviors such as disordered eating, excessive exercise, difficulty quitting smoking, and possibly long-term risk of eating disorders (Fletcher, 2009; King, Matacin, White, & Marcus, 2005). Dietary restraint was also exhibited, and strongly related to body dissatisfaction (Johnson and Wardle, 2005; Herman & Mack, 1975; Patterson C. et al, 2016). A recent meta-analysis assessed the influence of MM on body image and risk of eating disorders (ED) in a Brazilian population. Results showed an association between MM exposure and ED risk which was mediated by exposure to the thin ideal for women and muscular ideal for men. Exposure to these images was shown to affect the health of adolescents through the development of negative eating behaviors as a result of BID. These include meal skipping, over exercising, inducing vomiting, and the use of laxatives and diuretics, which are classified as subclinical signs of ED symptoms. (Uchôa et al., 2019). By the same token, evidence shows positive outcomes when a positive or improved body image is achieved, such as more confidence and empowerment with coping with illness in women with breast cancer (Pikler & Winterowd, 2003; Patterson C. et al, 2016). Thus, interventions aiming to improve body image may positively affect health behaviors and attitudes as seen in two recent systematic reviews. The first, conducted a search for nutrition intervention on young adults through social media and found the results to be promising despite the limited number of studies (Chau et al., 2018). The other systematic review was conducted using studies that assessed the impact of using social media as a promotional tool for health on positive health behaviors. Despite limitations on the extent of benefit, the results indicated not to rule out social media as a positive health influencing tool (Laroche et al., 2020).

2.1.6. State vs. Trait BI

BI assessments may evaluate “trait”, or “state” BI depending on the context (Cash, 2002; Fletcher B., 2009). Trait BI dissatisfaction is considered a stable baseline level of concern towards body image whereas “state” BI dissatisfaction is the feeling of anxiety or concern towards ones’ BI at any given moment (Fletcher B., 2009). Recent work assessed whether individuals with varying levels of trait body image differ in the severity, variability, and correlates of state body dissatisfaction experienced in their daily lives. Results showed that individuals who were more BI flexible (having varying state BI dissatisfaction over multiple assessments) had less body image dissatisfaction due to a reduced engagement in

behaviors and cognitions that encourage negative body image as compared with individuals with a more general trait BI dissatisfaction. In other words, BI flexibility is protective against overall negative behaviors (Tan, W. et al, 2019). It is necessary to assess and differentiate between both trait and state BI dissatisfaction in order to be able to evaluate the effects of various short- and long-term influences on body image and subsequently tailor interventions.

2.1.7. Self-esteem and BI perception

Previous research has identified self-esteem as an important influential factor with regards to BI perception. Self-esteem is defined as an individual's subjective emotional evaluation of his or her own worth (Ahadzadeh, A et al, 2018; Alebachew, F., & Ashagrie, M., 2017; Kalat, 2016) and was shown to be a mediator in BI dissatisfaction, influenced by BMI, BI perception, and fear of negative evaluation (Ahadzadeh et al., 2018). Research has shown a protective role of positive self-esteem on BI dissatisfaction (De souse Fortesa et al, 2014; Oney et al., 2011, Ahadzadeh et al, 2018) as well as overall better health and positive social behavior (Khanam & Moghal, 2012; Ahadzadeh, A et al, 2018). Furthermore, studies have observed that the higher the level of dissatisfaction about one's body, the higher the risk of low self-esteem, depression, and overall poorer quality of life (Rounsefell et al., 2019; Paxton et al, 2006, Ahadzadeh, A et al, 2018).

2.2. Social Media's impact on BI, Stress, Mood, and Cravings

2.2.1. Impact of Social Media on Mental Health

Social media use has been shown to impact stress, depression, mood, and anxiety. A systematic review by Keles et al. (2019) examined the influence of social media in young adolescents and classified their findings into four common domains of exposure to social media: time spent, activity, investment, and addiction. Activity is the interaction level with the platforms and other users. Investment was defined as the act of spending time and effort, while addiction refers to dependence on social media (Keles et al., 2019). Despite inconsistencies, there was an observed correlation between social media use and mental health issues in young adolescents. This result is in line with other studies, where depression and anxiety were positively correlated with time spent on social media (Shensa et al., 2018; Woods & Scott, 2016; Vannucci et al., 2017). More specifically, behaviors such as frequent message checking, personal posting, and insomnia due to time spent on social networking

sites were found to be key mediators in this relationship. Similarly, media use and dependence on technological devices were shown to be correlated with stress, BI dissatisfaction, and an increased risk for eating disorders, possibly through an increase in anxiety, depression, and unhealthy eating (Zeeni et al., 2018).

Further research has presented alarming results regarding the long-term effects of social media use. A 5-year longitudinal study explored the within-person correlation between time spent on SNS and symptoms of depression from early to late adolescence and found that social media use possibly increases when experiencing depressive symptoms, but no effect found with the reverse relationship (Puukko et al., 2020). Problematic social media use (PSMU) was also found to be independently correlated with increased depressive symptoms (Rosen et al., 2013; Shensa, A. et al, 2017). PSMU is a behavior characterized by constant occupation and distress about social media, the drive and motivation to use and spend so much time and effort that it impairs other activities, commitments and relationships as well as affecting mental well-being (Shensa, A. et al, 2017; Andreassen & Pallesen, 2014).

2.2.2. Impact of Social Media on Cravings and Eating Behavior

Recent research showed promise when using social media for possible nutrition interventions such as posting nutrition tips and healthy recipes (Chau, M. M., Burgermaster, M., & Mamykina, L., 2018) while another study found success in increasing desirable food groups, but failure in reduction of undesirable food groups (Hsu, M., Rouf, A., & Allman-Farinelli, M. (2018). A study conducted the effect of mood and stress due to a violent vs non-violent movie stimulus effect on appetite perception and food preferences. Results highlighted the effect of acute stress due to a stimulus increasing the consumption of highly palatable foods to dampen the stress response (Mattar et al., 2019).

An exploratory analysis was conducted on social media, the thin ideal, BID and disordered eating behaviors. The hypotheses engaged the ideas that among young adolescent women, the internalized thin ideal would be linked to high BID as a cause of low self-esteem, consequently causing disordered eating behaviors. This cross-sectional analysis analyzed 18–25-year-old college females with the possibility of disordered eating behaviors to be influenced by ideal beauty standards imposed on social media. Another significant finding was the thin ideal promoted on social media platforms appealing to women and their desire to change their behaviors to attain these unrealistic standards. Possible implications of this

research speculate the possibility of decreasing BI satisfaction through increasing body appreciation through awareness interventions (Aparicio-Martinez et al., 2019).

2.2.3. Impact of Social Media on Stress and Mood

Stress and mood are instantaneous measures in response to a stimulus. In this context, SNS content has been studied as a potential stimulus that affects mood and stress. A recent study examined the impact of social media on mood and body dissatisfaction through measures of momentary assessment. Results indicated that the higher the number of SNS visited, the higher the level of overall BID, while time spent on SNS showed no correlation. Both number of SNS and time spent on SNS showed to be predictors of an overall negative effect, including sadness and guilt (Bennett et al., 2019). Another study examined the difference between active and passive social media use and their effects on symptoms of anxiety and depressed mood among Icelandic adolescents. Active use refers to chatting, sharing updates or personal content (including photos) while passive use involves browsing, scrolling, or sharing links. Results showed that passive use of social media was strongly related to a depressed mood while active use was related to decreased symptoms of depressed mood and anxiety while controlling for time spent on SNS (Thorisdottir et al., 2019). Additionally, a meta-analysis examining depression and anxiety in the context of SNSs explored mental illness assessment and to possibly identify moderators and mediators that improve mental well-being (Seabrook et al., 2016). Results showed that social support and connectedness along with positive interactions showed lower levels of depression and anxiety, while social comparisons and overall negative interaction related to higher levels of depression and anxiety (Seabrook et al., 2016). These results emphasize that the type of content presented to individuals on social media may differentially impact their mood and overall mental well-being.

