Evaluating Associations between Fitspiration and Thinspiration Content on Instagram and Disordered-Eating Behaviors Using Ecological Momentary Assessment: A Registered Report

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Abstract

Introduction: Greater use of appearance-focused social media, such as Instagram, is associated with increased body dissatisfaction and eating disorder (ED) symptoms; however, questions remain about the mechanism connecting social media use to disordered-eating behaviors (DEBs). The proposed study evaluates how and for whom exposure to fitspiration or thinspiration on Instagram is associated with DEBs.

Methods: We will evaluate a hypothesized pathway from Instagram use to disordered-eating mediated by negative affect. We will test how individual differences in internalized weight stigma, trait self-esteem, and trait self-comparison moderate the pathway from social media use to negative affect. We will recruit 175 undergraduate women who report engaging in DEBs on average at least once per week over the past three months. Participants will complete a seven-day ecological momentary assessment protocol, during which they will report their Instagram use, affect, and engagement in DEBs.

Results: Multi-level modeling will be used to assess moderated mediation. Results from this study will provide increased specificity about how Instagram usage is linked to eating pathology and who may be most vulnerable to experiencing distress.

Discussion: Information about negative affect from Instagram and engagement in DEBs could contribute to the development of Just-In-Time Interventions for problematic social media use.

Keywords

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Disordered-eating behaviors (DEBs), such as restriction, excessive exercise, bingeing, and purging, significantly impact overall health and quality of life. College-aged women are particularly at risk for engaging in DEBs, which may precede the onset of an ED (Lipson & Sonneville, 2017). Individuals with high levels of DEBs often fail to sustain recovery after treatment (Linardon & Wade, 2018), indicating that early intervention is critical. There is an important need to identify potential risk factors and mechanisms that lead to, and maintain, DEBs. Social media is an important risk factor for DEBs to evaluate, given the high frequency of use among young adults (Fardouly & Vartanian, 2016; Smith & Anderson, 2018).

Higher frequency and longer duration of social media use has been associated with increased body image concerns and elevated DEBs (Holland & Tiggemann, 2016; Saiphoo & Vahedi, 2019; Turner & Lefevre, 2017); however, not all social media exposure is equally detrimental to well-being. Recent research found that associations between social media and poorer well-being were driven by exposure to appearance-focused social media, rather than general use of social networking sites (Cohen et al., 2017; Meier & Gray, 2014; Saiphoo & Vahedi, 2019). As a photo-only application, Instagram offers numerous opportunities for appearance-focused social media exposure, making studying the unique aspects of this application particularly crucial. Furthermore, three-quarters of young adults 18–29 years of age report using Instagram, with 76% of users accessing it at least once per day and 60% of users accessing it multiple times per day (Smith & Anderson, 2018).

Of particular concern is an at-risk individual's exposure to ED-salient content, such as "thinspiration" or "fitspiration" which may increase negative affect and body dissatisfaction. "Thinspiration" images typically feature very thin bodies, praise thinness, and promote weight loss and dietary restraint (Alberga et al., 2018; Boepple & Thompson, 2016; Ghaznavi & Taylor, 2015; Talbot et al., 2017). Although fitspiration images seemingly promote healthy living, content analysis suggests that it reinforces the thin-ideal by featuring toned and low-fat bodies, promoting excessive or inappropriate attitudes towards exercise, and inducing guilt through stigmatizing messages about body sizes (Alberga et al., 2018; Boepple & Thompson, 2016; Talbot et al., 2017; Tiggemann & Zaccardo, 2018).

More frequent exposure to both fitspiration and thinspiration images has been associated with increased ED symptom severity in people with (Griffiths et al., 2018) and without EDs (Holland & Tiggemann, 2017), increased ED behaviors (Holland & Tiggemann, 2017; Jett et al., 2010), and increased body/appearance dissatisfaction (Ahadzadeh et al., 2017; Cohen et al., 2017, 2019; Hendrickse et al., 2017; Holland & Tiggemann, 2017; Slater et al., 2017; Tiggemann & Zaccardo, 2015). Consequently, researching how exposure to ED-salient images, such as fitspiration or thinspiration, on Instagram leads to engagement in DEBs is important given the wide availability and ease of access (Alberga et al., 2018; Boepple & Thompson, 2016; Ghaznavi & Taylor, 2015; Griffiths et al., 2018; Holland & Tiggemann, 2016, 2017; Jett et al., 2010; Talbot et al., 2017; Tiggemann & Zaccardo, 2018).

