

The effects of Fitspiration images on body attributes, mood and eating behaviors: An experimental Ecological Momentary Assessment study in females

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ABSTRACT

Through an experimental Ecological Momentary Assessment (EMA) design, we assessed the effects of fitspiration images (relative to neutral) on body image, mood and disordered eating and whether trait body dissatisfaction, thin-ideal internalization and pressures from the media, family and peers moderated these effects. After completing trait-based measures, 85 women were prompted via a mobile application 6 times daily for 7 days to view an image (fitspiration or neutral) and report on state levels of perceived pressures to attain an idealized physique, satisfaction with various body attributes, mood and eating behavior. When participants were exposed to fitspiration images, their perceived pressure to attain an idealized physique was significantly higher than after exposure to the control images. This effect was most pronounced for women experiencing pressure from the media. Furthermore, fitspiration images lowered the extent to which women felt that idealized physiques were attainable, and decreased satisfaction with current fitness. There were no significant effects on mood and disordered eating. Exposure to fitspiration content predicted only a few adverse outcomes in terms of negative body attributes and perceived pressures to attain a similar physique, suggesting that its content is not as detrimental as initially believed, but further research is needed.

Keywords: fitspiration, body attributes, disordered eating, mood, pressures to be thin, thin-ideal internalization, ecological momentary assessment

INTRODUCTION

Fitspiration, generally shortened to ‘fitspo’, is a term used to describe media images designed to inspire fitness. These images can include photographs, videos, self-portraits (‘selfies’) and

before and after images of healthy/fit attractive men and women, often dressed in exercise gear or engaging in physical activity (Boepple, Ata, Rum, & Thompson, 2016). Fitspiration content that is self-generated by users and consumers of social media has received much attention in the body image and disordered eating literature. Most studies have been content analyses of specific social media websites (Facebook, Instagram, etc.; e.g. Carrotte, Prichard, & Lim, 2017; Carrotte, Vella, & Lim, 2015). The few experimental studies in the area have been cross-sectional and generally find that exposure to fitspiration content is associated with increased body dissatisfaction, disordered eating and negative mood (e.g. Holland & Tiggemann, 2017; Robinson et al., 2017). To date, no experimental study on fitspiration has used an Ecological Momentary Assessment (EMA) component, which is of interest because it assesses micro-longitudinal data. Thus, the current study examined for the first time the effects of fitspiration images (relative to neutral images) on body dissatisfaction, mood and disordered eating using an experimental EMA design.

The Tripartite Influence Model of eating pathology

A model within the eating disorder literature that comprehensively examines the impact of sociocultural influences on body image and disordered eating is the Tripartite Influence Model (Thompson, 1999). Thompson (1999) proposed three harmful primary sources of appearance pressures: media, peers and family. These three sources are related to eating pathology through thin-ideal internalization and social comparison of appearance. Thin-ideal internalization refers to the adoption of societally-endorsed body ideals as one's physical appearance standard, and appearance comparison refers to the comparison of one's appearance to others' appearances. Increased exposure to sociocultural pressures, such as through thin-ideal images, leads to increased body dissatisfaction and eating pathology, because of the perceived disparity between an individual's ideal and actual physical appearance (Stice, 2002; Stice, Marti, & Durant, 2011).

Several cross-sectional studies examining the validity of the Tripartite Influence Model have concluded that both internalization and appearance comparison contribute to body dissatisfaction and an increase in disordered eating behaviors (e.g. Hazzard et al., 2019; Javier & Belgrave, 2015; Shagar, Donovan, Loxton, Boddy, & Harris, 2019; Shroff & Thompson, 2006), with social comparison considered a stronger predictor of body dissatisfaction in girls and women than thin-ideal internalization (e.g. Javier & Belgrave, 2015; Schaefer & Blodgett Salafia, 2014a). This finding held true in a longitudinal sample too, where the internalization of media ideals predicted appearance comparison and body dissatisfaction, and internalized appearance comparison predicted body dissatisfaction up to 14 months later (Rodgers, Chabrol, & Paxton, 2011). Although the Tripartite Influence Model (Thompson, 1999) posits that the media is an influential component for the internalization of the thin ideal and social comparison, research initially focused on classical mass media, such as magazines, television and movies. The model is therefore outdated in that its premises have not been updated to social media platforms, with no study to date assessing how the components of the model are affected by specific social media trends, such as fitspiration.

The impact of Fitspiration on body image and eating behaviors

Before the trend of fitspiration, 'thinspiration' or 'thinspo' was a phenomenon popularized through social media and associated with increased unhealthy dietary practices and disordered eating behaviors (e.g. Groesz, Levine, & Murnen, 2002; Talbot, Gavin, van Steen, & Morey, 2017). A wealth of research has been conducted on the thinspiration trend, which itself refers to media that glorifies thinness, thin ideals and weight loss, and hence promotes the thin-ideal (e.g. Ghaznavi & Taylor, 2015; Talbot et al., 2017). Thinspiration does not have the same focus on exercise behavior as the fitspiration trend. A recent meta-analytic review found that increased interaction with thinspiration content on social media was associated with the internalization of the thin ideal with a small to moderate effect size ($r = 0.18$; Mingoia,

Hutchinson, Wilson, & Gleaves, 2017). However, given its more recent popularity, little is known of the impact of fitspiration content on thin-ideal internalization, body dissatisfaction and disordered eating behaviors.

