

An Investigation of Individual Differences and Instagram Use as Predictors of Orthorexia

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Statement of Sources

I declare that this report is my own original work and that contributions of others have been duly acknowledged.

Signed: _____ Date: _____.

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Abstract

Previous research suggests Instagram, a picture based social-networking site, is associated with obsessive healthy-eating (orthorexia) in females. This study aimed to build upon this research by using a cross-sectional approach to investigate the effect of exposure to popular Instagram users (micro-celebrities), Instagram health-related content (e.g. ‘fitspiration’), and user characteristics on orthorexia. Australian adult female Instagram users ($N = 206$) completed online measures of orthorexia, exposure to Instagram micro-celebrities and fitspiration content, appearance comparisons, benign envy, perfectionism, Instagram connectedness, and Instagram investment. Multiple regression analysis revealed these variables predicted 42.2% of orthorexia behaviour, with significant predictors being benign envy, appearance comparison, and exposure to micro-celebrities. Users high in Instagram connectedness (feelings of social connection through the app) had significantly weaker orthorexia at higher levels of appearance comparisons. Overall, aspects of Instagram use, benign envy, and appearance comparison tendencies, might put some females at risk of developing orthorexia more than others. Results may also suggest that interventions that increase connection with others through Instagram might be successful in reducing harmful effects of Instagram appearance comparison for females, although further research is warranted to confirm this. Future research should investigate whether and how females derive a sense of connection through Instagram.

Keywords: orthorexia, micro-celebrity, fitspiration, Instagram, benign-envy, social comparison, social connectedness

Abundant previous research indicates that exposure to traditional media is associated with eating disorders in females, most likely through unfavourable appearance comparisons which decrease body satisfaction (Grabe et al., 2008; Groesz et al., 2002). Further, online social media has a similar effect (Fardouhly, Pinkus, & Vartanian, 2017; Holland & Tiggemann, 2016). Much less research has focused on the effect online social media has on orthorexia, a less well-known pattern of disordered eating characterised by an obsession with health foods (Donini, Marsili, Graziani, Imbriale, & Canella, 2004). Although evidence suggests that visual social media platforms, such as Instagram, may be associated with orthorexia (Turner & Lefevre, 2017), reasons for why remain unclear. Drawing on social comparison theory (Festinger, 1954), this study aimed to investigate for the first time the aspects of Instagram exposure and user characteristics which may be associated with orthorexia-like-behaviour.

Social Media and Social Comparison

Social networking sites (SNSs) are a form of online social media, on which users create and invite others to view profiles containing personal information (Verduyn, Ybarra, Resibois, Jonides, & Kross, 2017). Users may engage with SNSs both actively (such as posting personal information or interacting with others) and passively (such as browsing user generated content via newsfeeds or profiles) (Verduyn et al., 2017). Active SNS use has been shown to increase user's wellbeing through social connectedness (Grieve, Indian, Witteveen, Tolan, & Marrington, 2013; Verduyn et al., 2017). However, passive use has been associated with negative psychological outcomes, partially due to upward social comparison (Verduyn et al., 2017), which is when a person compares themselves unfavourably to another person in some domain (Wheeler, 1966).

Many studies suggest that upward social comparison on SNSs is associated with negative psychological outcomes. For example, a review by Holland and Tiggemann (2016) found consistent associations between SNS use and upward social comparisons regarding physical appearance, which in turn were linked to body dissatisfaction. Later studies continue to highlight the role of upward social comparison on social media, including on Pinterest (Lewallen & Behm-Morawitz, 2016), WeChat (Wang, Wang, Gaskin, & Hawk, 2017), Facebook (Park & Baek, 2018), and LinkedIn (Chae, 2018), as well as in the prediction of social media behaviours (such as taking selfies, Coyne, McDaniel, & Stockdale, 2017).

Evidence also suggests that SNS use may pose a greater threat than traditional media with regards to social comparison (Holland & Tiggemann, 2015). SNSs can rapidly distribute novel, thin-ideal imagery. With females reporting pervasive SNS use (Pew Research Centre, 2018) possibly more than any other form of media (Bell & Dittmar, 2011), as well as trends suggesting young adults are moving away from traditional media outlets (Stelter, 2012), SNSs have the capacity to elicit high levels of social comparison across a large number of users. Further, use of image-based SNSs can readily facilitate appearance-based upward social comparison (Holland & Tiggemann, 2016), particularly since uploading idealised and edited images on image-based platforms is normative (Lowe-Calverley & Grieve, 2018).

Instagram: Made for Social Comparison

Instagram is an image-based SNS, currently with more than 1 billion monthly users (Statista, 2018). On Instagram users scroll a news feed on which they view and can like other's images, share their own images, and use hashtags to find related content (Sheldon & Bryant, 2016). Commonly used as an application (or app) on hand-held mobile devices, Instagram allows users to add in-app filters to their photographs before sharing, to enhance colour and resolution,

and external apps such as Hipstamatic and ProCamera readily allow further editing before sharing (Marwick, 2015). Mindful that posts on Instagram are positively biased, with users reporting carefully selecting to enhance self-presentation (Lowe-Calverley & Grieve, 2018), the use of filters and editing apps to make images more appealing means that upward, appearance-related social comparison will be inevitable for many users.

Recently, the Royal Society for Public Health (RSPH, 2018) asked 1,479 young adults between 14 and 24 years of age to rate five SNSs individually in terms of the impact each site has on positive and negative aspects of their health (such as body image, anxiety, sleep, emotional support, and more). Compared to Snapchat, Facebook, Youtube, and Twitter, Instagram was rated as most negative in terms of net impact on health, and worst on average in body image related issues (RSPH, 2018).

Overall, it seems reasonable to conclude that the dominance of edited images on Instagram (Marwick, 2015), and the pervasiveness of its use in women (Pew Research Centre, 2018; Bell & Dittmar, 2011) make it likely that users experience social comparison on Instagram more-so than other SNSs and traditional media. However, more research is needed, as there continues to be a disproportionately large focus on Facebook compared to Instagram, despite calls for more research on Instagram as its popularity continues to sky-rocket (Fardouly & Vartanian, 2016; RSPH, 2018).

#fitspo: Instagram and Fitspiration

A popular online trend is ‘fitspiration’, which aims to motivate people to be healthier by posting inspirational exercise and dieting advice (Boepple & Thompson, 2016; Boepple et al., 2014), and is particularly prominent on Instagram. For example, a search of the hashtag

#fitspiration returning over 5 million pictures in March 2016 (Holland & Tiggemann, 2017), and over 15 million pictures in July 2018, suggesting its popularity is rising.

Fitspiration content often includes pictures of lean women working out, augmented by phrases such as “strong is the new skinny” (Bohjalian, 2017; Boepple et al., 2014; Uhlmann, Donovan, Zimmer-Gembeck, Bell, & Ramme, 2018), readily allowing social comparison based on appearance. Tiggemann and Zaccardo (2015) randomly exposed 130 female undergraduates to view Instagram fitspiration images, or a control set of travel images. Those authors found that acute exposure to fitspiration images had negative effects on mood, body satisfaction, and state appearance self-esteem relative to travel images, and this effect was mediated by state appearance comparison. While fitspiration appears to endorse healthy eating and exercise, exposure to fitspiration content can increase body-image issues, and disordered eating in females, similar to that elicited by ‘thinspiration’ websites: sites which glorify eating disorders through posting of extremely underweight females, and that are associated with body dissatisfaction and disordered eating (Rodgers, Lowy, Halperin, & Franko, 2015). In a comparison of fitspiration and thinspiration, Boepple and Thompson (2016) found that both contain similar content about women’s body weight, thinness, eating restriction, and guilt around eating. Uhlmann et al., (2018) found that striving for fitness in line with ‘fitspiration’ was not healthier, in terms of disordered eating outcomes, than striving for thinness in line with ‘thinspiration’.

Importantly, body dissatisfaction is a risk factor for disordered eating (Franko & Striegel-Moore, 2018). Eating disorders are when one experiences psychological disruptions to their eating behaviour (NIMH, 2016). For example, anorexia nervosa is the restriction of food intake to below the body’s requirements to lose weight, and bulimia nervosa is episodes of large food

intake followed by compensatory behaviour to prevent weight gain, such as self-induced vomiting (American Psychological Association, 2013). Orthorexia nervosa (or ‘orthorexia’) is a pattern of disordered eating characterised by obsessive dieting and restricting intake to biologically pure food, presumably to maximise health (Bratman & Knight, 2001; Donini et al., 2004; Head, Hanchob, McCracken, Jablome, & Dover, 2015; Koven & Abry, 2015).

Although orthorexia has been convincingly argued as a distinct eating disorder (Dunn & Bratmann, 2016), it is not currently recognised as a disease by the Diagnostic and Statistical Manual of Mental Disorders (Dunn & Bratmann, 2016; Head et al., 2015). However, evidence suggests that orthorexia-like-behaviours are of clinical concern. Orthorexia can lead to malnutrition (Dunn & Bratmann, 2016) and social isolation through prioritisation of food related behaviours (Donini et al., 2004; Sanchez & Rial, 2005). While orthorexia differs from anorexia nervosa, with a fixation on the quality, not quantity, of food intake (Donini et al., 2004; Koven & Abry, 2015; Sanchez & Rial, 2005), similarities exist between orthorexia nervosa and anorexia nervosa: both emphasise a perfectionistic striving toward control over food intake (Donini et al., 2004; Egan, Wade, & Shafran, 2010). Associations between orthorexia and a desire to be thin have also been shown by cross-sectional studies which found orthorexia to be positively associated with higher appearance orientation and overweight preoccupation (Barnes & Caltabiano, 2016), as well as internalisation of cultural beauty norms and social physique anxiety (Eriksson, Baigi, Marklund, & Lindgreen, 2007).

Recently, Turner and Lefevre (2017) surveyed 680 female social media users on their SNS use, and orthorexia-like-behaviours. Orthorexia significantly correlated with time spent on Instagram, but not any other SNS (among those analysed were Facebook, Twitter, Pinterest, and

LinkedIn). Turner and Lefevre suggested that the nature of Instagram means that users are selectively but continuously exposed to images that reinforce certain diets and behaviours.

Instagram Micro-celebrities and Social-Comparison Theory

Some SNS users gain large numbers of followers through posting fitinspiration content, thereby achieving ‘micro-celebrity’ (Bohjalian, 2017), or social media ‘influencer’ (Djaforova & Rushworth, 2017; Marwick, 2015) status. Unlike traditional celebrities (such as popstars or actors) who achieve large fame through outstanding talent (Brown & Fraser, 2004; Marwick, 2015), micro-celebrities achieve moderate fame on SNSs through self-mediation strategies (Khamis, Ang, & Welling, 2017).