To do so, we evaluate a proposed moderated mediation model (Figure 1) incorporating processes from the Dual Pathway Model (Stice, 2001) and the Tripartite Model (Thompson et al., 1999) of disordered eating. In the Dual Pathway Model, social pressure and

thin-ideal internalization lead to body dissatisfaction, which influences dieting behavior and negative affect, and, consequently, ED symptoms. Similarly, in the Tripartite Model, sociocultural influence, in the form of peer, parental, and media sources, leads to thin-ideal internalization and appearance comparisons, and further downstream, body dissatisfaction. Importantly, thin-ideal internalization moderates likelihood of making apperance comparisons. Ultimately, as with the Dual Pathway model, the Tripartite Model assumes that such body dissatisfaction leads to ED symptoms.

In our proposed model, fitspiration and thinspiration on Instagram could represent forms of social pressure (Dual Process) or media and peer influence (Tripartite Model). Furthermore, our proposed moderator, internalized weight stigma, could represent an aspect of thin-ideal idealization. We additionally include appearance comparisons as a propoposed moderator (Tripartite Model). Finally, our model examines elevated negative affect as a proximal factor for engaging in ED behaviors, which directly maps onto the Dual Pathway Model, and could serve as a proxy for negative affect elicited by body dissatisfaction in the Tripartite Model.

We chose to focus on individuals engaging in current DEBs, as viewing these images may exacerbate or precipitate ED behaviors, in line with these theoretical models. Focusing on individuals with current DEBs is critical because testing links between 'fitspo/thinspo' and self-esteem/body satisfaction in a high-risk sample has the potential to more directly inform future prevention and treatment efforts than focusing on individuals from the general population. Importantly, such findings could lead to the development of evidence-based recommendations for the use of social media for people with ED symptoms

Viewing Fitspiration and Thinspiration May Increase Negative Affect (NA)

Evidence suggests that viewing thin-ideal images in print and online, including Instagram, increases negative affect (NA) (Groesz et al., 2002; Rodgers et al., 2016). Experimental research found that viewing ED-salient content increased NA; for example, viewing fitspiration images was associated with increases in NA (Cohen et al., 2019; Tiggemann & Zaccardo, 2015), although other studies found no change in NA (Sherlock & Wagstaff, 2019; Slater et al., 2017). Similarly, compared to viewing neutral images, viewing images of attractive peers and celebrities resulted in greater NA (Brown & Tiggemann, 2016).

NA is Linked to DEBs

A review of ecological momentary assessment (EMA) designs showed that momentary increases in NA prospectively predicted DEBs, including purging (Engel et al., 2013; Goldschmidt et al., 2013, 2015), dietary restriction (Berg et al., 2013; Fitzsimmons-Craft et al., 2016; Selby et al., 2015), loss of control eating (Berg et al., 2013; Engel et al., 2013; Goldschmidt et al., 2012; Ranzenhofer et al., 2014), laxative misuse (Selby et al., 2015), and excessive exercise (Selby et al., 2015). Although previous studies hypothesized that NA mediates the effect between ED-salient content viewing and DEBs (Griffiths et al., 2018; Tylka & Subich, 2004), this has yet to be tested empirically. The proposed study will be the first to evaluate NA as a mediator between Instagram use and DEBs.

Vulnerablility and Resliency to Effects of Instagram Use

Not every person at-risk for an ED who views fitspiration or thinspiration on Instagram experiences heightened negative emotions, which result in engagement in DEBs. Thus, a second aim of the proposed study is to identify individuals with heightened ED pathology who are at risk for, and resilient to, the effects of Instagram use on affective response and engagement in DEBs.

