

The differential impact of viewing fitspiration and thinspiration images on men's body image concerns: An experimental ecological momentary assessment study

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ABSTRACT

To date, little is known about the impact of fitspiration and thinspiration exposure on men, as previous studies on these social media trends were primarily conducted on women. Male participants ($n = 223$) completed baseline measures of trait body image, then used a smartphone application to complete up to six state-based assessments daily for seven days. In each assessment, participants were randomly assigned to one of three image conditions (fitspiration, thinspiration, or neutral). Before and after viewing each image, they reported state body fat dissatisfaction, muscularity dissatisfaction, negative mood, and urge to engage in behaviours to reduce body fat and increase muscularity. Multi-level analyses revealed that compared to viewing neutral images, viewing fitspiration images increased men's body dissatisfaction, whereas viewing thinspiration images decreased body dissatisfaction. Viewing either fit- or thinspiration images also led to lower mood and greater urges to increase muscularity, whereas only fitspiration images increased urges to reduce body fat. Men with greater baseline muscularity dissatisfaction and higher appearance comparison were most vulnerable to muscularity dissatisfaction after viewing fitspiration images. Findings suggest the importance of limiting exposure to fitspiration imagery and implementing social media literacy programmes for men and well as women.

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1. Introduction

Media exposure is a key sociocultural factor contributing to body image concerns, and recent years have seen growing interest in the effects of social media on body image (e.g. Holland & Tiggemann, 2016). Social media trends such as fitspiration—content aimed at promoting exercise and healthy lifestyles (e.g. Carrotte, Prichard, & Lim, 2017; Tiggemann & Zaccardo, 2018)—and thinspiration—content aimed at promoting weight loss and often glorifying disordered eating behaviours (e.g. Ghaznavi & Taylor, 2015)—have been found to be associated

with greater body dissatisfaction, negative mood, and disordered eating behaviours (e.g. Griffiths & Stefanovski, 2019; Holland & Tiggemann, 2016). These outcomes arise because both types of images are unattainable for most men and therefore present unreasonable goals whose pursuit would require unhealthy or excessive behaviours. A large proportion of the studies assessing the impact of fitspiration and thinspiration images, however, were conducted on women, and the generalisability of these findings to men remain unclear. This is particularly so, given the gender differences in the perception of the 'ideal body' (e.g. Stanford & McCabe, 2002), which suggests that compared to women, men may respond differently to fitspiration and thinspiration content. To date, no study has investigated the causal effects of exposure to fitspiration and thinspiration imagery on men's body image. There is also limited research that has delineated the two dimensions of men's body dissatisfaction – body fat dissatisfaction and muscularity dissatisfaction (e.g. Griffiths, Murray, & Touyz, 2013). To rectify these gaps in the literature, here we utilise ecological momentary assessment (EMA) to investigate the effects of viewing fitspiration and

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thinspiration images on men's body dissatisfaction, negative mood, and urge to engage in behaviours to reduce body fat and increase muscularity.

1.1. Conceptualising body dissatisfaction in men

Whilst women report more body dissatisfaction than men, some level of body dissatisfaction is nonetheless reported by 60.4 % of men living in the general population of Australia, and moderate-to-high levels of body dissatisfaction are reported by 15.2 % of men (Griffiths et al., 2016). In Australia, there is evidence to suggest these rates may be increasing over time (Mitchison, Hay, Slewa-Younan, & Mond, 2014). Historically, body image studies mostly recruited female participants and focused on the drive for thinness (Bergeron & Tylka, 2007). Men, however, do not necessarily think about their bodies in the same way as women do. Over the past three decades, researchers have found gender differences in how the 'ideal body' is perceived. Men tend to place a greater emphasis on muscularity whereas women focus more on being thin (Grogan, 2016). This suggests that men's body dissatisfaction is not solely dependent on thinness (or fatness), and it would be inaccurate to generalise findings from prior body image research that recruited female participants to the male population.

As such, researchers are beginning to conceptualise men's body dissatisfaction in terms of two distinct but related dimensions – body fat dissatisfaction and muscularity dissatisfaction, which correspond to the drive for thinness and the drive for muscularity, respectively (Griffiths et al., 2013). The pursuit of thinness and muscularity may motivate different eating and exercise behaviours, both of which can be problematic. The desire to lose body fat may potentiate behaviours such as severe food restriction, taking diet pills (e.g., ephedrine), and engaging in excessive aerobic exercise (Grogan, 2016). The desire to increase muscularity may also potentiate behaviours like consuming protein-rich foods, extreme bodybuilding and weight training, and using appearance-enhancing drugs (e.g., anabolic steroids; Griffiths et al., 2013; Grogan, 2016). Given the differential associations of the two dimensions of men's body dissatisfaction with body change behaviours, it is pertinent to consider both body fat dissatisfaction and muscularity dissatisfaction in the context of key theoretical models of body image.

1.2. The tripartite influence model

The tripartite influence model is a key theoretical model of body image (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999), and can be used to generate predictions about men's body dissatisfaction and eating pathology. The tripartite influence model (Thompson et al., 1999) posits that three sources of influence contribute to the development of body image concerns and eating dysfunction – peers, parents, and media. This model proposes two mediation pathways that explain the relationship between the sources of influence and eating disturbances: internalisation of societal ideals and appearance comparison. Multiple studies have provided evidence to support the validity of components in the tripartite influence model in men across various age groups and cultures (e.g. Papp, Urban, Czeglédi, Babusa, & Tury, 2013; Smolak, Murnen, & Thompson, 2005).

Specific to media influence, an extensive body of literature has examined effects of mass media portrayals of the muscular ideal on men's body image (e.g. Barlett, Vowels, & Saucier, 2008; Blond, 2008; Hausenblas et al., 2013). In a meta-analysis consisting of 10 experimental studies, Barlett et al. (2008) found that men who viewed muscular media stimuli reported higher body dissatisfaction, and increased levels of negative psychological (e.g., depression, eating disorders) and behavioural (e.g., strategies to

lose weight and increase muscularity) outcomes. This finding is consistent with two other meta-analyses, which reported small to moderate negative effects of media portrayals of the ideal male physique on body image (Blond, 2008) and disordered eating among men (Hausenblas et al., 2013). Taken together, mass media depictions of the muscular ideal not only lead to stronger body dissatisfaction but also motivate appearance-enhancing behaviours.

Although the tripartite influence model provides a framework to explain the development of body image concerns and disordered eating behaviours, it does not consider body fat dissatisfaction and muscularity dissatisfaction as separate constructs. To address this limitation, Tylka (2011) expanded the tripartite influence model and incorporated dual body image pathways to men's body change behaviours. In this revised framework, body fat dissatisfaction predicts disordered eating behaviours to reduce body fat, whereas muscularity dissatisfaction predicts muscularity enhancement behaviours. Some studies to date have provided evidence for the dual body image pathways in young men (e.g. Girard, Chabrol, & Rodgers, 2018; Tylka, 2011; Tylka & Andorka, 2012). These findings reinforce the importance of delineating the two dimensions of body dissatisfaction to better understand motivations to engage in behaviours to alter body fat and muscularity among men.

1.3. Social media and male body image

Although the majority of past research has demonstrated the negative effects of mass media on male body image (e.g. Barlett et al., 2008), there is a need to develop a stronger understanding about the impact of social media specifically, given its high usage and unique characteristics that differentiates it from mass media. The shift from mass media to social media is evident in the proliferation of worldwide social media usage from 0.97 billion users in 2010 to 2.65 billion users in 2018 (Clement, 2019). This upward trend is projected to continue, reaching a total of 3.09 billion globally in 2021 (Clement, 2019).