While fitspiration and thinspiration may have different aims, fitspiration images can also highlight bone protrusions, thigh gaps and thin-objectification. Fitspiration content analysis studies, therefore, indicate a consistent theme of idealizing the thin body, while simultaneously promoting and valuing muscularity (e.g. Carrotte et al., 2017; Ghaznavi & Taylor, 2015). As a result, there is growing concern that fitspiration content may be harmful, given its current popularity. Accordingly, the few studies that have assessed the effects of fitspiration images (e.g. Griffiths et al., 2018; Yee et al., in Press) have revealed that emphasizing muscularity (as Fitspiration does)—within pre-existing ideals of thinness—is associated with similar harms as emphasizing thinspiration (e.g. Uhlmann, Donovan, Zimmer-Gembeck, Bell, & Ramme, 2018). This ultimately suggests that the internalization of fit or athletic fitspiration images is also harmful for women.

A recent study (Carrotte et al., 2017) investigating gender differences in fitspiration content across social media platforms found that social media users described themselves as more inspired to engage in physical activity after viewing fitspiration images as opposed to thinspiration images. However, even though exposure to fitspiration images increased body dissatisfaction, these images did not increase participants' likelihood of engaging in higher levels of exercise, implying that fitspiration may not motivate actual exercise behaviour (Carrotte et al., 2017). This is concerning because the ostensible aim of fitspiration is to do so, and instead it resulted only in increased body dissatisfaction. While several correlational studies (e.g. Boepple et al., 2016; Griffiths et al., 2018; Holland & Tiggemann, 2017) have indicated a positive relationship between exposure to fitspiration images and disordered eating,

only experimental or longitudinal studies allow conclusions to be drawn regarding causation between these constructs.

Given the novelty of fitspiration content, only a few experimental studies have been conducted in this area of research (e.g. Prichard, Mclachlan, Lavis, Tiggemann, 2018; Robinson et al., 2017; Slater, Varsani, & Diedrichs, 2017). For example, a study by Prichard and colleagues (2018) randomly allocated female participants to view fitspiration media which depicted the body in either a functional (engaging in active exercise) versus a non-functional (posed) manner. The results of this study indicated that overall exposure to fitspiration content, irrespective of whether it was functional or non-functional, lead to decreases in state body satisfaction and increases in negative mood (Prichard et al., 2018). This signified a substantial increase in negative consequences following exposure to fitspiration content, which is also congruent with another experimental study that found greater body dissatisfaction in women who viewed images of the thin, fit and muscular ideal (Robinson et al., 2017).

To our knowledge, only one EMA study has looked at the micro-longitudinal effects of viewing fitspiration images on social media on body image and mood. The study reported small effect sizes for the associations between fitspiration exposure, body satisfaction and positive affect (Cohen's *ds* ranged from |0.03–0.04|), but no significant association with negative affect (Griffiths & Stefanovski, 2019). However, no experimental EMA study— whereby participants are exposed to fitspiration images through a mobile app at various times of day— has assessed the impact of fitspiration images on body image and disordered eating. Compared to traditional self-report and experimental studies, EMA provides researchers access to the study of behavior in its natural context and therefore extends previous findings through improved ecological validity and extended data collection (Shiffman, Stone, & Hufford, 2008). Specifically, EMA can identify fluctuations in longitudinal in-the-moment behaviors (such as

viewing fitspiration images) and their effect on state characteristics (such as body dissatisfaction, mood and engagement in compensatory behaviors; Smyth & Stone, 2003).

The Current Study

This study aimed to assess for the first time the influence of fitspiration images (e.g., women exercising, women in exercise gear, muscular women etc.), relative to neutral images (e.g., furniture, plants, paintings) via an experimental EMA design on satisfaction with different body attributes, pressures to change one's body, disordered eating behaviors and mood. Given that the Tripartite Influence Model for eating pathology highlights that pressures from the family, media and peers, appearance comparisons and internalization of the thin ideal lead to body dissatisfaction and eating pathology, a further aim was to assess whether these trait variables moderated the relationships between exposure to fitspiration images and any of the state-based variables (Thompson, 1999; Rogers et al., 2011).

Trait thin-ideal internalization was assessed as internalization of both the thin ideal and the muscular ideal, due to the fact that fitspiration emphasizes both a toned and muscular physique (Robinson et al., 2017; Schaefer et al., 2015). While thin-ideal internalization relates to the internalization of leanness/thinness alone, the muscular ideal, which until recently has been studied mainly in males (Frederick et al., 2007), refers to a more toned, fit and athletic ideal. In females, the concept of the thin ideal has commonly been linked to a lean/slim appearance (Thompson, 1999), but more recent research has shown that women strive to attain both a thin and toned/athletic physique (Uhlmann et al., 2018; Uhlmann, Donovan, Zimmer-Gembeck, 2019).

Based on the literature explored above, it was hypothesized that:

1. Exposure to fitspiration compared to neutral images would heighten state variables of dissatisfaction with various body attributes, appearance comparisons, perceived pressures to change one's body, negative mood and disordered eating behaviours.
2. Trait pressures from the family, media and peers, appearance comparisons, internalization of the thin and muscular ideal, and body dissatisfaction would moderate the relationship between fitspiration images and the state-based variables, such that the relationship would be stronger among individuals with higher scores of these trait measures in comparison to those with lower scores.