Internalized weight stigma

The use of the Instagram application, in particular, may result in increased exposure to thin-ideal and exposure to content that perpetuates weight stigma. Thinspiration and fitspiration often overtly reinforce weight stigma by including negative messages about larger bodies and by using images of overweight people to "inspire" weight loss/fitness (Alberga et al., 2018; Boepple & Thompson, 2016; Ghaznavi & Taylor, 2015; Talbot et al., 2017; Tiggemann & Zaccardo, 2018). Increased self-stigmatization about weight has been associated with greater eating pathology, lower body image, and increased anxiety and depressive symptoms (Pearl & Puhl, 2014). We hypothesize that women who report higher levels of internalized weight stigma will be more likely to experience NA as a result of viewing ED-salient and stigmatizing content on Instagram, compared to women with lower levels of internalized weight stigma, who will show a smaller association between viewing Instagram content and NA.

Trait Self-Esteem

Low trait self-esteem has been posited as a risk factor for eating pathology (Jacobi et al., 2018; e.g., Polivy & Herman, 2002), whereas high trait self-esteem may be a protective factor (Ahadzadeh et al., 2017; Cervera et al., 2003). Women with low self-esteem tend to report higher levels of body dissatisfaction (Paxton et al., 2006; Tiggemann, 2005); however, body dissatisfaction and self-esteem likely mutually influence each other (Cooley et al., 2007; Paxton et al., 2006; Tiggemann, 2005). In contrast, high self-esteem may buffer the association between body dissatisfaction and DEBs (Twamley & Davis, 1999). In one study, which examined Instagram use, self-esteem served as a moderator between content exposure and negative self-schema (Ahadzadeh et al., 2017). Specifically, Instagram usage was linked to body dissatisfaction through negative self-schema only among those with low self-esteem. Thus, research suggests that individuals with low self-esteem may be vulnerable to body dissatisfaction and DEBs and, thus, particularly vulnerable to the effects of social media. In contrast, individuals with high self-esteem may be more resilient to the effects of social media on DEBs.

Trait Social Comparison

Meta-analytic research found that increased social comparison was linked to higher body dissatisfaction (Myers & Crowther, 2009). Furthermore, women with DEBs were more likely to compare themselves to others and report higher negative evaluations of themselves after viewing images of other women (Corning et al., 2006). In studies when women were exposed to the thin-ideal, trait social comparison moderated effects on body image (Betz et al., 2019; Dittmar & Howard, 2004), with only individuals with higher trait social

comparison showing increased body dissatisfaction. Conversely, in several studies, trait social comparison did not moderate the association between exposure to social media and body dissatisfaction (Fardouly et al., 2015; Robinson et al., 2017; Tiggemann & Zaccardo, 2015). Due to this inconsistency in findings, it is necessary to continue to evaluate this construct.

Hypotheses

We hypothesize that NA will mediate the association between fitspiration and thinspiration exposure on Instagram and DEBs (Figure 1) for women who habitually engage in DEBs. Furthermore, we expect that weight stigma, trait self-esteem, and trait self-comparison will moderate the association between Instagram use and NA, such that symptomatic women who report higher levels of internalized weight stigma, lowered self-esteem, or higher trait self-comparison will be most vulnerable to experiencing NA after viewing fitspiration or thinspiration Instagram content.

Methods

Participants

Participants will be 18–25-year-old women who own a smartphone, use Instagram daily, and endorse current DEBs (i.e., engaging in bingeing, purging, restriction or fasting, excessive exercise, and/or laxative or diuretic use at least once per week on average over the past three months). As this is the first study to test a mediational model of the effects of ED-salient Instagram content on DEBs, the sample will be restricted to women to decrease heterogeneity. Overall, women tend to report higher body dissatisfaction (Frederick et al., 2007) and more DEBs than men (Hoerr et al., 2002). Meta-analytic research found that individuals with higher body dissatisfaction levels are more strongly affected by viewing thin-ideal images than those without high levels (Groesz et al., 2002); thus, if mediation is present, it is likely that it will be observed in this population. College-aged women are the most frequent users of Instagram (Smith & Anderson, 2018) suggesting that studying this population has high ecological validity. Finally, men may differentially respond to thinspiration and fitspiration images compared to women. For instance, men may perceive thinspiration images to be less personally relevant, as they often depict very thin female bodies, whereas men tend to endorse desiring a muscular ideal (Ridgeway & Tylka, 2005). Contrary to expectation, in one study exposure to thinspiration reduced body image dissatisfaction in men (Yee et al., 2020). Overall, there is sufficient evidence to suggest gender could be a significant moderator, thus for the purposes of initially examining this phenomenon, we will restrict the sample to women.