2.2.4. Exposure to Food-Related Social Media Content

Food media has become a prevalent part of social media content, so much that specific filters have been created so that enhance the colors and sharpness of food images (Mejova et al., 2016). Statistics about food-related content on Instagram show over 1,460,226 posts on Instagram for the hashtag #food, and 675,145 posts for #foodporn which is a commonly used label to designate junk food (Mejova et al., 2016). Despite it being used in a

positive context for the food images being delicious, #foodporn could have negative implications and promote unhealthy eating because of the associations of 'guilt' or 'indulgence' with the consumption of these foods (Rousseau, 2013). Along the same lines, a theoretical framework describing the factors that influence adolescent's food preferences and relationship with food was suggested by Story et al. (2002). This model included intrapersonal (individual), interpersonal (social environment), physical environment, and macrosystem influences (ie., media and social norms). Given the high level of exposure and presence of food-related images on SNS, and specifically Instagram, exposure to this type of content may influence body image and eating behavior. There have been several mechanisms suggested for the association between food related content and eating behaviors. There are four cognitive theories that have best explained the mechanisms: the Social learning theory, the Priming theory, Attention theories, and Reward theories. A meta-analysis studying the theories and research on media effects on behavior, specifically those trends that explore mass communication versus social media (Valkenburg, Peter, & Walther, 2016). It was also explained that the hypothesis tested and developed by Valkenburg & Peter (2009) on the Internet-enhanced self-disclosure theory among adolescents applies to exposure to junk food content (Neter et al., 2018). Cognitive processing of food rewards was simplified by Higgs (2016) using the example in the case that someone was to decide whether to buy a chocolate cake or an apple. If they had not eaten for a long time (feeling of hunger) then the chocolate cake would likely be favored over the apple due to past learning that the energy dense option is more satiating. Further detail was discussed that the specific action of buying the chocolate cake from a specific store may be favored due to multiple past purchases knowing that it is tasty from that store. This goal directed behavior could have been from the person's best perceived outcome from their known possibilities, however over time the behavior could be more habitual and automatic (Higgs, 2016). This shows the complexity of individual behavior learned from exposure to food related content and its effects on overall eating behavior.

2.2.5. COVID-19 Lockdown, Eating Behavior, and Social Media Use

The recent COVID-19 lockdown (beginning March 2020) caused an upsurge in media and technology use as the primary form of communication (Fernandes et al, 2020). Studies from different populations exploring the changes in food and exercise habits during the COVID-19 lockdown observed a positive correlation between time spent on social media and

disordered eating behaviors and risk of eating disorders (Abbas et al., 2021; Chaves et al., 2020, Vall-Roqué et al., 2021; Bakaloudi et al., 2021; Naja & Hamadeh, 2020; Di Renzo et al., 2020). The combination of reduced social support and increased time spent on social media has triggered dysfunctional eating behaviors and increased body dissatisfaction (Robertson et al., 2020). Other researchers have stressed on the vulnerabilities of those individuals predisposed to mental health issues and either instigating or increasing the severity of eating disorders (Robertson et al., 2020; Holmes et al., 2020; Touyz et al., 2020; Weissman et al., 2020).

2.3. Knowledge Gap and Objective of the Study

Many studies have explored the effect of social media use on BID, however very little attempting to assess the further impact on cravings and food choice. The overall aim of the present project is therefore to examine the effect of Instagram food-related content exposure on BID and eating behavior (cravings and dietary choice) in healthy Lebanese young adults. Stress, anxiety and mood (positive/negative affect) will also be assessed as potential mediators in the studied relationships.

Chapter Three

Methodology

The outcomes of the study include social media use, overall BID, the impact of social media on state BID, stress, mood, and cravings in young adolescents.

1.1. Study Design

This study followed a randomized crossover experimental trial approved by the Institutional Review Board (IRB) at the Lebanese American University, Lebanon (LAU.SAS.NZ3.4/Dec/2019). It was advertised on a simple flyer (Appendix A) and was broadcasted on text by five trained research personnel. A convenient sample of eligible participants (those 18-30 years enrolled at university) were presented with an informed consent form before proceeding. At T0, participants were asked to complete a baseline survey that collected demographic characteristics, healthy eating habits, overall body image satisfaction, and social media use. Subsequently, participants were randomly presented with either neutral Instagram content or a junk food Instagram content. The neutral account was created and followed accounts through searching the popular hashtags: #travel, #architechture, #animals, #nature. The junk food account was created by searching the popular hashtags: #foodporn, #food, and #junkfood. The accounts followed all had >100,000 followers as that would mean the content posted on these accounts were constant and would appear on participants' feed. However, the food account contained 20% neutral content to minimize bias. Participants were given a login for these accounts and asked to browse for ten minutes and interact as they would scrolling through their own Instagram account. Participants were asked to fill out a short survey immediately after containing questions about state BI, state mood, and state cravings. At the end of the survey participants were asked to build a meal tray including healthy or unhealthy items. After a seven-day washout period, at T1, participants were given login information to the other account and then asked to fill out the short survey again. All participants were asked to conduct this an hour before their next meal (between breakfast and lunch) to further minimize bias on cravings.

1.2. Focus Group

Qualitative data was collected in a focus group conducted after data collection recruiting participants who completed the trial and consented to participate. The outcomes measured were the level of awareness on the effect of social media on body image, mood, and cravings. The structure of the focus group included an opening ice breaker, a verbal confidentiality statement, and a recap of the study and purpose of the focus group. Participants were asked a series of open-ended questions and were allowed to share and discuss their personal opinions and thoughts. A recording of the focus group meeting was transcribed and analyzed to further explain the results seen in the quantitative data collection.

1.3.Ethical Considerations

Ethical permission for this study was obtained from the IRB Institutional Review Board at the Lebanese American University which is constituted in accordance with the US Code of Federal Regulation (45CFR 46.107, 21CFR 56.107), and Good Clinical Practice ICH. “Approval number: LAU.SAS.NZ3.4/Dec/2019”.

1.4. Study Questionnaires – Baseline survey

1.4.1. Sociodemographic factors and Social Media Use

In the baseline survey: age, gender, self-reported height and weight, year at university, physical activity frequency, purpose of exercising, and how long they have been exercising was collected. Social media use was studied using a validated survey in Lebanon (Zeeni, N., Doumit, R., Abi Kharma, J., & Sanchez-Ruiz, M. J. (2018). Questions included a 9-point scale (from Never to all the time) on certain activities about social media including checking home page, posting/liking posts, browsing profiles, etc.

1.4.2. BSQ-8c: the Body Shape Questionnaire (shortened version)

The BSQ-8c was adapted for males and females created and validated by Evans and Dolan, 1993, has been used to measure body image satisfaction. The 8-item scale including a 6-point likert scale (Never to Always) score used to classify participants into either no, mild, moderate, or marked concern with shape (Evans, 2019). This scale was previously used in the

general Swedish population (Welch, E., Lagerström, M., & Ghaderi, A., 2012) and was also used in Lebanon (Zeeni, N., Doumit, R., Abi Kharma, J., & Sanchez-Ruiz, M. J. (2018.).

1.4.3. Dietary Habits

Dietary intake was measured using an adapted version of the Arab Teens Lifestyle Questionnaire (ATLS-Q), developed in Saudi Arabia (Al-Hazzaa, Musaiger, & ATLS Research Group, 2011), validated in Bahrain (Musaiger, Bader, Al-Roomi, & D'Souza, 2011) and used in Lebanon in previous studies Zeeni, N., Doumit, R., Abi Kharma, J., & Sanchez-Ruiz, M. J. (2018). Questions included a short food frequency questionnaire (FFQ) from 0-7 times per week of the following: breakfast consumption, sugary drinks intake, fruit and vegetable intake, dairy, fast food, French fries and/or potato chips, pastries, candy and/or chocolate, and energy drinks/sugary drinks intake.

