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Social media, body satisfaction and well-being among adolescents: A mediation model of appearance-ideal internalization and comparison

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Abstract

Despite adolescents' prolific use of social media, relationships between social media and body satisfaction and well-being are not yet well understood, especially among boys. This study tested a sociocultural model of body image within the context of social media among adolescent boys and girls. Specifically, this study examined whether appearance-ideal internalization and social appearance comparisons mediated relationships between social media engagement (intensity and appearance-focused use) and body satisfaction and subjective well-being. Australian adolescents between 11 and 17 years ($N = 1,579$, $M_{age} = 13.45$ years, $SD = 1.15$; 55.4% boys) completed an online survey. Structural equational modelling indicated that only higher appearance-focused social media use was directly associated with lower body satisfaction and well-being. Generally, higher appearance-ideal internalization and comparisons mediated the relationships between higher social media engagement and lower body satisfaction and well-being. Multi-group analyses indicated these relationships were equivalent across gender. Findings supported the proposed model among boys and girls and extend existing theoretical knowledge to encompass male body image and well-being. Interventions which target internalization and comparisons in the context of social media are likely to be valuable in improving body satisfaction and subjective well-being in co-educational settings.

Keywords: Adolescent, Body image, Social media, Sociocultural theory, Structural equation modelling, Subjective well-being

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1. Introduction

1
2 Social media use has increased dramatically in the last decade. Data suggest that 97% of US
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4 adolescents report using at least one social media platform (Anderson & Jiang, 2018). In a study of
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6 over 500 Australian adolescents, participants reported spending approximately three hours per day
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8 on social media (Mingoia, Hutchinson, Gleaves, & Wilson, 2019). Such extensive social media use
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10 means it is now an integral part of adolescent life and development. However, elevated levels of
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12 social media use are associated with lower body satisfaction and well-being among adolescents
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14 (Orben, Dienlin, & Przybylski, 2019; Saiphoo & Vahedi, 2019). Consequently, not only is it essential to
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16 understand the role of social media use for adolescents' development, but also the contributing
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18 mechanisms. This knowledge will inform interventions which may empower adolescents to use
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20 social media positively. This study tested a cross-sectional model examining potential mechanisms of
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22 the relationships between social media use and body satisfaction and subjective well-being among
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24 adolescent boys and girls.
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1.1. Social Media and Body Satisfaction

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32 Body image is defined as subjective thoughts and feelings experienced in relation to one's
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34 appearance (Grogan, 2016). Body satisfaction is an aspect of body image that primarily reflects
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36 satisfaction with appearance. Although research has mostly described the relationship between
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38 social media and body dissatisfaction, we will refer to body satisfaction for consistency with the
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40 other construct of interest, well-being. Research suggests that, as social media typically presents
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42 appearance-focused content, with users often portraying an idealized version of their appearance
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44 and life which is difficult to emulate, frequent social media users are at risk of lower body
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46 satisfaction (Perloff, 2014). While cross-sectional research supports an inverse association between
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48 time spent on social media and body satisfaction among adolescent boys and girls (e.g., Saiphoo &
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50 Vahedi, 2019), only a few studies have examined this relationship prospectively to provide support
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52 for a causal relationship. Tiggemann and Slater (2017) found that a greater number of Facebook
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54 friends, an indicator of social media engagement, predicted an increase in drive for thinness two
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years later among Australian adolescent girls. Similarly, de Vries, Peter, de Graaf, and Nikken (2016) found that higher time spent on social media predicted lower body satisfaction among adolescent boys and girls 18-months later. These findings suggest that elevated time spent on social media has a small, but significant, negative impact on adolescents' body satisfaction.

1.2. Social Media and Well-Being

Subjective well-being refers to cognitive and affective evaluations of one's life, including satisfaction across a number of domains (Lopez, Snyder, Diener, Oishi, & Lucas, 2009). Relative to other well-being indices, such as self-esteem, loneliness and depression, subjective well-being has received less research attention within the social media literature (Huang, 2017) and, therefore, warrants further exploration. In the present study, we focus specifically on life satisfaction as our measure of subjective well-being, as previous studies have done (e.g., Twigg, Duncan, & Weich, 2020). Therefore, any reference to well-being made in the present study is referring to life satisfaction, unless otherwise stated. As with body satisfaction, it has been proposed that frequent exposure to images of the idealized lives of others on social media instils dissatisfaction with one's own life circumstances among adolescents (Weinstein, 2017). However, research examining the relationships between social media use and well-being have produced mixed findings. Some have found that more time spent on social media is associated with positive well-being among university (Valenzuela, Park, & Kee, 2009) and high school students (Lai, Hsieh, & Zhang, 2018), while others have reported the opposite relationship among university students (e.g., Chou & Edge, 2012).

Repeated assessment of well-being and Facebook use over a two-week period found that higher Facebook use predicted reductions in well-being immediately and two-weeks later in young adults (Kross et al., 2013). Of the limited prospective literature, time spent on social media has been found to predict slight decreases in well-being in a large-scale representative study of British adolescents (Orben et al., 2019). Systematic reviews have demonstrated the complexities of the relationship, indicating both positive, for example increased social support, and negative, for example exposure to cyberbullying, impacts on well-being (Best, Manktelow, & Taylor, 2014; Erfani & Abedin, 2018).

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1 One shortcoming of the literature is the lack of consideration or application of theoretical
2 frameworks as a way to determine the role of social media in shaping well-being (Erfani & Abedin,
3 2018; McCrory, Best, & Maddock, 2020), and only a handful of studies have sought to understand
4 the mechanisms within this relationship (Frison & Eggermont, 2016). Taken together, the literature
5 examining the relationship between social media use and well-being is complex and inconclusive,
6 indicating the need for further investigation.
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1.3. Types of Social Media Use