METHOD

Experimental stimuli

Image type. Due to a lack of validated images, we conducted a pilot study to construct two sets of images (fitspiration and neutral) for the experimental stimuli. Firstly, the student researcher (P.S.) sourced 60 images for each of the two image conditions (120 images in total) from Instagram. These images were then reviewed by the student's research supervisors (I.K. & L.H). The search terms '*#fitspo*' and '*#fitspiration*' were used to gather the initial pool of fitspiration images. For the control condition, the search terms included '*#furniture*', '*#pattern*', '*#nature*', and '*#sunrise*'. The criteria for choosing the fitspiration images included images of full female bodies wearing exercise attires, whereas the criteria for the neutral images comprised any type of object, with no bodies or models visible in the images. Both types of images also had to be coloured and not contain words or quotes. Of the 120 images, 70 (35 fitspiration, 25 neutral) were chosen based on our inclusion/exclusion criteria with the rest discarded due to inconsistent themes/content. A copy of the images can be obtained on request from the corresponding author.

To establish content validity for the two sets of images, 45 female participants from the general public ($M_{\text{age}} = 23.84$, $SD = 6.71$ years) rated the 35 fitspiration images and 25 neutral

the extent that each image made the participant think about their appearance (an 11-point scale; 0 = *not at all*, 10 = *significantly so*). A further 11-point scale asked about attractiveness of the image (0 = *very unattractive*, 10 = *very attractive*, or not applicable (N/A for the neutral images). The 15 images that received the highest ratings to these two questions for the fitspiration images formed the fitspiration images for the current study. The final set of images appeared ethnically diverse (5 each from Caucasian, Asian, and African American backgrounds), allowing us to represent different sociodemographic backgrounds. The 15 neutral images with the lowest ratings were chosen for the neutral condition.

Main study

Participants

Following approval from the Human Ethics Sub-Committee at the University of [redacted for peer-review], participants were recruited through social media and online advertisement to female university students and the public in Australia. Eighty-five female participants met the inclusion criteria for the study by completing the baseline survey and at least 50% of the EMA surveys as per prior studies (Fuller-Tyszkiewicz et al., 2020; Griffiths & Stefanovski, 2019). The mean age for the sample was 19.68 years ($SD = 3.06$) with a mean Body Mass Index (BMI, kg/m^2) categorized as normal ($M = 22.06$, $SD = 5.03$). The demographics of this sample are reported in Table 1. Upon completion of the study, participants received either two undergraduate course credits or entered a raffle to win one of five \$50 iTunes gift cards as compensation for their time.

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Measures

Apparatus and Procedure

The EMA phase of the study was conducted through the InstantSurvey application, and participants were required to have an iPhone with iOS 8 (or newer) to be able to download the InstantSurvey application. Participants were informed that the purpose of the study was to investigate the relationship between viewing fitspiration images and body image, mood and eating behaviours. The study was run in two phases, and participants completed both phases in the same chronological order.

Phase 1: Baseline questionnaire (trait-based assessment).

This phase was completed through Qualtrics online survey platform. Participants read the Participant Information Sheet and gave their informed consent. They were given instructions on how they could download the InstantSurvey mobile phone application from the iTunes App Store and obtain a unique ID that was assigned to them via the application. They were then prompted to enter their unique ID into the questionnaire, so that their Phase 1 baseline questionnaire data would be linked to their Phase 2 EMA data. After that, participants completed the baseline questionnaire, which included the demographic questions as well as the trait appearance comparison measure.

Trait measures at baseline.

Demographics. The Qualtrics questionnaire obtained information concerning age, gender, ethnicity, first language, marital status, the highest level of education completed, current employment status, current height and weight (to calculate current BMI).

Pressures to be thin and thin-ideal internalization. The Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4; Schaefer et al., 2015) is a 22-item measure which contains five subscales. Pressures to be thin is assessed by three subscales (the media, peers and the family), and internalization is evaluated by two subscales (thin/low body fat internalization and muscular/athletic internalization). All items are assessed on a 5-point Likert type scale ranging from “*Definitely agree (5)*” to “*Definitely disagree (1)*”. Higher scores on

these subscales indicate greater appearance-related sociocultural influence. The SATAQ-4 has demonstrated excellent internal consistency in three separate samples of undergraduate women, with alphas ranging from .85 to .96 (Schaefer et al., 2015). In the current study, all five subscales provided good to excellent psychometric properties, which ranged from $a = 0.79$ for internalization of the muscular ideal to $a = 0.94$ pressures from the media.

Appearance comparison. Appearance comparison was assessed using the Physical Appearance and Comparison Scaled-Revised (PACS-R, Schaefer & Thompson, 2014b). The PACS-R is an 11-item scale assessing comparisons in a variety of contexts, namely in public, in social situations, and within casual social relationships. Responses are rated on a 5-point scale, ranging from 'Never' (1) to 'Always' (5), with items averaged to create a total score. The PACS-R is a valid and reliable tool in assessing appearance comparison with strong correlations with body satisfaction and disordered eating in women (Schaefer & Thompson, 2014b; Schaefer, Harriger, Heinberg, Soderberg, & Thompson, 2017). The PACS-R had high internal consistency within the current sample ($a = 0.95$).