Self-mediation refers to strategic posting and sharing of information in accordance with how you wish to be seen by others (Khamis et al., 2017). Although self-mediation has existed in society prior to social media, the emergence of SNSs has facilitated these behaviours (Khamis et al., 2017). For example, many micro-celebrities attract followers by posting content emphasising good looks, expensive purchases, and vacations, as well as authentic and likable demeanours (Albidin, 2016; Djaforova & Rushworth, 2017; Khamis et al., 2017; Marwick, 2015). Micro-celebrities exist in particularly high numbers on Instagram (Djafarova & Trofimenko, 2018; Saul, 2016), presumably because the platform allows instantaneous self-mediation to a large audience. For example, Kayla Itsines has accrued over 10 million followers on Instagram through posting fitinspiration content, including “before and after” images sent in by her followers, with the aim being that the person looks more lean or muscular following workouts Itsines has prescribed (Bohjalian, 2017; Kayla Itsines, 2018).

Female Instagram users report micro-celebrities as being more trustworthy, and relevant to their lives than traditional celebrities (Djafarova & Rushworth, 2017), perhaps because

traditional celebrity reflects much greater wealth and fame. Festinger's (1954) social comparison theory suggests that comparison is more likely when the target is more like the observer. Therefore, in the context of modern Instagram use, female users may be more likely to target micro-celebrities for comparison purposes as they lead more similar lives. In support of this, when interviewed, 18 female Instagram users admitted following micro-celebrities to view their envy-evoking lifestyles and physical appearance (Djafarova & Rushworth, 2017). One participant stated that she used Instagram daily to "stalk people" whose lifestyle and physical appearance she was "jealous" of, an explicit admission of social comparison.

Most micro-celebrities are females (Albidin, 2016), and females use Instagram (Sheldon & Bryant, 2016; Pew Research Centre, 2018), and engage in self-appearance comparison more than men (Davison & McCabe, 2005). In line with social comparison theory (Festinger, 1954) micro-celebrities therefore provide females users with more relevant appearance comparison targets than males.

Additional Factors Influencing Social Comparison and Eating Behaviours

Perloff (2014) argues that the effect of media and SNS exposure is not straight forward and is dependent on personality factors which make it more likely that an individual will compare their appearance with others. For example, envy is traditionally defined as an outcome of upward social comparison characterised by negative emotion and maliciousness toward the target (Smith & Kim, 2007; Parrott & Smith, 1993).

Jin (2018) randomly assigned 141 females to view Instagram accounts owned by either a lean female, or a larger bodied-female. The profiles showed pictures of food posted by the account owner, and pictures of the account-owner herself. Firstly, participants had higher

intentions to eat the food pictured when it was posted by a lean account owner and participants with higher envy were more likely to report attempting to interact with popular (higher number of followers), lean account owners. This study provides a valuable clue as to a potential mechanism linking Instagram use with orthorexia. That is, lean fitspiration micro-celebrities may motivate users, through envy, to restrict their food intake to that which is promoted by the micro-celebrity.

Furthermore, Crusius and Lange (2014) argue that a benign form of envy exists, which does not involve malicious feelings towards the target, and instead motivates the envier to become more like the target. Although both forms of envy are associated with negative affect, benign envy is also associated with admiration of the envied target, hope for success, and high self-efficacy (Lange & Crusius, 2015; Tai, Narayanan, & McAllister, 2012). Benign may be more relevant in the context of micro-celebrities on Instagram, as Instagram users admire microcelebrities (Djaforova & Rushworth, 2015; Marwick, 2015).

Supporting the idea that Instagram use is associated with higher benign envy in its users, a cross-sectional study by Meier and Schafer (2018) found Instagram-specific social comparison to be positively related to benign envy, inspiration, and positive affect. However, envy can be conceptualised as a personality trait, as individuals differ in their tendency to feel envy (Smith et al., 1999). Further, Meier and Schafer (2018) did not consider whether users high in dispositional benign envy be more prone to making upward appearance comparisons and striving toward their own appearance-enhancement as a result. For example, fitspiration micro-celebrities' healthy-living advice delivers a message to audiences that if they work hard, they too could be this lean, which may be perceived by the benignly envious user as a method to achieve a lean-body type like the micro-celebrity (Bohjalian, 2017).

It is also likely to be prudent to consider the role of perfectionism when examining the relationship between SNS exposure and orthorexia. Perfectionism encompasses high standards of personal performance, as well as a tendency to be overly self-critical (Frost, Marten, Lahart, & Rosenblate, 1990). Perfectionism has consistently been linked with anorexia nervosa, bulimia nervosa (Egan, Wade, & Shafran, 2010; Bulik et al., 2003) and orthorexia (Barnes & Caltabiano, 2017; Koven & Abry, 2015). Specific aspects of perfectionism such as concern over one's mistakes, and to a lesser extent doubts about one's actions, have been shown to be highly predictive of anorexia nervosa and bulimia nervosa (Bulik et al., 2003).

Instagram Engagement

The importance of studying motivations for SNS use rather than simply frequency of SNS use has been highlighted in previous research. For example, Nadkarni and Hoffmann (2012) propose that SNS use is motivated by a need to belong, and for self-presentation.

Instagram Connectedness. Belongingness theory suggests as humans we are motivated to build and maintain social relationships with others (Baumeister & Leary, 1995). Research suggests this can be achieved through social connectedness in both offline (face-to-face) and online contexts (Nadkarni & Hoffmann, 2012; Grieve et al., 2013). Instagram fitness micro-celebrities often have communities of followers who interact with each other to increase motivation and gain social support (Chung et al., 2017). For example, those who complete Kayla Itsines' workouts often share their progress under the hashtag #kaylasarmy (Suddath, 2016), a search of which currently brings forward over two million posts (Instagram, 2018). Blight, Ruppel, and Schoenbauer (2017) found that female Instagram users who were motivated to use Instagram for companionship and expressive information sharing had higher para-social interaction (one-sided relationships with media figures), and sense of community (feelings of

belongingness derived from group membership) on Instagram. It was argued that Instagram users may connect with other users through mutual para-social relationships with fitspiration micro-celebrities, and this may motivate and reinforce like-minded behaviour (Blight et al., 2017).

Based upon this research, females may derive social connectedness from Instagram, but at the same time experience increased pressure to conform to excessive dieting and exercise behaviour within these communities, hence predicting orthorexia-like behaviour.

Instagram Investment. Self-objectification (the extent an individual views themselves as an object to be evaluated based upon appearance) has been associated with the frequency that females post images emphasising one's physical appearance online, a desire to receive 'likes' on these images (Bell, Casarly, & Dunbar, 2018), and disordered eating (Tiggeman & Williams, 2012). Supporting this, McLean, Paxton, Wertheim, and Masters (2015) found that females who report sharing photos of their selves more frequently, as well as higher investment in the photo (effort taken to choose and manipulate photo) reported higher over-evaluation of shape and weight, body dissatisfaction, and dietary restraint. Based on research suggesting body dissatisfaction stays consistent over time (Ohring et al., 2002; Tiggemann, 2004), this effect may further generalise to a sample of adult female Instagram users.

The Current Study

To summarise, the use of SNSs have been associated with upward appearance comparisons and disordered eating in females (Holland & Tiggemann, 2015). Moreover, Instagram may pose the biggest threat to female user's body image, due to the dominance of idealised images on the app (Fardouly, Pinkus, Vartanian, 2017; Kleemans et al., 2016; Lowe-Calverley & Grieve, 2018). Given research suggesting females engage in appearance comparison

(Davison & McCabe, 2015), use SNSs, (Pew Research Centre, 2018) and Instagram more (Sheldon & Bryant, 2016) than males, this study focuses on adult female Instagram users.

Furthermore, orthorexia, an obsession with healthy eating (Dunn & Bratmann, 2016), has been linked to Instagram use (Turner & Lefevre, 2017). Although much research has targeted disordered eating outcomes from appearance comparisons online in terms of anorexia nervosa and bulimia nervosa (Grabe et al., 2008; Jin, 2018), no research has yet investigated which specific aspects of Instagram use predict orthorexia-like-behaviours in female users of the app. Therefore, this study aims to bridge this gap by investigating whether aspects of Instagram use and personality factors predict orthorexia-like behaviour in female Instagram users.

Fitspiration imagery is abundant on Instagram (Holland & Tiggemann, 2017) and has been associated with disordered eating (Tiggemann & Zaccardo, 2015; Uhlmann et al., 2018). Furthermore, micro-celebrities also exist in large quantity on Instagram (Djarforova & Trofimenko, 2018; Djarforova & Rushworth, 2017). Traditional celebrities have been shown to elicit appearance comparison in females (Brown & Tiggemann, 2016), however as micro-celebrities lead a more relevant lifestyle, they may provide a better target of appearance comparison for users of Instagram, in line with social comparison theory (Festinger, 1954). Micro-celebrities also often post fitspiration content which gives healthy-living advice, which users may see as a method to achieve a lean body-shape following appearance comparison to the micro-celebrity (Bohjalian, 2017).

Evidence further suggests personality factors such as perfectionism (Barnes & Caltabiano, 2017) and benign envy (Crusius & Lange, 2014; Djarforova & Rushworth, 2017) may contribute to the likelihood an individual will strive toward appearance enhancement, possibly through orthorexia-like behaviour. Lastly, social connectedness

derived from Instagram (Blight et al., 2017), and investment in the Instagram photos shared by user (McLean et al., 2015), may further be associated with orthorexia-like behaviour.

Overall, this study aims to build upon research suggesting an association between Instagram and orthorexia by investigating whether aspects of Instagram use and personality predict orthorexia-like behaviour in female Instagram users. Firstly, it was hypothesised that passive Instagram use would be associated with higher micro-celebrity appearance comparison. Secondly, it was hypothesised that exposure to fitspiration content, micro-celebrities, and micro-celebrities who post fitspiration content, would be associated with higher orthorexia. Thirdly, it was hypothesised that exposure to micro-celebrities would be a more significant predictor of orthorexia than time spent on Instagram. Furthermore, it is hypothesised that benign envy, concern over mistakes, personal standards, and doubts about actions, would all predict additional variance in orthorexia beyond time spent on Instagram and micro-celebrity exposure, with benign envy as the most significant (Crusius & Lange, 2014; Jin, 2018). Furthermore, it is hypothesised that appearance comparisons to distal media figures and micro-celebrities would both explain additional variance again, however micro-celebrity appearance comparison as a more significant contributor. It was additionally hypothesised that higher Instagram connectedness, and Instagram investment, would both be significant predictors of orthorexia-like behaviour beyond the already mentioned variables.