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17 Inconsistencies within the literature may be explained by several factors. First, social media
18 use has been operationalized and measured in numerous ways. Most commonly, research has
19 examined time spent on social media, often as frequency or duration of use (Sampasa-Kanyinga &
20 Lewis, 2015). However, this approach does not capture the richness of the user's experience as an
21 individual may spend considerable time on social media, yet not feel emotionally tied to or invested
22 in social media, and vice versa. Social media investment may capture intensity; the extent to which
23 an individual feels emotionally connected to social media and its integration in their daily life
24 (Ellison, Steinfield, & Lampe, 2007). Consequently, it has been suggested that social media
25 investment and activities may be of greater importance than time spent (Verduyn, Ybarra, Resibois,
26 Jonides, & Kross, 2017).
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41 Additional measurement issues relate to the assessment of type of social media platform
42 used and the nature of social media activities. Research has generally focused on engagement with
43 Facebook (Verduyn et al., 2017). However, the social media environment is rapidly evolving,
44 requiring research foci to adapt to this shifting environment. For example, Facebook use among
45 adolescents has decreased, alongside an increase in newer platforms such as Instagram and
46 Snapchat (Anderson & Jiang, 2018). Further, with the increasing popularity of these more visually
47 based platforms, appearance-focused activities have become common, including photo-based
48 activities such as posting, sharing, viewing, or commenting on photos, in addition to following
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1 appearance-focused accounts (e.g., models and fitness bloggers). Systematic reviews and meta-
2 analysis have identified appearance-focused social media activities to be particularly detrimental to
3 body satisfaction and well-being (Holland & Tiggemann, 2016; Saiphoo & Vahedi, 2019). Moving
4 beyond time spent on specific social media platforms, particularly Facebook, to examine intensity
5 and appearance-focused use may provide a richer understanding of the impact of social media use
6 on adolescents.
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1.4. Adolescence

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17 Today's adolescents are the first generation to have grown up in a fully digital era. As in the
18 US and UK (Anderson & Jiang, 2018; Booker, Kelly, & Sacker, 2018), Australian adolescents report
19 spending approximately three hours per day on social media (Mingoia et al., 2019), making it a
20 crucial part of their lives and development (Australian Psychological Society, 2017). Simultaneously,
21 adolescence is a critical period where individuals are more vulnerable to external influences, such as
22 social media, which may place them at a higher risk of developing poor body satisfaction and well-
23 being (Rodgers, 2016). The role of peers becomes particularly important during adolescence, with
24 heightened pressure to conform and fit in with peers. How they are perceived by others is extremely
25 important and adolescents are highly vulnerable to interpersonal and social evaluations of the self
26 (Nesi, Choukas-Bradley, & Prinstein, 2018). The interactive nature of social media allows for
27 feedback, including likes and comments, which has been found to impact Australian adolescent girls'
28 well-being (Jong & Drummond, 2016). Puberty may also heighten appearance concerns and diminish
29 well-being as adolescents experience changes to their body weight and shape and mood (Lewis-
30 Smith, Bray, Salmon, & Slater, 2020). Given Australian adolescents prolific use and their potential
31 vulnerability for poor body satisfaction and well-being, it is imperative that scholars examine the
32 impact social media use may have on this population.
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1.5. Tripartite Influence Model of Body Image

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2 Our investigation into mechanisms linking social media use and body satisfaction and well-
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4 being was guided by the well-established tripartite influence model (Thompson, Heinberg, Altabe, &
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6 Tantleff-Dunn, 1999), which stipulates that appearance ideals are presented and reinforced through
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8 three primary sociocultural channels; media, parents, and peers. These influences impact the
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10 development and maintenance of body dissatisfaction and psychological functioning through two
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12 pathways: internalization of appearance ideals (the extent to which an individual personally adopts
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14 socially defined appearance ideals) and social appearance comparisons (the tendency to compare
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16 one's physical appearance with that of another). According to the theory, exposure to sociocultural
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18 influences (e.g., media) will increase the likelihood that an individual will adopt appearance ideals as
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20 their personal standard and contribute to a greater tendency to make social appearance
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22 comparisons with such images. Due to the unrealistic nature of appearance ideals, an individual who
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24 compares themselves with these standards will likely feel that they do not match up to the
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26 appearance ideal, resulting in lower levels of body satisfaction and psychological functioning. These
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28 pathways have received cross-sectional and prospective support among adolescent samples (Keery,
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30 van den Berg, & Thompson, 2004; Papp, Urban, Czegledi, Babusa, & Tury, 2013; Rodgers, McLean, &
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32 Paxton, 2015).

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35 In Western culture appearance ideals typically focus on thinness and leanness as well as
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37 muscularity, both of which have been identified as key factors among boys (Rodgers, Ganchou,
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39 Franko, & Chabrol, 2012) and girls (Rodgers et al., 2017). Revisions to the tripartite influence model
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41 now account for these gender-based appearance ideals, specifically thin- and muscular-ideal
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43 internalization (Girard, Chabrol, & Rodgers, 2017). To ensure that the tripartite influence model
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45 remains current for both boys and girls, the addition of both thin- and muscular-ideal internalization
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47 is important, as is attention to social media intensity and appearance-focused use.
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1.6. The Tripartite Influence Model Applied to Social Media Use