Body dissatisfaction. Body dissatisfaction was assessed using the Body Image Dissatisfaction subscale of the Body Change Inventory (BCI; Fuller-Tyszkiewicz et al., 2012). This is a brief 9-item scale that assesses respondents' satisfaction with specific parts of their body, such as the chest, hips, thighs, and abdominal muscles. The choices ranged from a scale of 'Extremely happy' (1) to 'Extremely unhappy' (5), with a maximum total of 45 so that higher scores indicated greater body dissatisfaction. The BCI has been shown to be a valid and reliable tool to assess body concerns and desire for change (Fuller-Tyszkiewicz et al., 2012), and had high internal consistency within the current sample ($a = .84$).

Current fitspiration exposure. Participants were also asked to indicate their current exposure to fitspiration content and how often they share/post fitspiration content on personal social networking sites, if at all. This was assessed via questions asking, 'Do you view

fitspiration images/content on social media, if yes on what platforms and how often?’ and *‘Have you ever posted fitspiration content, if yes on what platforms and how often?’* with choices ranging from *‘more than once per day’* (1) to *‘never’* (5). Responses were reverse coded, so a higher score indicated more frequent exposure to fitspiration content.

Phase 2: EMA (State-based assessment). On the first day of Phase 2, the InstantSurvey application began signalling 6 times per day, every day for 7 days. It buzzed briefly at random intervals between 9 am to 9 pm resulting in a maximum of 42 assessments over the entire Phase 2 period. The signals alerted the participant to complete a short survey on the application, which would remain accessible for 30 minutes. Each survey included questions evaluating state variables (disordered eating behaviors, mood and satisfaction with body attributes) followed by exposure to a fitspiration or neutral image. To assess the impact of being exposed to the stimuli (e.g., fitspiration image), the state questions were only administered at the next time point. Each survey intended to evaluate the impact of the exposure to the fitspiration/neutral image from the previous survey/time point. If the participant did not complete the short survey within 30 minutes, the time point was counted as missing.

State measures for EMA.

Satisfaction with different body attributes was assessed with the following items: *‘How satisfied are you currently with the following: muscle tone/weight/physical fitness/sex appeal/health?’* with the responses rated on a 10-point scale (*Completely Dissatisfied* to *Completely Satisfied*). The weight single-item approach was adapted from previous EMA studies that investigated body dissatisfaction (Fuller-Tyszkiewicz, Richardson, Lewis, Smyth, & Krug, 2018; Rogers, Fuller-Tyszkiewicz, Lewis, Krug, & Richardson, 2017). The other categories (e.g., muscle tone, physical fitness) were created for the current study to capture better the notion of fitspiration content.

Appearance comparison and perceived pressures to change body shape were assessed with the following two questions: ‘*How much are you thinking about how you look compared to other people?*’, and ‘*How much pressure do you feel to change your body shape?*’, which were rated on a 10-point scale (*Not at all to Very much*). For the fitspiration images, participants were also asked an *attainability* question: “*How attainable does this body shape seem to you?*”, using the same 10-point scale. The appearance comparison item has been used in previous studies (e.g. Druschinin, Fuller-Tyszkiewicz, de Paoli, Lewis, & Krug, 2018).

Mood. State mood was assessed with the item ‘*How happy are you right now?*’ with responses rated on a 10-point scale (“*Completely Unhappy*” to “*Completely Happy*”) and coded so that lower scores indicated a lower mood. This single-item approach was adapted from previous EMA studies that investigated negative affect (e.g. Chia, Fuller-Tyszkiewicz, Buck, Chamari, Richardson, & Krug, 2018).

Disordered eating. State disordered eating was assessed by asking participants ‘*Did you engage in any of the following behaviors since you last responded?*’ and allowing participants to select more than one of the following answers: ‘*(1) binge eating, (2) self-induced vomiting, (3) self-induced dietary restrictions, (4) skipped a meal, (5) exercise to lose weight*’. For the analysis, any responses that answered in the affirmative were dummy coded as 1, while no engagement in disordered eating behaviors was coded as 0. An overall disordered eating variable was assessed for participants who selected at least one of the disordered eating behaviors above. These questions were summed to make an overall variable of disordered eating. This single-item approach was adapted from previous EMA studies that investigated disordered eating behaviors (e.g. Chia et al., 2018; Druschinin et al., 2018).

Data Analytical Plan

Data screening and preliminary analyses. There were minimal data missing in the present study. Less than 2% of cases had missing baseline data, and these were handled using expectation maximization (Tabachnick & Fidell, 2007). Participants differed in the number of EMA surveys they completed (out of a possible 42) but gave complete data when they did respond to a given survey. Threat to the generalizability of results was explored by correlating the number of EMA surveys completed with scores on baseline variables (trait baseline variables and demographic factors).