Method

Participants

Participants were 206 females who were above 18 years of age, currently used Instagram, and had never received an eating disorder diagnosis. On average, participants were 23.95 years old ($SD = 7.48$), and this ranged from 18-57 years of age. Moreover, on average participant's

reported using Instagram for four to five years and spent 30 minutes to 2 hours on Instagram per day. Additionally, 112 participants (54.63%) followed between 100 and 500 users, and 106 (51.70%) were followed by between 100 and 500 users.

Design and Analytical Approach

Controlling for age and social-desirability, a cross-sectional, correlational design was used to investigate whether exposure to fitspiration content and micro-celebrities, personality variables (benign envy, concern over mistakes, personal standards, and doubts about actions), frequency of appearance comparison with distant persons, frequency of appearance comparison with Instagram micro-celebrities, and Instagram engagement (investment and connectedness) predict orthorexia-like-behaviour beyond time spent on Instagram.

Because measurement of orthorexia-like-behaviour requires measuring the extent to which individuals monitor their food intake, the data was analysed for systematic effects of participant's dietary requirements (Donini et al., 2004). Therefore, participants were asked to specify whether they had a food-related illness (such as diabetes, intolerances, or allergies) or follow diets (such as vegan or vegetarian), which may impact participants' monitoring of food-intake for reasons other than orthorexia.

Controls.

Social desirability. Social desirability is a tendency to present the self in the most favourable way possible, affecting the validity of self-report scales (Van de Mortel, 2008). Although participants were informed of their anonymity, participant's high in social desirability may still under-report the extent to which they envy or compare themselves to others. Therefore, the 13-item Marlow-Crowne Social Desirability Scale

(Crowne & Marlowe, 1960; Reynolds, 1982) was used to control for social desirability. The scale contains items describing undesirable behaviours, which generally are true of everyone. For example, social desirability is indicated by a false response to *I sometimes feel resentful when I don't get my way*, and a true response to *No matter who I'm talking to, I'm always a good listener*. Scores are summed with higher scores indicating higher social desirability. The scale has good reliability (Cronbach's alpha = .76) and correlates highly with the original 33-item scale, which is related positively to MMPI scales measuring attempts to present the self positively, demonstrating convergent validity (Crowne & Marlowe, 1960; Reynolds, 1982). See Appendix A for scale items.

Based upon the theoretical background, a hierarchical multiple regression analysis in SPSS was used to test whether scores on the predictor variables explain unique variance in orthorexia-like-behaviour (Hofmann, 1997). Multiple regression analysis allows this by providing partial association measures (beta weights), which quantify the unique relationship of individual predictors with the outcome variable (Hayes, 2018). Multiple regression also provides the model R^2 , which is the variance in the outcome explained by all combined predictor variables included in each model (Hayes, 2018). Therefore, this allows inferences to be made regarding whether, and to what extent, the variables in question explain systematic variance in orthorexia-like behaviour.

***A priori* power calculation.** An a priori power calculation was performed. Following the recommendations of Green (1991), a minimum sample size of 116 is needed for enough power to obtain a medium effect size in a multiple regression analysis with 12 predictors.

Materials

Copies of all measures are presented in Appendix A.

Demographics. Participants were asked to report their age, gender, and were questioned about their Instagram usage. Although all participants were Instagram users, and presumably knew what was meant by the term “micro-celebrity”, in order to ensure that all participants were accurately using the term in the context of the study, participants were presented with the following definition of a micro-celebrity: *Micro-celebrities are also known as social influencers, or people who have achieved ‘Insta-fame’. They are not traditional celebrities (e.g. Taylor Swift). They have achieved this fame predominantly through their social media accounts. Micro-celebrities commonly post about day-to-day lifestyle habits, diet, travel, fashion, beauty, or various other things.*

Following this definition, participants who follow micro-celebrities were asked to respond to an open-ended question about what the micro-celebrities they follow post about (for example, a micro-celebrity may post about diet and exercise, and another about fashion). As the Instagram “Explore Page” presents posts to users from pages users may not follow, participants may be exposed to micro-celebrity content without having to explicitly be following any, and as such participants were also asked to rate out of all the posts they see on Instagram what percentage are from micro-celebrities.

Orthorexia. An amended English version of the ORTO-15 (Donini et al., 2004) was used to assess participant’s orthorexia-like-behaviour. The original ORTO-15 consists of 15-items that were found to accurately diagnose orthorexia symptoms in an Italian sample (area under ROC curve was .70, sensitivity of 55.6% and specificity of 75.8%, Donini et al., 2004). However, this version was translated from Italian for editorial purposes, and is still awaiting validation in an English-speaking population.

Therefore, in the current study, the item *Do you feel guilty when transgressing?* was amended to *Do you feel guilty transgressing when eating?* to improve clarity. Additionally, three items were added for the current study which aimed to capture orthorexia characteristics proposed by Dunn and Bratmann (2016), such as severe distress around thoughts of healthy eating. Factor analysis (maximum likelihood with oblique rotation) performed on all 17 items revealed that seven of the items loaded onto one factor with good internal consistency (Cronbach's alpha = .83). The final scale consisted of these seven items; five from the ORTO-15 (Donini et al., 2004) such as *Does the thought of food worry you for more than three hours a day?*, the amended item, and one added item, *Do you feel stressed at the thought of eating unhealthy food?* Participants responded on a 4-point Likert scale from 1 = *always* to 4 = *never*. Scores were summed with lower scores indicating higher orthorexia-like-behaviour.

Benign envy. The 5-item Benign Envy Scale (Lange & Crusius, 2015) was used to measure dispositional benign envy. Sample items include *When I envy others, I focus on how I can become equally successful in the future*, and *If someone has superior qualities, achievements, or possessions, I try to attain them for myself*. Participants respond along a Likert scale ranging from 1 = *strongly disagree* to 6 = *strongly agree*. Scores were summed with higher scores indicating higher envy. The scale has excellent internal consistency (Cronbach's alpha = .85) and is positively related to hope for success, motivational goal-setting, and increased performance in a timed running-race (Lange & Crusius, 2015).

Perfectionism. The 9-item concern over mistakes, 7-item personal standards, and 4-item doubts about actions subscales of the Multidimensional Perfectionism Scale (Frost, Marten, Lahart, & Rosenblate, 1990) were used to measure aspects of dispositional perfectionism. Sample items are *I should be upset if I make a mistake* (concern over mistakes subscale); *I have*

extremely high goals (personal standards); and *It takes me a long time to do something right* (doubts about actions). Participants respond along a 5-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Scores were summed on each with higher scores indicating higher perfectionism. Acceptable to excellent internal consistency has been found for each, with Cronbach's alpha at .70, .80, and .88 for doubts about actions, personal standards and concern over mistakes respectively (Suddarth & Slaney, 2001). Furthermore, the personal standards subscale is positively related to striving toward goals and self-critical depression (Frost et al., 1990), while concerns over mistakes and doubts about actions are both positively related to anorexia and bulimia nervosa (Bulik et al., 2003), demonstrating convergent validity.

Appearance comparisons. The 3-item frequency of distal comparison subscale of the Physical Appearance Scale-3 (Schaefer & Thompson, 2018), and a frequency of micro-celebrity comparison scale were used to measure frequency of appearance comparison to distal persons and micro-celebrities respectively. Sample items include *When I see a model in a magazine, I compare my weight/shape to his/her weight/shape*, and *When I watch a movie, I compare my overall appearance to the appearance of the actors/actresses*. The 2-item frequency of micro-celebrity appearance comparison scale was created for the purposes of this study. Sample items are *When I see a micro-celebrity on Instagram I compare my weight/shape to his/her weight shape*, and *When I see a micro-celebrity on Instagram I compare my muscularity to his/her muscularity*.

Participants respond to both scales along a 5-point Likert scale where 1 = *never* and 5 = *almost always*. Scores were summed on both scales with higher scores indicating more frequent appearance comparison. The frequency of distal comparison subscale has been

reported to have excellent internal consistency (Cronbach's alpha = .86) and is positively related to disordered eating in females, demonstrating convergent validity (Schaefer & Thompson, 2018).

Instagram Connectedness. Derived from the Social Connectedness Scale-Revised (Lee, Draper, & Lee, 2001), the 20-item Facebook Social Connectedness Scale measures social connectedness online (Grieve et al., 2013). Sample items include *I don't feel I participate with anyone or any group on Facebook* (negative feelings) and *My Facebook friends feel like family* (positive feelings). The Facebook Social Connectedness scale has excellent internal consistency (Cronbach's alpha = .89) and correlates positively with subjective wellbeing and negatively with depression, demonstrating convergent validity (Grieve et al., 2013). All items were adapted to an Instagram context with statements such as *I don't feel I participate with any community on Instagram* and *The people who I follow on Instagram feel like family*. Participants respond along a 6-point Likert scale from 1 = *strongly disagree* to 6 = *strongly agree*. Negative items were reversed scored and scores were summed with higher scores indicating higher Instagram social connectedness.

Instagram Investment. Emotional investment in Instagram was measured by a 6-item Instagram Investment Inventory (Lowe-Calverley, Grieve, & Padgett, under review). Sample items include *I feel anxious/nervous about the response I will receive when I post an image to Instagram*, and *A lack of response from my followers/the public on Instagram (few likes/comments) can change the way I feel about the subject matter of an image/the event featured in my image*. Participants respond along a 7-point Likert scale from 1 = *strongly disagree* to 7 = *strongly agree*. Negative items were reversed scored and scores were summed with higher scores indicating greater emotional investment in Instagram. The scale has excellent

internal consistency (Cronbach's $\alpha = .84$), and is significantly positively correlated with anxiety, demonstrating convergent validity (Lowe-Calverley, Grieve, & Padgett, under review).

Procedure

Ethical clearance was obtained from the University of Tasmania's ethics committee (ethics approval number: H0017335; see Appendix B). Participants were recruited through posters, social media, and the SONA page for first year psychology students at the University of Tasmania. A link to the online information letter was given, where individuals gave informed consent to participate in the study by clicking 'yes' before beginning the survey. Participants who had a current or past eating disorder diagnosis or did not use Instagram were exited from the study prior to the presentation of any measures.

Participation incentives were that upon completion participants were given the option of providing their details to enter a draw to receive one of six \$50 gift-vouchers, and first-year psychology students were given the alternate option of receiving research credit. On the last page of the survey, participants followed a separate link to a new page to enter their details, therefore the two surveys could not be linked and the data remained anonymous.