1.5. Study Questionnaires – Short Surveys

1.5.1. Mood and Cravings – Quick survey

A visual analogue scale (VAS) (adapted for the internet) was presented to measure state mood and cravings and has been validated to detect changes in mood in response to different stimulus. The 10-point scale contained 18 questions ranging from (Very little to Very much) about positive and negative feelings, and cravings of salty, sweet, and fatty foods (Monk,1989; Rogers & Blundell, 1979) and has also been used in another study in Lebanon (Mattar, et al, 2015).

1.5.2. State Body Image – Body Image States Scale (BISS)

State BID was measured using a consistently valid 6-item scale, a self-evaluation of physical appearance at a particular moment in time. Its effectiveness of use is attributed to the validity and sensitivity to detect reactions to positive or negative stimulus. The uniqueness of the scale comes from the confirmation of use in experimental and clinical contexts to assess information about individuals' thoughts on physical appearance and level of BI dysfunction (Cash, T. et al, 2002).

1.5.3. Food Image Cravings and Meal Tray

The final part of the survey contained five images of different types of foods with a scale of 1-10 presenting the cravings of that food image and the likeliness of the participant to

consume those foods. The images were a burger and fries platter, a homemade Lebanese dish (Kibbe, minced beef balls with burghul cooked in yoghurt), a whole wheat turkey bagel, a chicken salad, and a pizza. Consequently, a word list of food and drink items were presented, and participants were asked to put together a meal tray of a lunch they would consume at that point in time. There was an unlimited choice of 16 food and drink items including both healthy and unhealthy options.

1.6. Statistical Analysis

Statistical analysis was conducted using SPSS-version 25. Initial descriptive analysis was conducted on sociodemographic characteristics of participants displaying means and frequencies for gender, year at university, and physical activity. BMI was calculated from self-reported weight and height and classified according to the scores. Normality was checked for all variables and all scores were computed according to subscales of the surveys. Baseline survey scores were displayed with mean and standard deviation of scores and subscales.

Paired-sample t-tests were conducted for short survey scores for pre and post exposure of Control and Food accounts to check the difference of scores within participants. Those included the VAS subscales, BISS scores, Food pictures cravings, and meal tray unhealthy item score. Correlation analysis was conducted between ATLS-Q and BSQ-8c as well as VAS subscales and BSQ-8c using Pearson's correlation. Pearson's correlation was also conducted between the VAS subscales and food images presented in the short survey after being exposed to the food account.

Finally, bivariate analysis was conducted for each independent variable related to the main outcome, the food image craving scores. If the p-value was less than 0.2 it was eligible to be used in the multiple linear regression analysis to highlight the predictors for cravings of certain foods (displayed as images) while correcting for confounders.

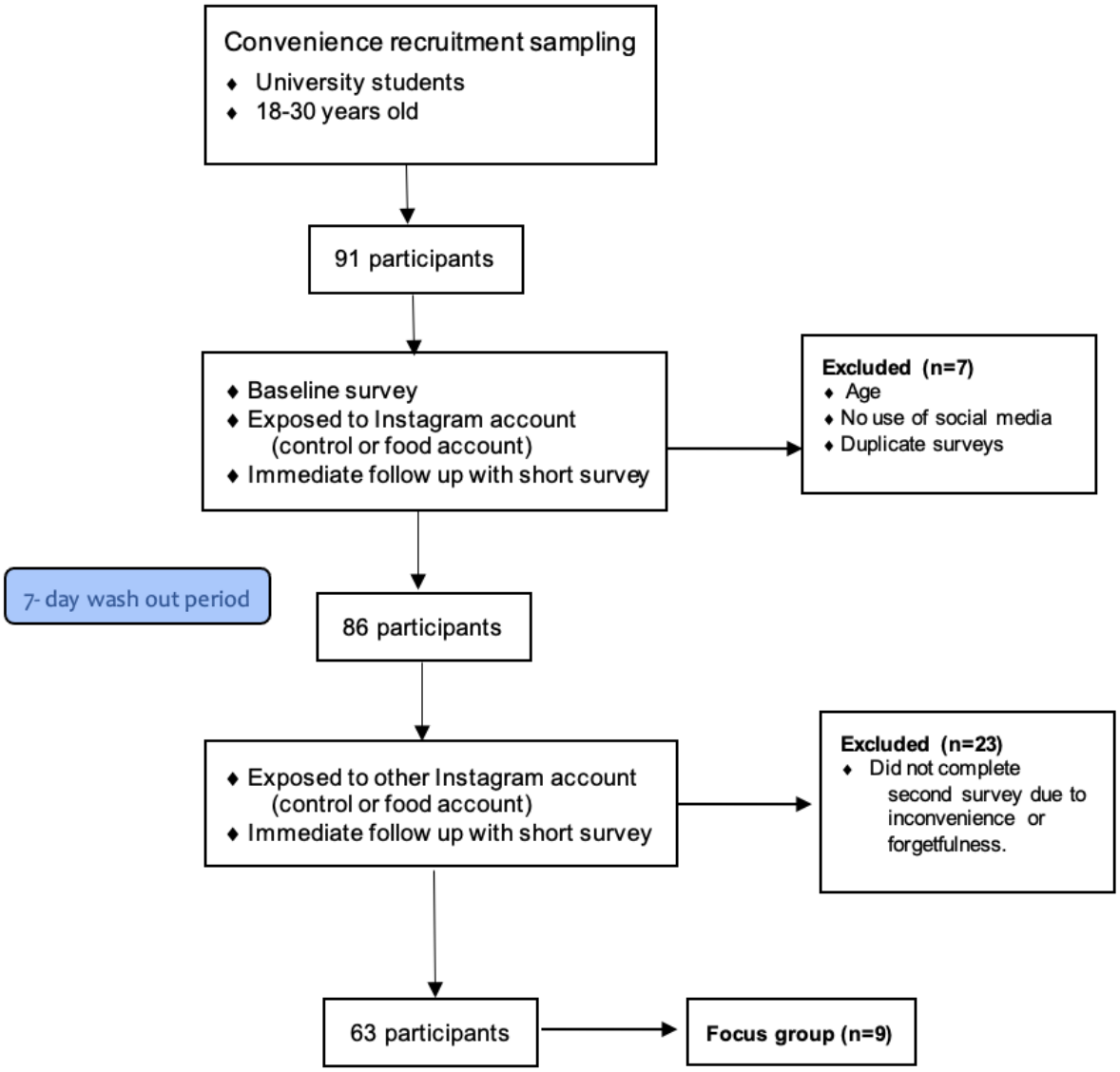

Figure 1. Flow chart of the recruitment and selection of the sample.

Chapter Four
Results and Discussion

4.1. Results

4.1.1. Sociodemographic and Characteristics of Participants

After excluding participants (n=30) who did not complete both surveys or didn't meet the age requirement (Figure 1), a total of 63 participants remained. Frequency of gender, year at university, physical activity and BMI classification were reported in Table 1. Additionally, the mean age of the sample was 20.97 ± 2.48 years old and a mean BMI of 23.13 ± 3.84 kg/m^2.