Hypothesis testing. All hypothesis testing was undertaken using multilevel modelling in Mplus version 8. In these models, pressure ratings, satisfaction with body attributes, mood, and disordered eating variables were regressed onto image exposure (0 = control image, 1 = fitspiration images). This effect of image exposure on dependent variables was tested as a random effect; if significant, trait level variables (trait body dissatisfaction, appearance comparisons, internalization, and pressure) were included as moderators to determine whether effect sizes for exposure to fitspiration images differed based on these trait variables. In cases where the random effect was not significant, a fixed effect is reported, and no trait-level moderation effects were tested. When pressure was used as the outcome, no correction for time lag was included since exposure was necessary. For all other outcomes, the time interval between exposure and the dependent variable was included as a covariate. All lagged analyses were constrained to within a day, to prevent exposure occurring the day before measurement of the dependent variable, as per prior studies (e.g. Rogers, Fuller-Tyszkiewicz, Lewis, Krug, & Richardson, 2017). As we wanted to evaluate the full contribution of each moderator rather than the relative contribution, each moderator was tested in a separate model.

RESULTS

Preliminary Analyses

Compliance. The average number of EMA surveys completed per participant was 34.69 ($SD = 5.93$). Compliance rates for EMA surveys were not significantly related to age ($r = .04, p = .714$), BMI ($r = .07, p = .510$), trait body dissatisfaction ($r = .01, p = .943$), appearance comparisons ($r = -.08, p = .476$), internalization of the thin ideal ($r = -.04, p = .698$), internalization of the muscular ideal ($r = .00, p = .975$), or appearance-related pressure from family ($r = .02, p = .838$), peers ($r = .02, p = .852$), or the media ($r = -.09, p = .419$).

Descriptives. Table 2 provides descriptive statistics for the trait-based variables. The means are comparable to data from previous studies (Schaefer & Thompson, 2014b), except for appearance comparison, which seemed to be slightly higher in the current sample, and peer pressures, which appeared to be slightly lower. In addition, 17 participants (20%) reported having had an eating disorder, with 8 participants (9.4%) reporting that they were currently suffering from an eating disorder.

----- INSERT TABLE 2 ABOUT HERE -----

Table 3 provides a breakdown of the frequency of use of different social media platforms. Descriptive statistics for social media use revealed that 53 participants (62.4%) reported viewing fitspiration images or content regularly. However, only 13 participants (15.3%) reported posting fitspiration content. Instagram was the platform most commonly used by this sample.

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Main Analyses

Exposure to fitspiration images predicting perceived pressure to attain an idealized physique. After exposure to fitspiration images, participants' perceived pressure to change their body was significantly higher than after exposure to the control images ($b = 1.17$, 95% CIs: 0.73, 1.62, $p < .001$, Cohen's $d = .18$). This effect varied significantly across individuals ($p < .001$) and was found to be moderated by pressure from the media ($b = 0.43$, 95% CIs: .06, .79, $p = .022$, $R^2 = .05$). Thus, for individuals with elevated perceived pressure from the media, the impact of fitspiration image exposure was magnified.

The effect of fitspiration image exposure on perceived pressure to change their body was not moderated by pressure from family ($b = 0.12$, 95% CIs: -.34, .58, $p = .618$, $R^2 < .01$) or peers ($b = 0.05$, 95% CIs: -.38, .47, $p = .828$, $R^2 < .01$), trait body dissatisfaction ($b = 0.00$, 95% CIs: -.07, .08, $p = .937$, $R^2 < .01$), appearance comparisons ($b = 0.19$, 95% CIs: -.23, .61, $p = .373$, $R^2 < .01$), internalization of either the thin ideal ($b = 0.10$, 95% CIs: -.41, .60, $p = .714$, $R^2 < .01$) or muscular ideal ($b = 0.20$, 95% CIs: -.46, .85, $p = .592$, $R^2 < .01$).

Exposure to fitspiration images predicting perceived ability to attain an idealized physique. When participants were exposed to fitspiration images, their perceived attainability scores tended to be low ($M = 4.25$, possible range = 0-10), though this varied significantly across individuals ($p < .001$). None of the trait level variables significantly predicted individual differences in perceived attainability scores: pressure from family ($b = -0.33$, 95% CIs: -.76, .10, $p = .136$, $R^2 = .03$), peers ($b = 0.29$, 95% CIs: -.14, .72, $p = .180$, $R^2 = .02$), or media ($b = 0.003$, 95% CIs: -.36, .37, $p = .989$, $R^2 < .01$), trait body dissatisfaction ($b = -0.001$, 95% CIs: -.06, .06, $p = .972$, $R^2 < .01$), appearance comparisons ($b = 0.19$, 95% CIs: -.27, .65, $p = .423$, $R^2 = .01$), internalization of either the thin ideal ($b = 0.41$, 95% CIs: -.11, .92, $p = .120$, $R^2 = .03$) or muscular ideal ($b = 0.52$, 95% CIs: -.27, .65, $p = .089$, $R^2 = .04$).