The negative effects of social media usage on body image have been widely documented. A systematic review on the impact of social media use on body image revealed positive correlations between the duration of social media use and body dissatisfaction, body surveillance, and disordered eating (Holland & Tiggemann, 2016). These body image concerns and behaviours increased between four weeks and 18 months later (Holland & Tiggemann, 2016), indicating the possible longitudinal effects of social media usage. Although most studies utilised female samples to examine the relationship between social media usage and body image (e.g. Fardouly, Diedrichs, Vartanian, & Halliwell, 2015), a few studies recruited male participants (e.g. Griffiths, Murray, Krug, & McLean, 2018).

In terms of gender differences, findings have been mixed, with some studies (e.g. Thompson & Lougheed, 2012) revealing social media usage affected women's body dissatisfaction and eating pathology more than men's, whereas other studies were not able to find gender differences in the association between social media use and body dissatisfaction (Stronge et al., 2015) or weight concerns (Kim & Chock, 2015). A key limitation across these studies is that the researchers only measured the general indices of social media usage, such as duration and frequency of social media use. Little is known about the association between the type of social media content individuals view (e.g., fitspiration, thinspiration) and body image, especially in men. Given that men and females have different perceptions of the 'ideal body' (Stanford & McCabe, 2002) and may, therefore, respond differently to fitspiration and thinspiration imagery, this is an area that warrants further investigation.

1.3.1. The effects of fitspiration on body image

A recent trend that has emerged on social media is fitspiration (also termed 'fitspo'), which is a term derived from the amalgamation of the two words, 'fitness' and 'inspiration' (Tiggemann & Zaccardo, 2015). Multiple content analyses have found that fitspiration content comprises images and texts related to exercise and diet that aim to promote healthy and fit lifestyles (e.g. Carrotte et al., 2017; Tiggemann & Zaccardo, 2018). Specific to fitspiration images portraying men, a large emphasis is placed on displaying visible biceps, pectoral muscles, and abdominal muscles (Carrotte et al., 2017; Tiggemann & Zaccardo, 2018). Men portrayed in these images conform to a particular body type characterised by a medium build with high levels of muscularity, which is consistent with today's societal standard of the ideal male physique (Tiggemann & Zaccardo, 2018). Fitspiration images are often accompanied by motivational or inspirational quotes (Carrotte et al., 2017), such as 'Winners train, losers complain' and 'You won't always love the workout, but you'll always love the results'. Fitspiration content on social media is often tagged with hashtags like '#fitspo', which enables users to search for and view other posts related to fitspiration easily (Carrotte et al., 2017).

Although fitspiration content may have initially been intended to inspire and motivate viewers to lead a healthy lifestyle, its unintended negative effects on body image and mood have been documented, albeit mostly among women. In an experiment conducted by Tiggemann and Zaccardo (2015), women were randomly assigned to view either fitspiration or travel (control) images found on Instagram. Compared to participants who viewed travel images, those exposed to fitspiration imagery reported greater body dissatisfaction and negative mood, and lower appearance self-esteem. Participants who viewed fitspiration images also disclosed feeling more motivated to be fit and maintain a healthy diet. In a separate study, Prichard, Mclachlan, Lavis, and Tiggemann (2018) examined the causal effects of viewing various forms of fitspiration imagery (i.e., the depiction of bodies performing an exercise or simply posing; presence or absence of appearance-focused text) on women's body image. Findings revealed that regardless of focus or presence of text, participants reported lower body satisfaction and increased negative mood after exposure to fitspiration images. Conversely, Slater, Varsani, and Diedrichs (2017) found that compared to neutral control images, viewing fitspiration images did not lead to poorer body image or negative mood in women. Only one study studied similar topics among men, with findings indicating that viewing fitspiration content was positively correlated with body dissatisfaction and appearance-based exercise motivation (Fatt, Fardouly, & Rapee, 2019).

1.3.2. The effects of thinspiration on body image

Another social media trend is thinspiration (also termed 'thinspo'), which is derived from the words 'thin' and 'inspiration'. More of than not, thinspiration content is aimed at promoting weight loss and glorifying disordered eating (Ghaznavi & Taylor, 2015). Previous content analyses have revealed that thinspiration content largely depicts images of extremely thin and objectified bodies posing in sexually suggestive ways, and quotes like 'Waking up thinner is worth going to bed hungry' and 'The best way to maintain the loss is to lose even more' (e.g. Ghaznavi & Taylor, 2015; Wick & Harriger, 2018). Although the majority of thinspiration content features images of women (Talbot, Gavin, Van Steen, & Morey, 2017), thinspiration is still relevant to men. For example, Alberga, Withnell, and von Ranson (2018) found that about 8.6 % of thinspiration images contained male bodies. Men also participate in pro-eating disorder websites, where they can access thinspiration content (Wooldridge, Mok, & Chiu, 2014). On social media, thinspiration content targeted at men can be found by searching the hashtag '#malethinspo'. Related images from this search often illus-

trate skinny, topless men dressed in tight jeans to accentuate their bone protrusions and emaciation.

Multiple studies have documented the negative psychological impact of thin-ideal media portrayals, including increased body dissatisfaction, negative mood, and disordered eating behaviours and cognitions (e.g. Grabe, Ward, & Hyde, 2008; Groesz, Levine, & Murnen, 2002). However, a significant proportion of these studies focused on mass media and recruited only female participants (e.g. Harper & Tiggemann, 2008; Hawkins, Richards, Granley, & Stein, 2004). Research on the impact of thinspiration social media content on body image remains in its infancy, with published papers mostly being content analyses (e.g. Ghaznavi & Taylor, 2015; Talbot et al., 2017). Only one experimental study has been conducted, with findings showing that women experienced elevated body dissatisfaction after viewing thinspiration images relative to viewing fitspiration images (Robinson et al., 2017). It is unclear if findings based on mass media portrayals of the thin-ideal are generalisable to thinspiration content on social media. Nevertheless, given that men tend to place greater emphasis on a mesomorphic (muscular and lean) physique than an ectomorphic (thin) build in the perception of the 'ideal body' (Griffiths et al., 2013; Ridgeway & Tyllka, 2005), they may consider thinspiration content to be a less relevant benchmark for comparison. Currently, there is minimal evidence to demonstrate how thinspiration content on social media affects the way men perceive their bodies, as well as their mood and motivation to engage in body change behaviours.

1.3.3. Comparing the effects of fitspiration and thinspiration on male body image

A few studies have compared the relationship between viewing fitspiration and thinspiration content, body dissatisfaction, negative mood, and disordered eating behaviours among men (e.g. Griffiths & Stefanovski, 2019). One study found that exposure to thinspiration imagery was associated with greater eating disorders symptom severity compared to exposure to fitspiration imagery (Griffiths, Castle et al., 2018). Another study that utilised EMA reported small negative effects for the associations between exposure to thinspiration and fitspiration content and body satisfaction (d s ranged from 0.03 to 0.07), with only thinspiration exposure found to be related to stronger negative mood (Griffiths & Stefanovski, 2019). Of note, both studies were correlational and only a minority of the samples comprised men. Hence, these results may be skewed as the majority of the data were contributed by female participants. The lack of male participants in the samples also rendered the assessment of gender differences implausible. A separate experiment by Galioto and Crowther (2013) examined the causal effects of viewing thin and muscular images on men's body image and found that exposure to both types of images led to an increase in body dissatisfaction. However, these images were derived from advertisements on websites, which may be different from those found on social media platforms that predominantly feature images posted by peers. Given the limitations of previous studies, more research is needed to compare the effects of viewing fitspiration and thinspiration social media images on male body image.