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2 The tripartite influence model has been applied extensively to understanding the role of
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4 traditional media use on body image. Social media provides an additional and important avenue for
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6 disseminating appearance ideals, as well as seemingly endless opportunities for social and
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8 appearance comparisons (Fardouly & Vartanian, 2015; Holland & Tiggemann, 2016). Thus, the
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10 relevance of this model within a social media context requires investigation. Empirical support has
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12 been demonstrated for components of the model as applied to social media. Specifically, among
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14 young people, cross-sectional and prospective support for the relationships between higher social
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16 media use and higher internalization (Mingoia, Hutchinson, Wilson, & Gleaves, 2017; Rodgers et al.,
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18 2020; Tiggemann & Slater, 2013) and social and appearance comparisons (Fardouly, Diedrichs,
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20 Vartanian, & Halliwell, 2015; Rousseau, Eggermont, & Frison, 2017) exists. However, examination of
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22 the integrated model within a social media context in adolescents has not yet been studied.
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29 Although the tripartite influence model has primarily been examined in relation to body
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31 image, in earlier cross-sectional research empirical support was presented for the inclusion of
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33 psychological functioning as an outcome variable (Keery et al., 2004). Well-being may be considered
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35 an indicator of psychological functioning. Although psychological functioning has previously been
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37 included in the model as an outcome of body dissatisfaction, one might theoretically argue that
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39 internalization and comparisons are likely to mediate the relationship between social media use and
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41 well-being. Specifically, greater internalization may reinforce higher appearance and societal
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43 standards, and engaging in comparisons, specifically social and appearance comparisons, may result
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45 in negative self-evaluations and poorer well-being. Despite initial evidence to support such
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47 associations in children and adults (Easterbrook, Wright, Dittmar, & Banerjee, 2014; Gerson, Plagnol,
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49 & Corr, 2016), research is yet to explore the mediating role of appearance-ideal internalization and
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51 comparisons on the relationship between social media and well-being. Extending the tripartite
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53 influence model to include well-being may extend theoretical frameworks within the literature and
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55 provide greater understanding and clarity to the role of social media use in shaping well-being.
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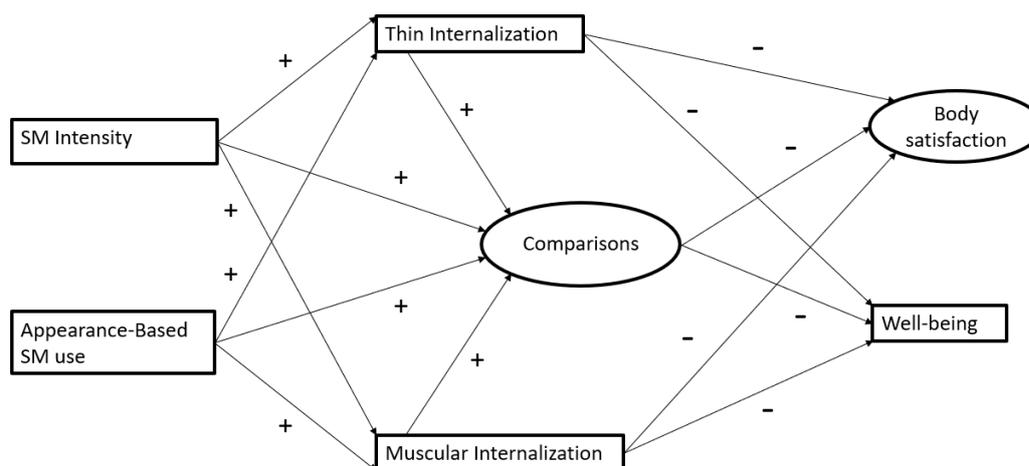
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Girls typically spend more time on social media than boys (Booker et al., 2018; Vannucci & Ohannessian, 2019) and engage in more appearance-focused social media use and appearance comparisons (Mingoia et al., 2019). However, research suggests that the nature of the relationships between social media use and body satisfaction and well-being is similar in boys and girls (de Vries et al., 2016; Kross et al., 2013; Rousseau et al., 2017; Vannucci & Ohannessian, 2019; Wang, Fardouly, Vartanian, & Lei, 2019). Consistent with this, theoretical and empirical research support the relevance of the tripartite influence model among adolescent boys and girls (Papp et al., 2013; Rodgers et al., 2015).

1.7. Research Aim and Hypotheses

The present study tested a modified version of the tripartite influence model within a social media context, incorporating well-being as an additional outcome (see Figure 1). Although the tripartite influence model typically considers the influence of the media, parents and peers, the current study will focus specifically on the influence of (social) media. We predicted that this model would demonstrate good fit across adolescent boys and girls. Specifically, higher social media use, operationalized as social media intensity and appearance-focused use, will be associated with higher thin- and muscular-ideal internalization and higher social and appearance comparisons (hypothesis 1). Higher thin- and muscular-ideal internalization and higher social and appearance comparisons will be associated with lower body satisfaction and well-being (hypothesis 2). Higher social media use will be directly and indirectly associated with lower body satisfaction and well-being, through thin- and muscular-ideal internalization and social and appearance comparisons (proposed mediators; hypothesis 3). Finally, we hypothesized that these relationships will be equivalent between adolescent boys and girls (hypothesis 4).

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Note. SM = social media; Ovals represent latent constructs; + = positive association, - = negative association.

Fig. 1. Proposed model of the relationships between social media use, appearance-ideal internalization, comparisons, body satisfaction and well-being

2. Materials and Methods

2.1. Participants

A total of 1,899 adolescents from two private, co-educational secondary schools in metropolitan Melbourne, Australia, were invited to participate in a longitudinal study examining social media use and body image and well-being. Data in the present study are from the first wave of data collected. Of all invited participants, only a small number of parents requested that their child not take part ($n = 35$; 1.84% opt-out rate). Data were collected in 2019 from 1,579 adolescents in grades 7-10 ($M_{age} = 13.45$ years, $SD = 1.15$, range = 11-17). Several students were absent from school during data collection ($n = 260$) and a further 25 students chose not to participate without giving a reason. Students were eligible to participate in the study if they were in grades 7-10 and were proficient in English. No exclusion criteria were applied. Of the sample, 875 identified as male (55.41%), 652 identified as female (41.29%), 16 identified as 'other' (mostly irrelevant responses; 1.01%), and 36 participants selected 'prefer not to say' (2.28%). Participants who identified as 'other'

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were asked to provide further information in an open-ended text box. Of these, only one participant identified as non-binary and all other responses were deemed inappropriate (e.g., ‘attack helicopter’) by the authors. The majority of participants were born in Australia or New Zealand (85.55%), followed by Asia (8.27%), Europe (3.88%) and other countries (2.30%). Participants’ parents were born in Australia or New Zealand (mothers: 68.84%; fathers: 70.29%), followed by Asia (mothers: 14.66%; fathers: 11.09%), Europe (mothers: 9.99%; fathers: 11.99%) and other countries (mothers: 6.52%; fathers: 6.63%). Participants’ home postcode was used to calculate a score of relative socioeconomic advantage and disadvantage (Australian Bureau of Statistics, 2018). Scores ranged from 1 (most disadvantaged) to 10 (most advantaged), with a mean of 9.30 ($SD = 1.14$). This was expected due to the demographic profile of the two schools.

2.2. Measures

2.2.1. Demographic information. Participants self-reported age, gender, school year, home postcode, and country of birth (self and parent).

2.2.2. Social media use. Participants were asked if they had a social media profile (yes, no). If participants answered “no” ($n = 147$), there were no further questions about social media use, if “yes” they completed further items.