Table 1: Sociodemographic and characteristics of participants

Participants (N=63)	**Frequency (n)**	**Percent (%)**
Gender		
Male	20	31.7
Female	43	68.3
Year at University		
Freshman	4	6.3
Sophomore	7	11.1
Junior	16	25.4
Senior	22	34.9
Graduate	14	22.2
Physical Activity		
How frequently do you practice physical activity?		
< 1 hour per week	17	26
1 hour per week	13	20.6
2 hours per week	11	17.5
3 hours per week	5	7.9
3+ hours per week	17	27
If you exercise, what is the main purpose?		
To be healthy	17	27
To increase muscle size	5	7.9
To be fit	23	36.5
To lose weight	18	28.6
How long have you been exercising?		
Few weeks	8	12.7
Few months	18	28.6
1-2 years	4	6.3
2 years	23	36.5
BMI Classification		
Underweight	4	6.3
Normal	42	66.7
Overweight	13	20.6

Obese Class 1	4	6.3
Participants (N=63)	**Mean**	**SD**
Age	20.97	2.48
BMI	23.13	3.84

4.1.2. Baseline Survey Scores

At baseline, participants' scores for the BSQ-8c, ATLS-Q (score for healthy eating) and social media use was calculated (Table 2). For all participants, BSQ-8c had a mean of 19.63 ± 1.81, with a minimum score of 8 and maximum of 37. Classification of BSQ-8c according to Evans (2019), scores indicated 49.2% of participants had no concern with shape, 23.2% and 22.2% had moderate and mild concern with shape respectively, and 4.8% had marked concern with shape (Appendix D). As for the ATLS-Q score, it was a composite score of habitual dietary intake of fruit and vegetables, dairy products, french fries and potato chips, fast food, pastries, candy, and sugary drinks. The score also included breakfast skipping. A higher ATLS-Q score indicated higher healthy eating habits. Social media use was measured using frequency of social media checking, the number of follower's a participant has, the number of followers they know in person, the number of followers they know only online, and social media anxiety measured by computing statements about feeling anxious away from a phone or access to internet. Social media anxiety was measured with a compound score of 3 items with 5-point Likert scale. The mean score was 10.68 ± 2.66 with certain participants scoring at the minimum and maximum possible score for social media anxiety.

Table 2: Baseline Survey Scores

	Minimum	**Maximum**	**Mean**	**SD**
BSQ-8c	8	43	20.11	8.01
ATLS–Q (Healthy eating score)	6	51	31.2	8.13
Social Media Use				
Social media checking	29	67	50.79	9.98
Followers	0	2770	760.24	642.59
Followers know in person	0	1800	452.24	369.201
Online acquaintances only	0	1000	44.76	146.533
Social media anxiety	3	15	10.68	2.66

4.1.3. Short Survey Scores

For short survey scores, paired sample t-tests were conducted to compare the results of participants exposed to the control account and food account (Table 3). There was a

significantly higher score in all VAS subscales when participants were exposed to the control versus the food account, with sweet craving subscale being borderline significant. As for BISS scores, there was no statistically significant difference between both exposures. Food pictures scores were presented between 1 and 10 craving level. There were significantly higher craving scores (p=0.0001) for both burger and pizza image when participants were presented with junk food Instagram content versus when they were exposed to the control Instagram. Conversely, there were statistically significant lower craving scores for the healthy food images of a whole grain turkey bagel (p=0.01) and chicken salad (p=0.016) when presented with the junk food content versus the control Instagram content. There was no significant difference in craving score for the traditional Lebanese dish "Kibbe" image when participants were exposed to the control or junk food Instagram content. Finally, the meal tray score was a composite score of the items chose out of 16 possible choices, attributing a score of 1 for healthy food and drink items and a score of 2 for unhealthy food and drink items. There was a statistically significant higher scores when participants were presented with the junk food Instagram content than when exposed to the control account (p=0.008).

Table 3: Paired sample t-test of short survey scores

	Control account (Mean ± SD)	**Junk Food account (Mean ± SD)**	**t**	**p-value**
VAS Subscales				
Stress	17.22 ± 6.94	21.19 ± 7.21	3.363	**0.001**
Sadness	11.26 ± 5.14	13.52 ± 6.05	2.699	**0.007**
Exhaustion	16.57 ± 4.78	18.81 ± 5.18	4.176	**0.009**
Hunger	21.08 ± 8.76	26.25 ± 9.46	2.813	**0.0001**
Sweet craving	4.83 ± 2.81	5.68 ± 3.03	1.980	0.052
Salty craving	4.62 ± 2.81	6.60 ± 2.81	4.860	**0.0001**
Savory craving	4.56 ± 2.81	6.24 ± 2.54	4.595	**0.0001**
Fatty craving	4.35 ± 2.81	5.73 ± 3.07	2.931	**0.005**
BISS Scores	29.87 ± 2.16	29.46 ± 2.31	1.376	0.174
Food Pictures				
Burger	5.16 ± 2.87	7.67 ± 2.48	5.613	**0.0001**
Kibbe[a]	5.32 ± 2.78	4.95 ± 2.69	0.875	0.385
Whole grain turkey bagel	5.48 ± 2.77	4.51 ± 2.60	2.659	**0.01**
Chicken salad	6.59 ± 2.36	5.76 ± 2.75	2.479	**0.016**
Pizza	5.13 ± 2.81	7.56 ± 2.54	5.537	**0.0001**
Meal Tray Score	6.13 ± 3.24	7.37 ± 3.84	2.720	**0.008**

[a]= kibbe is a Lebanese traditional dish made of minced beef and burghul balls in a cooked yoghurt sauce. It was placed to decrease bias between extremely healthy and extremely unhealthy food pictures presented.

4.1.4. Correlation between baseline survey scores and short survey scores

Correlations between the baseline survey scores and short survey scores were performed to understand the associations between trait body dissatisfaction, state body image dissatisfaction, social media use, mood, and cravings (Table 4). Firstly, the BSQ-8c was negatively correlated with the ATLS-Q with a Pearson's correlation of -0.323 (p=0.01), confirming those participants with higher overall body shape concern to have unhealthy eating habits. Additionally, those who have higher body shape concern (BSQ-8c) scored high on the social media anxiety score (0.384, p=0.002), had higher BMI (0.448, p=0.0001) and practiced less physical activity (0.295, p=0.019). Participants who usually spend more time on social media, had higher social media-related anxiety (0.429, p=0.0001) but lower state body image dissatisfaction after being exposed to neutral content (-0.366, p=0.003). Scoring high on feelings hunger after being exposed to junk food content were positively correlated with having high body shape concern (0.284, p=0.024) and selecting more food for their meal tray (0.271, p=0.032).

Table 4: Pearson's correlation between baseline survey scores and short survey scores

		ATLS-Q	Social Media anxiety score	BMI	Neutral BISS score	Food VAS hunger subscale	Physical activity frequency
BSQ-8c	*Pearson Correlation*	*-0.323***	*0.384***	*0.448***		*0.284**	*-0.295**
	P-value	*0.01*	*0.002*	*0.0001*		*0.024*	*0.019*
	N	*9*	*63*	*63*		*63*	*63*
BMI	*Pearson Correlation*	*-0.350***					
	P-value	*0.005*					
	N	*63*					
Physical Activity frequency	*Pearson Correlation*	*0.291**					
	P-value	*0.021*					
	N	*63*					
Social Media Use score	*Pearson Correlation*		*0.429***		*-0.366***		
	P-value		*0.0001*		*0.003*		
	N		*63*		*63*		
Meal Tray score	*Pearson Correlation*					*0.271**	
	P-value					*0.032*	
	N					*63*	

**Correlation is significant at the 0.05 level (2-tailed)*

***Correlation is significant at the 0.01 level (2-tailed)*

4.1.5. Correlation between BSQ-8c, VAS Subscales, and Food Image Cravings

After observing a significant difference between VAS subscales of the control exposure and junk food exposure, the VAS subscales were further analyzed. Those VAS scores with the junk food account were correlated with the food image craving scores to understand the relationship between participants' state mood and the effect on cravings (Table 5). For the burger image presented, there was a highly significant Pearson's correlation of 0.384 (p=0.002) with the hunger VAS subscale, and significant Pearson's correlation of 0.284 (p=0.024) and 0.321 (0.01) for salty craving and fatty craving respectively. This indicates when participants were presented with junk food images, they reported feelings of hunger as well as cravings for salty and fatty foods and scored high when asked if they were inclined to eat a burger (presented as an image) in the short survey. Similar findings were observed for the pizza food image, with high significant correlation for hunger and sadness subscales with strong positive Pearson's correlation of 0.410 (p=0.001) and 0.343 (p=0.006) respectively. Additionally, a strong positive correlation was obtained in sweet and fatty craving VAS subscales and the pizza food image of 0.357 (p=0.004) and 0.307 (p=0.014) respectively. On the contrary, a strong negative Pearson's correlation was found between the savory and fatty craving scores and chicken salad food image of -0.361 (p=0.004) and -0.325 (p=0.009) respectively. Looking at the correlation between VAS subscales and chicken salad food image craving, there was only significant negative correlation of -0.270 (p=0.032) in the exhaustion subscale, meaning those who reported low on the exhaustion subscale after being presented with a junk food account displayed higher cravings for a chicken salad. No significant correlation was found between VAS subscales and the food images cravings of a wholegrain turkey bagel or Kibbe.