The psychological mechanism by which thinspiration and fitspiration affect individuals is likely through social comparison, which noted above is a key component of the tripartite influence model (Thompson et al., 1999). Because people are more likely to engage in upward (comparing oneself to someone more attractive) versus downward (comparison to a less attractive target person) social comparisons (Festinger, 1954), even those who are objectively fit and thin can subjectively experience being inadequate compared to others. Appearance comparisons through social media are especially common, and upward comparisons are an important sociocultural factor adversely affecting body image (e.g. Fardouly,

Pinkus, & Vartanian, 2017). While most studies on fitspiration and thinspiration have been conducted among women, recent work indicates that male fitspiration posts increase appearance comparison in men, which, in turn, reduces body satisfaction (e.g. Fatt, et al., 2019).

1.4. Gaps in the literature

Past research has demonstrated that exposure to mass media portrayals of the muscular ideal leads to higher levels of body dissatisfaction, negative mood, and disordered eating behaviours (e.g. Barlett et al., 2008; Blond, 2008; Hausenblas et al., 2013). However, the effects of social media trends like fitspiration and thinspiration on men's body image remain inconclusive. Most experimental studies that examined the effects of exposure to fitspiration and/or thinspiration imagery on body image recruited female participants (e.g. Robinson et al., 2017; Tiggemann & Zaccardo, 2015). Given the gender differences in the perception of the 'ideal body' (e.g. Stanford & McCabe, 2002), and the fact that body dissatisfaction in women is often normative (e.g. Runfola et al., 2013), generalisability of these findings to men is highly questionable.

Furthermore, the above mentioned experimental studies were limited in that they assessed participants in a constrained laboratory environment. EMA provides researchers access to the study of behaviour in its natural context and therefore extends previous findings through improved ecological validity and extended data collection compared to traditional self-report and experimental studies (Shiffman, Stone, & Hufford, 2008). Specifically, EMA can identify fluctuations in longitudinal in-the-moment behaviours (such as viewing fitspiration images) and if they affect state characteristics (such as body dissatisfaction and/or mood) (Smyth & Stone, 2003). Finally, the realm of male body image research, there is also insufficient research that analysed body fat dissatisfaction and muscularity dissatisfaction as separate constructs.

1.5. The current study

To address these research gaps, our study utilised EMA with an experimental design embedded within, to investigate the effects of exposure to fitspiration and thinspiration imagery on men's body image. The primary aim of our study was to investigate the causal effects of viewing fitspiration and thinspiration images on state body fat dissatisfaction, muscularity dissatisfaction, negative mood, and urge to engage in behaviours to reduce body fat and enhance muscularity among men (whilst maintaining ecological validity). Our secondary aim was to examine the moderating effects of trait body dissatisfaction and appearance comparison on the relationship between exposure to fitspiration and thinspiration imagery, and state body dissatisfaction. These moderating factors were chosen because they are the key variables of the Tripartite Influence Model for eating pathology for men (e.g. Papp, et al., 2013). Prior research has suggested that trait body dissatisfaction and appearance comparisons may influence one's momentary experiences of body dissatisfaction (e.g. Fuller-Tyszkiewicz, Richardson, Lewis, Smyth, & Krug, 2018). Although no research has investigated how these trait variables may moderate the effects of exposure to fitspiration and thinspiration images on body dissatisfaction, men who are more dissatisfied with their bodies and engage more frequently in appearance comparison may experience more heightened body dissatisfaction. Given that men generally perceive the 'ideal body' to be muscular rather than thin (e.g. Griffiths et al., 2013), fitspiration images may be more relevant targets for comparison. Thus, the moderating effects of trait body dissatisfaction and appearance comparisons may be more pronounced when men view these images.

Based on this literature, we posit the following hypotheses. Compared to viewing neutral images, viewing fitspiration images but not thinspiration images will increase state body fat dissatisfaction, muscularity dissatisfaction, negative mood, and urge to engage in behaviours to reduce body fat and increase muscularity among men (H1). Men with higher trait body fat dissatisfaction will report higher state body fat dissatisfaction after viewing fitspiration images compared with neutral images (H2). Men with higher trait muscularity dissatisfaction would report higher state muscularity dissatisfaction after viewing fitspiration images compared with neutral images (H3). Finally, men with higher trait appearance comparison will report higher state body fat dissatisfaction and muscularity dissatisfaction after viewing fitspiration images compared with neutral images (H4).

2. Method

2.1. Participants

A total of 347 male participants signed up for our study and downloaded the *InstantSurvey* app (Richardson, 2015) to assist with data collection. However, 124 participants were excluded from our data analysis either because they did not start the study, did not complete the baseline data, or completed less than 50 % of the EMA assessments. We decided to retain participants with at least 50 % compliance to ensure sufficient statistical power and reduce biased results due to missing data that were not randomly distributed (Shiffman et al., 2008). Our final sample comprised 223 male participants aged between 18 and 52 years old. Inclusion criteria were men aged 18+, who owned an iPhone (the EMA software was only compatible with iOS at the time of our study). Participants were informed that the purpose of the study was to investigate the relationship between viewing fitspiration images and thinspiration images on body image, the urge to engage in body change behaviours, and mood among men.

Power calculations using the R package SIMR (Green & MacLeod, 2016) suggested power exceeded .90 given our sample size, 1000 simulations of a multilevel model, and the following assumptions: (1) $\alpha = .05$, (2) intraclass correlation = .50, (3) average cluster size of 30 (constituting ~70 % compliance to EMA phase), (4) standardized effects at Level 1 and 2 and cross-level interaction of .2 (4 % variance explained), and (5) random slope for the Level 1 effect with a moderate effect size. The intraclass correlation size is consistent with prior EMA studies in the body image area (e.g. Fuller-Tyszkiewicz et al., 2018), standardized effect sizes equate to Ferguson's (2009) recommended minimum effect size, and a moderate random slope size ensures the model is neither too lenient nor too conservative in power estimation (Arend & Schäfer, 2019).

The majority of our participants were single, heterosexual students from an Asian background. Demographic characteristics of the retained sample are summarised in Table 1. Almost 58 % of the sample reported viewing fitspiration content on social media, and nearly 30 % indicated that they viewed thinspiration content on social media.

2.2. Materials

2.2.1. Experimental stimuli

2.2.1.1. Image type. Due to a lack of validated images, we conducted a pilot study to construct fitspiration, thinspiration, and neutral images for the experimental stimuli. Firstly, we sourced 30 images for each of the three image conditions from Instagram, Facebook, and Tumblr. We used the search terms '#fitspo' and '#malethinspo' to gather the initial pool of fitspiration and thinspiration images, respectively. All sourced fitspiration and thinspiration

images depicted only male models and bodies. For the control condition, we used the search terms '#furniture', '#pattern', '#nature', and '#sunrise' to obtain neutral images that did not contain people. All images were coloured and did not contain words or quotes. A copy of the images can be obtained on request from the corresponding author.

Similar to the procedure used in previous studies to establish content validity for the three sets of images (Arbour & Martin Ginis, 2006; Leit, Gray, & Pope, 2002), 92 men with a mean age of 30.80 years ($SD = 12.94$) rated the extent to which each image was consistent with the concept of fitspiration and thinspiration on an eight-point Likert scale (0 = *not at all*, 7 = *extremely*). Mean ratings on these fitspiration and thinspiration scales were calculated for each image. The overall mean value for all the 90 images was 3.30 ($SD = .65$) and 3.02 ($SD = -.76$) for the fitspiration and the thinspiration scales, respectively. The 20 images that received the highest mean ratings on the fitspiration scale formed the set of fitspiration images, whereas the 20 images with the highest mean ratings on the thinspiration scale formed the set of thinspiration images. The 20 images with the lowest average scores across the mean ratings on the fitspiration and thinspiration scales formed the set of neutral images. The final set of fitspiration images had significantly higher mean ratings on the fitspiration scale compared to the final sets of thinspiration and neutral images, $F(2, 57) = 1762.85, p < .001$. The final set of thinspiration images had significantly higher mean ratings on the thinspiration scale than that of the final sets of fitspiration and neutral images, $F(2, 57) = 1112.87, p < .001$. All three image sets demonstrated excellent internal consistency, with Cronbach alphas ranging from $\alpha = .95$ to $\alpha = .98$ across the fitspiration and thinspiration scales.