2.2.2.1. Social media intensity. Social media intensity and salience was assessed with four items from the Facebook Intensity Scale (Ellison et al., 2007), adapted to denote general, as opposed to site specific, social media investment. Two items were excluded given the modification for general social media assessment made the Facebook friends’ item invalid and the additional social media scale (described below) collected time spent on social media. Participants responded to items, such as “Social media is part of my everyday activity” on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). Item responses were averaged, with higher scores representing greater social media intensity. Internal reliability was high (overall sample $\alpha = .83$; boys $\alpha = .83$; girls $\alpha = .82$), and

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consistent with previous research suggesting good internal consistency, 2-week test-retest reliability, and structural validity among adolescents (Li et al., 2016).

2.2.2.2. Appearance-focused social media use. Participants also self-reported frequency of Snapchat and Instagram use on a 5-point scale (1 = *never*, 5 = *always*). These platforms are two of the most popular social media platforms among Western adolescents (Anderson & Jiang, 2018). Frequency of Instagram and Snapchat use were averaged ($r_s = .40$) to represent appearance-focused social media use.

2.2.3. Body satisfaction. Three measures of body satisfaction were used. A modified version of the Body Shape Satisfaction Scale (Pingitore, Spring, & Garfield, 1997) measured body satisfaction with specific body parts. The original 10-item scale asks participants to rate how satisfied they are with a list of physical features. Four additional items were added to ensure relevance among adolescent boys (chest, muscles, overall body fat, hair). Participants' responded on a 5-point scale (1 = *very dissatisfied*, 5 = *very satisfied*). Item responses were summed, with higher scores representing greater body shape satisfaction. Scores on the original scale have demonstrated discriminant, convergent, and predictive validity as well as 2-week test-retest reliability among adolescents (Bucchianeri, Arikian, Hannan, Eisenberg, & Neumark-Sztainer, 2013; Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006). Internal reliability in the current study was high (overall sample $\alpha = .95$; boys $\alpha = .95$, girls $\alpha = .95$).

The Appearance Esteem subscale of the Body Esteem Scale (Mendelson, Mendelson, & White, 2001) was used to assess appearance esteem. The scale has 10-items which ask participants to report how often statements about their appearance apply to them (e.g., "I'm pretty happy about the way I look"). Participants responded on a 5-point scale (1 = *never*, 5 = *always*). Item responses were averaged. Higher scores reflect greater appearance esteem. Scores on the subscale have demonstrated acceptable internal consistency, test-retest reliability, and structural and convergent

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validity among adolescent boys and girls (Kling et al., 2019; Mendelson et al., 2001). Internal reliability in the current study was high (overall sample $\alpha = .90$; boys $\alpha = .88$, girls $\alpha = .92$).

Two-items from the Weight and Shape subscales of the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994) measured overvaluation of weight and shape. Participants reported how often over the past 28 days their weight and shape had influenced their self-concept (e.g., “Has your weight influenced how you think about (judge) yourself as a person?”). Participants responded on a 7-point scale (1 = *not at all*, 7 = *markedly/a lot*). Item responses were averaged, then reversed to be consistent with the other body satisfaction measures. Higher scores represent lower overvaluation of weight and shape. Acceptable internal consistency has been demonstrated among adolescent girls for this two-item measure (McLean, Paxton, Wertheim, & Masters, 2015). Spearman-Brown coefficient was high (overall sample $r_s = .92$; boys $r_s = .91$, girls $r_s = .90$).

2.2.4. Well-being. The 5-item Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) measured well-being. It included items such as “I am satisfied with my life”, to which participants responded on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*). Item responses were averaged, with higher scores representing greater life satisfaction. Scores on this measure have demonstrated good construct validity and reliability among adolescents (Proctor, Linley, & Maltby, 2009). Internal reliability in the current study was high (overall sample $\alpha = .92$; boys $\alpha = .90$, girls $\alpha = .93$).

2.2.5. Internalization of appearance ideals. Internalization of the thin-ideal was assessed using the Thin/Low Body Fat subscale of the Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4; Schaefer et al., 2015) which contains 5-items (e.g., “I want my body to look very thin”). Items were modified to ensure that participants understood they were referring to appearance ideals; specifically, the text “like celebrities and models” accompanied each item, “I want my body to look like it has little fat (e.g., like celebrities and models)”. All participants

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1 responded on a 5-point scale (1 = *definitely disagree*, 5 = *definitely agree*). Item responses were
 2 averaged; higher scores represent greater thin-ideal internalization. Scores on the SATAQ-4 have
 3 demonstrated excellent reliability and good convergent validity among adults (Schaefer et al., 2015)
 4 and good reliability among adolescents (Halliwell, Jarman, McNamara, Risdon, & Jankowski, 2015;
 5 McLean et al., 2015). Internal reliability in the current study was high (overall sample $\alpha = .91$; boys α
 6 = .88, girls .92).

14 Internalization of the muscular-ideal was assessed using the Muscular subscale of the
 15 SATAQ-4R-Male (Schaefer, Harriger, Heinberg, Soderberg, & Thompson, 2017) which contains 4-
 16 items (e.g., “It is important for me to look muscular”). As above, items were modified whereby “like
 17 sports stars and fitspiration posts” accompanied each muscular item, “I think a lot about looking
 18 muscular (e.g., like sports stars and fitspiration posts)”. All participants responded on a 5-point scale
 19 ranging from (1 = *definitely disagree*, 5 = *definitely agree*). Item responses were averaged, with
 20 higher scores representing greater muscular-ideal internalization. Scores on the SATAQ-4R-Male
 21 have demonstrated good reliability and construct validity among young men (Schaefer et al., 2017).
 22 Internal reliability in the current study was high (overall sample $\alpha = .93$; boys $\alpha = .92$, girls .93).

37 **2.2.6. Social and appearance comparisons on social media.** Three measures assessed social
 38 and appearance comparisons. The text “on social media” was added to all comparison measures to
 39 capture comparisons that occurred on social media. A single item scale (Lee, 2014) assessed
 40 frequency of comparisons (“I think I often compare myself with others on social media”).
 41 Additionally, negative social comparisons were assessed using three items (e.g., “On social media, I
 42 often think that others are doing better than me”; Frison & Eggermont, 2016; Lee, 2014).
 43 Participants responded to these measures on a 5-point scale (1 = *strongly disagree*, 5 = *strongly*
 44 *agree*). Responses to these three items were averaged, with higher scores representing a greater
 45 tendency to engage in negative social comparisons on social media. Scores on the original items
 46 have demonstrated acceptable internal consistency among adolescent boys and girls (Frison &
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1 Eggermont, 2016). Internal reliability in the current study was high (overall sample $\alpha = .87$; boys $\alpha =$
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.87, girls .85).

