Critical measurement issues in the assessment of social media influence on body image

Hannah K. Jarman [a,b,*], Siân A. McLean [c], Scott Griffiths [d], Samantha J. Teague [a,b], Rachel F. Rodgers [e,f], Susan J. Paxton [g], Emma Austen [d], Emily Harris [d], Trevor Steward [d], Adrian Shatte [h], Long Khanh-Dao Le [i], Tarique Anwar [j], Cathrine Mihalopoulos [i], Alexandra G. Parker [k,l], Zali Yager [k], Matthew Fuller-Tyszkiewicz [a,b]

[a] School of Psychology, Deakin University, 1 Gheringhap Street, Geelong, Victoria, Australia
[b] Centre for Social and Early Emotional Development, School of Psychology, Deakin University, Burwood, Australia
[c] The Bouverie Centre, School of Psychology & Public Health, La Trobe University, Melbourne, Australia
[d] Melbourne School of Psychological Sciences, University of Melbourne, Melbourne, Victoria, Australia
[e] APPEAR, Department of Applied Psychology, Northeastern University, Boston, USA
[f] Department of Psychiatric Emergency & Acute Care, Lapeyronie Hospital, CHRU Montpellier, France
[g] School of Psychology & Public Health, La Trobe University, Melbourne, Australia
[h] School of Engineering, Information Technology & Physical Sciences, Federation University, Melbourne, Australia
[i] Deakin Health Economics, Institute for Health Transformation, School of Health and Social Development, Deakin University, Burwood, Australia
[j] Department of Computing Technologies, Swinburne University of Technology, Melbourne, Australia
[k] Institute for Health and Sport, Victoria University, Melbourne, Australia
[l] Orygen and Centre for Youth Mental Health, University of Melbourne, Australia

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ABSTRACT

Progress towards understanding how social media impacts body image hinges on the use of appropriate measurement tools and methodologies. This review provides an overview of common (qualitative, self-report survey, lab-based experiments) and emerging (momentary assessment, computational) methodological approaches to the exploration of the impact of social media on body image. The potential of these methodologies is detailed, with examples illustrating current use as well as opportunities for expansion. A key theme from our review is that each methodology has provided insights for the body image research field, yet is insufficient in isolation to fully capture the nuance and complexity of social media experiences. Thus, in consideration of gaps in methodology, we emphasise the need for big picture thinking that leverages and combines the strengths of each of these methodologies to yield a more comprehensive, nuanced, and robust picture of the positive and negative impacts of social media.

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* Corresponding author at: School of Psychology, Deakin University, 1 Gheringhap Street, Geelong, Victoria, Australia.
E-mail address: h.jarman@deakin.edu.au (H.K. Jarman).

1. Introduction

The introduction and rapid ascent of social media has led to a considerable amount of research on the various psychological impacts of social media use, including on body image. A broad variety of methods and research designs have been used to explore social media use, including qualitative approaches, self-report, experimental exposure, and objective social media data capture. The present article illustrates the types of research insights gained from each of these methods to date and offers future-focused considerations of where further research efforts might usefully focus next. To orient this discussion, we start by defining social media and its significance. Next, we touch on the theoretical frameworks that stimulate and guide interpretation of much of the research pertaining to the relationship between social media and body image. Following this, the different approaches used to assess social media and body image are explored, including their application and contribution to knowledge. A critical perspective is then presented which outlines the gaps within the literature, and which proposes key directions and recommendations for future research.

2. Significance of social media

Although conceptualisations of social media vary, in the present review, social media is defined as "computer-mediated communication channels that allow users to engage in social interaction with broad and narrow audiences in real-time or asynchronously" (Bayer, Trieu, & Ellison, 2020, p.472). Popular social media platforms include Facebook, Instagram, Twitter, and YouTube (Auxier & Anderson, 2021). In 2020, over 3.6 billion people worldwide were using social media, with rates projected to increase to 4.4 billion by 2025 (Statista, 2021). Adults spend approximately 2.5 h on social media per day, equating to roughly 15% of their waking life (Kemp, 2020). While social media is accessible and used by most, higher use is reported among women than men (Auxier & Anderson, 2021), and among younger than older generations (Hayes, van Stolk-Cooke, & Muench, 2015). Adolescents are avid social media users, with 85% of American adolescents having at least one social media account by the age of 14 years (Odgers & Robb, 2020). Higher rates of use among these populations are particularly concerning given that these individuals are often at the greatest risk of body image disturbance (Paxton & Heinicke, 2008). Given the prevalence of use, social media is now considered an integral part of many people's daily lives, supporting the critical need for research examining its impact.

3. Theoretical perspectives

Various theoretical perspectives have been employed to frame the relationships between social media use and body image; most notably, sociocultural theory (Fitzsimmons-Craft, 2011; Thompson et al., 1999), objectification theory (Fredrickson & Roberts, 1997), and uses and gratifications theory (Katz, Blumler, & Gurevitch, 1973). While these theories were originally used to understand traditional forms of media, more recent work has applied these frameworks within the context of social media (e.g., Rodgers, 2016). Together, these theories allow consideration of multiple aspects of social media use, including the appearance-related images and content on social media that individuals are exposed to, the process of viewing and creating content for social media, and the motivations for social media use.

Sociocultural and objectification theories describe the ways in which individuals are socialised to endorse and strive for oppressive and unrealistic appearance ideals (Fitzsimmons-Craft, 2011). The unattainable nature of these appearance ideals results in most individuals failing to meet these standards in healthy, sustainable ways, thus leading to poor body image. Sociocultural theories highlight the role of two key mechanisms in this process. The first is the internalisation of unattainable socially imposed appearance standards and their pursuit (Thompson, Heinberg, Altabe & Tantleff-Dunn, 1999). The second is appearance comparison, through which individuals evaluate themselves against others or their images as depicted on social media (Schaefer & Thompson, 2014). Social media overwhelmingly depicts idealised bodies and images that are often edited and curated to approximate thin, toned, and muscular appearance ideals (Tiggemann & Zaccardo, 2018). Thus, sociocultural theories describe a process through which repeated exposure to such images leads individuals to endorse and strive for unrealistic appearance standards, and feel dissatisfied with their own appearance in comparison. In addition, the visual nature of social media reinforces appearance as a central facet of identity and self-worth.