Finally, there was a significantly strong positive association between BSQ-8c baseline scores and state stress VAS subscale scores of stress, hunger, salty cravings, savory cravings, and fatty cravings. State stress was the strongest Pearson's correlation of 0.432 (p=0.001) while hunger was 0.284 (p=0.024), and salty, savory, and fatty craving were 0.316 (p=0.012), 0.275 (p=0.029), and 0.311 (p=0.013) respectively. This indicates those participants scoring higher for BID, had higher state stress and hunger when presented with junk food Instagram content and scored high on craving salty, savory, and fatty food.

Table 5: Pearson's correlation between VAS Subscales with cravings of food images presented after exposure to Junk food account) and BSQ-8c

VAS Subscales (Food account)	Burger	Kibbe	Turkey Bagel	Chicken salad	Pizza	BSQ-8c
Stress	-0.044	-0.223	-0.024	-0.103	0.122	0.432**
Exhaustion	0.109	-0.156	-0.097	-0.270*	0.121	0.241
Hunger	0.384**	0.007	-0.088	-0.080	0.410**	0.284*
Sadness	-0.014	-0.233	-0.025	0.002	0.343**	0.218
Sweet craving	0.196	-0.059	0.129	0.039	0.357**	0.209
Salty craving	0.284*	0.01	-0.016	-0.227	0.049	0.316*
Savory craving	0.234	0.115	-0.204	-0.361**	-0.088	0.275*
Fatty craving	0.321*	0.077	-0.011	-0.325**	0.307*	0.311*

**Correlation is significant at the 0.05 level (2-tailed)*

***Correlation is significant at the 0.01 level (2-tailed)*

4.1.6. Predictors for cravings after being exposed to junk food Instagram content

A multiple linear regression equation was calculated to predict cravings of food images based on state mood (VAS subscales of hunger, sadness, exhaustion, and stress), BISS score and BSQ-8c score. After correcting for age, BMI, physical activity, and social media use, a regression equation was found. After checking independent variables (VAS subscales, BISS score, BSQ-8c score, time of last meal prior to junk food Instagram exposure) and its relation to the five food images through a bivariate analysis, those with a p value > 0.2 were included in regression models (Table 6 and 7). Predictors for food image cravings were achieved for the outcomes of each the burger and pizza food images while correcting for possible confounders. The independent variables for the burger food image were the hunger VAS subscale, BISS score and BMI with an R^2 of 0.344. The independent variables found for the pizza image were BISS score, hunger VAS subscale and time of last meal consumed before exposure to the junk food Instagram content with an R^2 of 0.248.

Table 6: Multiple linear regression table to check association between independent variables and outcome (craving of burger image score)

	B	**SE B**	**ß**	**P-value**
Junk food account VAS Hunger subscale	0.081	0.031	0.309	**0.013**
Junk food account BISS Score	0.292	0.122	0.272	**0.020**
BMI	0.173	0.085	0.268	**0.047**

a. *Dependent Variable: Burger image craving score*
b. *B; unstandardized Beta, SE; Standard Error, ß Standardized Beta*
c. *Note. R^2 = 34.4%*

Table 7: Multiple linear regression tables to check association between independent variables and outcome (craving of pizza image score)

	B	SE B	ß	P-value
Junk food account VAS Hunger subscale	0.101	0.035	0.376	**0.005**
Junk food account BISS Score	0.281	0.134	0.256	**0.040**

a. *Dependent Variable: Pizza image craving score*
b. *B; unstandardized Beta, SE; Standard Error, ß Standardized Beta*
c. *Note. R^2 = 24.8%*

Time of last meal/snack was omitted from the regression equation due to the collinearity with the VAS hunger subscale. Additionally, there was a methodological limitation when collecting data for time of last meal/snack including that it could bias the results as it is unclear whether the participant consumed a meal or snack, affecting their craving scores.

Overall, predictors for craving a burger were explained by higher reported feelings of hunger after being exposed to junk food Instagram content with a standardized Beta of 0.309 (p= 0.013), scoring higher on state body image dissatisfaction ß= 0.272 (p=0.02) and having a higher BMI of ß=0.268 (p=0.047). For the pizza food image craving outcome, predictors for scoring high on pizza craving were higher reported feelings of hunger after being exposed to junk food Instagram content of ß=0.376 (p= 0.005) and scoring higher on state body image dissatisfaction ß= 0.256 (p=0.04).

Qualitative analysis was conducted through a focus group of 9 participants who had completed both arms of the trial. The meeting was held on Zoom for a total duration of fifteen minutes, conducted by a trained interviewer. Open ended questions about BI, food and cravings when exposed to food images were asked. Most participants answered that they don't actively follow junk food pages because of awareness of cravings increasing but wouldn't mind seeing people they know posting junk food content. Some participants expressed self-restraint in buying junk food after seeing images/videos of those foods on SNS. Some also expressed unfollowing certain accounts that post too many food images to avoid subjecting themselves to hunger, guilt, and consequent restraint.

4.2. Discussion

This randomized cross-over experimental trial aimed to understand how being exposed to different types of social media content can affect BI, mood, stress, and cravings. It was hypothesized that exposure to junk food images on SNS would result in low mood and high junk food cravings, and that these effects would be higher in individuals with high BID. Results confirmed the hypotheses as exposure to junk food images were associated with higher self-reported feelings of stress, sadness, hunger, and exhaustion. Additionally, higher craving for salty, savory, and fatty foods were shown when exposed to junk food content as compared to control content.

Results of this paper validate the initial hypothesis that the type of content on SNS does negatively impact BID and further impact mood and cravings. This was displayed through the significantly higher scores of negative emotions (stress, exhaustion, hunger, sadness), higher cravings for junk food (salty, savory, fatty cravings; burger and pizza cravings) and lower cravings for healthy foods (wholegrain turkey bagel and chicken salad) before and after exposure to images of junk food. Correlation between high body shape concern and higher BMI was also observed in university students in the United Arab Emirates (Radwan et al., 2019) as well as correlation between high body shape concern and unhealthy eating in adolescent females (Mallick et al., 2014).

The results of this study coincide with research that assess the psychological characteristics of human choice of food in response to stress or other emotional-related eating. A trial examining social media use through momentary ecological assessment negatively impacts mood and body dissatisfaction by Bennett et al (2019) concluded that time spent on social media was one of the significant predictors for sadness and guilt. Thus, to further explain the mechanisms of the implications of stress, emotions and hunger on food choice, Gibson's (2006) study explains these associations to food choices. Through hedonic and sensory pathways, mood and emotions can be an outcome of food choice, or vice versa. Mood is characterized into positive and negative mood, and Gibson claims that those with positive and pleasant moods were related to lower stress and higher energy whereas negative and unpleasant mood, depression, and anxiety were related to higher feelings of stress and lower energy (Gibson, 2006). This was also observed in the current study, after being exposed to Instagram content, participants voted higher on the VAS scales of stress and voted lower on happiness and calmness also tended to score higher on burger and pizza cravings. This can be explained by these negative and arousing emotions such as fear or stress may

increase impulsive eating in order to regulate the emotional state by consuming highly palatable foods (Macht, 2008) Another study also had similar observations when subjecting an experimental group to violent movies versus a control group and found higher consumption of fatty and salty food items (Mattar et al., 2019).