Exposure to fitspiration images predicting satisfaction with different body attributes and mood variables. Exposure to fitspiration images had negligible impact on

satisfaction with weight ($b = -0.05$, 95% CIs: $-.13, .03$, $p = .201$, Cohen's $d = .01$), muscle tone ($b = 0.02$, 95% CIs: $-.05, .08$, $p = .623$, Cohen's $d < .01$), health ($b = 0.02$, 95% CIs: $-.07, .10$, $p = .723$, Cohen's $d = .01$), sex appeal ($b = -0.06$, 95% CIs: $-.13, .01$, $p = .101$, Cohen's $d = .01$), happiness levels ($b = -0.13$, 95% CIs: $-.29, .02$, $p = .084$, Cohen's $d = .02$), or the extent to which participants thought about how their appearance compared to others ($b = -0.001$, 95% CIs: $-.15, .15$, $p = .993$, Cohen's $d < .01$). Exposure to fitspiration images did however significantly predict satisfaction with fitness ($b = -0.07$, 95% CIs: $-.14, -.01$, $p = .025$, Cohen's $d = .01$), with slightly lower satisfaction scores after exposure to these images relative to neutral images. None of these associations varied significantly across individuals, and hence trait-based moderators were not tested.

Exposure to fitspiration images predicting disordered eating. Exposure to fitspiration images relative to neutral images was unrelated to subsequent reported disordered eating behavior ($b = -0.13$, 95% CIs: $-1.07, 0.81$, $p = .428$, odds ratio = 0.88).

DISCUSSION

Using an experimental EMA design spanning 7 days, we examined for the first time whether exposure to fitspiration images in real life affected satisfaction with different body attributes, disordered eating, and current mood in women. We then examined whether these effects were moderated by trait levels of pressure to obtain an idealized physique from the family, the media and peers, appearance comparisons, internalization of the thin and muscularity ideals and body dissatisfaction. These variables were chosen in line with the Tripartite Influence Model for eating pathology, which is a prominent model accounting for eating disorder symptomatology (Thompson, 1999). We found that viewing fitspiration images led to an increased perceived pressure to attain an idealized physique, especially if participants experienced high degrees of pressure from the media in everyday life. We further found that fitspiration images lowered the

extent to which women felt that idealized physiques were attainable, and decreased satisfaction with current fitness. There were no effects of fitspiration image exposure on various other aspects of satisfaction with other body attributes (e.g. health, sex appeal, muscle tone), or on mood, disordered eating, or the frequency of appearance comparisons.

Previous studies indicate that fitspiration content on social media raises body dissatisfaction, body image issues and eating pathology in women (e.g. Griffiths et al., 2018; Holland & Tiggemann, 2017; Prichard et al., 2018; Robinson et al., 2017; Slater et al., 2017). Findings regarding the effect of fitspiration exposure on negative mood have been inconsistent, with some studies finding negative relationships (e.g. Prichard et al., 2018) and others revealing no meaningful effects (e.g. Slater et al., 2017). However, with some exceptions (e.g. Griffiths et al., 2018), most studies have been limited by correlational designs and therefore, lack of a clear causal pathway.

Using an experimental EMA design, we sought to establish a causal relationship between fitspiration content and these outcomes. Of note, our results were mostly inconsistent with previous findings. Although we did find that fitspiration images increased the pressure upon women to attain an idealized physique and lowered their satisfaction with their current level of fitness, fitspiration exposure did not causally affect state body satisfaction with weight, muscle tone, health, or sex appeal. Likewise, fitspiration image exposure did not causally affect disordered eating or negative mood. None of these null results were moderated by trait differences between individuals, suggesting that they were applicable to our entire study population.

Insight into our findings might be obtained by looking at the results of a study by White et al., (2016). White et al. (2016) used EMA to examine eating behaviors in relation to exposure to media images not reflecting fitspiration. Similar to our results, they found that exposure to media images did not directly predict disordered eating. Yet, they did find that media image

exposure increased stress, which in turn, exacerbated bingeing and restrictive eating behaviors (White et al., 2016). Fitspiration images may affect maladaptive eating behaviors and body dissatisfaction through this pathway, which we were unable to test as we did not measure stress in the current study. Future work delineating the psychological mechanisms that may account for this relationship would be a welcome contribution to future work.

Paradoxically, fitspiration exposure pressured women to obtain idealized bodies yet left them feeling as if such bodies were unattainable. Rather than inspire fitness, fitspiration exposure appeared to simply exacerbate the harmful effects of objectifying media content, which promotes body ideals that are unattainable for most people. By lowering the perceived attainability of the body ideal, however, it may be that fitspiration exposure protected women from the full gamut of possible body dissatisfaction, low mood, appearance comparison, and maladaptive eating measured in the current work. Although such outcomes are usually due to high pressure to obtain an idealized body (e.g. Harris et al., 2018; Myers & Crowther, 2009), it may be that some degree of attainability must be present for worse outcomes to develop. Future work investigating whether poorer outcomes eventuate when high pressure to obtain an idealized body is combined with at least some degree of attainability would help clarify the conditions under which fitspiration negatively affects women. Research has, for instance, shown that appearance standards of peers on social media platforms such as Facebook—which are seen as more attainable than the ones of the general media—are especially detrimental to a person's self-worth, body dissatisfaction and disordered eating (e.g. Leahey & Crowther, 2008). It would, therefore, be important in future studies to compare the fitspiration images of strangers or celebrities to fitspiration images of peers.

Appearance comparisons have been shown to significantly impact an individual's body image, particularly in the context of social media trends (e.g. Dougherty & Krawczyk, 2018; Fardouly, Diedrichs, Vartanian, & Halliwell, 2015). Poor body image, in turn, increases the

risk of maladaptive eating. Our null results for the effect of fitspiration on body image and disordered eating may result from the fact that fitspiration content did not exacerbate appearance comparisons among women. Potentially this finding may also be due to the low idealized body attainability scores that our fitspiration images engendered in the current sample. For fitspiration images to be significantly harming, appearance comparisons may be a necessary psychological mechanism driving the effect.