Five items from the Upward Physical Appearance Comparison Scale (O'Brien et al., 2009) were used to assess tendency to make upward appearance comparisons. Participants responded to items (e.g., "On social media, I tend to compare myself to people I think look better than me") on a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). Responses to items were averaged, with higher scores representing a greater tendency to engage in upward appearance comparisons on social media. Scores on these five items have demonstrated high construct validity and internal validity among adolescent girls (McLean, Paxton, & Wertheim, 2016). Reliability in the current study was very high (overall sample $\alpha = .97$; boys $\alpha = .97$, girls .97). The single-item frequency of social media comparisons was positively and strongly correlated with the social ($r_s = .63, p < .001$) and appearance ($r_s = .76, p < .001$) comparison scales, indicating convergent validity of these measures.

2.3. Procedure

Ethics approval was attained from the [name redacted for blind review] Human Ethics Committee (HEC18424). School principals were given information about the study and invited to participate. Informed, opt-out parental consent and active participant assent was obtained. Students in grade 7-10 who had not been opted out by their parents were invited to complete an online questionnaire via Qualtrics. Questionnaires were completed during normal class time under the supervision of a teacher and a trained researcher. To ensure privacy, students were spaced out as much as possible in their classroom and the class teacher and research ensured students were not interacting or viewing others' screens. The questionnaire took approximately 30 minutes to complete. Participants completed the measures in the order described above.

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2.4. Data Analytical Plan

2.4.1. Data preparation and preliminary analyses

Data were assessed for normality and univariate outliers. The data were not normally distributed, and transformations did not restore normality; therefore, non-parametric analyses were performed. The frequency of missing data across each outcome was moderate (0-12.2%), consistent with empirical research with adolescents (Diedrichs et al., 2015; Vannucci & Ohannessian, 2019). Little's missing completely at random (MCAR) test was performed (Little, 1988) and produced non-significant results ($p > .05$), suggesting that the data were missing completely at random. Of the sample, 147 adolescents (9.3%) reported that they did not use social media. Subsequently, these participants were excluded from the analyses. The final sample comprised 1,432 participants. A sensitivity analysis delivered 80% power to detect a true correlation $\rho > .074$ for our sample ($n = 1,432$). Mean scores, standard deviations and zero-order Spearman correlations were calculated to assess associations between variables.

2.4.2. Main analyses

The proposed model was examined using structural equational modelling (SEM) in Mplus version 8 (Muthén & Muthén, 2017). As the data were not normally distributed, Maximum Likelihood Robust (MLR) estimator with robust standard errors was used for analyses (Yuan & Bentler, 2000). Body satisfaction and social and appearance comparisons were specified as latent constructs. Given that body image is a multifaceted construct which encompasses a range of elements, the latent construct for body satisfaction was indicated by three body image scales; body shape satisfaction, appearance esteem, and reverse-scored overvaluation with weight and shape. Social media comparisons were indicated by one single-item measure and two scales; frequency, social, and appearance comparisons, respectively. Global fit indices were used to determine the goodness-of-fit of the model: chi-square test statistic (χ^2) with degrees of freedom, Comparative Fit Index (CFI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of

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Approximation (RMSEA). Excellent model fit is indicated when $CFI > .95$, $SRMR < .05$, and $RMSEA < .08$ (Hu & Bentler, 1999).

To establish the robustness of indirect effects within the model, 10,000 bootstrap samples with 95% bias-corrected bootstrap CIs were estimated (Mackinnon, Lockwood, & Williams, 2004). If the CI of the indirect effect does not include zero, we can reject the null hypothesis and infer support for the indirect effect. Given the large number of indirect effects, the Benjamini-Hochberg procedure for adjusted significance tests (Benjamini & Hochberg, 1995) was used to reduce the risk of Type 1 error.

Finally, to test our hypothesis that the relationships within the model would not be significantly different across gender, we conducted a multigroup SEM. In this analysis we constrained the measurement model, keeping the factor loadings to be equal by boys and girls. Since we were testing whether the structural part of the model was different by gender, all paths were allowed to be freely estimated (as were all intercepts). Wald tests were then used to compare the strength of each path by gender. Participants who did not identify as male or female ($n = 52$) were excluded from the multigroup analyses.

3. Results

3.1. Descriptive Statistics and Correlations

Zero-order correlations are presented in Table 1. The majority of correlations were significant and demonstrated the expected patterns of associations. Specifically, social media use was weakly associated with higher thin- and muscular-ideal internalization and lower body satisfaction and well-being and moderately associated with comparison variables. Thin-ideal internalization was more strongly associated with all study variables than muscular-ideal internalization, demonstrating medium-large as opposed to small effects. The comparison variables were moderately-strongly associated with lower body satisfaction and well-being. All three body satisfaction variables were moderately-strongly associated with higher well-being. Only two of the

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Table 1*Mean, Standard Deviations, Theoretical Score Range, and Zero-Order Spearman's Correlations*

	<i>M (SD)</i>	Range	1	2	3	4	5	6	7	8	9	10
1. Social media intensity	3.38 (0.80)	1-5	-									
2. Appearance-focused social media use	3.36 (1.09)	1-5	.54**	-								
3. Muscular internalization	2.58 (1.10)	1-5	.17**	.11**	-							
4. Thin internalization	2.50 (1.05)	1-5	.22**	.18**	.29**	-						
5. Frequency of comparisons	2.31 (1.23)	1-5	.32**	.27**	.16**	.48**	-					
6. Social comparisons	2.36 (1.05)	1-5	.30**	.22**	.17**	.44**	.63**	-				
7. Appearance comparisons	2.21 (1.17)	1-5	.31**	.30**	.21**	.55**	.76**	.70**	-			
8. Body shape satisfaction	50.21 (13.02)	14-70	-.13**	-.07*	.03	-.32**	-.33**	-.37**	-.41**	-		
9. Appearance esteem	3.49 (0.09)	1-5	-.21**	-.18**	-.06*	-.48**	-.49**	-.52**	-.60**	.65**	-	
10. Overvaluation of weight and shape ^a	5.24 (1.87)	1-7	-.22**	-.16**	-.16**	-.46**	-.48**	-.46**	-.53**	.45**	.57**	-
11. Well-being	5.34 (1.38)	1-7	-.11**	-.06*	-.02	-.21**	-.26**	-.44**	-.34**	.52**	.50**	.31**