Study recruitment—Recruitment for this study will be embedded within an ongoing ED screening protocol of university students conducted by our research group. Over the course of one year, the university student body will be emailed a link to complete a secure online screening survey evaluating eating behaviors (see Figure 2 for participant characteristics in the first round of recruitment). For information about recruitment of ethnic and racial minorities and use of post-sampling stratification weights, please see Supplement 2.

Power Analysis—Power analyses were conducted using Monte Carlo simulation with M*plus* for a two-level mediation model with random slopes. With 6300 observations (150 persons × 42 occasions(6 occasions for 7 days) and ICC=.40, the simulation revealed power .90 to detect the expected indirect effect of ED content on disordered-eating at level 1, and .89 power to detect the total effect of ED content on disordered-eating. We will also have power > .90 to detect small effects of level-two moderators on the level one mediation. To account for potential attrition and technology malfunction, we will invite 175 individuals to participate in the study and anticipate an analytic sample of approximately 150 young women.

Study Procedures

The study will consist of two parts: a baseline session via a secured web interface and a seven-day EMA protocol (Table 1).

Baseline—Participants will participate in a one-hour initial study session through a secured video conferencing platform. At the baseline session, they will complete questionnaires and receive guidance on how to use the EMA application (PiLR). Participants will be instructed in operational definitions of constructs assessed in the study (e.g., fitspiration, thinspiration) (see Boepple & Thompson, 2016 and Tiggeman & Zaccardo, 2015) to reduce variability among participants in interpretation of key measures. Participants will also view several sample images and complete a practice rating to ensure they understand what is and is not considered fitspiration and thinspiration. A trained research assistant will guide the participant in downloading the PiLR application, completing a practice EMA survey, and accessing length of Instagram use from the application. The participant will receive a handout with operational definitions and instructions on using the application (Supplement 3). Additionally, the handout and instructions will be made available on the PiLR application. The EMA surveys will begin the next day.

Seven-Day Ecological Momentary Assessment—Participants will be prompted on their smartphone six times per day over seven days to complete survey responses (42 surveys total) using the PiLR application. Prompts will be semi-random and occur in two-hour blocks between the hours of 10am and 10pm. Participants will have 30 minutes to complete the survey after being prompted.

Study measures

Questionnaires included in the planned analyses are described below.

Supplement 2 describes other administered questionnaires and measures.

Screening Questionnaires

Demographics.: We will collect information on participant age, race, ethnicity, sexual orientation, education level, and socioeconomic status.

Eating Disorders Diagnostic Scale (EDDS) (Stice et al., 2000).: The EDDS is a 23-item questionnaire that assesses DSM-5 (American Psychiatric Association, 2013) symptoms of

anorexia nervosa, bulimia nervosa, and binge eating disorder. Participants will rate their average frequency of DEBs (binge eating, self-induced vomiting, laxative/diuretic use, fasting, excessive exercise) per month, over the past three months. The EDDS will be used to evaluate eligibility for the study.

Baseline Measures

Body Mass Index (BMI).: Participants completing the baseline session via videoconferencing will self-report their height and current weight to calculate BMI.

Comparison of Self-Scale (CoSS) (Laker & Waller, 2019).: The CoSS is a 22-item measure that uses a seven-point scale to evaluate levels of social comparison. The CoSS has two subscales: Physical Appearance Comparison and Personality Comparison, as well as a total score. The CoSS has demonstrated good internal reliability and test-retest validity (Laker & Waller, 2019). For this study, we will use the total score to measure trait social comparison.