Results

Preliminary Analyses

Overall 323 participants attempted the survey, however 117 were deleted due to not meeting the selection criteria of being female, using Instagram, and not having a past or present eating disorder, leaving a sample of 206 participants. Initially, reported Instagram use was reviewed. The highest number of participants expressed the opinion that user's Instagram posts

are somewhat like (55.8%), not like (32.5%), or nothing like (9.75%) their real lives. However, very few participants expressed the opinion that user's Instagram posts are like (1.9%), or are exactly like, (0%) their real lives. This suggests generally participants understand that user's Instagram posts are not accurate reflections of their real lives.

An independent samples *t*-test was used to determine whether participants with a food-related illness ($n = 29$) reported different levels of orthorexia than those who did not ($n = 177$). Levene's Test was non-significant, thus equal variances were assumed. Those with a food-related illness ($M = 18.28$, $SD = 4.0$) did not have significantly different orthorexia scores to those without ($M = 18.76$, $SD = 4.27$), $t(204) = -.57$, $p = .567$, two tailed, Cohen's $d = -.11$, with a small effect (Cohen, 1988). A second independent samples *t*-test was used to compare the average difference in orthorexia scores for those who reported following a diet ($n = 55$), and those who did not ($n = 151$). Levene's Test was non-significant. No significant effect was found, $t(204) = 1.19$, $p = .237$, two tailed; those who reported following a diet ($M = 19.27$, $SD = 4.03$) did not have significantly different orthorexia scores to those who did not ($M = 18.48$, $SD = 4.29$), with a small effect (Cohen's $d = .19$). Importantly, this suggests orthorexia scores are not systematically influenced by monitoring of food intake for other reasons, such as having a food-related illness or following a diet such as vegetarianism.

Data Screening

Normality. For most variables, histograms were bell shaped, and skewness and kurtosis values were between plus and minus one, which taken together indicate normal distributions in larger samples (Tabachnick & Fidell, 2007). However, age was positively skewed. To improve normality, both square root and logarithmic transformations were performed on the variable,

however this had no effect on the regression model and did not improve skewness significantly, so therefore age was left untransformed (per Tabachnick & Fidell, 2007) for analysis.

Multiple regression assumptions. Examination of both the standardised residual against standardised predicted values scatterplots, and the standardised residual normal probability plots, suggested assumptions of normality, linearity, and homoscedasticity had been met (Tabachnick & Fidell, 2007). Secondly, inspection of Pearson correlations (none above .9), Tolerance ($> .2$), and VIF (< 5) values suggested no high multicollinearity. Thirdly, the maximum standardised residual value (< 3), and maximum Cook's Distance (< 1) indicated no concern over outliers. However, the maximum Mahalanobis' distance was above the critical χ^2 value of 32.91 for $df = 12$ at $\alpha = .001$ (Tabachnick & Fidell, 2007), indicating potential outliers. The deletion of the data point with the highest Mahalanobis' distance brought this value to below 32.91. However, because there was no significant change to the regression beta values upon deletion of the data point, the data point was retained in the final model (Stevens, 2002).

Descriptive Statistics

Means, standard deviations, and Cronbach alphas for all major variables are shown in Table 1. Participants' mean scores for variables used in previous research, those being doubts about actions, personal standards, concern over mistakes, benign envy, frequency of comparison to distal persons, Instagram investment, Instagram connectedness, social desirability, and orthorexia, were similar to what has been reported previously (Coles, 2003; Grieve et al., 2013; Lowe-Calverley, Grieve, & Padgett, under review; Meier & Schaefer, 2018; Schaefer & Thompson, 2018; Schweitzer, Perkoulidis, Krome, Ludlow, & Ryan, 2005; Turner & Lefevre, 2017). On average participants were more likely to use Instagram for passive reasons, rated 20%

Table 1

*Descriptive Statistics and Internal Reliability of Orthorexia, Instagram-use, and Personality**Variables*

Variable	<i>M</i>	<i>SD</i>	Cronbach's α	Range	
				Potential	Actual
Passive Instagram Use	37.33	23.48	-	0-100	0-100
Age	23.95	7.48	-	>18	18-57
Social desirability	6.29	2.94	.72	0-13	0-13
Micro-celebrity exposure	2.38	1.16	-	1-5	1-5
Time spent on Instagram	3.66	1.19	-	1-7	1-7
Doubts about actions	11.95	3.65	.78	4-20	4-20
Benign envy	17.66	5.57	.86	5-30	5-30
Personal standards	23.96	6.05	.88	7-35	7-35
Concern over mistakes	25.64	8.91	.93	9-45	9-45
Distal appearance comparison	7.70	3.45	.89	3-15	3-15
Micro-celebrity comparison	5.20	2.43	.77	2-10	2-10
Instagram connectedness	71.51	13.17	.93	20-120	26-108
Instagram investment	25.57	8.48	.88	6-42	6-36
Orthorexia	2.67 ^a	.60	.83	1-4	1-4

Note. ^a item-level mean is presented to enable comparison with previous use of the measure, as a subset of items and two new items were added.

to 60% of posts on Instagram to be from micro-celebrities, and were seldom to sometimes likely to compare their appearance to micro-celebrities. Acceptable to excellent reliability was demonstrated on all scales with Cronbach's alphas ranging from .72 to .93.

Bivariate correlations for all major variables are shown in Table 2. The relationships were as expected based upon previous research. For example, time spent on Instagram was significantly negatively related to age with a small to medium effect, supporting the widely acknowledged view that younger populations use SNSs more frequently (Pfeil, Arjan, & Zaphiris, 2009). Additionally, higher orthorexia-like-behaviour was significantly related to higher doubts about actions and concerns over mistakes, both with a medium effect, consistent with previous research linking eating disorders to these perfectionism domains (Bulik et al., 2003).

Inferential Statistics

It should be noted that orthorexia was scored such that lower scores indicate higher orthorexia-like behaviour.

Hypothesis 1. Contradictory to the hypothesis, passive Instagram use was not significantly related to frequency of appearance comparisons to Instagram micro-celebrities, $r = .057, p = .420$.

Hypothesis 2. To test the hypothesis that higher exposure to Instagram fitspiration content (posts associated with fitness, food, or health) is associated with higher orthorexia-like-behaviour, an independent samples t -test was used to test whether those who reported looking at hashtags relating to fitness, food, or health ($n = 21$) report greater orthorexia-like-behaviour than those who did not ($n = 185$). Levene's Test was significant, thus equal variances were not assumed. The t -test indicated significantly higher orthorexia-like-behaviour in those who

Table 2

Bivariate Correlations of Orthorexia, Instagram-use, and Personality Variables

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	-												
2. Social desirability	.050	-											
3. Micro-celebrity exposure	-.021	.002	-										
4. Time spent on Instagram	-.272***	-.170*	.271***	-									
5. Doubts about actions	-.065	-.186**	.162*	.099	-								
6. Benign envy	-.201**	-.134	-.060	.076	.305***	-							
7. Personal standards	-.233**	.031	-.050	.046	.386***	.518***	-						

Note. *** denotes $p < .001$. ** denotes $p < .01$. * denotes $p < .05$.

(continued)

Table 2 (continued)

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13
8. Concern over mistakes	-.259***	-.300***	-.025	.107	.664***	.504***	.633***	-					
9. Distal comparison	-.122	-.248***	.124	.232***	.307***	.199**	.152*	.380***	-				
10. Micro-celebrity comparison	-.152*	-.199**	.175*	.288***	.294***	.255***	.171*	.376***	.740***	-			
11. Instagram connectedness	-.159*	-.171*	-.018	.157*	-.229**	-.043	-.004	-.140*	-.185**	-.189**	-		
12. Instagram investment	-.290***	-.339***	.052	.218**	.271***	.352***	.148*	.415***	.340***	.435***	.022	-	
13. Orthorexia	.117	.156*	-.260***	-.243***	-.393***	-.358***	-.231**	-.398***	-.509***	-.510***	.138*	-.334***	-

Note. *** denotes $p < .001$. ** denotes $p < .01$. * denotes $p < .05$.

reported viewing health-related hashtag content ($M = 16.00$, $SD = 4.88$), than those who did not ($M = 19.00$, $SD = 4.05$), $t(23.23) = 2.71$, $p = .012$, Cohen's $d = .62$, with a medium effect (Cohen, 1988).

Furthermore, an independent samples t -test was used to test the hypothesis that those who report higher exposure to micro-celebrities (perceived 20% or higher of posts on Instagram to be from micro-celebrities, $n = 185$), have greater orthorexia-like-behaviour than those who report low, or no exposure to micro-celebrities (followed no micro-celebrities and perceived below 20% of posts on Instagram to be from micro-celebrities, $n = 21$). Levene's Test was significant, thus equal variances were not assumed. Participants with higher micro-celebrity exposure reported significantly higher orthorexia ($M = 18.32$, $SD = 4.21$), than participants with lower micro-celebrity exposure ($M = 22.00$, $SD = 2.68$), $t(32.47) = -5.56$, $p < .001$, two tailed, Cohen's $d = 1.04$, with a small effect (Cohen, 1988).

Additionally, a one-way between groups ANOVA was used to investigate whether those who report following micro-celebrities who post about fitness ($n = 29$), food ($n = 32$), and fitness, food, or health ($n = 49$), score higher on orthorexia than those who report viewing micro-celebrity posts unrelated to fitness, food, or health ($n = 96$). Levene's Test was significant, thus equal variances were not assumed. The ANOVA was statistically significant, *Welch's* $F(3, 74.95) = 7.34$, $p < .001$. Post-hoc analysis with Games-Howell revealed that those who report following micro-celebrities who post about fitness, food, or health ($M = 16.50$, $SD = 4.77$) reported higher orthorexia than those who do not ($M = 19.96$, $SD = 3.60$). Overall, this supported the hypothesis that exposure to fitspiration content, micro-celebrities, and fitspiration micro-celebrities on Instagram is associated with higher orthorexia-like-behaviour, as indicated by a lower orthorexia score.

Hypothesis 3. A hierarchical multiple regression analysis was used to test the hypothesis that exposure to micro-celebrities, personality variables, frequency of appearance comparison to distal persons and micro-celebrities, and Instagram engagement variables are significant predictors of orthorexia-like-behaviour (lower scores indicating higher orthorexia behaviour) beyond time spent on Instagram.

In step 1, control variables age and social desirability accounted for a significant 3.6% of the variance in orthorexia-like behaviour, $R^2 = .036$, adjusted $R^2 = .027$, $F(2, 203) = 3.82$, $p = .023$. This combined effect is considered by Cohen (1988) as small ($f^2 = .04$). Social desirability was a significant positive predictor in step 1.