Objectification theory also acknowledges the existence of pressures to attain unrealistic appearances, and places them within a critical political and economic perspective that accounts for ways in which they preserve and maintain existing systems of power and privilege (Fredrickson & Roberts, 1997). In this way, objectification theory and its extensions highlight how appearance ideals are gendered, and emphasise not only thinness and muscularity but also fairness and whiteness, youth, ability, and other characteristics that are typically associated with privilege in Western societies (Anderson, Holland, Heldreth, & Johnson, 2018). The objectification of individuals, in particular women and individuals holding other, and intersecting, minoritized identities, occurs when individuals are reduced to their bodies and their worth is equated with their appearance (Anderson et al., 2018). Western media objectifies women via the sexualisation of women's bodies and the portrayal of women as objects. Through socialisation, individuals, and women in particular, learn to internalise this objectifying gaze through a process known as self-objectification, which in turn is associated with body

monitoring, surveillance, dissatisfaction, and shame stemming from inevitable disparities between unattainable appearance ideals and reality (Fredrickson & Roberts, 1997). Objectification is built-in to social media processes, whereby platforms invite people to view and evaluate other's bodies and self-presentation, content that is created by and for others, and is principally photo-based content (Fox, Vendemia, Smith, & Brehm, 2021). In addition, the act of creating self-images has been described as a manifestation of individuals' self-objectification and self-surveillance as images are created to be evaluated by others and judged to be close enough to appearance ideals to provide self-worth and social capital (Zheng, Ni, & Luo, 2019).

Finally, uses and gratifications theory highlights how different user motivations may influence the type of media content consumed as well as the way in which media content impacts individuals (Katz et al., 1973). The theory emphasises the active nature of media use and the capacity for individuals to self-select certain types of content and to work with algorithm-driven content, leading to online environments that reflect their interests. Through this perspective, social media users may knowingly or unknowingly modulate the content they are exposed to, for example, by increasing or decreasing exposure to appearance-based content. Furthermore, individuals' motivations for using social media and their level of investment in social media as a tool for obtaining appearance-related information, or leveraging their appearance for social mobility or capital, may modulate the impact of social media use (Rodgers, McLean, et al., 2020). For example, among individuals for whom online feedback regarding self-image is very important, social media use may be very tightly related to body image (and a source of positive body image or in contrast body dissatisfaction), while among those for whom social media feedback is less important, or who mainly use social media for information related to current events or entertainment, social media use may be largely unrelated to body image.

Together these theories highlight the ways in which understanding the association between social media use and body image likely requires accurate assessment of multiple elements including the types of content individuals are exposed to, the ways in which they interact with them and contribute to social media, and their motivations and activities.

4. Qualitative research

The usefulness of qualitative research is sometimes overlooked in research linking social media and body image. Yet, qualitative research is ideal for obtaining rich, detailed information about how people use social media, thereby helping us understand the specific types and patterns of interaction that hinder and help body image. By allowing participants the freedom to take the research in whichever direction they believe is important, qualitative research is able to delve into how people think and feel and the reasoning behind that. Relatedly, qualitative approaches are useful for identifying new trends, generating leads for quantitative research, and for helping correct researcher biases in what constructs are identified as important. Here, we review recent qualitative research on social media and body image, focusing on two major categories of qualitative research: interview-based studies and content analyses.

4.1. Current applications of qualitative research

Interview-based studies enable participants to speak freely about their experiences, without being constrained by response options designed by researchers. In this way, interviews enable a grounded, experience-based approach to understanding the role social media plays in shaping body image. Crucially, these responses reveal the sophistication of individuals' thoughts about their social media use, inclusive of both positive and negative potential impacts on their body image. For example, recent interview-based studies have shown that individuals are keenly aware of, yet nonetheless heavily invested in, those elements of social media that contribute to body dissatisfaction. Burnette, Kwitowski, and Mazzeo (2017) conducted six focus groups with adolescent girls aged 12–14 years in the United States and found that selfies were a particularly controversial and emotionally charged topic. In one group, a facilitator asked the adolescents if they ever took selfies, and when several girls responded "No", a participant spoke up and pointed saying "She does!", to which that participant responded "So do you!". This accusatory exchange highlights the selfie paradox (Diefenbach & Christoforakos, 2017), whereby selfies are implicitly encouraged by value structures that reward "successful" selfies – those deemed by others as attractive, beautiful, and/or cool – with more likes, comments, and other forms of social capital; yet, these same selfies are explicitly discouraged through the sharing of views that selfie posting is often done for the "wrong reasons", such as to attract attention, compensate for low self-esteem, or to pander to others. The challenge of navigating this paradox of simultaneous valuation and condemnation has been described for other appearance-oriented pursuits such as cosmetic surgery (Bonell, Barlow, & Griffiths, 2021) and seems to be a common theme uncovered in interview-based research on how people engage with social media, including both adolescents and adults, and females and males (e.g., Baker, Ferszt, & Breines, 2019; Bell, 2019).