Eating Pathology Symptoms Inventory (EPSI) (Forbush et al., 2013).: The EPSI is a 45-item measure that assesses eating disorder pathology over the past month. The EPSI is scored on five-point scale and scores are summed to create eight dimensional scales (Body Dissatisfaction, Binge Eating, Cognitive Restraint, Excessive Exercise, Restriction, Purging, Muscle Building, and Negative Attitudes toward Obesity). The EPSI shows excellent convergent and discriminant validity (Forbush et al., 2013). For this study, the EPSI will be used to indicate past month ED symptom severity and characterize the sample across these dimensional scales.

Inventory of Depression and Anxiety Symptoms- II- Dysphoria Subscale (IDAS-II) (Watson et al., 2012).: The 99-item IDAS-II is a comprehensive assessment of internalizing symptoms. The IDAS-II contains eighteen subscales and has shown good internal consistency and temporal stability (Watson et al., 2012). For this study, the Dysphoria subscale will be used to index depressive and anxiety pathology.

Social Media Use Survey.: Participants will indicate their frequency of use of the following social media platforms: Twitter, Instagram, Facebook, Snapchat, TikTok, and estimate their average daily usage in minutes over the past two weeks.

Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965).: The RSE is a 10-item measure that uses a four-point Likert scale to assess self-worth. Higher scores indicate higher levels of self-esteem. The RSES is one of the most frequently used measures of self-esteem and has demonstrated strong internal reliability and validity (Sinclair et al., 2010). We will use the RSES to measure trait self-esteem.

Weight Bias Internalization Scale- Modified (WBIS-M) (Pearl & Puhl, 2014).: The WBIS-M is an 11-item measure that uses a seven-point Likert scale to assess the extent to which people internalize weight-based stereotypes across body weight categories. The WBIS-M has demonstrated good internal validity and construct validity (Hübner et al., 2016; Pearl & Puhl, 2014). We will use the WBIS-M to measure internalized weight stigma.

EMA Surveys

Instagram usage.: Participants will report their Instagram usage using an objective measure of duration of usage obtained from the Instagram application. For each EMA survey, participants will provide the current day's usage total. Participants will indicate using dichotomous variables if they viewed fitspiration or thinspiration on Instagram during the survey period.

Affect.: Participants will complete an abbreviated version of the Positive and Negative Affect Schedule at each EMA survey (PANAS; Watson et al., 1988). The PANAS is a widely used measure of affect and has shown good psychometric properties (Crawford & Henry, 2004; Heubeck & Wilkinson, 2019). To reduce participant burden in completing EMA surveys, we will shorten the PANAS to ten items based on the developer's recommendations for abbreviating the measure. The ten item PANAS will consist of five negative affect (i.e., scared, nervous, guilty, irritable, upset) and five positive affect (i.e., excited, interested, alert, proud, determined) variables. Participants will rate the extent to which they felt each of the affect variables as a result of viewing fitspiration or thinspiration Instagram content using a five-point Likert scale.

Disordered-eating behaviors (DEBs).: Participants will report the number of times since the previous survey that the following DEBs occurred: restriction, self-induced vomiting and laxative/diuretic use, excessive exercise, and loss-of-control eating.

Data Analysis

Multilevel random-effects mediation models will test whether NA mediates the association between exposure to fitspiration or thinspiration Instagram content and engagement in DEBs. We will model occasions nested within persons at Level 1. We will test mediation at Level 1 to examine whether the direct effect of ED exposure on DEBs is reduced or becomes non-significant when NA is modeled. Person-level moderators (internalized weight stigma, trait self-esteem, trait self-comparison) will be modeled at Level 2 to assess moderated mediation models (Bauer et al., 2006). Instagram use duration and baseline depression and anxiety symptoms will be modeled as covariates in all models. All models will be estimated using full-information maximum likelihood (FIML) estimation to handle missing data and we will examine patterns of missingness.

Conclusion

Given the high utilization of social media among young adults, it is important to understand *how* and *for whom* viewing ED-salient Instagram content may trigger DEBs in people who report elevated eating pathology. This study will contribute to a nuanced understanding of how social media use is associated with DEBs in this population by using an ecologically valid design and stratified sample of college students. Results will be discussed in terms of existing models, such as the Dual Pathway Model (Stice, 2001) and the Tripartite Model Model (Thompson et al., 1999) of disordered eating.