In step 2, exposure to micro-celebrities and time spent on Instagram were added to the regression equation to delineate whether exposure to micro-celebrities on Instagram explained further variance in orthorexia-like-behaviour beyond simply time spent on Instagram. This step accounted for an additional and significant 8.3% of the variance in orthorexia-like-behaviour, $\Delta R^2 = .083$, $\Delta F(2, 201) = 9.52$, $p < .001$, in total explaining 12% of the variance in orthorexia-like behaviour, $R^2 = .12$, adjusted $R^2 = .102$, $F(4, 201) = 6.83$, $p < .001$, and a medium effect ($f^2 = .14$). Furthermore, in step 2, exposure to micro-celebrities and time spent on Instagram were both significant negative predictors.

In step 3, benign envy, concern over mistakes, personal standards, and doubts about actions were added to the regression equation to investigate which personality variables are predictive of orthorexia beyond what is explained by exposure to micro-celebrities and time on Instagram. The personality variables explained an additional and significant 18.5% of variance in orthorexia-like-behaviour, $\Delta R^2 = .185$, $\Delta F(4, 197) = 13.14$, $p < .001$. At this step, 30.5% of the variance in orthorexia-like behaviour was explained overall, $R^2 = .305$, adjusted $R^2 = .227$, $F(8,$

197) = 10.81, $p < .001$, a combined effect considered by Cohen (1988) as large ($f^2 = .44$).

Exposure to micro-celebrities, time spent on Instagram, benign envy, and concern over mistakes were significant negative predictors in step 3.

In step 4, frequency of distal appearance comparisons was added to the regression equation to investigate whether appearance comparisons to distal persons can explain orthorexia-like behaviour above what is already explained by personality and exposure to micro-celebrities. In turn, distal appearance comparisons was found to account for an additional and significant 10.3% of the variance in orthorexia-like-behaviour, $\Delta R^2 = .103$, $\Delta F(1, 196) = 34.09$, $p < .001$, overall explaining 40.8% of the variance in orthorexia-like-behaviour, $R^2 = .408$, adjusted $R^2 = .381$, $F(9, 196) = 15.01$, $p < .001$. This combined effect is considered by Cohen (1988) as large ($f^2 = .69$). Moreover, exposure to micro-celebrities, benign envy, and frequency of distal appearance comparison were significant negative predictors in step 4.

In step 5, frequency of micro-celebrity appearance comparison was added to the regression equation to investigate whether appearance comparisons specifically to micro-celebrities predicts extra variance in orthorexia behaviours beyond appearance comparisons to distal persons more generally. Micro-celebrity appearance comparison accounted for a further significant 1.2% of the variance in orthorexia-like behaviours, $\Delta R^2 = .012$, $\Delta F(1, 195) = 3.90$, $p = .05$, in total explaining 42% of the variance in orthorexia-like-behaviour at this step, $R^2 = .420$, adjusted $R^2 = .390$, $F(10, 195) = 14.10$, $p < .001$. This combined effect is considered by Cohen (1988) as large ($f^2 = .72$). Moreover, at this step exposure to micro-celebrities, benign envy, frequency of distal appearance comparison, and frequency of micro-celebrity appearance comparison, were significant negative predictors.

Lastly, in step 6, Instagram connectedness and Instagram investment were added to the regression equation to explore whether Instagram engagement variables can predict additional variance in orthorexia behaviour. Instagram engagement variables accounted for an added but non-significant .2% of the variance in orthorexia like behaviours, $\Delta R^2 = .002$, $\Delta F(2, 193) = .32$, $p = .725$. Overall, all predictor variables explained 42.2% of the variance in orthorexia-like behaviour, $R^2 = .422$, adjusted $R^2 = .386$, $F(12, 193) = 11.72$, $p < .001$, a combined effect considered as large ($f^2 = .73$, Cohen, 1988). In this last step, exposure to micro-celebrities, benign envy, and frequency of distal comparison were significant negative predictors. Standardised regression coefficients for each predictor on each step of the analysis are reported in Table 3.

Additional Analysis

As Instagram connectedness and Instagram investment did not perform as expected within the regression model, post hoc analyses were conducted to investigate other relationships between Instagram connectedness, frequency of micro-celebrity comparison, and orthorexia. In turn, a moderation analysis using PROCESS found that Instagram connectedness significantly moderated the relationship between frequency of appearance comparison to micro-celebrities and orthorexia-like-behaviour, $b = .01$, 95% CI [.0006, .03], $t(202) = 2.06$, $p = .040$. At low levels of Instagram connectedness, there was a stronger relationship between frequency of micro-celebrity appearance comparison and orthorexia-like-behaviour, $b = -.98$, 95% CI [-1.22, -.75], $t(202) = -8.25$, $p < .001$, than there was at moderate levels of Instagram connectedness, $b = -.81$, 95% CI [-1.03, -.60], $t(202) = -7.41$, $p < .001$, and was weaker again at high levels of Instagram connectedness, $b = -.64$, 95% CI [-.94, -.33], $t(202) = -4.14$, $p < .001$ (see Figure 1).

Table 3

Hierarchical Multiple Regression Analysis of Predictors of Orthorexia

	$\beta_{\text{step 1}}$ (95% CI)		$\beta_{\text{step 2}}$ (95% CI)		$\beta_{\text{step 3}}$ (95% CI)		$\beta_{\text{step 4}}$ (95% CI)		$\beta_{\text{step 5}}$ (95% CI)		$\beta_{\text{step 6}}$ (95% CI)	
Step 1												
Age	.11	(-.15, .14)	.07	(-.04, .11)	-.021	(-.08, -.06)	-.02	(-.08, -.05)	-.02	(-.08, .05)	-.027	(-.08, .05)
Social desirability	.15*	(.02, .42)	.13	(-.005, .37)	.003	(-.18, .19)	-.03	(-.22, .13)	-.03	(-.21, .13)	-.04	(-.24, .12)
Step 2												
Micro-celebrity exposure			-.22**	(-1.29, -.304)	-.21***	(-1.23, -.32)	-.19**	(-1.1, -.25)	-.17**	(-1.05, -.21)	-.17**	(-1.05, -.204)
Time spent on Instagram			-.14*	(-1.02, .001)	-.14*	(-.94, -.02)	-.08	(-.71, .14)	-.06	(-.65, .203)	-.07	(-.68, .2)

Note. *** denotes $p < .001$. ** denotes $p < .01$. * denotes $p < .05$.

(continued)

Table 3 (continued)

	$\beta_{\text{step 1}}$ (95% CI)	$\beta_{\text{step 2}}$ (95% CI)	$\beta_{\text{step 3}}$ (95% CI)	$\beta_{\text{step 4}}$ (95% CI)	$\beta_{\text{step 5}}$ (95% CI)	$\beta_{\text{step 6}}$ (95% CI)
Step 3						
Doubts about actions			-.16 (-.37, .01)	-.13 (-.33, .02)	-.14 (-.33, .02)	-.13 (-.33, .03)
Benign envy			-.25*** (-.30, -.08)	-.23*** (-.28, -.08)	-.22*** (-.27, -.07)	-.21** (-.26, -.06)
Personal standards			.09 (-.05, .18)	.05 (-.07, .14)	.04 (-.08, .14)	.03 (-.09, .13)
Concern over mistakes			-.22* (-.20, -.004)	-.09 (-.14, .05)	-.08 (-.13, .06)	-.06 (-.13, .06)
Step 4						
Distal comparison				-.36*** (-.59, -.29)	-.25** (-.51, -.11)	-.25** (-.51, -.11)
Step 5						
Micro-celebrity comparison					-.17* (-.58, .00)	-.15 (-.55, .04)

Note. *** denotes $p < .001$. ** denotes $p < .01$. * denotes $p < .05$.

(continued)

Table 3 (continued)

	$\beta_{\text{step 1}}$ (95% CI)	$\beta_{\text{step 2}}$ (95% CI)	$\beta_{\text{step 3}}$ (95% CI)	$\beta_{\text{step 4}}$ (95% CI)	$\beta_{\text{step 5}}$ (95% CI)	$\beta_{\text{step 6}}$ (95% CI)
Step 6						
Instagram connectedness						.03 (-.03, .05)
Instagram engagement						-.05 (-.09, .04)
ΔR^2	.04	.08	.18	.103	.01	.002
ΔF	3.82*	9.52***	13.14***	34.09***	3.901*	.32
Adjusted R^2	.03	.102	.28	.38	.39	.39
Model F	3.82*	6.83***	10.81***	15.01***	14.10***	11.72***

Note. *** denotes $p < .001$. ** denotes $p < .01$. * denotes $p < .05$.

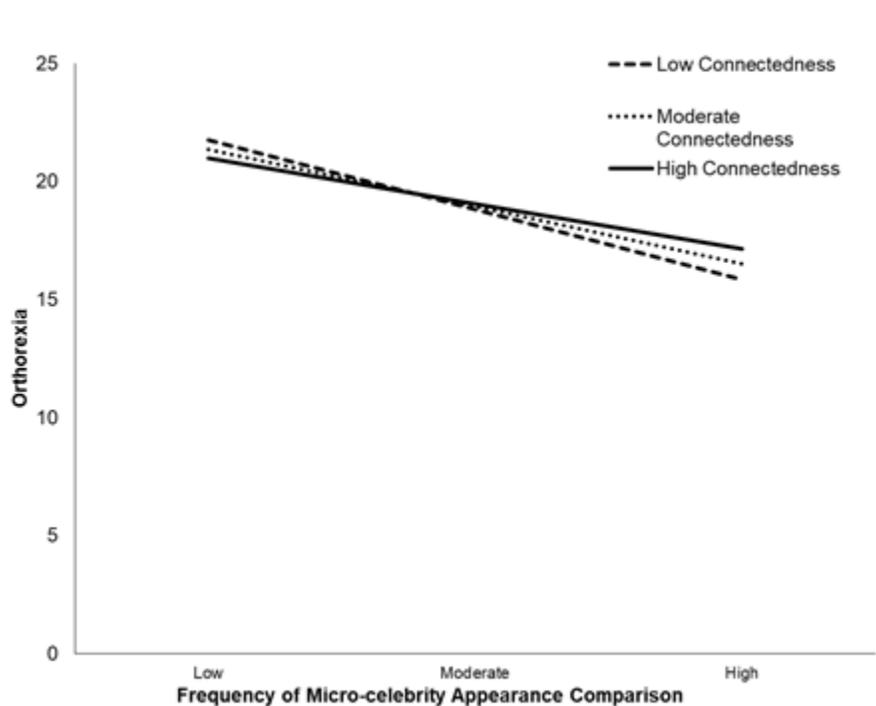


Figure 1. Instagram connectedness as a moderator of the relationship between micro-celebrity comparison and orthorexia.