Given these tensions and its ubiquity, one might question how social media users protect their body image whilst using social media. In a thoughtful study, Evens, Stutterheim, and Alleva (2021) conducted interviews with young adult women aged 18–25 living in the Netherlands. The women were asked about the thoughts and strategies they used to protect and promote their positive body image whilst using social media. In summary, these women were critical, conscious users of social media. They questioned the motivations behind women sharing objectifying images of their body, criticised what they perceived to be an excessive amount of time and energy required to achieve and maintain the idealised physical appearances on social media, and deemed the beauty-idealising images on social media as broadly unrealistic. Importantly, nearly all the participants described conscious attention as an important factor that moderated their ability to successfully use protective filtering strategies. Scrolling mindlessly through their feed allowed the images to unconsciously take control of their thoughts and emotions, resulting in negative self-evaluations. Mindful scrolling, however, allowed the women to retain control over their thoughts and emotions, resulting in positive self-evaluations. Nonetheless, most participants recommended limiting exposure to beauty ideal imagery, with some suggesting to follow body positive accounts.

In summary, interview-based research suggests that some social media users are familiar with the appearance-based economies and contingencies that fuel social media, including the paradoxical encouragement and condemnation of many social media behaviours, such as posting selfies. In response, some develop strategies to reconcile their social media behaviour with their body image, and among those with positive body image, there appear to be clearly defined and promising strategies. As Evens et al. (2021, p 50) notes, "most of the strategies that formed the women's protective filter may be the result of active, conscious long-term effort, and are thus, to some degree, amenable to intervention and change".

Content analyses shine light on the types of social media content that might be helpful and harmful to body image and give a sense of the sorts of content that are commonly shared on social media. Content analyses of thinspiration and fitspiration sites and healthy living blogs have found content frequently includes weight/fat stigmatisation, objectification, dieting/restraint messaging, and notions of food guilt on thinspiration compared to fitspiration sites (Boepple & Thompson, 2014, 2016). More recently, researchers have

started to explore the potentially helpful aspects of social media. Specifically, understanding how likely a social media user is to encounter content that may be protective versus problematic is important information that may (i) contextualise any findings of an association (or lack thereof) between social media use and body image, and (ii) motivate interventions to minimise the effects of harmful content or boost user interaction with helpful content. Crucially, and in respect to the latter, Cohen, Irwin, Newton-John, and Slater (2019a) conducted a content analysis of 640 posts from 32 influential body positivity accounts on Instagram. The images showcased diverse body sizes, with two-thirds portraying larger bodies, alongside bodily 'imperfections' such as cellulite, stomach rolls, stretch marks, and skin blemishes. The posts frequently espoused broad conceptualisations of beauty and body appreciation that align with empirical conceptualisations of positive body image. Closely aligned hashtags, such as #fatspiration and #fatspo, are more specific in their promotion of fat acceptance and positive body image for individuals in larger bodies (Webb, Vinoski, Bonar, Davies & Etzel, 2017).

We must be wary, however, of the potential for co-option of these movements and hashtags by companies and individuals who ultimately reinforce dominant beauty ideals. Lazuka, Wick, Keel, and Harriger (2020) conducted a content analysis of 246 images from 238 accounts found by searching #BodyPositivity via Instagram's "Explore" feature. The authors found that around 8% of images nonetheless promoted weight loss, dieting to change one's appearance, or praise for being thin. A significant degree of commercialisation (17%) was also present, including promotions for detox teas, restrictive diets, and cosmetic surgeries. The potential for co-option of otherwise body positivity categories of social media content is an important avenue for future research.

Relatedly, because social media is constantly evolving, content analyses of new social media phenomena is useful and welcomed. Monitoring social media content to understand evolution over time is vital information to help determine whether our quantitative measures continue to address issues as they actually exist online. Relatedly, Lucibello et al. (2021) analysed 800 posts on Instagram with "#quarantine15″, referring to the fear and experience of weight gain during COVID-19 lockdowns, an analogue of "#freshman15″, referring to the fear and experience of weight gain during undergraduates' first year of university. The authors coded the image, image caption, and hashtags included in the post. They found that posts with the quarantine15 hashtag featured mostly lower-weight individuals and reinforced weight-normative assumptions and appearance preoccupations, with approximately half expressing dislike towards larger bodies. In summary, content analyses represent an important qualitative methodology for helping us understand the types of social media content that individuals engage with, which, as exemplified through "#quarantine15″, can quickly emerge and achieve international traction.

5. Survey-based research

While qualitative work enables participants to respond in their own words, and may elicit concepts not anticipated by researchers, survey-based research seeks to quantify level and associations among constructs of interest. Survey-based research offers a brief, fast, affordable, and non-intrusive method for measuring social media use, particularly when collected via online means which has become increasingly necessary during the COVID-19 pandemic (Hlatshwako et al., 2021). As detailed below, survey-based methodologies - from both cross-sectional and longitudinal study designs - provide insights into typical frequency of social media use, as well as drivers and possible consequences of this use.

5.1. Current applications of survey-based research

The most common measure of social media use within survey-based body image research is a single-item measure of social media engagement (Saiphoo & Vahedi, 2019). This is used to indicate the level of exposure to the social media environment. Measures typically ask participants to report the duration (e.g., Fardouly & Vartanian, 2015; Marques, Paxton, McLean, Jarman, & Sibley, 2022), or frequency of social media use (e.g., 'never' to 'always'; Rodgers, Slater, et al., 2020) across social media platforms in general. Overall, cross sectional research has shown a relationship between higher time spent on general social media use and higher body dissatisfaction and eating concerns among adults and adolescents (Holland & Tiggemann, 2016; Saiphoo & Vahedi, 2019). However, inconsistent findings are found in longitudinal survey-based studies (Ryding & Kuss, 2019), so substantial claims cannot be made about the causality of these relationships. While Facebook is the most frequently measured platform (e.g., Tiggemann & Slater, 2017). frequent use (> 2 h per day) of highly visual social media platforms (i.e., Instagram and Snapchat) is more closely related to body image concerns than Facebook use (Marengo, Longobardi, Fabris, & Settanni, 2018).