Findings from this study could inform the development of guidelines for appropriate social media usage for individuals at high risk for an ED. Results from this study will contribute to the emerging field of digital phenotyping (Insel, 2017), wherein smartphone technology can be used to more accurately facilitate the collection of naturalistic and longitudinal data through active (e.g. survey) and passive techniques (e.g., motion sensor, voice data). This research will provide the groundwork for developing Just-In-Time-Adaptive Interventions (e.g., Juarascio et al., 2018) for problematic social media use that could provide personalized feedback to individuals based on patterns of Instagram usage, emotional changes, and behavioral indicators.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data availability:

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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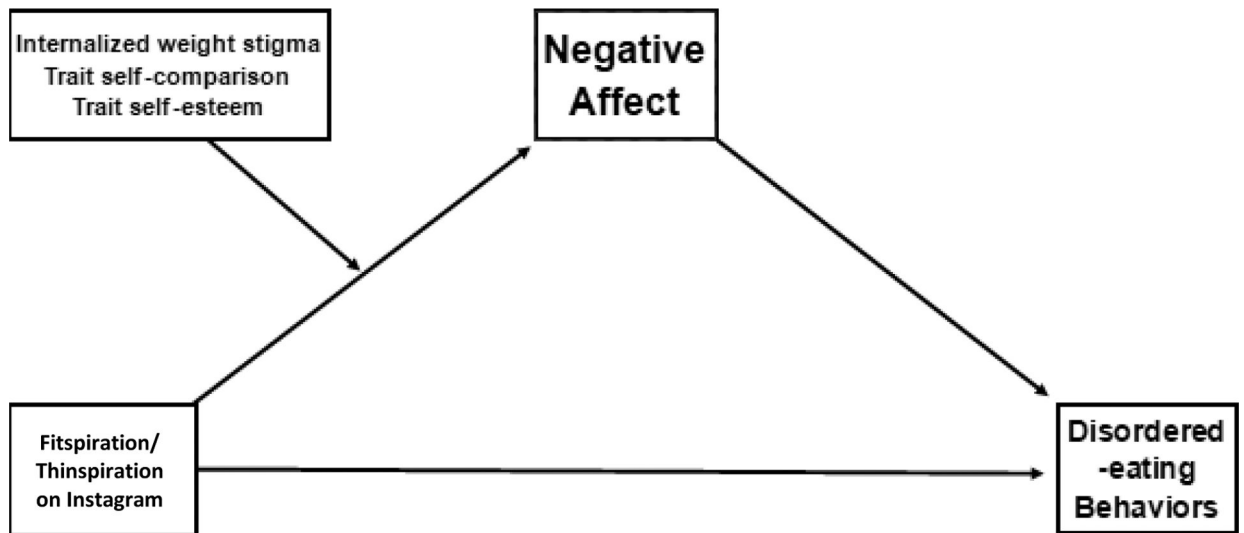
Figure 1: Moderated Mediation Model of Instagram Use and DEBs.
Negative affect is hypothesized to mediate between exposure to ED-salient Instagram comment and engagement in disordered-eating behaviors. This study will additional assess proposed moderators of the relationship between exposure to ED-salient Instagram content and negative affect.