2.2.2. Trait-level measures

Trait level measures were assessed at baseline through Qualtrics, which is an online survey platform.

2.2.2.1. Demographics. Participants' indicated their age, ethnicity, marital status, sexual orientation, the highest level of education completed, current employment status and current self-reported height and weight (to calculate current BMI). Participants also answered whether they viewed fitspiration or thinspiration images on social media.

2.2.2.2. Trait body dissatisfaction. We used the five-item Body Fat subscale and seven-item Muscularity subscale of the Revised Male Body Attitudes Scale (MBAS-R; Ryan, Morrison, Roddy, & McCutcheon, 2011) to measure participants' baseline body fat dissatisfaction and muscularity dissatisfaction, respectively. Items on these subscales ask participants to indicate how frequently they endorse various statements related to their attitudes about their body fat (e.g., 'I think I have too much fat on my body') and muscularity (e.g., 'I think my back should be more muscular'; 1 = never, 6 = always). Higher scores on the MBAS-R indicate higher trait body dissatisfaction (Body fat subscale $\alpha = .87$, Muscularity subscale $\alpha = .86$).

2.2.2.3. Trait appearance comparison. The 40-item Physical Appearance Comparison Scale-Revised (PACS-R; Schaefer & Thompson, 2014) assessed participants' tendency to engage in appearance comparisons across various contexts (e.g., in public, at work or school, with friends). Items on the PACS-R ask participants to indicate how frequently they endorse multiple statements related to appearance comparison (e.g., 'When I'm at the gym, I compare my physical appearance to the appearance of others') on a five-point scale (0 = never, 4 = always). Higher scores reflect a stronger baseline tendency to engage in appearance comparison ($\alpha = .99$).

Table 1
Demographic Characteristics of the Final Sample (n = 223).

Demographic variable	Statistic
Age ($M \pm SD$)	20.89 \pm 4.39
Body Mass Index ($M \pm SD$)	23.21 \pm 3.94
Currently viewing fitspiration content (%)	57.40
Currently viewing thinspiration content (%)	29.60
Ethnicity (%)	
Asian	58.30
Caucasian	27.35
Other	14.35
Marital Status (%)	
Single	91.92
Married / De Facto	4.04
Other	4.04
Highest Educational Level Attained (%)	
Year 12	65.47
Certificate/Diploma	7.62
Bachelor	22.43
Post-graduate	2.24
Other	2.24
Employment Status (%)	
Studying Full-Time	87.00
Studying Part-Time	2.70
Employed Full-Time	8.10
Employed Part-Time	13.50
Unemployed	4.00
Sexual Orientation (%)	
Heterosexual	79.40
Homosexual	7.20
Asexual	9.00
Bisexual	4.00
Other	0.40

Note. M = mean, SD = standard deviation.

2.2.3. State-level measures

Before and after viewing an image that participants were randomly assigned to (fitspiration, thinspiration, or neutral) in each assessment, participants reported their response to the following state-level measures.

2.2.3.1. State body fat and muscularity dissatisfaction. We asked participants 'How do you feel about your level of body fat/level of muscularity right now?' on an 11-point scale (0 = *extremely dissatisfied*, 10 = *extremely satisfied*). Responses were reverse-coded so that higher scores reflect higher state body fat/muscularity dissatisfaction. In the present study, both state body fat dissatisfaction and state muscularity dissatisfaction had strong correlations ($r = .51$) with their trait-based equivalents, trait body fat dissatisfaction and trait muscularity dissatisfaction as measured by the PACS-R.

2.2.3.2. Negative mood. We asked participants 'Right now, what is your mood like?' using an 11-point rating scale (0 = *extremely unhappy*, 10 = *extremely happy*). Responses on this item were reverse-coded so that higher scores reflect a stronger state negative mood. The same single-item approach was used in previous EMA studies that investigated negative mood (Chia et al., 2018). The within-person correlation between negative mood and the state body dissatisfaction measures was $r = .53$ with body fat dissatisfaction and $r = .52$ with muscularity dissatisfaction, suggesting good construct validity (see Fuller-Tyszkiewicz, 2019 for further supporting validity).

2.2.3.3. Urge to engage in body change behaviours. We asked participants 'Right now, are you experiencing the urge to engage in any of the following behaviours?'. Participants then answered yes or no to the following options, (1) exercising to increase muscularity, (2) exercising to reduce body fat, (3) consuming anabolic steroids,

(4) going on a diet to increase muscularity, and (5) going on a diet to reduce body fat. Responses were dummy-coded as 0 for a “No” response and 1 for a “Yes” response. These items were then combined to create variables indicating an overall urge to reduce body fat (options 2 and 5; with a possible score range of 0–2) and an overall urge to increase muscularity (options 1, 3, and 4; possible score range of 0–3).

2.3. Procedure

Following ethics approval from the University in Melbourne, we recruited participants through the university’s student research experience programme, community advertisements, and snowball sampling. We provided participants with a web link to the plain language statement. Those who consented to participate then completed a baseline questionnaire that assessed trait-level variables (Phase 1). Within this questionnaire, we embedded instructions to download the smartphone app *InstantSurvey* to be used for the EMA data collection, which assessed state-level variables (Phase 2). The *InstantSurvey* app generated a unique ID for each participant, which participants reported in the baseline questionnaire to link their Phase 1 data to their Phase 2 data.

Phase 2 commenced the morning after participants installed the *InstantSurvey* app. For seven days, *InstantSurvey* sent six notifications per day at semi-random intervals between 8 am and 11 pm, which prompted participants to complete one-minute assessments. This resulted in a maximum of 42 assessments throughout Phase 2. Previous EMA studies on body image have utilised a similar sampling period and frequency as the one employed in our research and shown that this testing interval (roughly 1–2 h apart) is sensitive to detecting changes in mood and body image over day whilst also helping to ensure sampling coverage across the whole day (e.g. Drutschinin, Fuller-Tyszkiewicz, Paoli, Lewis, & Krug, 2018; Fuller-Tyszkiewicz et al., 2018). Each assessment was accessible for 30 min. If participants did not complete an assessment within 30 min, the data point was considered missing.

We used a within-subject design for the current study, whereby each participant was randomly assigned to one of the three images (fitspiration, thinspiration, or neutral) at each EMA assessment. We also asked participants to answer a short survey (state-level measures) before and after viewing each image. Before starting the EMA component, participants were provided with a definition of fitspiration (images that promote exercise and healthy lifestyle) and thinspiration (images that promote weight loss and glorify disordered eating). Upon completion of the study, participants received either two-unit credits or entered a raffle to win one of five \$50 iTunes gift cards as compensation for their time.

2.4. Data analytical plan

2.4.1. Data preparation and preliminary analyses

Less than 2 % of our final sample had missing baseline data, and the results of Little’s MCAR test revealed that these data were missing completely at random, $\chi^2(8) = 2.415, p = .97$. Therefore, we imputed the missing baseline data using the expectation-maximisation algorithm.