Visual hunger assessment is currently being studied, because inherently the specific mechanisms of how visual images (specifically on SNS) can trigger such strong behavioral responses. However, through the understanding of cognitive processes, studies available in the literature have found that self-restraint is one of the major outcomes after exposure to images of desirable foods (mainly junk food) as a goal to maintain a healthy weight (Fishbach et al., 2003; Kroese et al., 2009; van den Bos & de Riddler, 2006). It was also noted that those individuals with pre-existing eating disorders exhibit greater sensitivity rewards and brain activation when exposed to food images (Schienle et al., 2009) while obese individuals exhibit significantly less brain activation response to food consumption, suggestion that those who are overweight expect a higher reward from food intake but experience less sensory reward after eating (Stice et al., 2008). Coupling this elicitation of restraint through guilt along with the negative impact of other content on social media (social and peer comparison) it is clear that SNS strongly influence mood, anxiety, and food preferences immediately after exposure.

Results from this trial are in line with a recent study using similar food images (cheeseburger for unhealthy food and salad for healthy food items), in which hunger caused consumers to be more susceptible to food cravings compared to mood (Shahriari et al., 2019). However, a trial exposing individuals to food images of junk food vs healthy foods (The Effect of Exposure to Food in Social Networks on Food Cravings and External Eating, FEECAEE trial) did not find significant causality of food cravings after being exposed to video clips showing food images versus a control (Neter et al., 2018). Despite the lack of statistical significance, findings from this study showed an increase in food portion size and a preference for unhealthy options chosen by participants who were exposed to junk food images, however not on social media, similarly to the significantly higher meal tray score analyzed this study (Neter et al., 2018). Likewise, other studies found significant associations between feelings of stress and a higher intake of junk foods (64,65,66) with some studies showing those who report eating overlall less during periods of stress, report a higher intake of junk foods.

Results from the focus group are in agreement with a systematic review on social media, BI, and food choices in healthy young adults, which identified five key themes: (1) the

social media comparison theory, (2) comparisons heighten feelings about the body, (3) modification of appearance to portray a perceived ideal image, (4) awareness of social media impact on BI and food choices, and (5) external validation through social media (Rounsefell, 2019). The themes identified in the present study overlap with others including: negative emotions result from food images on social media, awareness of social media impact on BI and food choices, awareness of cravings from social media, comparison to others' food choices, and the awareness of the effect of visual hunger through food images.

The current study has several strengths and limitations. Strengths include its cross-over experimental design which reduces bias and allows each participant to be his own control. This study's strengths also include comparing state and trait BI of participants, to identify the true effect from food-related stimulus. Moreover, the design allowed to mimic the active usage of social media and content viewing, by exposing participants to real world Instagram accounts and the use of their cell phones in the comfort of their regular, everyday environment.

Limitations of the study include its small sample size that couldn't be statistically divided by gender and compared individually. Also, residual confounders such as pre-menstrual syndrome cravings known to impact cravings (Hallam et al, 2016) were not taken into consideration. Other limitations include recruitment through convenience sampling through WhatsApp as well as the use of self-reported survey tools.

Chapter Five

Conclusion

The present study revealed that SNS junk-food related content may negatively affect BID as well as mood and cravings. The results shed light on the need for interventions to increase community awareness such as social media literacy programs that provide technical, cognitive, and emotional competencies for mindful SNS use and reduce the negative impact of certain types of social media content. Previous intervention studies and trials has been done to use SNS as a means to change health behaviors such as sexual health, drug and alcohol misuse, physical activity among others (van Woudenberg, T.J., Bevelander, K.E., Burk, W.J. et al, 2018; Hunter et al 2017; Grabe, Ward, & Hyde, 2008; Sanger, 2020). However, in light of this study the delicacy of social networking tools should be used with caution. Future studies should correct for the limitations missed in the study while possibly adding other types of content that is commonly found on social media platforms (e.g. healthy food images, fitness/body transformation images). Other considerations for future studies include studying the reverse pathway, to observe what type of content individuals with high BID search for on SNS.

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Appendices

Appendix A: Data Collection flyer

Appendix B: Baseline Survey

Effect of social media use on Body Image, Mood and Cravings Part 1

Informed Consent Form to Participate in a Research Study

Principal Investigator: Dr. Nadine Zeeni, (Associate Professor of Nutrition, Department of Natural Sciences, Byblos Campus, Lebanese American University) +961 1 786456 ext. 2317, (nadine.zeeni@lau.edu.lb)
Co-Investigator (s): Dana Malli, Graduate student at Lebanese American University (dana.malli@lau.edu)

You are being asked to take part in a research study where you will fill-out a survey about social media use and body image satisfaction, and will be given a login username and password to browse through Instagram. After that you will be given a short survey about state body image, mood and cravings. A week later, you will be asked to login to another account and then answer another short survey after. As a thank you for participating, you will receive a free consultation with a Dietician (if you wish to have one) personally scheduled with you.

The survey is comprised of multiple sections:
Part 1:
- Baseline survey: Demographics, Body Image, Dietary Intake, and Use of Social Media.
- you Browsing through Instagram; you will be given an account login to browse the feed for about 10 minutes.
Part 2:
- Short survey: A short survey about State Body Image Satisfaction, State mood and food cravings.

1 week later you will complete Part 3:
- Browsing through Instagram; you will be given another account login to browse the feed for about 10 minutes.
- Short survey: A short survey about State Body Image Satisfaction, State mood and food cravings.

The information provided by you in this study will be used for research purposes. Your answers will not be released to anyone and your identity will remain anonymous. Your name will not be written on the questionnaire or be kept in any other records. All responses you provide for this study will remain confidential. When the results of the study are reported, you will not be identified by name or any other information that could be used to infer your identity. Only researchers will have access to view any data collected during this research. Your participation is voluntary, and you may withdraw from this research any time you wish or skip any question you don't feel like answering. Your refusal to participate will not result in any penalty or loss of benefits to which you are otherwise entitled to.

At the end of the study, we will be asking for around 10-15 volunteers that participated in this study to schedule a zoom call to discuss questions related to the study where you will be asked a few questions relating to Body Image, Mood and Cravings. You may choose not to participate in this section at all and just complete the surveys.

The research intends to abide by all commonly acknowledged ethical codes. You agree to participate in this research project by filling the following questionnaire. If you have any questions, please ask the research team listed at the beginning of this questionnaire. Thank you for your time.

If you have any questions, you may contact:
Dr.Nadine Zeeni +961 1 786456 ext.: 2317, nadine.zeeni@lau.edu.lb

If you have any questions about your rights as a participant in this study, or you want to talk to someone outside the research, please contact the:
IRB Office,
Lebanese American University
3rd Floor, Dorm A, Byblos Campus
Tel: 00 961 1 786456 (ext.: 2546)

* Required

I have carefully read the above information about this study. All of my questions have been answered to my satisfaction. I know that I may refuse to take part in or withdraw from the study at any time. I freely give my consent to take part in this study. I understand that by clicking yes I am agreeing to take part in the study. Do you wish to participate in the study? *

- ◯ Yes
- ◯ No

Do you wish to be contacted after the survey to participate in the short de-briefing by zoom? *

- ◯ Yes
- ◯ No

Do you wish to be contacted for your free dietician consultation? *

- ◯ Yes
- ◯ No

Next

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Baseline Survey

The information provided by you in this questionnaire will be used for research purposes. Your answers will not be released to anyone and your identity will remain anonymous. Your name will not be written on the questionnaire or be kept in any other records. All responses you provide for this study will remain confidential. When the results of the study are reported, you will not be identified by name or any other information that could be used to infer your identity. Only researchers will have access to view any data collected during this research. Your participation is voluntary and you may withdraw from this research any time you wish or skip any question you don't feel like answering. Your refusal to participate will not result in any penalty it loss of benefits to which you are otherwise entitled to.

The research intends to abide by all commonly acknowledged ethical codes. You agree to participate in this research project by filling the following questionnaire. If you have any questions, please ask the research team listed at the beginning of this questionnaire. Thank you for your time.