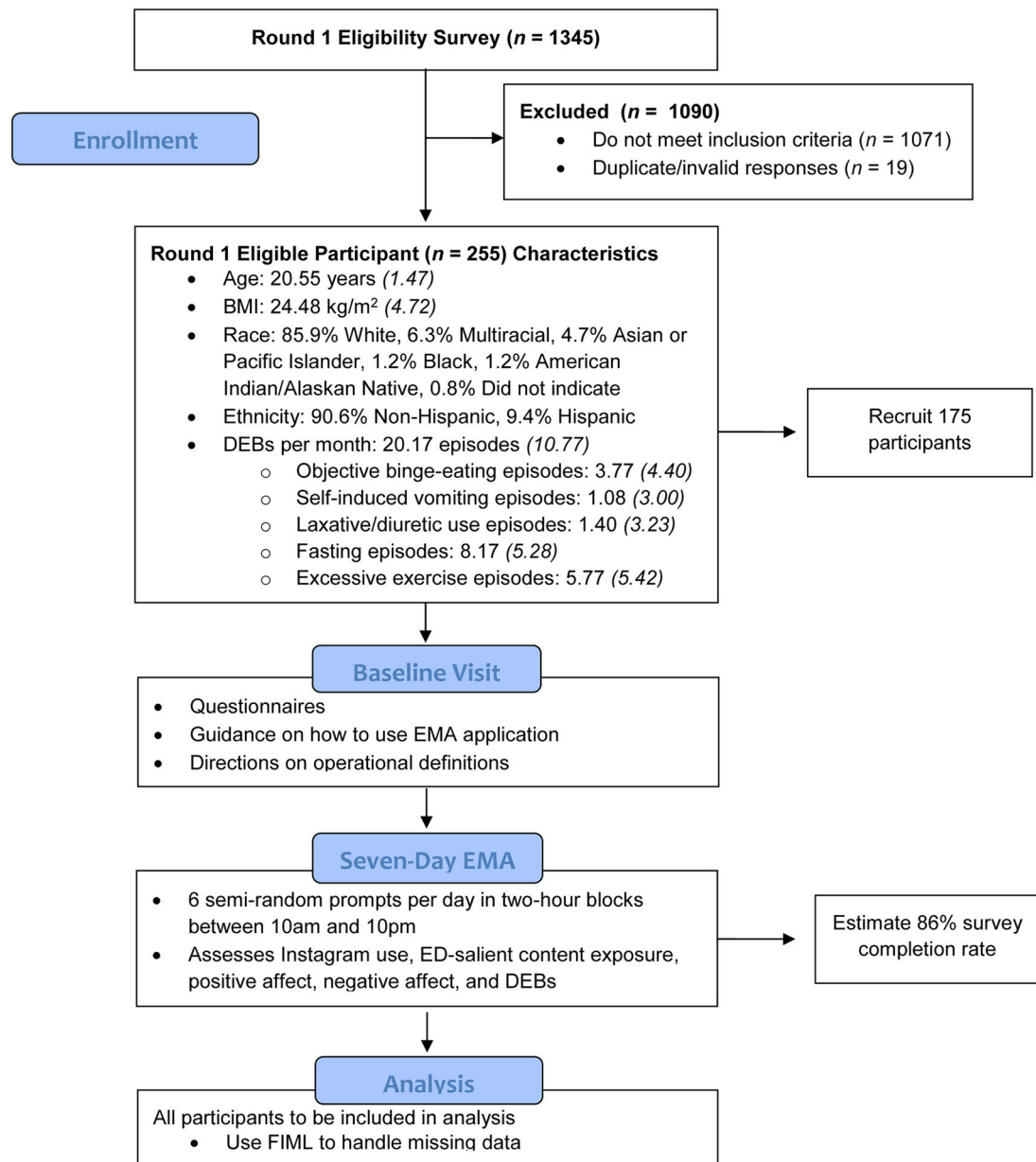
Figure 2: CONSORT Diagram of Study Recruitment.
Participant characteristics of the first round of recruitment are presented for illustrative purposes. Final sample characteristics may differ.

Table 1:

EMA Survey Questions

Construct	Measure
Instagram use frequency/ duration	According to your screen time feature, how many minutes have you used Instagram today?
Instagram content	Since your last survey, have you viewed the following types of images on Instagram (yes/no)? • Thinspiration • Fitspiration
Affect	After you viewed thinspiration or fitspiration images on Instagram, how often did you feel the following emotions? (1= Not at all to 5= Very much) • Scared • Nervous • Guilty • Irritable • Upset • Excited • Interested • Alert • Proud • Determined
DEBs	Since my last survey, I have… • Restricted my food intake to influence my shape or weight (# times) • Vomited or used laxatives/diuretics to influence my shape or weight (# times) • Exercised excessively to influence my shape or weight (# times) • Felt a loss of control while eating an objectively large amount of food (# times) • Felt a loss of control while eating a small or normal amount of food (# times)