Several sources of bias in EMA data were evaluated next. First, compliance in the EMA phase (i.e., the number of state-based assessments completed) was correlated against baseline variables to determine whether there was evidence of systematic bias in individual differences for EMA completion rates. Second, all state-level outcome variables were tested for reactivity and time effects. Specifically, we regressed these outcome variables on the order of assessment within-person (i.e., first assessment for day 1, second assessment of day 1, etc.), time of assessment (coded in hour-blocks, i.e., 8:00–8:59 am = 8 to 10:00–10:59 pm = 22), and day of

the week (coded as weekday = 0, weekend = 1). We included these time-based variables as covariates in our primary analyses when they were significantly associated with the outcome variables.

2.4.2. Main analyses

Hypothesis testing was undertaken using multi-level models via Mplus version 8.3, to control for the nested nature of repeated measures data (state assessments nested within individuals). To test H1, each dependent variable was regressed onto dummy-coded variables for image condition (thinspiration vs neutral images, fitspiration vs neutral images). Random effects for these predictors were retained if the variation across individuals was significant ($p < .05$). We constructed five models by entering the dummy-coded variables of the image conditions as predictors of the outcome variables. These effects were retained in the models as random effects if they were significant ($p < .05$). For models with random effects, H2–H4 was tested by entering trait-level predictors individually as main effects and interactions (moderating the impact of image type on the state-based outcomes). In cases where the random effect in testing H1 yielded a non-signification moderation effect, no further testing was undertaken. As recommended by Enders and Tofghi (2007), trait-level variables (trait body dissatisfaction for H2, trait muscularity dissatisfaction for H3, and trait appearance comparisons for H4) were grand-mean centred in these moderator analyses.

For models testing H1–H4, age, BMI, and baseline exposure to fitspiration and thinspiration were included as covariates in our primary analyses since previous research has reported their substantial influence on body image (Dakanalis et al., 2015). Significant predictors from the bias tests were also included in these models. Cohen’s d values were calculated for H1 converting from t values as per Arnow et al. (2013) whereas trait influences for H2–H4 were calculated based on Snijders and Bosker’s (2011) formulae for pseudo- R^2 estimation. A Gaussian distribution was used for models with mood, body fat or muscularity dissatisfaction as the outcomes, and a zero-inflated Poisson distribution for the count variables.

3. Results

3.1. Preliminary analyses

3.1.1. Differences in completers versus non-completers

Participants who completed all components of the current study (“retained participants”; $n = 223$) and those who met various exclusion criteria differed significantly in terms of trait muscularity dissatisfaction ($t = 2.03, p = .043$, Cohen’s $d = .30$), history of viewing thinspiration ($\chi^2(1) = 17.82, p < .001, \phi = .24$) and fitspiration content ($\chi^2(1) = 14.49, p < .001, \phi = .22$), employment status ($\chi^2(5) = 55.41, p < .001$, Cramer’s $V = .42$), educational attainment ($\chi^2(4) = 29.43, p < .001$, Cramer’s $V = .30$), marital status ($\chi^2(2) = 20.34, p < .001$, Cramer’s $V = .25$), and ethnicity ($\chi^2(2) = 13.18, p = .001$, Cramer’s $V = .20$). The retained participant sample had slightly lower muscularity dissatisfaction ($M = 24.71$ vs 26.63), were less likely to have viewed thinspiration content (30 % vs 57 %) yet were more likely to have viewed fitspiration content (57 % vs 32 %). Retained participants were also more likely to be single (92 % vs 76 %), report studying full-time (74 % vs 52 %), and more likely to have highest level of education completed as High School (66 % vs 46 %). Retained participants were more likely to be Asian (58 % vs 51 %) or Caucasian (27 % vs 18 %) versus another ethnic background. There were non-significant differences on the remaining baseline variables: age ($t = 1.68, p = .095$, Cohen’s $d = .24$), BMI ($t = 0.69, p = .491$, Cohen’s $d = .12$), sexual orientation ($\chi^2(4) = 3.80, p = .434$, Cramer’s $V = .11$), trait body fat dissatisfaction ($t = 1.17, p = .242$,

Cohen's $d = .15$), or trait appearance comparisons ($t = 1.41, p = .160$, Cohen's $d = .19$).

3.1.2. Descriptive statistics

Table 2 displays the means and standard deviations, and possible ranges for the state-level outcome variables. Among the three image conditions, mean scores for state body dissatisfaction, muscularity dissatisfaction, and mood highest after participants viewed fitspiration images. Participants were also most likely to report urges to reduce body fat and increase muscle when exposed to fitspiration images, and least likely to have these urges when exposed to neutral images. Significance testing comparing the effects of image type on these state measures is covered in the Main Analysis section below, concerning H1. The average baseline levels of body fat dissatisfaction ($M = 14.76, SD = 6.11$) and muscularity dissatisfaction ($M = 23.80, SD = 5.56$) were above the scale midpoint, whereas the mean score of trait appearance comparison was below the scale midpoint ($M = 17.12, SD = 10.19$).

3.1.3. Compliance

The average number of assessments completed in Phase 2 was 30.45 ($SD = 4.86$) out of a maximum of 42 assessments, which corresponds to a mean compliance rate of 72.45%. This compliance rate was comparable or higher than previous EMA studies on body image (e.g. Fuller-Tyszkiewicz et al., 2018; Tan et al., 2019). Bivariate correlations between EMA compliance rates and trait-level variables were all non-significant (all $|r|s < .10$, all $ps > .05$), suggesting no clear evidence of individual difference factors that may account for the level of compliance.

3.1.4. Reactivity and time effects

Order of assessment (from the first assessment on day 1 to last assessment on the final day of the EMA phase) was predictive of all state-based outcome measures. In all cases, scores on these variables decreased over the testing period. Time of day effects were also observed for negative mood and the two urge variables, with lower scores reported later in the day. Where these predictors were significant, they were added into primary analyses below as covariates. All reactivity and time effects are displayed in full in the supplementary materials.

3.2. Main analyses

3.2.1. Effects of image type on state body dissatisfaction, negative mood, and urge to engage in body change behaviours (H1)

Table 3 summarises the impact of image condition on the outcome variables based on a series of models constructed to test H1. Note that for the two urge outcomes, random effects for the exposure variables (exposure to fitspiration and thinspiration, respectively) were non-significant, and hence results of the fixed effects model were reported for these variables. Random effects were all significant for the remaining outcome measures and retained in the models reported in Table 3.

Exposure to fitspiration imagery led to a significant increase in state body fat dissatisfaction, muscularity dissatisfaction, more negative mood, and urge to engage in behaviours to reduce body fat and increase muscularity, as compared to viewing neutral images. Interestingly, exposure to thinspiration imagery led to lower state body fat dissatisfaction and muscularity dissatisfaction relative to exposure to neutral imagery. However, participants reported a significant increase in negative mood and urge to increase muscularity after viewing thinspiration compared to neutral images. Viewing thinspiration images relative to neutral images did not affect participants' moment-to-moment urge to reduce body fat.