How old are you? *

Your answer

What is your gender? *

- ◯ Female
- ◯ Male
- ◯ Prefer not to say
- ◯ Other: _____

What is your weight in kg? (Please give your best estimate): *

Your answer

What is your height in cm? (Please give your best estimate):

Your answer

What year are you at university? *

- ◯ Freshman
- ◯ Sophomore
- ◯ Junior
- ◯ Senior
- ◯ Graduate (Master's)
- ◯ Other:

How frequently do you practice physical activity? *

- ◯ Less than 1 hour per week
- ◯ 1 hour per week
- ◯ 2 hours per week
- ◯ 3 hours per week
- ◯ More than 3 hours per week

What is your weight in kg? (Please give your best estimate): *

Your answer

What is your height in cm? (Please give your best estimate):

Your answer

What year are you at university? *

- ◯ Freshman
- ◯ Sophomore
- ◯ Junior
- ◯ Senior
- ◯ Graduate (Master's)
- ◯ Other: _____

How frequently do you practice physical activity? *

- ◯ Less than 1 hour per week
- ◯ 1 hour per week
- ◯ 2 hours per week
- ◯ 3 hours per week
- ◯ More than 3 hours per week

If you exercise, what is the main purpose? *

- ◯ To be healthy
- ◯ To increase muscle size
- ◯ To be fit
- ◯ To lose weight

How long have you been exercising? *

- ◯ Just started
- ◯ Few weeks
- ◯ Few months
- ◯ 1-2 years
- ◯ More than 2 years

Do you have a social media account? *

- ◯ Yes
- ◯ No

Body Image

For the following questions, please answer on a 6 point scale from Never to Always

Over the past four weeks ... *

	Never	Rarely	Sometimes	Often	Very Often	Always
Have you been afraid that you might become fat (or fatter)?	○	○	○	○	○	○
Has feeling full (e.g. after eating a large meal) made you feel fat?	○	○	○	○	○	○
Has thinking about your shape interfered with your ability to concentrate (e.g. while watching television, reading, listening to conversations)?	○	○	○	○	○	○
Have you imagined removing fleshy areas of your body?	○	○	○	○	○	○
Have you felt excessively large and rounded?	○	○	○	○	○	○
Have you thought that you are in the shape you are because you lack self-confidence	○	○	○	○	○	○

Have you thought that you are in the shape you are because you lack self-confidence	○	○	○	○	○	○

Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?	○	○	○	○	○	○
Have you been particularly self-conscious about your shape when in the company of other people?	○	○	○	○	○	○

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Dietary Intake

How many times per week do you.. *

	None	Once	Twice	3 times	4 times	5 times	6 times	7+ times
have your breakfast?	○	○	○	○	○	○	○	○
drink sugary drinks /soft drinks (e.g. Coke, Pepsi, 7up, Sports drink)?	○	○	○	○	○	○	○	○
eat vegetables (fresh or cooked)?	○	○	○	○	○	○	○	○
eat fresh fruit?	○	○	○	○	○	○	○	○
have dairy products (e.g. milk, yogurt, cheese)?	○	○	○	○	○	○	○	○
eat fast food (e.g. burgers, sausage, pizza, or Arabic shawarma, inside or outside your home?	○	○	○	○	○	○	○	○
eat French fries and/or potato chips?	○	○	○	○	○	○	○	○
eat pastries such as cakes, biscuits, donuts, or similar food?	○	○	○	○	○	○	○	○
eat candy and/or chocolates?	○	○	○	○	○	○	○	○
drink energy drinks (e.g. Red Bull, Power Horse, and XXL)?	○	○	○	○	○	○	○	○

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Use of Social Media & Technology

How many times do you... *

	Never	Once a month	Several times a month	Once a week	Several times a week	Once a day	Several times a day	Once an hour	All the time
check your social network page?	○	○	○	○	○	○	○	○	○
check your social network page from your Smartphone?	○	○	○	○	○	○	○	○	○
check social media at work or university?	○	○	○	○	○	○	○	○	○
post status updates?	○	○	○	○	○	○	○	○	○
post photos?	○	○	○	○	○	○	○	○	○
browse profiles and photos?	○	○	○	○	○	○	○	○	○
read posts?	○	○	○	○	○	○	○	○	○
comment on postings, status updates, photos, etc.?	○	○	○	○	○	○	○	○	○
click "Like" to a posting, photo, etc.?	○	○	○	○	○	○	○	○	○

Please answer the following questions about your Online Friends or Followers on the social media that you use the MOST:

How many friends/followers you have on Instagram? *

Please enter an estimate/average (number)

Your answer

How many of your Social network friends/followers do you know in person? *

Please enter an estimate/average (number)

Your answer

How many people do you regularly interact with online that you have never met in person? *

Please enter an estimate/average (number)

Your answer

Please rate the following statements; *

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I get anxious when I don't have my cell phone	○	○	○	○	○
I get anxious when I don't have the internet available to me	○	○	○	○	○
I am dependent on my technology	○	○	○	○	○

Browsing through Instagram

You have been provided a username and password to login to Instagram.

It is preferable to do it from your phone, but you can also login from any other type of device (ipad, laptop, etc). You are not required to enter any information or follow any accounts, just mimic how you would usually scroll through your own feed. This is an important step in the study and you are encouraged not to skip it or rush it. Any questions or details about any part of the study can be asked to the investigators who have shared the link with you and would be happy to respond. Please make sure to logout once you have finished. After browsing, please click the link for part 2 of the study.

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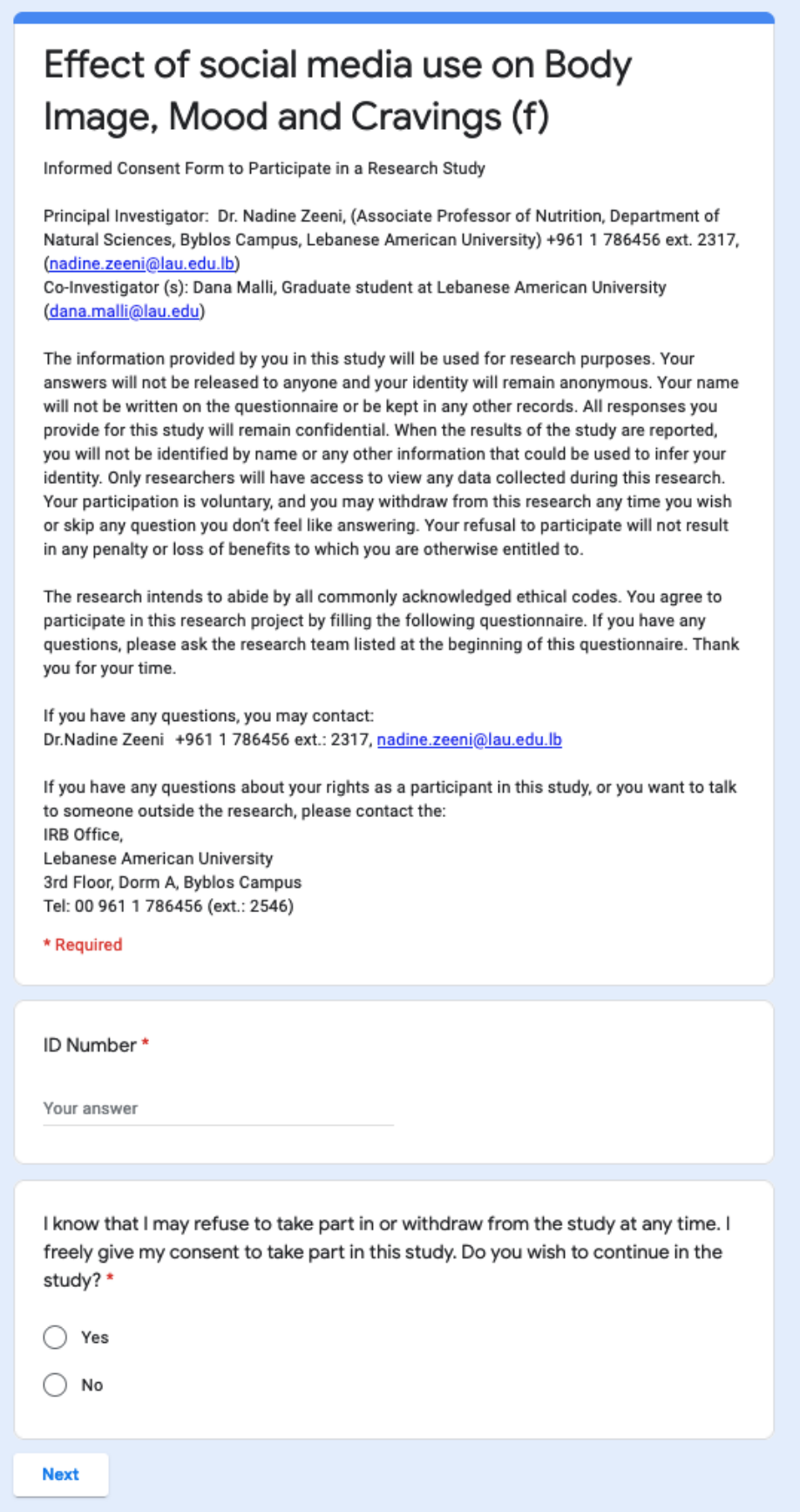
Appendix C: Short Survey