Finally, in terms of the moderation effects, the only significant moderation finding was obtained via pressures from the media. Our results revealed that for individuals with elevated perceived pressure from the media, the impact of fitspiration image exposure was magnified. The current findings may suggest that perhaps not all components of the Tripartite Influence Model carry equal weight in their influence on body image and disordered eating. Accordingly, previous research has also found more substantial impact from the media and peers than the family when assessing the Tripartite Influence Model (e.g. de Carvalho, Alvarenga, & Ferreira, 2017; Hardit & Hannum, 2012; Javier & Belgrave, 2015; Rodgers et al., 2011). The non-significant findings of pressures from the family, peers, internalization and appearance comparisons contradict previous studies that have found support for the entire Tripartite Influence Model (Hazzard et al., 2019; Keery, van den Berg, & Thompson, 2004; Yamamiya, Shroff, & Thompson, 2008). Future research is required to verify these inconsistent findings.

Limitations and Strengths

The findings from the present study need to be considered within the context of its limitations. First, the participants were all female and primarily university students aged under

30, with iPhones with the latest Apple operating systems. Generalizability is thus limited to affluent, young and educated females. Second, a significant proportion of the sample (20%) reported having had an eating disorder, which is not uncommon for a student population that is at risk for eating disorders (Fitzsimmons-Craft, Karam, Monterubio & Wilfley, 2019). The more-than-expected number of participants with significant eating pathology could have influenced the results and possibly have resulted in underreporting of the adverse effects of fitspiration images on body image concerns and disordered eating behaviors.

Third, disordered eating was assessed using dichotomous variables, which may not have adequate sensitivity to determine the severity or frequency of engagement with these behaviors between the EMA assessments. It is also important to note that some of the disordered eating variables entailed pathology (e.g. dietary restriction, skipped a meal and exercise to lose weight) commonly found in the general population (e.g. Mitchison, Hay, Slewa-Younan, Mond, 2012; Krug et al., 2009) and therefore might entail symptoms that are less severe than diagnosable eating disorders. Fourth, due to the EMA design, repeated exposure to questions regarding maladaptive eating patterns and body dissatisfaction may have increased participant reactivity and attention, ultimately influencing these behaviors (e.g. Burke et al., 2017; Shiffman et al., 2008).

Fifth, we had difficulties controlling for exposure to fitspiration content in participants' daily life. We were unable to determine daily levels of exposure to fitspiration content outside the context of the experiment, and it may be that some participants naturally viewed more fitspiration content than others. Such a possibility would account for the mostly transient effects we found in the current study. However, even when we limited the time lag to less than two hours, the impact of fitspiration on our behavioral and emotional outcomes were still mostly non-significant. It may be that the fitspiration exposure must reach a certain threshold to exert

effects on disordered eating and body image outcomes, and the low trait level of fitspiration exposure in the current study did not reach this threshold.

Alternatively, relationships may be more complex and require rumination or other psychological phenomena to then lead to body dissatisfaction and disordered eating outcomes. It is also possible that cumulative effects of exposure to the fitspiration images could have taken place that could not be seen until some time, and multiple exposures have taken place. In the current study, a total of 42 possible exposures were assessed throughout 7 days. Future research may benefit by including more exposure throughout a more extended timeframe to be able to determine such cumulative effects in more detail. Although this was beyond the scope of our study, further studies aiming to delineate these complex relationships would be a welcome addition.

Sixth, as previously outlined, our sample comprised of women who viewed fitspiration images but rarely posted these images on social media. This could have impacted the current findings. Future studies might want to include participants that have previously engaged more regularly with fitspiration content. This could, for instance, include self-selected fitspiration users to test the increased experience of body dissatisfaction and disordered eating symptoms in such a group. Such a group would have more naturalistic validity, meaning those who self-select might be more preoccupied with all weight- and appearance-related thoughts and thus more likely to be negatively impacted by the use of the current fitspiration images.

Seventh, we only used the terms '*#fitspiration*' and '*#fitspo*' at the initial image retrieval stage. When we asked participants to rate the images in the pilot phase, we asked them to rate each image on its attractiveness and how much it made them think about their own attractiveness. It would have been advantageous in this part of the study to also ask participants how much each image made them think about exercise, fitness and fitspiration. Recently, we conducted another study (Yee, Griffiths, Fuller-Tyszkiewicz, Richardson, Blake, & Krug, In

press) that used the same experimental EMA design as in the current study, but in a male sample. In the pilot phase of this study, male participants were asked to rate the extent to which each image was consistent with the concept of fitspiration (defined in the study as content aimed at promoting exercise and healthy lifestyles) on an eight-point Likert scale (0 = *not at all*, 7 = *extremely*). The overall findings of the fitspiration scale revealed a very high Cronbach alpha ($\alpha = .95$) value, indicating that the images chosen were representative of fitspiration content. It is therefore highly likely that if we had used such a scale in the current pilot phase, similar reliability findings would have been obtained for the current fitspiration images. However, this needs to be explicitly assessed in future studies.