3.2.2. Moderation by trait variables (H2-H4)

Moderation effects were tested for the outcomes with random effects for the exposure variables (body fat dissatisfaction, muscularity dissatisfaction, and negative mood; see Fig. 1). Consistent with H2, trait body fat dissatisfaction moderated the effect of thinspiration exposure on state muscle dissatisfaction ($b = -.03, 95\% CIs: -.05, -.01, p = .016, R^2 = .05$). Thus, while state muscle dissatisfaction tended to be lower after exposure to thinspiration images (relative to neutral images) for the sample overall, this effect was more pronounced for individuals with higher trait body fat dissatisfaction. However, trait dissatisfaction did not moderate effects of fitspiration exposure on state muscle dissatisfaction ($b = .01, 95\% CIs: -.01, .03, p = .475, R^2 = .01$), state body fat dissatisfaction ($b = .01, 95\% CIs: -.01, .03, p = .414, R^2 = .02$), or state negative mood ($b = .00, 95\% CIs: -.01, .013, p = .954, R^2 = .01$). Trait body fat dissatisfaction also did not moderate effects of thinspiration exposure on state body fat dissatisfaction ($b = -.01, 95\% CIs: -.03, .01, p = .169, R^2 = .01$) or state negative mood ($b = .00, 95\% CIs: -.02, .01, p = .706, R^2 < .01$).

Most findings were inconsistent with H3. Trait muscle dissatisfaction failed to moderate the effect of fitspiration image exposure on state body fat dissatisfaction ($b = .00, 95\% CIs: -.01, .02, p = .599, R^2 = .01$) or negative mood ($b = .01, 95\% CIs: .00, .02, p = .080, R^2 = .01$), or the effects of thinspiration image exposure on state body fat dissatisfaction ($b = .00, 95\% CIs: -.02, .01, p = .637, R^2 < .01$), state muscularity dissatisfaction ($b = .00, 95\% CIs: -.02, .01, p = .642, R^2 < .01$), or negative mood ($b = .00, 95\% CIs: -.01, .01, p = .669, R^2 < .01$). However, trait muscle dissatisfaction did moderate the effect of fitspiration on state muscularity dissatisfaction ($b = .02, 95\% CIs: .00, .03, p = .033, R^2 = .01$), such that the effect of fitspiration exposure on increased muscularity dissatisfaction was stronger for individuals with higher trait muscle dissatisfaction.

Several findings were consistent with H4. Trait appearance comparisons moderated the effect of fitspiration exposure on state body fat dissatisfaction ($b = .004, 95\% CIs: .00, .01, p = .003, R^2 = .03$) and state muscularity dissatisfaction ($b = .004, 95\% CIs: .00, .01, p = .017, R^2 = .02$), though not state negative mood ($b = .00, 95\% CIs: .00, .00, p = .097, R^2 = .02$). For the significant moderation analyses, the effect of fitspiration exposure on increasing dissatisfaction was greater for individuals with higher trait appearance comparison. Trait appearance comparisons also moderated the effect of thinspiration exposure on state body muscularity dissatisfaction ($b = -.01, 95\% CIs: -.01, .00, p = .008, R^2 = .06$) and negative mood ($b = -.003, 95\% CIs: .00, .00, p = .020, R^2 = .04$), but not state body fat dissatisfaction ($b = .00, 95\% CIs: -.01, .00, p = .171, R^2 < .01$). In terms of moderators for thinspiration exposure, we found that individuals with higher trait appearance comparison showed worse state muscularity dissatisfaction but less negative mood after exposure to thinspiration.

4. Discussion

The primary aim of this study was to investigate the fitspiration and thinspiration exposure on men's body image, using an experimental paradigm and EMA. Our findings revealed the differential impact of exposure to fitspiration and thinspiration images, particularly on body dissatisfaction. In support of H1, we found that viewing fitspiration compared to neutral images increased state body fat dissatisfaction, muscularity dissatisfaction, negative mood, and the urge to reduce body fat and increase muscularity. Conversely, viewing thinspiration relative to neutral images reduced both state body fat and muscularity dissatisfaction. Participants also reported more negative mood and urges to increase muscularity after viewing thinspiration compared with neutral images.

Table 2
Descriptive Statistics for State-Level (Outcome) Variables.

Outcome variable	Fitspiration image condition		Thinspiration image condition		Neutral image condition		Possible range
	M	SD	M	SD	M	SD	
Body fat dissatisfaction	4.94	2.05	4.10	2.07	4.34	1.88	0–10
Muscularity dissatisfaction	5.24	2.03	4.02	2.03	4.46	1.82	0–10
Negative mood	4.34	1.86	4.03	1.95	3.87	1.84	0–10
Urge to engage in behaviours to reduce body fat	0.69	0.83	0.59	0.79	0.57	0.77	0–2
Urge to engage in behaviours to increase muscularity	0.82	0.79	0.72	0.76	0.62	0.74	0–3

Note. M = mean, SD = standard deviation. Higher scores for the dissatisfaction and mood variables reflect more negative experiences. Higher scores for the urge variables reflect greater endorsement of urges.

Table 3
Effects of exposure to images on state-based outcomes.

Outcome variable	Predictor	b	95 % CIs	p	Cohen's d
Body fat dissatisfaction	Exposure to fitspiration imagery	0.58	0.46, 0.70	<.001	0.90
	Exposure to thinspiration imagery	−0.24	−0.35, −0.12	<.001	0.37
Muscularity dissatisfaction	Exposure to fitspiration imagery	0.77	0.64, 0.90	<.001	1.10
	Exposure to thinspiration imagery	−0.45	−0.58, −0.33	<.001	0.68
Negative mood	Exposure to fitspiration imagery	0.45	0.35, 0.54	<.001	0.86
	Exposure to thinspiration imagery	0.25	0.14, 0.35	<.001	0.44
Urge to engage in behaviours to reduce body fat	Exposure to fitspiration imagery	0.15	0.09, 0.21	<.001	0.48
	Exposure to thinspiration imagery	0.00	−0.05, 0.05	.943	0.01
Urge to engage in behaviours to increase muscularity	Exposure to fitspiration imagery	0.28	0.22, 0.35	<.001	0.82
	Exposure to thinspiration imagery	0.09	0.04, 0.15	.001	0.33

Note. b = unstandardised coefficient, 95 % CIs = 95 % confidence intervals.