Discussion

The aim of the current study was to build upon previous research by Turner and Lefevre (2017) who suggested an association between Instagram use and orthorexia, by investigating links between specific aspects of Instagram and obsessive healthy eating behaviours. Specifically, this study investigated whether exposure to fitspiration posts, micro-celebrities, benign envy, personal standards, concern over mistakes, doubts about actions, appearance comparison to distal persons and micro-celebrities, Instagram connectedness, and Instagram investment, predict orthorexia-like-behaviour in adult female Instagram users.

The first hypothesis, that participants who reported higher passive Instagram use would report more appearance comparison to Instagram micro-celebrities, was not supported. This contradicts previous findings that passive SNS use, mainly on Facebook, is associated with higher comparison to others (e.g., Verduyn et al., 2017). This finding may be due to differences

between Instagram and Facebook. On Facebook users engage in a wide variety of activities, both active; such as posting statuses and joining groups, and passive; such as viewing other's images (Meier & Gray, 2014). In another study, actively keeping in touch with others was the highest reported reason for using Facebook (Joinson, 2008). However, Sheldon and Bryant (2016) found that surveillance of others was the biggest reason students reporting using Instagram, and Yang (2016) found on average students reported higher browsing, than interaction, on Instagram. Indeed, the current data revealed that passive use of Instagram is common. As Instagram use is mostly passive, it is possible that a restriction of range has occurred which may explain why no significant relationship was visible.

The second hypothesis was supported: those who reported viewing health-related hashtags (fitness, food, or health) reported greater orthorexia-like-behaviour than those who did not. This finding supports previous research which has found links between exposure to fitspiration blogs and disordered eating (Hefner et al., 2016; Tiggemann & Zaccardo, 2015). Although exercise and healthy eating advice found online is generally well-intentioned and beneficial to some users, it may have adverse effects for others. For example, Derenne and Beresin (2017) argue that the popularity of online clean-eating advice and exercise trends, coupled with images of unrealistically lean and muscular bodies (due to flattering poses or editing), is likely triggering for individuals already vulnerable to eating disorders, potentially stimulating dietary restriction. It has been argued that fitspiration content presents similar messages as thinspiration content, as they both emphasise the importance of a lean appearance (Boepple & Thompson, 2016). Worryingly, fitspiration content emphasises achieving fitness and not thinness, making it more socially acceptable and attractive to a wider audience than thinspiration (Boepple, 2014).

Building on previous research examining general levels of fitspiration exposure (Hefner et al., 2016; Tiggemann & Zaccardo, 2015), the current study specifically considered the role of micro-celebrities. As hypothesised, those who reported following Instagram micro-celebrities who post about health, reported significantly greater orthorexia-like-behaviour than those who did not. Additionally, exposure to micro-celebrities in general was also related to higher orthorexia, supporting the hypothesis and further highlighting the important role that exposure to Instagram micro-celebrities may have in predicting orthorexia. Micro-celebrities often post about healthy dietary and exercise regimes with the aim of motivating their audience to have healthier lifestyles, coupled with attractive pictures of themselves (Marwick, 2015). It is likely that through these posts from micro-celebrities present an enviable lifestyle, motivating their followers to engage in similar behaviours, which may entail extreme restriction of food intake in vulnerable individuals (Derenne & Beresin, 2017).

In turn, benign envy was a significant predictor in every model, supporting the hypothesis that female Instagram users higher in dispositional benign envy may be at risk of orthorexia. The finding that benign envy is linked to negative psychological outcomes, such as orthorexia, builds upon findings by Meier and Schaefer (2018) who suggested benign envy and Instagram use is linked to positive outcomes. This finding supports previous research suggesting higher experiences of envy may motivate users to follow dieting advice put forward by lean account owners (Jin, 2008). Additionally, benignly envy users may be more vulnerable to healthy-living messages which encourage hard work and diligence in one's eating and exercise as a method to achieving a lean-body type (Bohjalian, 2017).

The hypothesis that exposure to micro-celebrities would be a stronger predictor of orthorexia than simply the amount of time users spend on Instagram was supported. Although

time spent on Instagram was a significant predictor of orthorexia, supporting previous research (Turner & Lefevre, 2017), it was not as strong a predictor as exposure to micro-celebrities, suggesting that it is not just SNS usage, but the psychological processes that users experience which is important. This aligns with other research suggesting studying rates of SNS use alone may lead to inconsistent results, for example time on SNS has been shown to increase body image concerns (Tiggemann and Slater, 2014), however non-significant relationships have been reported elsewhere (Lewin & Malik, 2011).

Instagram users high in perfectionism, such as consistently worrying about making mistakes, rarely feel satisfied about their performance quality, and having excessively high standards of performance, reported significantly higher orthorexia-like-behaviour, supporting research linking perfectionism and disordered eating (Perloff, 2014). Concern over mistakes was the only significant perfectionism variable in the regression model, which supports findings that fear of making mistakes, for example stress arising from minor eating transgressions, has the strongest relationship with disordered eating (Bulik et al., 2003). However, no perfectionism variables were significant predictors when benign envy and distal appearance comparisons were included in the model.

The frequency that Instagram users reported comparing their appearance to distal persons, for example in magazines or on television, significantly predicted orthorexia-like-behaviour in every step of the model. This finding supported the hypothesis and ample amounts of research suggesting appearance comparison is linked to disordered eating (Grabe et al., 2008; Holland & Tiggemann, 2016). It was also hypothesised that appearance comparisons specifically to micro-celebrities would be a stronger predictor of orthorexia-like-behaviour than distal appearance comparison. Micro-celebrity appearance comparison predicted a significant amount

of variance in orthorexia beyond distal appearance comparison. However, contradictory to the hypothesis, micro-celebrity appearance comparison was a non-significant predictor in the final model, although distal appearance comparison remained significant. Micro-celebrities present a more relatable lifestyle than traditional, distant media figures (Djaforova & Rushworth, 2017). As social comparison theory suggests we compare ourselves more to those who are like us (Festinger, 1954), the finding that distal appearance comparison is more important in predicting orthorexia-like-behaviour than micro-celebrity appearance comparison is surprising. These hypotheses were generated on the predication that micro-celebrities would be considered as proximal, rather than distal targets. However, many micro-celebrities also have a traditional media presence, for example through modelling, and in magazines (Davies, 2018). An explanation for this may be that many micro-celebrities are also seen as media figures, and therefore distal appearance comparison may be capturing both Instagram micro-celebrities and general exposure to distal media figures.

Interestingly, few participants in this study thought that users Instagram posts are accurate reflections of their real lives, showing implicit understanding that Instagram posts likely reflect self-mediation and photo-editing behaviour (in line with Khamis et al., 2018; Marwick, 2015). What is interesting is that despite this awareness, the Instagram users in our study were still engaging in social comparisons on the app. This may suggest that the explicit knowledge that user's Instagram photos are not necessarily an accurate reflection of their real appearance, does not decrease the frequency that users compare their appearance to these posts.

Although higher Instagram investment was significantly correlated with greater orthorexia at a bivariate level, it was not a significant predictor beyond benign envy, distal appearance comparison, and micro-celebrity exposure, contrary to the hypothesis. Similarly,

Instagram connectedness did not predict any additional variance in orthorexia. In further contradiction to the hypothesis, higher Instagram connectedness was correlated with lower orthorexia. This finding is surprising, as it is common for female Instagram users to engage in large healthy eating communities on Instagram, which may normalise excessive dieting behaviour (Chung et al., 2017; Suddath, 2016). A potential explanation for this finding may be that Instagram users seem to aggregate around many different forms of posts, such as study blogs (Doyle, 2018), and humorous content (Fisher, 2016), providing many avenues for users to derive connection from on the app. Therefore, the finding that Instagram connectedness was not associated with higher orthorexia may be an artefact of the complexity of Instagram in that connectedness is likely to be found through a diverse range of communities, and not just fitpiration communities.

Interestingly, a post hoc moderation analysis found that users who experience higher connectedness on Instagram reported lower orthorexia-like-behaviour at high levels of micro-celebrity appearance comparison, than those at lower levels of Instagram connectedness. This suggests feelings of connectedness derived from Instagram may be protective against negative outcomes of micro-celebrity appearance comparison, such as orthorexia. This explanation would be consistent with previous research suggesting that social connectedness is associated with positive psychological outcomes, such as increased satisfaction with life and decreased anxiety, in both online (Grieve et al., 2013) and offline (Lee & Robbins, 2015) contexts. It is further consistent with belongingness theory, which suggests as humans we have a need to build social relationships with others (Baumeister & Leary, 1995).

Limitations and Recommendations for Future Research

As this was the first research to examine the effect of fitspiration content on orthorexia, it was deemed prudent to define fitspiration broadly, as posts in which the participant mentioned food, exercise, or health content. However, it cannot be determined whether these posts included promotion of weight loss, thin-ideal body imagery, and appearance-motivated health content, in line with more specific definitions of fitspiration (Prichard, McLachlan, Lavis, & Tiggemann, 2018). Future research would benefit from a closer analysis of the fitspiration content viewed by female Instagram users and its effect on orthorexia. Similarly, measurement of Instagram connectedness was also general. It would be helpful to look at connectedness derived from participation in different types of Instagram communities, such as those aiming to empower female users to place higher value on aspects of their selves other than physical appearance (Barr, 2018). Future research could also investigate whether a sense of connectedness on Instagram is derived from posting, viewing, or commenting behaviours, or all three.

Additionally, inherent limitations exist in relying on participant self-report. For example, memory issues are likely to add noise when participants are asked to recall the average amount of time they spend on Instagram per day. However, future research in this field could increase the accuracy of self-reports by encouraging participants to make use of the recent 'Screen Time' Apple iOS12 Software Update (Apple, 2018) which allows Apple smartphone users to review precise measurements of the amount of time spent on social media apps per day. Although limitations in self-report exist, using an anonymous online self-report questionnaire meant participants could provide explicit informed consent to participate, and was therefore deemed an ethically preferable method than harvesting information directly from participant's SNSs without consent (Zimmer, 2010).

Importantly, the correlational nature of this study means that casual relationships between aspects of Instagram use and orthorexia can not be established. For example, it may be likely that users already high in orthorexia-like-behaviour expose themselves to health-related content. It could also be possible that a bidirectional relationship exists, whereby body dissatisfaction causes individuals to more frequently seek photo-based SNS aspects for comparison, and in turn be negatively affected by comparisons made (Meier & Gray, 2014). Future research should make use of experimental and longitudinal designs to delineate the mechanisms involved, and whether Instagram use elicits orthorexia, or maintains orthorexia in users with an already high tendency toward obsessive healthy eating.