Note. * $p < .05$, ** $p < .001$. ^a Reverse-scored; *M* = mean, *SD* = standard deviation

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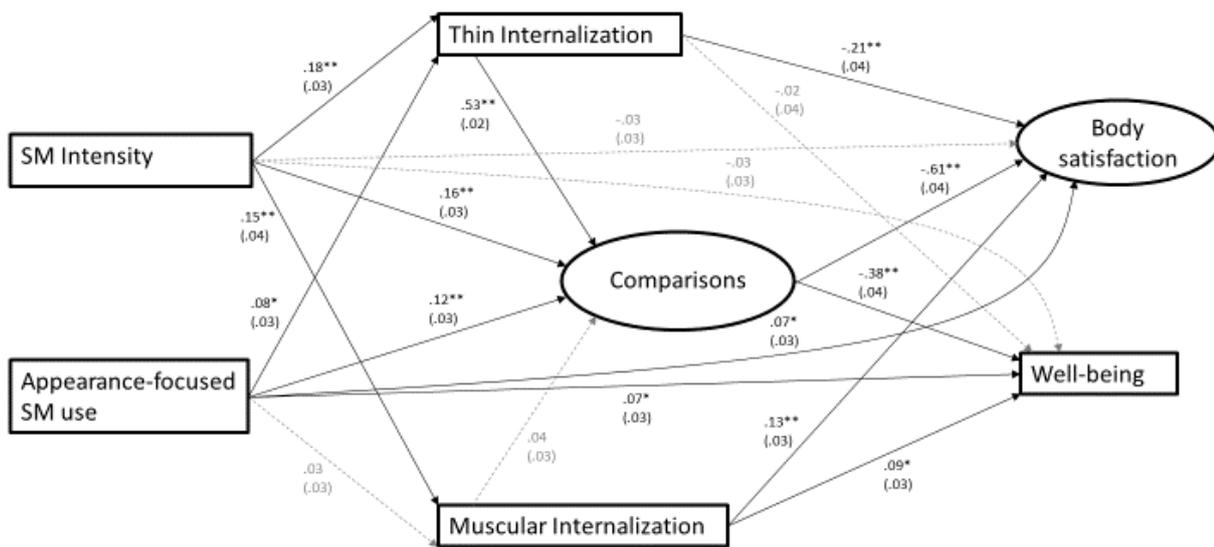
relationships did not meet statistical significance; muscular-ideal internalization with both body satisfaction and well-being. Although other associations were statistically significant their effect size indicated negligible relationships ($r_s < .10$).

3.2. Model Testing

Our proposed model was examined and suggested an excellent “approximate fit” of the model ($\chi^2 (28) = 210.54, p < .001, CFI = .95, SRMR = .04, RMSEA = .07 [90\% CI = .06, .08]$)¹. Figure 2 displays the standardized path coefficients and standard errors in parentheses. Overall, the model explained 53.6% of the variance for body satisfaction and 14.8% of the variance for well-being. Social media intensity was positively associated with thin- and muscular-ideal internalization and social and appearance comparisons. Appearance-focused social media use was positively associated with thin-ideal internalization, social and appearance comparisons, body satisfaction and well-being. Thin-ideal internalization was positively associated with social and appearance comparisons and negatively associated with body satisfaction. Social and appearance comparisons were negatively associated with body satisfaction and well-being. Most of these associations were in the hypothesized direction, with the exception of muscular-ideal internalization with body satisfaction and with well-being which, contrary to our predictions, were positive.

¹ The model was also tested in the reverse direction. This reversed model suggested poor fit: $\chi^2 (29) = 599.03, p < .001 (CFI = .87, SRMR = .12, RMSEA = .12 [90\% CI = .11, .12])$, which supports the proposed direction of the original model.

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Note. SM = social media; Ovals represent latent constructs; Dashed lines represent non-significant paths; $*p < 0.05$, $**p < 0.001$.

Fig. 2. Structural equation model assessing the mechanisms of social media use on body satisfaction and well-being

Table 2 displays only the significant indirect effects. A full list of indirect effects is available as a supplementary table. The findings indicated that the relationship between social media intensity and body satisfaction was mediated by: thin-ideal internalization; muscular-ideal internalization; social and appearance comparisons; and thin-ideal internalization and social and appearance comparisons. The relationship between social media intensity and well-being was mediated by: muscular-ideal internalization; social and appearance comparisons; and thin-ideal internalization and social and appearance comparisons. For appearance-focused social media use, the indirect effects to body satisfaction were mediated by: thin-ideal internalization; social and appearance comparisons; and both thin-ideal internalization and social and appearance comparisons. Finally, the relationship between appearance-focused social media use and well-being was mediated by: social and appearance comparisons; and thin-ideal internalization and social and appearance comparisons.

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All significant indirect effects were maintained following the Benjamin-Hochberg procedure for adjusted significance tests (Benjamini & Hochberg, 1995).