Effect of social media use on Body Image, Mood and Cravings (f)

Informed Consent Form to Participate in a Research Study

Principal Investigator: Dr. Nadine Zeeni, (Associate Professor of Nutrition, Department of Natural Sciences, Byblos Campus, Lebanese American University) +961 1 786456 ext. 2317, (nadine.zeeni@lau.edu.lb)
Co-Investigator (s): Dana Malli, Graduate student at Lebanese American University (dana.malli@lau.edu)

The information provided by you in this study will be used for research purposes. Your answers will not be released to anyone and your identity will remain anonymous. Your name will not be written on the questionnaire or be kept in any other records. All responses you provide for this study will remain confidential. When the results of the study are reported, you will not be identified by name or any other information that could be used to infer your identity. Only researchers will have access to view any data collected during this research. Your participation is voluntary, and you may withdraw from this research any time you wish or skip any question you don't feel like answering. Your refusal to participate will not result in any penalty or loss of benefits to which you are otherwise entitled to.

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IRB Office,
Lebanese American University
3rd Floor, Dorm A, Byblos Campus
Tel: 00 961 1 786456 (ext.: 2546)

* Required

ID Number *

Your answer

I know that I may refuse to take part in or withdraw from the study at any time. I freely give my consent to take part in this study. Do you wish to continue in the study? *

- ◯ Yes
- ◯ No

Next

Effect of social media use on Body Image, Mood and Cravings (f)

* Required

Browsing through Instagram

You have been provided a username and password to login to Instagram.

It is preferable to do it from your phone, but you can also login from any other type of device (ipad, laptop, etc). You are not required to enter any information or follow any accounts, just mimic how you would usually scroll through your own feed. This is an important step in the study and you are encouraged not to skip it or rush it. Any questions or details about any part of the study can be asked to the investigators who have shared the link with you and would be happy to respond. Please make sure to logout once you have finished.

Please do not continue to the next section until you have completed browsing through Instagram.

I confirm that I have browsed Instagram for at least 10 minutes. *

- ◯ Yes
- ◯ No

Back Next

Effect of social media use on Body Image, Mood and Cravings (f)

* Required

Short Survey

Please answer the questions taking into account that you have just finished browsing the Instagram account given to you

Time of Last meal/snack: *

(hours ago)

Your answer

How tense do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very Much

How stressed do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How anxious do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How upset do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How alert do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How sad do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How happy do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How tired do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How calm do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How sleepy do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How hungry do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How full do you feel? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How strong is your desire to eat? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

How much do you think you can eat? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

Would you like to eat something sweet? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

Would you like to eat something salty? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

Would you like to eat something savory? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

Would you like to eat something fatty? *

	1	2	3	4	5	6	7	8	9	10	
Very Little	○	○	○	○	○	○	○	○	○	○	Very Much

For each of the items below, check the box beside the one statement that best describes how you feel RIGHT NOW AT THIS VERY MOMENT. Read the items carefully to be sure the statement you choose accurately and honestly describes how you feel right now.

Right now I feel about....

Right now I feel about.... *

	Extremely dissatisfied	Mostly dissatisfied	Moderately dissatisfied	Slightly dissatisfied	Neither dissatisfied nor satisfied	Slightly satisfied	Moderately satisfied	Mostly satisfied	Extremely satisfied
my physical appearance:	○	○	○	○	○	○	○	○	○
my body size and shape:	○	○	○	○	○	○	○	○	○
my weight:	○	○	○	○	○	○	○	○	○
my attractiveness	○	○	○	○	○	○	○	○	○

Right now I feel ..... *

- ○ A GREAT DEAL BETTER about my looks than I usually feel
- ○ MUCH BETTER about my looks than I usually feel
- ○ SOMEWHAT BETTER about my looks than I usually feel
- ○ JUST SLIGHTLY BETTER about my looks than I usually feel
- ○ ABOUT THE SAME about my looks than I usually feel
- ○ JUST SLIGHTLY WORSE about my looks than I usually feel
- ○ SOMEWHAT WORSE about my looks than I usually feel
- ○ MUCH WORSE about my looks than I usually feel
- ○ A GREAT DEAL WORSE about my looks than I usually feel

Right now I feel ..... *

- ○ A GREAT DEAL BETTER than an average person looks
- ○ MUCH BETTER than an average person looks
- ○ SOMEWHAT BETTER than an average person looks
- ○ JUST SLIGHTLY BETTER than an average person looks
- ○ ABOUT THE SAME than an average person looks
- ○ JUST SLIGHTLY WORSE than an average person looks
- ○ SOMEWHAT WORSE than an average person looks
- ○ MUCH WORSE than an average person looks
- ○ A GREAT DEAL WORSE than an average person looks

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Rate the images

Please rate on a scale from 1 to 10 how likely you would consume the following food images.

Lunch Option #1

Right now, how likely would you have the meal pictured above? *

	1	2	3	4	5	6	7	8	9	10	
Very Unlikely	○	○	○	○	○	○	○	○	○	○	Highly Likely

Lunch Option #2

How likely would you have the meal pictured above? *

	1	2	3	4	5	6	7	8	9	10	
Very Unlikely	○	○	○	○	○	○	○	○	○	○	Highly Likely

Lunch Option #3

How likely would you have the meal pictured above? *

	1	2	3	4	5	6	7	8	9	10	
Very Unlikely	○	○	○	○	○	○	○	○	○	○	Highly Likely

Lunch Option #4

How likely would you have the meal pictured above? *

	1	2	3	4	5	6	7	8	9	10	
Very Unlikely	○	○	○	○	○	○	○	○	○	○	Highly Likely

Lunch Option #5

How likely would you have the meal pictured above? *

	1	2	3	4	5	6	7	8	9	10	
Very Unlikely	○	○	○	○	○	○	○	○	○	○	Highly Likely

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Final Section - Build your own meal

If you were to have lunch right now, and on the table the following options, please select all the item(s) you would consume *

- [ ] Side Fries
- [ ] Chips packet
- [ ] Lasagna
- [ ] Fresh orange juice
- [ ] Snickers bar
- [ ] Granola bar
- [ ] Shawarma sandwich
- [ ] Mozerella sticks
- [ ] Diet pepsi/7up
- [ ] Chicken kale salad
- [ ] Brownie
- [ ] Pepsi/7up
- [ ] Dried fruit and nut mix
- [ ] Turkey and cheese sandwich (made with multigrain bread)
- [ ] Banana
- [ ] Side green salad

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Appendix D: BSQ-8c Classification

	Frequency	Percent
No concern with shape (<19)	31	49.2
Mild concern with shape (19-25)	15	23.8
Moderate concern with shape (26-33)	14	22.2
Marked concern with shape >33	3	4.8