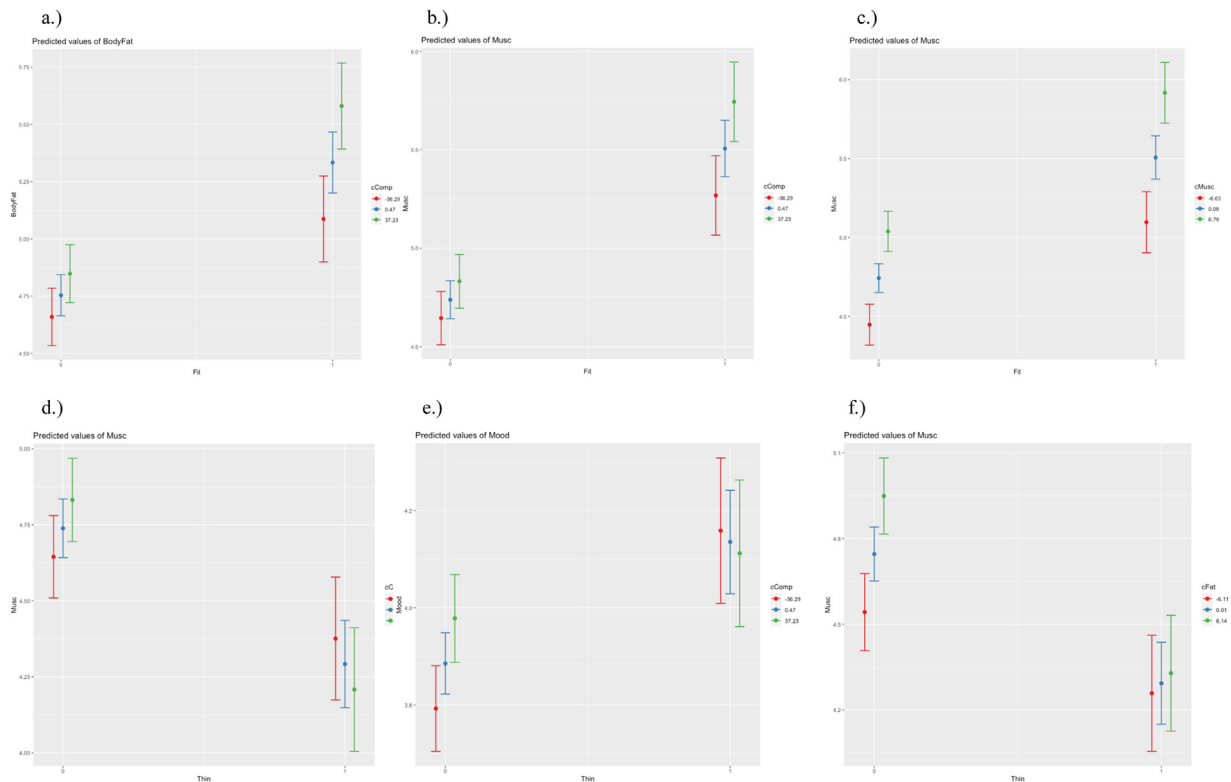


Fig. 1. Moderation analyses for the significant trait-based moderation effects for fitspiration and thinspiration images.

- a: Fitspiration images: Trait Appearance Comparison * State Body Fat.
- b: Fitspiration images: Trait Appearance Comparison * State Muscularity.
- c: Fitspiration images: Trait Muscularity * State Muscularity.
- d: Thinspiration images: Trait Appearance Comparison * Thinspiration Image for State Muscularity.
- e: Trait Appearance Comparison * Thinspiration Image for State Negative Mood.
- f: Trait Body Fat * Thinspiration for State Muscularity.

In partial support of H2, trait body fat dissatisfaction moderated the effects of thinspiration but not fitspiration exposure on state muscle dissatisfaction. In support of H3, trait muscularity dissatisfaction moderated the impact of viewing fitspiration and thinspiration images on state muscularity dissatisfaction. Likewise, in accordance with H4, trait appearance comparison moderated the effects of viewing fitspiration images on both state body fat dissatisfaction and muscularity dissatisfaction. Finally, the effect of thinspiration exposure on state body muscularity dissatisfaction and negative mood was moderated by trait appearance comparisons.

4.1. *The effects of viewing fitspiration images on men's body image*

Compared to viewing neutral images, viewing fitspiration images led to an increase in state body fat and muscularity dissatisfaction, negative mood, and urges to reduce body fat and increase muscularity (H1). By demonstrating the causal, adverse effects of viewing fitspiration images on multiple facets of male body image, this finding strengthens previous reports of the positive associations between exposure to fitspiration content and body dissatisfaction (e.g. Griffiths & Stefanovski, 2019), as well as fitspiration content and the motivation to alter physical appearance among men (e.g. Fatt et al., 2019). That viewing fitspiration images led to higher levels of both state body fat and muscularity dissatisfaction suggests that fitspiration content is not solely about muscularity, but also concerned with leanness; a suggestion consistent with published content analyses on fitspiration (e.g. Talbot et al., 2017; Tiggemann & Zaccardo, 2018).

In line with past research conducted on women (e.g. Prichard et al., 2018; Tiggemann & Zaccardo, 2015), our participants reported more negative mood after viewing fitspiration images. Thus, it appears that the effect of exposure to fitspiration imagery on women's emotional states is generalisable to men. Past research also found that exposure to fitspiration imagery led to greater motivation for self-improvement (e.g. Peng, Wu, Chen, & Atkin, 2019). In our study, participants reported stronger urges to reduce body fat and increase muscularity after viewing fitspiration images, suggesting that higher motivation for self-improvement may heighten the desire to exercise or diet as a means to decrease body fat and enhance muscularity. Integrating evidence from prior research that investigated the mediating role of appearance comparison on the relationship between viewing muscular ideal media images and male body image (e.g. Karazsia & Crowther, 2009), it is plausible that fitspiration imagery is a particularly relevant target that men compare themselves against when they engage in upward comparison (comparing oneself to a more attractive person; Festinger, 1954).

4.2. *The effects of viewing thinspiration images on male body image*

We found that viewing thinspiration compared to neutral images reduced state body fat and muscularity dissatisfaction among men. Juxtaposed with previous research that reported that viewing thinspiration images increased body dissatisfaction in women (e.g. Robinson et al., 2017), this finding suggests that men and females are differently impacted by exposure to thinspiration imagery. One interpretation of this finding is that men tend to view the male bodies depicted in thinspiration images as less desirable than their own body or the ideal male body. Drawing on social comparison theory (Festinger, 1954), we propose that thinspiration images facilitate downward comparisons (comparing oneself to a less attractive person), insofar as men believe they compare favourably to thinspiration images. Consequently, view-

ing these images may make men feel better about the way they look, as observed in our study as lower levels of state body fat and muscularity dissatisfaction.

Despite experiencing decreases in state body fat and muscularity dissatisfaction after viewing thinspiration images, participants still reported increased negative mood and urge to engage in behaviours to increase muscularity after thinspiration exposure. Furthermore, exposure to thinspiration imagery did not have any effect on urges to reduce body fat. This phenomenon may be explained by other contributing factors not specific to one's body image that was not captured in this study. Considering that the thinspiration images portrayed men who were emaciated, our participants may have perceived these models as unhealthy or sickly, especially if they have internalised the ideal mesomorphic male physique. It is thus possible that our male participants engaged in downward comparison after seeing these images, which might have left them with a stronger motivation for self-enhancement to avoid looking like the thinspiration models (e.g. Dondzilo, Rodgers, Turnbull, & Bell, 2019). More research is required to determine the processes that explain the effects of viewing thinspiration images on men's body image detected in our study.

4.3. *Moderation by trait body dissatisfaction*

Consistent with H2, state muscle dissatisfaction was lower after viewing thinspiration compared to neutral images and this effect was more pronounced among those with high trait body fat dissatisfaction. Despite having pre-existing body fat dissatisfaction, the men in our study may have still perceived their bodies as more attractive when they compared themselves favourably against the male physiques portrayed in thinspiration images. Regarding H3, we found supporting effects of fitspiration exposure on increased muscularity dissatisfaction, which was stronger among those with higher trait muscularity dissatisfaction. This finding is consistent with the results of another study that found that men with heightened baseline muscularity dissatisfaction experienced a greater increase in state muscularity dissatisfaction after viewing muscular media images (e.g. Arbour & Martin Ginis, 2006). It is plausible that men with high baseline muscularity dissatisfaction have internalised societal standards of the mesomorphic ideal and engage in more robust negative evaluations of their muscularity when confronted with idealised male fitspiration images (e.g. Karazsia & Crowther, 2009).

4.4. *Moderation by trait appearance comparison*

Consistent with H4, trait appearance comparison moderated the effects of exposure to fitspiration imagery on both state body fat and muscularity dissatisfaction. After viewing fitspiration images, participants with higher appearance comparison tendencies reported feeling more dissatisfied with their levels of body fat and muscularity. The current findings are in line with the tripartite influence model for eating pathology, which outlines appearance comparison as an important mediating factor between the different sources of influence (media, peers and peers) and disordered eating symptoms (Thompson et al., 1999). Our findings suggest that men with elevated levels of trait appearance comparison have a stronger tendency to compare themselves unfavourably to fitspiration models, whom they view as having the 'ideal body'. This upward comparison process, in turn, elicits concerns around physical appearance, leading to an increase in overall state body dissatisfaction.