Table 2

Significant Indirect Effects After Bootstrapping from Social Media Intensity/Appearance-Focused Social Media Use to Body Satisfaction/Well-Being

Indirect path	β	SE	95% CI
SM intensity > Thin internalization > Body satisfaction	-.04**	.01	-.06, -.02
SM intensity > Muscular internalization > Body satisfaction	.02*	.01	.01, .04
SM intensity > Comparisons > Body satisfaction	-.10**	.02	-.14, -.06
SM intensity > Thin internalization > Comparisons > Body satisfaction	-.06**	.01	-.09, -.04
SM intensity > Muscular internalization > Well-being	.01*	.01	.01, .03
SM intensity > Comparisons > Well-being	-.06**	.01	-.09, -.04
SM intensity > Thin internalization > Comparisons > Well-being	-.04**	.01	-.06, -.02
Appearance-focused SM > Thin internalization > Body satisfaction	-.02*	.01	-.04, -.00
Appearance-focused SM > Comparisons > Body satisfaction	-.07**	.02	-.02, -.04
Appearance-focused SM > Thin internalization > Comparisons > Body satisfaction	-.03*	.01	-.05, -.01
Appearance-focused SM > Comparisons > Well-being	-.04**	.01	-.07, -.02
Appearance-focused SM > Thin internalization > Comparisons > Well-being	-.02*	.01	-.03, -.00

Note. SM = social media. * $p < .05$, ** $p < .001$

The multigroup analyses demonstrated that, in general, the strength of each path did not significantly differ by gender (all were at $p > .10$), with two exceptions: thin-ideal internalization and comparisons (Wald = $-.31$, SE = $.06$, $p \leq .001$) and appearance-focused social media use and muscular-ideal internalization (Wald = $.13$, SE = $.07$, $p = .04$). However, only the relationship between thin-ideal internalization and comparisons was maintained when the Benjamini-Hochberg procedure of adjusted significance tests was used to reduce the risk of Type 1 error. Our findings, therefore,

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suggest overall homogeneity in our structural model across gender². These findings indicate that the relationships within the model were largely consistent between boys and girls.

4. Discussion

The present study tested a modified version of the tripartite influence model within a social media context among adolescents. Our proposed model, which hypothesized that higher intensity of social media and appearance-focused use would relate to lower body satisfaction and lower well-being directly and indirectly through higher thin- and muscular-ideal internalization and social and appearance comparisons, was partially supported. The model pathways were largely consistent across gender, providing support for the relevance of the model within a social media context among adolescent boys and girls.

Our first hypothesis, that higher social media use would be associated with higher appearance-ideal internalization and comparisons, received partial support. Although social media intensity and appearance-focused use were positively associated with thin-ideal internalization and social and appearance comparisons, the relationship with muscular-ideal internalization varied according to the social media measure. Specifically, social media intensity, but not appearance-focused use, was positively associated with muscular-ideal internalization and thus a unique predictor of muscular-ideal internalization. That appearance-focused use was not a unique predictor of muscular-ideal internalization may be considered in the context of the measure for this variable which assessed frequency of using Instagram and Snapchat. Although one might assume that these sites present appearance-focused content (Rodgers & Melioli, 2016), it is possible that there is more variability in the images that adolescents are exposed, including content among peers which is not related to appearance or muscularity (e.g., food, nature, animals), which may account for our

² When the model was examined by gender, it demonstrated excellent fit among both samples:
 Boys - $\chi^2(28) = 102.04, p < .001, CFI = .96, SRMR = .04, RMSEA = .06; 90\% CIs [.05, .07].$
 Girls - $\chi^2(28) = 144.60, p < .001, CFI = .94, SRMR = .04, RMSEA = .09; 90\% CIs [.07, .10].$