Although these measures of social media use may indicate duration of exposure, they do not capture the nuances of users' experiences. While algorithms determine some content, users are primarily active and purposive, having much greater autonomy over their use than traditional forms of media. Given the vast number of platforms with wide variations in features available (e.g., from synchronous to asynchronous, from text-based to image- or video-based), the social media experience is very individualised. In response to this, researchers have started to make distinctions between different types of use, namely passive vs active use (Burke, Marlow, & Lento, 2010). Passive use refers to simply viewing or consuming social media content while active use refers to interactive activities where the user communicates, either directly or indirectly, with others. Although a number of measures have been used to assess passive and active use, most typically examine how frequently respondents engage in a range of social media activities which are then grouped into passive (e.g., "view friends' status updates"; Facebook Questionnaire, Meier & Gray, 2014) or active use (e.g., "post a message on your own Facebook timeline"; Multidimensional Scale of Facebook Use, Frison & Eggermont, 2016). Although little research has examined overall active use, passive use has been found to be directly and indirectly related to higher body dissatisfaction through comparisons (Rousseau, Eggermont, & Frison, 2017; Santarossa & Woodruff, 2017). Given the rising popularity of selfies, research has also started to examine the role of passive and active engagement in selfies. While one study found that greater viewing of selfies was related to poorer body esteem and greater posting of selfies was associated with greater body esteem (Chang, Li, Loh, & Chua, 2019), outcomes from posting may be contingent upon the valence and quantity of feedback received (Wang et al., 2018). However, the motivations of users for engaging in such active/passive behaviours is often not collected which precludes any claims regarding, for example, whether users post selfies because they already feel confident or as a means to seeking reassurance.

In line with uses and gratifications theory, survey-based research has assessed motivations to use social media (e.g., Rodgers, McLean, et al., 2020). A recent cross-sectional survey among adolescents examined the relationships between a range of motivations for social media use (e.g., social interaction, escapism, appearance-focused use), a number of types of social media engagement (e.g., frequency, intensity, passive use), and body image and well-being (Jarman, Marques, McLean, Slater, & Paxton, 2021; Jarman, McLean, Slater, Marques, & Paxton, 2021). Results found that motivations for

escapism and appearance feedback motivations were negatively associated with body satisfaction whereas motivation for information sharing was positively associated with body satisfaction. Interestingly, social media engagement was not related to body image or well-being when motivations for social media use were included in the model. This suggests that social media engagement is less impactful on body image when motivations for use are taken into account.

The visual nature of social media has also prompted researchers to examine the role of photo-based social media use on body image. Research suggests that photo-based Facebook use (i.e., posting and viewing photos on social media), but not overall Facebook use, is related to greater internalisation and body surveillance (Cohen, Newton-John, & Slate, 2017). Editing of and investment in photos has also been examined. Measures such as the photo or self-photo manipulation scale assess the extent to which respondents manipulate or edit photos of themselves before posting them on social media, and the photo investment or selfie investment scale is a related measure which assesses investment and effort expended choosing selfies to share on social media (McLean, Paxton, Wertheim, & Masters, 2015). Among adolescents, photo manipulation and investment are related to greater body dissatisfaction and likelihood of eating disorder diagnosis (Lonergan et al., 2020; McLean et al., 2015).

While photo-based activities and visually focused platforms may contain idealised and appearance-focused images, the variety of content available online means that it is also possible that content is not always focused explicitly on appearance. For example, social media platforms may contain images of travel, pets, or memes (Verrastro, Fontanesi, Liga, Cuzzocrea, & Gugliandolo, 2020). Therefore, researchers have started to assess certain types of appearance-focused content on social media. Cohen et al. (2017) asked participants to report the type of Instagram accounts they followed. They found that following appearance-focused accounts (e.g., health and fitness) was associated with greater internalisation, body surveillance, and drive for thinness relative to appearance-neutral accounts (e.g., travel). In a similar vein, frequency of viewing fitspiration content, measured as frequency of exposure to #fitspiration, has been found to be indirectly related to body satisfaction through muscular-ideal internalisation and appearance comparisons (Fatt, Fardouly, & Rapee, 2019).

Another area of focus is the mechanisms through which social media exerts influence on body image, including internalisation and comparisons as identified within sociocultural theory. While traditional measures are typically used to evaluate internalisation and comparisons, some research has started to modify these scales to capture the social media context more specifically. For example, the term "on social media" has been added to validated scales (e.g., Physical Appearance Comparison Scale-Revised; Schaefer & Thompson, 2014) to assess appearance comparisons made on social media. Likely attributable to the appearance potency and idealised content presented on social media, upward comparisons on social media have been found to be associated with poorer body image and mood outcomes, more so than comparisons made in person (Fardouly, Pinkus, & Vartanian, 2017). Higher internalisation (e.g., Wang, Fardouly, Vartanian, & Lei, 2019) and comparisons (e.g., Jarman, Marques, et al., 2021; Jarman, McLean, et al., 2021), both separately and in combination (e.g., Fatt et al., 2019), have been found to mediate the relationship between social media use and poor body image.

6. Explorations of momentary experiences in daily life

Ecological momentary assessment (EMA; alternatively referred to as experience sampling methodology, ambulatory assessment, or daily diary studies) approaches are designed to obtain repeated snapshots of key constructs and contextual variables in daily life, often (though not necessarily) via self-report (Shiffman, Stone, & Hufford, 2008). The use of brief, repeated surveys (e.g., 5–10 assessments daily for 1–2 weeks) forces researchers to prioritise the questions they ask at each time point, and often result in shallow (and sometimes single-item) coverage of key constructs to balance breadth of information yield against participant burden. Repeated questioning is designed to mitigate data quality issues associated with retrospective bias by narrowing the time window for which participants need to recall key information (e.g., report experiences right now, past half hour, past 2–3 h, etc). An added benefit of repeated assessment is that researchers can evaluate frequency, duration, and effects of target variables as they evolve over the course of a day. Hence, whereas lab-based experiments typically measure immediate body image-related effects of a single exposure to social media, EMA can explore whether these effects persist over longer time horizons, and the impacts of multiple exposures relative to a single instance of social media exposure (Griffiths & Stefanovski, 2019).