Furthermore, over half of adult SNS users use more than one form of SNS (Duggan, Ellison, Lampe, Lenhart, & Madden 2015). The current study only questioned participants on their Instagram use, and therefore is unable to rule out the possibility that other SNSs may also be contributing to orthorexia-like-behaviour. Future research could investigate whether, and to what extent, exposure to micro-celebrities and fitspiration content on other platforms, such as Facebook, predict orthorexia-like behaviour. This research also did not allow comparison in orthorexia between those who do and do not use Instagram, which may be another interesting avenue for future research.

Additionally, research in male body image is lacking compared to females, even though men have also been shown to experience body dissatisfaction linked to eating pathology, but with an emphasis on achieving muscularity rather than thinness (Olivardia, Pope, Borowiecki, & Cohane, 2004). Although most micro-celebrity accounts are run and followed by more females than males, accounts run by males do exist (Albidin, 2016). Future research should investigate

whether exposure to micro-celebrity fitspiration accounts run by males have similar consequences for male users of the app.

Implications and Additional Considerations

The findings of the current study have several potential implications for clinical practice, social media policy and education, and future research. For example, females who present with symptoms of obsessive dieting could be questioned more specifically about their Instagram use, such as around their exposure to micro-celebrities and fitspiration content. Celio et al., (2000) found that an online psychoeducational intervention significantly reduced body image concerns and disordered eating attitudes in adult females, compared to a face-to-face and control condition. Therefore, future body image psychoeducation interventions conducted online could incorporate the findings of this study, such that females, particularly those with high benign envy, are made aware of the risks of appearance comparison and exposure to micro-celebrity content on Instagram. The high ecological validity of such an approach could prove valuable. Additionally, the current data indicated that Instagram connectedness attenuates orthorexia-like behaviour, suggesting that enhanced Instagram connectedness might serve a protective function. If future research can replicate this finding, and delineate how Instagram connectedness is derived, boosting Instagram connectedness might be a promising way to facilitate healthy use of this particular media platform.

If Instagram connectedness can minimise negative consequences following social comparison to Instagram micro-celebrities, this may have implications for body positivity campaigns and support groups on Instagram. For example, the 'I weigh' Instagram campaign (Barr, 2018) encourages women to share what self-aspects they are proud of other than their physical appearance. Studies have highlighted the existence of various eating disorder recovery

support communities online (LaMarre & Rice, 2017), communities which likely provide supportive social capital. Shields (1995) interviewed women ages 21 to 71 and found that a sense of connectedness formed a large part of women's experiences of empowerment. As such, it may be that these Instagram communities are providing a way for many women to gain a sense of empowerment through connection, in turn reducing the negative outcomes associated with unfavourable appearance comparisons.

Mindful that this is the first study to investigate microcelebrity and orthorexia, ideally, this research could (with replication) be used to inform Instagram policy. For example, when Instagram micro-celebrities reach a certain number of followers, they could be asked to comply with ethical obligations, such as flagging posts which have edited or frequently reminding their audience of the negative consequences of appearance comparisons on Instagram. On a broader, and perhaps more realistic level, this research could be used to inform and educate female users of Instagram around the potential for benign envy, micro-celebrities, fitspiration content, and appearance comparison to be linked to orthorexia. As a result, female users could be empowered to take steps to reduce their exposure to micro-celebrity and fitspiration content and be more aware of the negative consequences of appearance comparisons.

Conclusion

Instagram has been associated with orthorexia in female users (Turner & Lefevre, 2017). This novel study aimed to build upon this research by investigating Instagram and personality factors which predict orthorexia-like behaviour. Specifically, results suggest exposure to Instagram micro-celebrities, dispositional benign envy, and frequency of appearance comparison to distal persons, may be particularly important factors which place female Instagram users at risk of orthorexia. Importantly, results also suggest there is potential for Instagram connectedness

to reduce negative outcomes associated with appearance comparisons through Instagram in female users, however more research is needed to confirm this. Research into how users derive connectedness on Instagram is also required, as it may be a mechanism through which vulnerable female users can protect themselves from the negative outcomes of appearance comparison on Instagram.

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Appendices

Appendix A: Testing Materials

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Appendix A1
Demographic Information

Do you use Instagram?

No/yes since 2010/yes since 2011/yes since 2012/yes since 2013/yes since 2014/yes since 2015/
yes since 2016/yes since 2017/yes since this year (2018).

Do you have a current or past eating disorder diagnosis (for example, anorexia nervosa, bulimia
nervosa or related disorder)?

Yes/no.

What is your age? _____.

What is your gender?

Male/female/other.

Do you have a food-related disorder that makes it necessary to be highly vigilant of your food
intake (for example, diabetes, a lactose/glucose intolerance or a severe food allergy)? If so,
please click yes and describe the disorder(s) below.

No/yes (please specify) _____.

Do you follow a vegan, vegetarian, or any other diet which restricts your food intake in any way?

If yes, please specify the name of the diet.

No/yes (please specify) _____.

Appendix A2

Instagram Use Questions

Approximately how much time do you spend on Instagram on a typical day?

No time at all/less than 10 minutes/10-30 minutes/more than 30 minutes, up to an hour/more than 1 hour, up to 2 hours/more than 2 hours, up to 3 hours/ more than 3 hours.

What 'hashtags' do you find yourself viewing on Instagram? Please specify below. _____.

How many users do you follow on Instagram? _____.

How many followers do you have on Instagram? _____.

Please indicate your opinion about whether people's posts on Instagram are an accurate reflection of their real, day-to-day lives.

People's real lives are nothing like how they seem on Instagram/people's real lives are not like how they seem on Instagram/people's real lives are somewhat like how they seem on Instagram/people's real lives are like how they seem on Instagram/people's real lives are exactly like how they seem on Instagram.

Please indicate on the scale below which best reflects how you use Instagram (please note interaction with others on Instagram means communication with others through use of likes,

comments, direct-messages, posting photos on your own Instagram page, and posting on your Instagram story).

Participant's responded on a scale where 0 = I use Instagram purely to view others posts, I rarely use it to interact with others, to 100 = I use Instagram purely to interact with others, I rarely use it for purely viewing other's photos.

Important: please read this definition of micro-celebrities.

Micro-celebrities are also known as social influencers, or people who have achieved 'Insta-fame'. They are not traditional celebrities (e.g. Taylor Swift). They have achieved this fame predominantly through their social media accounts. Micro-celebrities commonly post about day-to-day lifestyle habits, diet, travel, fashion, beauty, or various other things.

Referring to the definition of micro-celebrities above, please indicate by writing in the box below, predominantly what the micro-celebrities you follow post about (e.g. lifestyle, beauty, travel, fashion, study-blog, health, diet, food, exercise, etc). Please list as many as are relevant. If you don't follow any micro-celebrities on Instagram, please write "n/a" or "not applicable".

_____.

Referring to the description of micro-celebrities above, out of the posts you see when scrolling your personal Instagram feed, what percentage of them come from micro-celebrities? (as opposed to from friends, family, acquaintances, advertisements for brand labels, or collective identities such as sports teams, universities, etc.).

0-20%/20-40%/40-60%/60-80%/80-100%.

Appendix A3

Orthorexia Scale - adapted from the ORT-15 (Donini et al., 2004)

Directions: “Please indicate how true the following statements are of you”.

(Participant’s respond along a 4-point Likert scale, where 1 = *not at all true*, 4 = *exactly true*).

1. When eating, do you pay attention to the calories of the food?
2. In the last 3 months, did the thought of food worry you?
3. Does the thought about food worry you for more than three hours a day?
4. Do you think your mood affects your eating behaviour?
5. Do you think that consuming healthy food may improve your appearance?
6. Do you feel guilty transgressing when eating?
7. Do you feel stressed at the thought of eating unhealthy food?

Note. Scores are summed such that lower scores indicate higher orthorexia-like behaviour.

Appendix A4

Benign Envy Scale (Lange & Crusius, 2015)

Directions: “Please indicate your agreement with the following statements”.

(Participant’s respond along a 6-point Likert scale where 1 = *strongly disagree* and 6 = *strongly agree*).

1. When I envy others, I focus on how I can become equally successful in the future.
2. If I notice that another person is better than me, I try to improve myself.
3. Envyng others motivates me to accomplish my goals.
4. I strive to reach other people’s superior achievements.
5. If someone has superior qualities, achievements, or possessions, I try to attain them for myself.

Note. Scores are summed such that higher scores indicate higher dispositional benign envy.

Appendix A5

Instagram Investment Scale (Lowe-Calverley & Grieve, under review)

Directions: “Please indicate the extent to which you agree with the following statements”.

(Participant’s respond on a 7-point Likert scale where 1 = *strongly disagree* and 7 = *strongly agree*).

1. The response I get to an image on Instagram (likes and comments) affects the way I feel about the post.
2. I feel anxious/nervous about the response I will receive when I post an image to Instagram
3. I do not consider the response I will receive when I post an image to Instagram. *
4. I like my own images more when they receive a positive response (likes and comments) from my followers/the public on Instagram.
5. A lack of response from my followers/the public on Instagram (few likes/comments) negatively influences my mood.
6. A lack of response from my followers/the public on Instagram (few likes/comments) can change the way I feel about the subject matter of an image/the event featured in my image.

Note. Items marked * are reverse scored. Scores are summed such that higher scores indicate greater Instagram investment.

Appendix A6

Instagram Connectedness Scale – adapted from the Facebook Connectedness Scale (Grieve et al., 2013).

Directions: “Following are statements that reflect various ways in which we view ourselves.

Rate the degree to which you agree or disagree with each statement”.

(Participant’s respond along a 6-point Likert scale where 1 = *strongly disagree* to 6 = *strongly agree*).

1. I feel comfortable in the presence of strangers when I’m on Instagram.
2. I am in tune with the Instagram world.
3. There is no sense of brother/sisterhood among the people I follow on Instagram. *
4. I fit in well in new situations on Instagram.
5. I feel close to people on Instagram.
6. I feel disconnected from the Instagram world around me. *
7. Even around people on Instagram I know, I don’t feel that I really belong. *
8. I see the people I follow on Instagram as friendly and approachable.
9. I feel like an outsider when I’m on Instagram. *
10. I feel understood by the people I follow on Instagram.
11. I feel distant from the people who I follow on Instagram. *
12. I am able to relate to the people who I follow on Instagram.
13. I have little sense of togetherness with the people I follow on Instagram. *
14. I find myself actively involved in the people who I follow on Instagram’s lives.