Despite the above limitations, the current study had some notable strengths. Shorter gaps between the EMA assessments were ideally spaced to promote compliance, which was appropriate for a daily monitoring study. This decent compliance rate increased the representation of the results and the statistical power necessary to undertake meaningful comparisons between our variables of interest. The fitspiration images were ethnically diverse, which allowed non-Caucasian participants to also identify with the person in some of the images. However, future research would benefit from including more varied images in terms of age, ethnicity and gender to raise ecological of our results. Upcoming studies would also benefit from using similar experimental EMA designs with large sample sizes from diverse ethnic/cultural groups in both males and females, to be able to account for statistical differences in these groups.

Finally, upcoming studies could also try to enhance the current study design by including a comparison condition of a lab-based exposure component. In such an improved study design, participants would be asked to complete Phase 1 (baseline measures). Then they would engage in an experimental task (Phase 2), where they would be exposed to the fitspiration versus neutral images in a lab setting. After this exposure, the participant would fill

in the post-exposure measures. In Phase 3, participants would then be asked to download the EMA app from the current study, where they would continue to get randomly exposed to the same fitspiration/neutral from Phase 2 for a duration of 7 days. This approach would allow to assess differences across the three different phases and tease apart whether the findings of the current experimental EMA component are similar or different to standardized lab exposure effects. However, it needs to be acknowledged that the data obtained from Phase 2 and Phase 3 would be very different, with Phase 2 providing pre-post data and Phase 3 comprising micro-longitudinal data. Such differences in data capture would make data analyses quite complex.

Conclusion

Using an experimental EMA design, we investigated the influence of fitspiration exposure on multiple measures of satisfaction with one's body attributes, mood and disordered eating. Engagement with fitspiration content did not affect disordered eating, most aspects of satisfaction with one's body attributes, mood or appearance comparisons, though it did lower current satisfaction with one's fitness. Likewise, fitspiration exposure simultaneously increased pressure to obtain an idealized body and decreased the perceived success of attempting to do so. Few trait-level variables moderated these effects, suggesting that they applied to the general study population of young and educated women. Our results demonstrate that the merely exposing women to fitspiration imagery has a limited effect on their moment-to-moment perceptions of their bodies and engagement in disordered eating. Still, more experimental and longitudinal research is needed to verify the current findings.

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Table 1
Demographic Characteristics of the Sample (N = 85)

Demographic variable	Statistic
Ethnicity (<i>n</i> , %)	
Aboriginal or Torres Strait Islander	1 (1.2%)
African	2 (2.4%)
Caucasian or white	35 (41.2%)
Eastern Asian	21 (24.7%)
Southern Asian	14 (16.5%)
Middle Eastern	3 (3.5%)
Mediterranean	4 (4.7%)
Other	5 (5.9%)
Highest education completed (<i>n</i> , %)	
More than Secondary School	68 (80.0%)

Year 12 or equivalent	2 (2.4%)
Certificate/Diploma	2 (2.4%)
Bachelor's Degree	8 (9.4%)
Postgraduate Degree	5 (5.9%)
Marital status (<i>n</i> , %)	
Married	1 (1.2%)
Divorced	1 (1.2%)
Single	78 (91.8%)
De facto	5 (5.9%)

Note. Percentages are based on complete data for demographic variables. *M* = mean, *SD* = standard deviation.

Table 2

Descriptive statistics for trait-level variables.

Variable	Possible <i>range</i>	<i>M</i>	<i>SD</i>
Appearance comparison	1-5	3.22	1.04
Body dissatisfaction	5-45	29.46	7.35
Internalization thin ideal	1-5	3.24	0.91
Internalization muscular ideal	1-5	2.84	0.81
Pressure from family	1-5	2.65	1.15
Pressure from peers	1-5	2.17	1.10
Pressure from media	1-5	3.80	1.11

Note. *M* = mean, *SD* = standard deviation.

Table 3 – Descriptive statistics for use of social media

	> Once daily	Daily	Once per week	Once per month	Never
View					
Instagram	22 (25.9%)	10 (11.8%)	16 (18.8%)	3 (3.5%)	34 (40%)
Facebook	5 (5.9%)	6 (7.1%)	14 (16.5%)	11 (12.9%)	49 (57.6%)
Snapchat	2 (2.4%)	4 (4.7%)	9 (10.6%)	5 (5.9%)	65 (76.5%)
Tumblr	4 (4.7%)	4 (4.7%)	3 (3.5%)	6 (7.1%)	68 (80.0%)
Other	7 (8.2%)	3 (3.5%)	4 (4.7%)	6 (7.1%)	65 (76.5%)
Post					
Instagram	3 (3.5%)	0 (0%)	2 (2.4%)	6 (7.1%)	74 (87.1%)
Facebook	2 (2.4%)	1 (1.2%)	1 (1.2%)	2 (2.4%)	79 (92.9%)
Snapchat	2 (2.4%)	1 (1.2%)	0 (0%)	3 (3.5%)	79 (92.9%)
Tumblr	1 (1.2%)	1 (1.2%)	1 (1.2%)	1 (1.2%)	81 (95.3%)
Other	1 (1.2%)	2 (2.4%)	0 (0%)	1 (1.2%)	81 (95.3%)