6.1. Current applications of EMA

To date, a handful of EMA-based studies have explored social media use related to body image. Studies have provided estimates of the amount of time people spend on social media platforms (Bennett et al., 2020; MacIntyre et al., 2021; Wyssen et al., 2020), and identified which platforms are commonly used (Stevens & Griffiths, 2020). These studies used self-reports of time spent on social media, with the exception of Christensen et al. (2021) who propose to obtain estimates from social media use statistics available on smartphones. Building on from this, researchers have also started to ask more pointed questions about the type of social media content participants have been exposed to. Wyssen et al. (2020) asked participants to clarify whether they had been exposed to the thin ideal in instances where they reported social media use. Fardouly et al. (2017) asked participants to report whether they had engaged in appearance comparisons via social (and other) media, the direction of these comparisons (lateral, upward, or downward), and gauged mood- and dieting-related consequences of these comparisons. Stevens and Griffiths (2020) asked participants to report whether they had been exposed to social media content depicting body positivity, thinspo, or fitspo since the last time they were surveyed. Krug et al. (2020) and Yee et al. (2020) instead used an experimental EMA design, in which participants were directly exposed to an appearance-related image (fitspo for Krug et al., and fitspo or thinspo for Yee et al.) or neutral image at each EMA survey rather than relying on self-report. These images were designed to mimic problematic content that individuals are exposed to via social media, and enable evaluation of immediate effects of exposure on body image, mood, and dieting intentions. This experimental approach ensures that participants are exposed to appearance-related images during the EMA phase, but ecological validity is contingent on these images being reflective of everyday use.

The mood, body image, and dieting behaviour-related effects of social media use have been a key feature of extant EMA studies. Drawing upon common sociocultural models, such as social comparison theory (Festinger, 1954), and the tripartite influence model (Thompson et al., 1999), a few of these studies have also attempted to identify psychological processes that may account for the negative impacts of social media. Krug et al. (2020) showed that exposure to fitspo images increased perceived pressure to attain the thin ideal, but had negligible effects on the extent to which individuals compared their appearance to others. Yee et al. (2020) showed that exposure to fitspo and thinspo images increased the urge to engage in body change behaviours among a sample of men.

7. Experimental designs including lab-based research

A range of studies have utilised experimental designs to isolate the mood and body image-related effects of distinct experiences of social media. Through randomisation, appropriately chosen control conditions, and tightly controlled research environments, these designs have sought to quantify causal effects of social media use on body image. As detailed below, innovative use of experimental designs have enabled exploration of more complex causal sequences and sought to limit threats to ecological validity by more closely mirroring the real-life experience of social media use.

7.1. Current applications of experimental designs

At the most straightforward level, experimental designs involve exposure to appearance-focused images on social media and follow-up measures of body image, often with a participant group who are exposed to neutral images. Experimental studies have observed relatively consistent findings whereby exposure to appearance-focused images results in increased body dissatisfaction. This is particularly the case when stimulus materials include only appearance-focused images (Prichard, Kavanagh, Mulgrew, Lim, & Tiggemann, 2020; Tamplin, McLean, & Paxton, 2018). By comparing edited and unedited images, it has been shown that the more closely images represent unrealistic appearance ideals, the stronger the effects on body image (Kleemans, Daalmans, Carbaat, & Anschutz, 2018; Tiggemann & Anderberg, 2019), although this effect may be attenuated when editing has been detected (Vendemia & DeAndrea, 2018).

To address concerns about low ecological validity of experimental designs, studies have examined participants' use of their own social media accounts or accounts of their peers. Findings have been somewhat mixed, with some studies showing increased body dissatisfaction from this type of browsing (Engeln, Loach, Imundo, & Zola, 2020; Hogue & Mills, 2019). In contrast, a study of Facebook browsing showed no impact on body dissatisfaction but an increase in appearance (facial) dissatisfaction only for those with high appearance comparison tendency (Fardouly, Diedrichs, Vartanian, & Halliwell, 2015). Facial dissatisfaction has recently been included as an outcome of interest in experimental studies of the impact of social media use, in response to the prevalence of selfie posting which focuses on facial appearance (Fardouly & Rapee, 2019; Tiggemann, Anderberg, & Brown, 2020a). Further research is required to determine the consequences of experiences of facial dissatisfaction.

Several studies have examined moderation and mediation effects of exposure. Study designs have assessed the moderating variable prior to exposure to social media to determine if effects of exposure differ according to pre-existing characteristics. A consistent finding is that the impact of social media appearance-ideal exposure on body image is greater among women (Fardouly et al., 2015), men (Sumter, Cingel, & Hollander, 2021), and adolescent girls (Kleemans et al., 2018) with higher appearance comparison tendency. Mediation has been examined to a lesser extent than moderation in social media research and has tended to focus on appearance comparison. In one type of study design, following image viewing participants are asked to report on the extent to which they compared themselves to images during exposure. Mediation by appearance comparison has been demonstrated among women (Tiggemann & Anderberg, 2019) but not men (Tiggemann & Anderberg, 2020). Experimental study processes have also been used to attempt to manipulate appearance comparison during the experimental procedure, which can provide evidence of causal mediation if the manipulation occurs following manipulation of the independent variable. McComb and Mills (2021) prompted appearance comparison by instructing participants to explicitly compare their own appearance with that of the Instagram models they viewed during the experimental exposure. However, lack of comparison with a no-manipulation control limits interpretation of findings. Isolation of the effects of appearance comparison during social media exposure and other potential mediating mechanisms is an important goal for future research.