15. I catch myself losing a sense of connectedness with society when I am on Instagram. *
16. I am able to connect with other people on Instagram.
17. I see myself as a loner when I am on Instagram. *
18. I don't feel related to most people on Instagram. *
19. The people who I follow on Instagram feel like family.
20. I don't feel I participate with any community on Instagram. *

Note. Items marked * are reverse scored. Scores are summed such that higher scores indicate greater social connectedness derived from Instagram.

Appendix A7

Frequency of Distal Appearance Comparison (Schaefer, in press)

(Participants respond along a 5-point Likert scale where 1 = *never*, 2 = *seldom*, 3 = *sometimes*, 4 = *often*, and 5 = *almost always*).

1. When I watch a movie, I compare my overall appearance to the appearance of the actors/actresses.
2. When I watch television, I compare my weight/shape to the weight/shape of the actors/actresses.
3. When I see a model in a magazine, I compare my weight/shape to his/her weight/shape.

Note. Scores are summed such that higher scores indicate more frequent appearance comparison to distant strangers.

Appendix A8

Frequency of Micro-celebrity Appearance Comparison – adapted from the Physical Appearance Comparison Scale (Schaefer, in press)

(Participants respond along a 5-point Likert scale where 1 = *never*, 2 = *seldom*, 3 = *sometimes*, 4 = *often*, and 5 = *almost always*).

1. When I see a micro-celebrity on Instagram I compare my weight/shape to his/her weight/shape.
2. When I see a micro-celebrity on Instagram I compare my muscularity to his/her muscularity.

Note. Scores are summed such that higher scores indicate more frequent appearance comparison to micro-celebrities.

Appendix A9

Social Desirability Scale (Reynolds, 1982)

Directions: “Please indicate whether the following statements are true or false for you”.

(Participant’s respond to each item as either *True* or *False*).

1. It is sometimes hard for me to go on with my work if I am not encouraged.
2. I sometimes feel resentful when I don’t get my way.
3. On a few occasions, I have given up doing something because I thought too little of my ability.
4. There have been times when I felt like rebelling against people in authority even though I knew they were right.
5. No matter who I’m talking to, I’m always a good listener
6. There have been occasions when I took advantage of someone.
7. I’m always willing to admit it when I make a mistake.
8. I sometimes try to get even rather than forgive and forget.
9. I am always courteous, even to people who are disagreeable.
10. I have never been irked when people expressed ideas very different from my own.
11. There have been times when I was quite jealous of the good fortune of others.
12. I am sometimes irritated by people who ask favours of me.
13. I have never deliberately said something that hurt someone’s feelings.

Note. Scores indicating a socially desirable response are summed such that higher scores indicate higher social desirability.

Appendix A9

Personal Standards Scale (Frost et al., 1990)

(Participant's respond along a 5-point Likert scale where 1 = *strongly disagree* to 5 = *strongly agree*).

1. If I do not set the highest standards for myself, I am likely to end up a second-rate person.
2. It is important to be that I be thoroughly competent in everything I do.
3. I set higher goals than most people.
4. I am very good at focussing my efforts on attaining a goal.
5. I have extremely high goals.
6. Other people seem to accept lower standards from themselves than I do.
7. I expect higher performance in my daily tasks than most people.

Note. Scores are summed such that higher scores indicate higher perfectionism in the domain of personals standards.

Appendix A10

Concern Over Mistakes Scale (Frost et al., 1990)

(Participant's respond along a 5-point Likert scale where 1 = *strongly disagree* to 5 = *strongly agree*).

1. If I fail at work/school, I am a failure as a person.
2. I should be upset if I make a mistake.
3. If someone does a task at work/school better than I, then I feel like I failed the whole task.
4. People will probably think less of me if I make a mistake.
5. If I do not do as well as other people, it means I am an inferior human being.
6. If I do not do well all the time, people will not respect me.
7. The fewer mistakes I make, the more people will like me.

Note. Scores are summed such that higher scores indicate higher perfectionism in the domain of concern over mistakes.

Appendix A11

Doubts About Actions Scale (Frost et al., 1990)

(Participant's respond along a 5-point Likert scale where 1 = *strongly disagree* to 5 = *strongly agree*).

1. Even when I do something very carefully, I often feel that it is not quite right.
2. I usually have doubts about the simple everyday things I do.
3. I tend to get behind in my work because I repeat things over and over.
4. It takes me a long time to do something "right".

Note. Scores are summed such that higher scores indicate higher perfectionism in the domain of doubts about actions.

Appendix B1

Social Sciences Tasmania HREC Approval

Social Science Ethics Officer
 Private Bag 01 Hobart
 Tasmania 7001 Australia
 Tel: (03) 6226 2763
 Fax: (03) 6226 7148
 Katherine.Shaw@utas.edu.au



HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

16 May 2018

Dr Rachel Grieve
 Psychology
 Private Bag 30

Dear Dr Grieve

Re: MINIMAL RISK ETHICS APPLICATION APPROVAL
 Ethics Ref: H0017335 - Instagram Celebrities, Social Comparison, and Eating Behaviour

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 15 May 2018.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.
2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.
5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**
6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Ethics Officer
Tasmania Social Sciences HREC

Appendix B2

Recruitment PowerPoint Slide

Instagram Celebrities, Social Comparison and Eating Behaviour.

Do you use Instagram?

We want to know about factors which influence following of social media celebrities on Instagram.

You can participate if you:

- Are over 18 years of age
- Use Instagram!
- Do not have a current or previous eating disorder diagnosis.



The Study:

- 45 min long online survey

For more information please contact Elise Norton (nortone@utas.edu.au) or Dr. Rachel Grieve (Rachel.grieve@utas.edu.au). If you would like to participate in this study please visit the website: https://www.surveymonkey.com/r/Instagram_socialcomparison

Claim 45 minutes of SONA credit
OR
Enter the draw to receive 1 of 6
\$50 Coles/Myer Gift Cards!

HREC approval number: H0017335

Appendix B3

Recruitment Poster



Do you use Instagram?
Are you over the age of
18?

We are interested in knowing what factors influence the following of social media celebrities on Instagram.

If you would like to contribute to this research, please follow the link to read further information about the study and to complete the online survey, which should take around 45 minutes.

[HTTPS://WWW.SURVEYMONKEY.COM/R/INSTAGRAM_SOCIALCOMPARISON](https://www.surveymonkey.com/r/instagram_socialcomparison)

This study will be conducted as part of a psychology Honours project, supervised by Dr. Rachel Grieve.

Completing the survey gives you the chance to win one of six \$50 gift vouchers, OR 45 minutes of research participation for 1st year psychology students in KHA111/KHA112.

If you have any further questions about this research, please contact Elise Norton (NORTONE@UTAS.EDU.AU).

Ethics approval number: H0017335

Appendix B4

Online Information and Consent Sheet

Participant Information Sheet

Instagram Celebrities, Social Comparison and Eating Behaviour

1. Invitation

You have been invited to participate in a study investigating the factors which influence the following of social media celebrities on Instagram. This study is being conducted as part of an Honours project by Elise Norton under the supervision of Dr Rachel Grieve in the School of Medicine (Psychology) at the University of Tasmania.

2. What is the purpose of this study?

The purpose of this study is to investigate factors which influence why people follow Instagram celebrities and to what extent following Instagram celebrities impacts different aspects of user wellbeing and eating behaviours.

3. Why have I been invited to participate?

You are eligible to participant in this study because you are an adult, and a current Instagram user. Participation in this study is entirely voluntary. There will be no consequences for individuals who do not wish to participate in this study.

4. What will I be asked to do?

If you decide to participate in the study, you will be asked to complete a number of short questionnaires and to provide responses to some open-ended questions. It will first ask you to answer demographic information such as your age and sex, as well as what percentage of posts you see on Instagram are from social media celebrities. Further, it will ask you to respond to questions about your patterns of Instagram use (e.g., rate your agreeance with statements such as ‘I feel bad if I don’t go on Instagram daily’), eating behaviours (e.g., ‘In the last 3 months, did the thought of food worry you?’) and other personality measures such as perfectionism (e.g., ‘I am very good at focusing my efforts on attaining a goal’) and social comparison tendencies (e.g., whether or not statements such as ‘When I’m at a party or social gathering, I compare my overall appearance to the appearance of others’ are true of you). Further, it will ask how you generally respond to feelings of envy (e.g., your agreeance with statements such as ‘When I envy others, I focus on how I can become equally successful in the future’). It will also ask you to respond to questions regarding your general well-being (for example, ‘how often in the last week did you feel downhearted and blue?’). The questionnaire itself will take approximately 45 minutes to complete. All responses that you provide will be completely anonymous, no information that could identify you (such as your name) will be collected.

5. Are there any possible benefits from participation in this study?

It is anticipated that participation in this study will not result in any direct benefits to participants. However, participants from the public will have a chance to receive one of six \$50 Coles/Myer gift vouchers. First year students studying psychology at the University of Tasmania will be given the choice to either enter the draw to receive one of six gift vouchers, or receive 45

minutes research participation credit via SONA for their participation in this study (please note: at the end of this study you will be asked to follow a separate secure link to provide your details to receive research credit, or to go into the draw to win the gift voucher. There will be no way to link your survey answers with your identity, thus participation is entirely anonymous).

6. Are there any possible risks from participation in this study?

There are no specific risks anticipated with participation in this study [however if participants would like to access counselling services they can do so by following this link:

<http://www.utas.edu.au/students/shw/counselling> or for non-students, contact your GP or Lifeline (131114)].

7. What if I change my mind during or after the study?

It is important that you understand that your participation in this study is completely voluntary. Throughout the study you may choose to discontinue your participation and/or withdraw your data at any point without need of an explanation, simply by closing the web page. All information you have provided up to that point will be treated in a confidential manner.

8. What will happen to the information when this study is over?

Your responses to the survey will be collected using a secure online service. Once the data is transferred for analysis, it will be stored on a password-protected server in the School of Psychology. The data will be kept for at least 5 years from the date of first publication. Following this, data will be deleted.

9. How will the results of this study be published?

Relevant findings from this study will be reported in an Honours Thesis, and may also be reported in an academic journal, or at an academic conference. As participation is anonymous, no participants will be identified in any publication.

10. What If I have questions about this study?

If you would like to discuss any aspect of this study please feel free to contact Elise Norton (nortone@utas.edu.au) or Dr Rachel Grieve (Rachel.grieve@utas.edu.au).

This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. Please quote ethics reference number[H0017335].

Thank you for considering participation in this study.

If you have read and understood all of the above information, and you consent to take part in this study, please click 'Yes'.

If you do not consent to taking part in this study, please click 'No' and you will be exited from the survey.