We also found that participants with higher appearance comparison tendencies experienced a greater decrease in state muscularity dissatisfaction and an increase in negative mood immediately after exposure to thinspiration imagery. This phenomenon, after viewing thinspiration images, may be explained

by downward appearance comparisons (Festinger, 1954). Unfortunately, this was not captured in our study as the PACS-R (Schaefer & Thompson, 2014), does not distinguish between upward and downward comparisons.

4.5. Implications

At a practical level, our findings suggest that it is crucial for men to limit their exposure to fitspiration images especially. The negative impact of viewing fitspiration images on body dissatisfaction, negative mood, and urge to engage in body change behaviours call for a specific concern. Without appropriate support, the adverse psychological effects of viewing fitspiration images may lead to the development of sub-threshold or even clinically significant eating disorders and muscle dysmorphia (e.g. Murray, Rieger, Touyz, & De la Garza Garcia Lic, 2010), which are characterised by unhealthy preoccupations about the way one's body looks and/or engagement in body change behaviours that may lead to detrimental health outcomes. Therefore, it is crucial to develop effective primary prevention strategies targeted at men, especially because social media literacy interventions thus far have only focused on adolescent girls (e.g. Halliwell, Easun, & Harcourt, 2011; McLean, Wertheim, Masters, & Paxton, 2017). Social media literacy interventions that educate young men on the negative impact of viewing fitspiration imagery, as well as the idealisation and unrealistic attainment of male physiques portrayed in fitspiration content, would be a welcome contribution. These programmes may be implemented in collaboration with social media platforms like Facebook and Instagram to provide practical tips on moderating exposure to fitspiration imagery (e.g., limiting social media usage, unfollowing accounts that do not contribute to mental well-being).

4.6. Limitations and future directions

It is essential to interpret our findings in the context of several limitations. First, our design is limited to a within-subject design, which meant that all participants were randomly allocated to one of the three types of images (fitspiration, thinspiration and neutral) at a time throughout the EMA phase. This design was chosen because it lessened the required sample size compared to a between-subjects design: Previous research has suggested that a sample size of more than 100 is adequate for multilevel modelling (Maas & Hox, 2005). This would have meant that we needed a sample size of 300 participants for the overall study (>100 participants for each image type). Given the complexity of the current design and the time-consuming EMA component, we felt that such a design was not feasible for the current study. However, it should be noted that our current within-subject design helped with demand characteristics since the random allocation of the three image types allowed for an obfuscation exercise.

Second, our sample size mostly comprised of young Asian men. Therefore, it is unclear if our results are generalisable to men of other ethnicities and age groups. Future studies may examine the effects of viewing fitspiration and thinspiration images on men from different diverse ethnic and cultural backgrounds, as well as adolescent boys given the high usage of image-centric social media platforms in this age group (Sensis, 2018). Third, the current sample was restricted to men with a BMI in the healthy range and with an average body fat dissatisfaction below the midline on the PACS-R (Schaefer & Thompson, 2014) scale. It might be valuable for further research to seek a sample of men who are either over- or underweight and are dissatisfied with their body fat.

Fourth, we assessed a sample of heterosexual, homosexual and bisexual men, with the majority (almost 80%) of participants being heterosexual. Inconsistencies between our findings and those from previous studies might be due to the differences in the composition

of sexual orientation. Most other studies focused on homosexual men and have generally shown that gay men reported higher rates of muscularity dissatisfaction and body fat dissatisfaction compared to heterosexual men, with effect sizes ranging from small to medium (Frederick & Essayli, 2016; Griffiths, Castle et al., 2018). Future studies would benefit from ascertaining large enough sample sizes of men from different sexual orientations, so that comparisons across heterosexual, homosexual and bisexual men were possible.

Fifth, we note that individuals who were retained in the final sample ($n = 223$), differed from those who were excluded in terms of baseline variables. Retained participants tended to have slightly lower muscularity dissatisfaction (though not for body fat), were less likely to view thinspiration content, and were more likely to view fitspiration content, be single, study full-time, and were more likely to be Asian or Caucasian. As the demographic factors of this retained sample are consistent with other samples of Australian university students, present findings may be comparable to prior work (e.g. Fardouly et al., 2017) but generalizability beyond a university sample remains less clear.

Sixth, the state muscularity and body fat body dissatisfaction items and the items relating to the urge to engage in body change behaviours have not been used in previous EMA studies. However, the urge variables behaved as expected (with exception of one null effect) in that they provided higher scores after the fitspiration and thinspiration images. Furthermore, both state body dissatisfaction items correlated strongly with the trait PACS-R (Schaefer & Thompson, 2014) subscales of muscularity and body fat dissatisfaction, and state negative mood also correlated strongly with the two state body dissatisfaction variables. Thus, although these items have not been used before, they provided strong face validity and produced results that may be expected for measures tapping into their intended constructs.

Seventh, although our findings detected changes in urges to engage in behaviours to reduce body fat and enhance muscularity after viewing fitspiration and thinspiration images relative to seeing neutral images, we did not measure actual behaviour change. Future research may look into assessing engagement in specific behaviours, including disordered eating behaviours (e.g., restriction, bingeing, purging) and muscularity enhancement behaviours (e.g., anabolic steroid use, excessive weight training, consumption of protein shakes). Eighth, it is likely that the thinspiration images used in the present study did not capture idealization from our participants, which might have limited the comparisons elicited by fitspiration images. Future studies could add another set of thinspiration images, ideally attractive images of men with a BMI of approximately 18 that present underweight images, that might be considered an ideal that is difficult to obtain. The new set of thinspiration images selected to create upward social comparison could be compared to the current images that created downward social comparison. Such a new study could also examine our above-outlined recommendations for media literacy by adding warning labels to some of the images.

Ninth, we acknowledge that many potential mediating factors were not explored in this study, as our focus was on the causal effects of exposure to fitspiration and thinspiration imagery on male body image. While we propose that upward and downward appearance comparisons account for the observed contrast effects of viewing fitspiration and thinspiration images on male body dissatisfaction, further investigation is required to ascertain the mediating effects of these processes. With multiple studies demonstrating that the adverse impact of mass media exposure on body image is mediated by internalisation of societal standards of the 'ideal body' (e.g. Karazsia, van Dulmen, Wong, & Crowther, 2013; Lawler & Nixon, 2011), researchers may also consider reviewing

this mechanism in the context of the effects of exposure to fitspiration and thinspiration imagery on men's body image.

4.7. Conclusions

We found that mere exposure to fitspiration and thinspiration imagery alone in the absence of words (e.g., quotes, hashtags, captions) that usually accompany them, is powerful enough to elicit changes in men's moment-to-moment perceptions of their bodies and urges to engage in behaviours to reduce body fat and increase muscularity. We found that viewing fitspiration images led to poorer body image in all facets that were assessed in our study. Men with heightened trait muscularity dissatisfaction and appearance comparison were also more susceptible to the harmful effects of viewing fitspiration images. Conversely, despite causing more vigorous negative mood and urges to enhance muscularity, viewing thinspiration images reduced body dissatisfaction, particularly among men with pre-existing body fat dissatisfaction and higher propensity to compare their physical appearance against others.

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CRediT authorship contribution statement

Zhi Wei Yee: Conceptualization, Methodology, Data curation, Writing - original draft. **Scott Griffiths:** Conceptualization, Writing - review & editing, Supervision. **Matthew Fuller-Tyszkiewicz:** Software, Data curation, Visualization, Validation, Writing - review & editing. **Khandis Blake:** Writing - review & editing. **Ben Richardson:** Software, Data curation. **Isabel Krug:** Conceptualization, Methodology, Writing - review & editing, Supervision.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.bodyim.2020.08.008>.

Declaration of Competing Interest

The authors report no declarations of interest.

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