In a sign of advances in experimental methodologies, designs have become more sophisticated in assessing specific features of social media use. Significant attention has been given to investigating impact of disclaimers on images alerting viewers to the edited or unrealistic nature of social media images. This body of work will be addressed in a separate contribution to this special issue. Other designs have focused on accounting for the active nature of social media engagement and exploration of effects related to the social aspect of social media. Studies have paired appearance-ideal images with comments, captions, and likes and compared effects on body dissatisfaction with standalone images. The small number of studies conducted to date have had varying foci and findings have been mixed (Prichard, McLachlan, Lavis, & Tiggemann, 2018; Tiggemann & Velissaris, 2020). Despite being identified in qualitative research as a significant feature of social media for adolescent girls (Chua & Chang, 2016), only one study to date (Tiggemann, Churches, Mitchell, & Brown, 2018) has examined the effect of the presence of 'likes' with social media images and found no greater impact on body dissatisfaction than viewing images without likes. An important caveat to consider for this study is that it examined likes attached to images of other people, rather than the impact of receiving likes for one's own selfies. Finally, research examining the impact on body image of self-presentation activities (i.e., taking, editing, and posting selfies) indicate that social media activities focused on one's own appearance is highly relevant for body image, although investigations have been limited to young women to date (Fox et al., 2021; Mills, Musto, Williams, & Tiggemann, 2018; Tiggemann, Anderberg, & Brown, 2020b; Vendemia & DeAndrea, 2021).

Finally, a small number of papers have looked at the impact on body image of exposure to content that may have positive effects. This includes self-compassion content (Slater, Varsani, & Diedrichs, 2017), humour through parodies of social media posts (Slater, Cole, & Fardouly, 2019), and body positivity or BoPo. Although research has shown that exposure to BoPo content may not have the same detrimental impact on body image as appearance-ideal social media content (Cohen, Fardouly, Newton-John, & Slater, 2019b), this may be dependent on diversity of body size in the images rather than on the intent of the content to promote body positivity expressed through other means such as captioning (Simon & Hurst, 2021; Tiggemann et al., 2020b). Furthermore, lab or experimental findings may not extend beyond those settings, as BoPo postings on Instagram and other platforms have been commodified by commercial and self-promotion motivations, diluting and undermining its positive impact (Brathwaite & DeAndrea, 2021; Vendemia, DeAndrea, & Brathwaite, 2021). Continued exploration of these areas is important to determine the content that might be most likely to provide a balance to appearance-ideal content and activities on social media that induce body dissatisfaction.

8. Computational methods for assessing social media data

There has been growing interest in recent years in computational methods for extracting and analysing meaningful body image-related insights from publicly available social media posts and comments. Collecting social media data using computational techniques can yield millions of data-points from social media users, and enable direct evaluation of the content (image, audio-visual, and textual) of body image-related conversations that arise on social media, as well as mapping of how this information proliferates on social media. Key advantages of this approach include the large volume of data that

may be accessed, the ecologically valid nature of obtained data, removal of reliance upon participant self-report of social media use, and ability to capture information on users who may be otherwise difficult to engage in research and treatment. Large datasets obtained from social media can produce several challenges for data analysis, most notably the need for sophisticated natural language processing, image analysis, machine learning techniques, and large computing power to provide insights from these typically large, unstructured datasets. As these data can provide social media users' thoughts, feelings, and behaviours in their own words, they often do not map neatly onto validated measures for diagnostic purposes. As such, quantification of levels of constructs such as body dissatisfaction require additional steps and assumptions some researchers may find contentious (although see Kern et al., 2016).

Computational methods can extract a range of features from social media content that are potentially relevant to negative body image detection and intervention. This includes: linguistic features (e.g., common combinations of words and contexts for word use), image features (e.g., colour, tone, pixel information), network features (e.g., breadth of members, level of communication/activity, and influential users within a network), social interaction features (e.g., interactions with others, followers/following), activity/behavioural features (e.g., volume of posts and comments, time spent on platform), clinical features (e.g., user statements of diagnoses), psycholinguistic features (e.g., positive and negative affect, sentiment, valence and arousal), and demographic features (e.g., age, gender, and location in user profiles). Such features can be used to model body image-focused users and social networks to address a range of research questions without need for survey data.

8.1. Current applications of computational methods

Research into body image-related conversations online is an exciting but nascent field of enquiry, and many possible areas for investigation remain. Even so, early findings show promise of this methodological approach. Body image-related content online has typically been sourced by searching for tweets with body image (and disordered eating) related hashtags or keywords (e.g., Tiggemann, Hayden, Brown, & Veldhuis, 2018) or downloading conversations from forums devoted to body image topics (e.g., Rodgers, Meyer, & McCaig, 2020; Sowles et al., 2018). Less frequently, content has been obtained via search for influential social media users (Bak, Priniski, & Holyoak, 2020) or from a combination of tweets and biographical information of users self-identifying as having body image or disordered eating issues (Wang, Brede, Ianni, & Mentzakis, 2019).

One strand of research explores the content of body image exchanges online. Researchers using this approach have demonstrated that body image concerns and preoccupation are common discussion points on social media (Bak et al., 2020; Cavazos-Rehg et al., 2019; Harris et al., 2018; Sowles et al., 2018; Tiggemann, Hayden, et al., 2018). Harris and colleagues (2018) found that fitspirational content was more likely to originate from organisations and businesses, whereas thinspirational content was more frequently authored by individual social media users, contained images of extremely thin women, and had greater tendency to be retweeted. Worryingly, Wang, Brede, et al. (2019) found that exposure to body image related content for individuals who were seeking to recover from an eating disorder served to change individuals' posting behaviour to emphasise more pro-ED sentiments. Finally, although presence of body positive content and fora have been reported (e.g., Rodgers, Meyer, et al., 2020), thin ideal supportive content is also common among these communities.

Another strand of research has used computational modelling of social media data to characterise the network of social media users who engage in these appearance-focused conversations. These approaches have enabled exploration of durability, size, and overlap among body image focused social media communities (McCaig, Bhatia, Elliott, Walasek, & Meyer, 2018; Tiggemann, Hayden, et al., 2018), as well as identifying influential social media users within these groups based on frequency of posting and likelihood that their posts are shared or liked (Mitchell, Santarossa, & Woodruff, 2018; Moessner, Feldhege, Wolf, & Bauer, 2018). Despite mapping of influential individuals and gaining insights into the spread of a social network, few efforts have been made to intervene upon these communities to change the nature and frequency of body image related content. Viguria et al. (2020) is an exception, in which the spread of an online eating disorder awareness campaign was monitored.

Finally, several researchers have attempted to characterise individuals who post body image and disordered eating related content. Peebles et al. (2012) surveyed 1291 users of 296 pro-ED websites, finding that users' eating disorder symptomatology was clinically elevated relative to community norms. Importantly, while most users reported engaging in eating disorder behaviours (e.g., binging and purging), less than 10% of participants reported being in treatment. Another study by Harper, Sperry, and Thompson (2008) surveyed 1575 women on their access to pro-ED websites, finding that those who had viewed pro-ED sites had higher body dissatisfaction and eating disturbance than control women. Such studies highlight that patterns distinguishing online eating disorder content from broader social media posts are adequately capturing digital traces of a clinically elevated eating disorder group. Even so, more work is needed to see how eating disorder and body image related terms used online may be useful for evaluating level of body image disturbance and disordered eating symptom severity. While much of the computational research has focused on eating disorders, relatively fewer studies have considered the impact of social media on body image-related outcomes. As a consequence, additional research focus is needed in this space.

9. Gaps and future research directions

The breadth of research covered above attests to the diversity of methodologies presently employed to understand the impacts of social media on body image. Research within this field has reached a level of maturity whereby we may more easily spot the limitations in current approaches and the opportunities for further research exploration. In this final section, we identify common concerns pertaining to measurement validity, inclusivity, and other design features whilst also offering future directions that are broader in focus and designed to combine learnings across methodologies. A summary of the gaps and future recommendations is provided in Table 1.

9.1. Gap #1: What are we trying to measure?

Accumulated literature shows overall social media use to be less predictive than appearance-focused social media use indices for body image. This latter approach is therefore becoming the more common approach to operationalise social media use in this field. Even so, broader questions remain about how best to quantify appearance focused social media use. Frequency of use measures imply a dose response effect for which limited empirical evidence has been marshalled in support of its validity. Just as overall use indices ignore the importance of type of content engaged with, frequency may be a less important predictor of body image outcomes than the motives for use, importance ascribed to social media engagement, and types of content consumed. Five hours of mindless viewing of social media content is qualitatively different to five hours spent searching for extreme dieting tips to attain unhealthy and unrealistic weight and shape goals.

Table 1
Research gaps and future directions.

Key considerations and research gaps	Future direction
#1 What are we trying to measure?	a. Define key social media elements and map them to identify what current measures are capturing and missing b. Examine invariance of measures over time and context
#2 Have we adequately captured the experience of social media?	a. Gain insights from objective social media data, including through use of machine learning and network-based analysis
#3 Who are we assessing?	a. Access more diverse samples (e.g., gender, ethnicities, age) through broad recruitment efforts and careful consideration of measurement issues
#4 How can we keep up with fast-evolving research ecology?	a. Use co-design methodologies for a user-centred approach b. Involve the general public through citizen science practices c. Develop evidence maps to avoid unnecessary replication and highlight gaps in the literature
#5 How can we maximise understanding and knowledge?	a. Compare, contrast, and combine different data types to gain a more complete understanding of the impact of social media on body image b. Use systems thinking approaches

In order to accurately understand and capture social media, there are a number of steps to be completed. First, we must define the key elements of social media in relation to body image. Next, we must use mapping to explore the interconnectedness of these and to assess what aspects current measures are and are not tapping into. This will then allow for a more informed approach of how these distinct social media measures all relate and identify any gaps within the literature. Another difficulty with current approaches to measuring social media is that they do not take into account variability over time among participants. While a user's frequency or duration of use may not fluctuate over time, their understanding, engagement, and motivations for social media will likely change. As a consequence, evaluation, and conceptual consideration of invariance of our measures over time and context is warranted.

9.2. Gap #2: Have we adequately captured the interpersonal experience of social media?

Reliance on self-report measures of social media use hinges on participants being able to accurately report their own and other social media users' activity levels. Such an approach lacks important nuance as an individual's perceptions of the aggregate influences of others fails to provide detailing about the social media users who are more or less influential within one's sphere. Similarly, this approach gives no account of the breadth of an individual's social media community, the extent to which the individual is central versus peripheral to this community, and the proportion of content shared within this community that has an appearance focus. As such, the experiences of an individual who is on the periphery of appearance-fixated social media communities may markedly differ from those of individuals at the centre of such discussions. The amount of appearance content, and the extent to which the community believes themselves to be identified by appearance related content may also dictate how impactful appearance information is to those who receive it.

We offer two potential remedies for this issue. First, rich, objective data is needed to provide necessary context to social media use, as covered in the computational modelling subsection. Second, future research should seek to augment this objective data with self-reports of social media use to provide necessary context to appraise the online experiences of the individual. Sophisticated modelling approaches such as machine learning-based textual analysis of themes and sentiment may help to characterise the sort of content that is most commonly shared online. In contrast, social network analysis may enable us to better understand dynamics of appearance-focused information exchange, including identifying how these communities develop and evolve, how individuals' body image content may intensify over time, and who the key influencers are within a social network.

9.3. Gap #3: Who are we assessing?

A significant limitation of literature examining the impact of social media use on body image is the heterogeneity of research samples. Across the varying designs outlined above, the majority focus on adult women, often sourced from universities. Although some research does exist among adult men (e.g., Sumter et al., 2021; Tiggemann & Anderberg, 2020), the findings among women cannot be generalised. In addition, as has been identified in a separate contribution to this special issue, to date very little research has focused on groups that present diversity on other dimensions such as ability, gender, sexual orientation etc. Younger and older populations are also less represented within research, with the overwhelming majority having used survey-based designs (e.g., Marques et al., 2022). Further, researchers have warned that over reliance on online methods, particularly during COVID-19, may result in even more skewed samples (Hlatshwako et al., 2021).

Consequently, one suggested way to combat this is to carefully consider study design and broaden recruitment efforts to obtain better representation and generalisability of research findings. For example, advertising through both online and offline methods (e.g., print materials at social events) has been found to increase participation in online surveys among under researched subgroups (i.e., men and ethnic or racial minorities; Ali et al., 2020). In addition, computational methods may also allow for broadening of participation by collecting data from individuals who may not otherwise actively participate in research, with the potential to produce samples which are less bias and more generalisable.

9.4. Gap #4: How can we keep up with fast-evolving research ecology?

In reviewing methodological issues for social media research, it was apparent to us that some methodologies (e.g., online surveys) are over-represented in the overall literature base, whereas others (e.g., EMA and computational methods) are less widely adopted. The risks for over-represented study types include an incomplete and narrowly focused knowledge base, and duplication of efforts. By contrast, uptake of newer methodologies and sub-areas of research focus are likely to be impeded without widespread knowledge sharing and educative resources to enable scale-up of new forms of expertise (e.g., machine learning and software engineering capability; Landers, Brusso, Cavanaugh, & Collmus, 2016).

Several principles from the open science movement (Nosek et al., 2015) may facilitate greater exploration of new areas of enquiry for social media research. First, inclusiveness and collaboration allows for coordinated efforts for established research priorities, distributed workloads to enable more outputs to rapidly emerge with (potentially) lower levels of slippage in research quality, and knowledge and practice exchange components that raise base level knowledge and expertise within the field (Grahe, Cuccolo, Leighton, & Alvarez,

2019). Second, somewhat absent from the current literature, co-design allows participants to be considered as active and equal partners in knowledge generation: something which is missing in current approaches outlined above (with the possible exception of qualitative methods). Co-design is increasingly used for development of intervention content (e.g., Thabrew, Fleming, Hetrick, & Merry, 2018), but could equally be used for other forms and stages of research including construction of surveys to more accurately and comprehensively capture salient elements of social media use (Slattery, Saeri, & Bragge, 2020). Less common to body image research is the notion of citizen science, whereby non-researchers contribute to knowledge generation and/or dissemination (e.g., Tauginienė et al., 2020). Given the rate at which new social media platforms and trends in content emerge, citizen scientists could help researchers stay abreast of this rapidly changing social media landscape. Open repositories and non-technical summaries of content are essential to ensure authentic, meaningful participation from the general public (Mairs, McNeil, McLeod, Prorok, & Stolee, 2013). Finally, coordination of research efforts could also be facilitated by greater emphasis and centralisation of evidence gap maps that identify which research questions have been sufficiently addressed and thus do not require further investigation, and which areas require additional exploration. Evolving documents such as living knowledge reviews (Macdonald, Loder, & Abbasi, 2020) could provide up-to-date summaries of current state of knowledge to support research attention to ongoing controversies and research gaps.

9.5. Gap #5: How can we maximise understanding and knowledge?

While the methods discussed in this paper have clear strengths and weaknesses that lend themselves to address specific research questions, one opportunity for future research is to use mixed method approaches. These would enable richer, more complex, and more complete analysis and have the potential to advance knowledge and spur further gains in understanding of the impacts of social media on body image.

Along these lines, two specific suggestions are provided. The first is to adopt triangulation methods of review (e.g., Lawlor, Tilling, & Smith, 2016; Taylor & Munafò, 2016), actively seeking to compare and contrast literature synthesis from different design types and methodologies. For instance, by looking in concert at findings from EMA and lab-based studies (which typically explore immediate, short-term effects) and prospective studies (which explore longer-term impacts), we may gain greater understanding of the time course and build-up of social media influences on body image. We are unaware of systematic application of this triangulation approach in the body image literature, though recent examples exist in diverse research areas including suicide (Harrison, Munafò, Davey-Smith, & Wooton, 2020), colorectal cancer (Zhang et al., 2020), and anorexia (Lloyd, Sallis, Verplanken, Haase, & Munafo, 2020). Relatedly, triangulation study designs may provide more nuance and complexity than single approaches. For example, measurement burst designs combine repeated EMA approaches with longitudinal survey-based approaches (Sliwinski, 2008). This type of design would provide insights into possible changes in strength of associations over time as well as the duration of effects over time. The second suggestion is to utilise systems thinking to better gauge the full impacts of social media on body image. Systems thinking has been used for a variety of complex population health topics where a range of positive and negative influences for a focal outcome co-exist. Through estimation of the influence of each of these paths on the outcome, a system can be statistically simulated to better predict different trajectories - whether at individual or community level - for the outcome of interest. Where a single study is unlikely to be able to capture all of the relevant variables to model effects simultaneously (due to participant burden concerns), estimates for each of the paths may be

derived with some confidence from separate meta-analytic reviews and combined to generate such a model (see Linardon, Tylka, & Fuller-Tyszkiewicz, 2021). This could similarly be used to more accurately evaluate the ways in which social media use may promote body image disturbances, and the levers that may be acted upon to prevent or offset these ill-effects.

10. Conclusion

In sum, although the early work in this area employed somewhat crude measures of time spent on social media, the more recent research examining the relationships between social media use and body image has used a variety of different types of assessment and methodological approaches, that each have specific strengths, however, when used in isolation they present multiple limitations. Moving forward, combining these different approaches, across different levels, and examining multiple indices of social media use will likely be the most fruitful for providing nuanced and useful data regarding these relationships. In particular, methodologies that can better identify which types of social media use, in which contexts (interpersonal or broader social media exposure), and for whom, may be most harmful or helpful in relation to body image are needed.

Declarations of interest

Nothing to declare.

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