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1 unexpected findings. It may also be that muscular ideals are underrepresented on social media
2 platforms such as Instagram and Snapchat, which are more prevalent among girls than boys
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4 (Anderson & Jiang, 2018). However, it is important to note that the effects between social media use
5
6 and appearance-ideal internalization were notably small. Future research should explore a range of
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8 distinct social media use measures to understand the impact of these more clearly.
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12 Thin-ideal internalization was inversely associated with body satisfaction but not well-being,
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14 providing partial support for our second hypothesis. Although the relationship between
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16 internalization and body satisfaction is well established in adolescent girls (Rodgers et al., 2015),
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18 little research has examined the relationship between internalization and well-being, with one study
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20 having found that internalization of consumer culture ideals inversely predicted well-being among
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22 children (Easterbrook et al., 2014). Perhaps subjective well-being is more closely tied to other life
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24 circumstances, such as family and peer relationships or academic success, and so is relatively
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26 independent of appearance ideals. More research is needed to confirm and extend these findings.
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32 Regarding muscular-ideal internalization, our model indicated a small, positive relationship
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34 with body satisfaction and well-being, the direction of which is inconsistent with our prediction and
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36 inconsistent with the direction of the zero-order correlations. It is possible that if ideals are
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38 perceived to be attainable, they may serve to inspire adolescents and motivate them to alter their
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40 appearance or life, resulting in positive impact on body image and well-being (de Lenne,
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42 Vandenbosch, Eggermont, Karsay, & Trekels, 2018). In line with this, some research on appearance
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44 comparisons among adults has suggested that men tend to be hopeful that they can achieve
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46 appearance ideals, resulting in higher body esteem (Franzoi et al., 2012). Given that diet culture
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48 often presents exercise as an accessible solution for increased muscularity, this self-hopeful
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50 approach may also be relevant for internalization of muscular ideals, although further research
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52 would be necessary to confirm this. However, inspection of the zero-order correlations revealed that
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54 muscular-ideal internalization was not associated with well-being or body shape satisfaction, and
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1 only weakly negatively associated with the other two body satisfaction variables. One explanation
2 may be that muscular-ideal internalization exerts a unique suppression effect which, when not
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4 accounted for, obscures the relationship between social media use and body satisfaction and well-
5
6 being. Consistent with the literature around suppression effects (Mackinnon, Krull, & Lockwood,
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8 2000), the inclusion of muscular-ideal internalization is likely important as it may provide a more
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10 accurate interpretation of this relationship. Research should continue to explore the role of
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12 muscular-ideal internalization in the relationship between social media use and body satisfaction
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14 and well-being.
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19 Social and appearance comparisons were strongly associated with body satisfaction and
20 well-being, providing partial support for hypothesis 2. The relationships between comparisons and
21 body satisfaction and well-being were stronger than those between thin- and muscular-ideal
22 internalization and body satisfaction and well-being. Within the well-being literature, this finding is
23 novel and may be explained by the inclusion of a range of comparisons, such as social comparisons.
24 When an individual is exposed to social media content, often portraying idealized appearances and
25 lives, it is likely that they will compare themselves against these ideals, resulting in negative self-
26 evaluations. Although not all previous evaluations of the tripartite influence model among
27 adolescents and adults have included social or appearance comparisons (Papp et al., 2013; Tylka,
28 2011), the present study supports the importance and consideration of these comparisons.
29 Furthermore, Fardouly, Pinkus, and Vartanian (2017) found that appearance comparisons made on
30 social media were more detrimental than those made on traditional media and in everyday life
31 among women. Social media users who compare themselves may engage in upward comparisons,
32 particularly given the idealized appearances and lives presented on social media, which will likely
33 lead to detrimental effects on body satisfaction and well-being (Wang, Wang, Gaskin, & Hawk,
34 2017). These findings provide support for the mediating role of social media comparisons between
35 social media use and body satisfaction and well-being among adolescents.
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1 Hypothesis 3 was largely supported. First, appearance-focused social media use was directly
2 associated with body satisfaction and well-being. Contrary to our hypothesis, within the model,
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4 higher appearance-focused social media use was associated with higher body satisfaction and well-
5 being. The reason for this is not clear. As this reflects a cross-sectional association, it is possible that
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7 individuals who are more confident in their appearance may also be more likely to engage in
8
9 appearance-focused social media use, but this possibility would require clarification with further
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11 longitudinal research. Furthermore, the coefficients were very small for this relationship, and the
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13 zero-order correlations demonstrated a negative relationship which, again, points to the possibility
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15 of suppression effects. Social media intensity was not directly associated with either outcome, but
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17 instead found to impact body satisfaction and well-being indirectly through the mediating pathways
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19 of internalization and social and appearance comparisons. Intensity of use may not be detrimental to
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21 body satisfaction or well-being in itself, but when the user engages with certain activities or content,
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23 including appearance-focused content, damaging effects appear. Second, social and appearance
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25 comparisons as a single mediator, and thin-ideal internalization and social and appearance
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27 comparisons as multiple mediators, mediated all pathways between social media use and body
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29 satisfaction and well-being. These findings are consistent with the literature, whereby internalization
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31 (Mingoia et al., 2017; Tiggemann & Slater, 2013) and social and appearance comparisons (Fardouly
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33 et al., 2015; Rousseau et al., 2017) mediate relationships between social media and body satisfaction
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35 and well-being among adolescents and adults. The present study extends past findings by providing
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37 partial support for the mediating pathways within the tripartite influence model in the context of
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39 social media and with the inclusion of well-being. Exploring possible mechanisms that drive this
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41 relationship, such as internalization and social and appearance comparisons, is important to
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43 understanding the role that social media plays on well-being.
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55 When examined across gender, there were very few differences in the relationships within
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57 the model for boys and girls, supporting hypothesis 4. A content analysis by Deighton-Smith and Bell
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59 (2018) found that social media, specifically fitspiration posts, frequently objectify men and women,
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1 which works to perpetuate appearance ideals. Given this, and the prevalence of social media use
2 among both boys and girls (Anderson & Jiang, 2018), exposure to social media will likely be
3
4 associated with increased internalization and comparisons among boys and girls, resulting in
5
6 diminished body satisfaction and well-being. Consequently, it is unsurprising that these relationships
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8 were largely consistent across gender. Only two relationships in the proposed model varied by
9
10 gender. First, in line with previous research (Rodgers et al., 2020), thin-ideal internalization was
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12 more strongly associated with comparisons among girls than boys. Second, appearance-focused
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14 social media use was significantly associated with muscular-ideal internalization only among boys,
15
16 not girls. This latter finding may suggest that social media content presents and reinforces the
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18 muscular ideal among males more so than females (Fatt, Fardouly, & Rapee, 2019). However, the
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20 latter effect was not maintained when the Benjamini-Hochberg procedure for adjusted significance
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22 was applied, therefore should be interpreted with caution.
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29 This study presents a novel investigation of the tripartite influence model adapted to a social
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31 media context among a large sample of both adolescent boys and girls. However, a number of
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33 limitations must be considered. The data were cross-sectional, limiting the interpretation of
34
35 causality. Despite this, fit indices of the reverse model indicated poor fit, providing some support for
36
37 the direction of relationships. Future prospective and experimental methods should examine the
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39 causality of the proposed relationships, also accounting for the potential that relationships are
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41 reciprocal. Finally, while our sample of adolescents was large enough to test a detailed model and
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43 have sufficient power to detect small effects, it consisted of a homogenous group of Australian
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45 students from high socioeconomic backgrounds which may limit generalizability. Further, given that
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47 adolescents are developmentally distinct from younger children and adults, these findings may not
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49 be generalizable among these populations so warrant further study.
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4.1. Conclusions

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2 Findings from the present study have theoretical and practical implications. Our results
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4 confirm the usefulness of a modified version of the tripartite influence model as a meaningful
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6 framework for understanding the mechanisms in the relationships between social media use and
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8 body satisfaction and well-being. In addition, the present study has successfully modified and
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10 extended this model to include well-being and findings suggest that inconsistent relationships (Best
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12 et al., 2014; Erfani & Abedin, 2018) between social media use and well-being may be accounted for
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14 by mechanisms, specifically social and appearance comparisons and, to a lesser extent,
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16 internalization. From a practical perspective, as the final model is largely consistent across gender,
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18 prevention and intervention efforts are likely to be both necessary and relevant within co-
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20 educational settings. Further, our findings suggest that social media intensity and appearance-
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22 focused use, not merely time spent on social media, should be addressed in interventions.
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Supplementary Table

Table 1

All Indirect Effects After Bootstrapping from Social Media Intensity/Appearance-Focused Social Media Use to Body Satisfaction/Well-Being

Indirect path	β	SE	95% CI
SM intensity > Thin internalization > Body satisfaction	-.04**	.01	-.06, -.02
SM intensity > Muscular internalization > Body satisfaction	.02*	.01	.00, .04
SM intensity > Comparisons > Body satisfaction	-.10**	.02	-.14, -.06
SM intensity > Thin internalization > Comparisons > Body satisfaction	-.06**	.01	-.09, -.04
SM intensity > Muscular internalization > Comparisons > Body satisfaction	-.00	.00	-.01, .00
SM intensity > Thin internalization > Well-being	-.00	.01	-.02, .01
SM intensity > Muscular internalization > Well-being	.01*	.01	.01, .03
SM intensity > Comparisons > Well-being	-.06**	.01	-.09, -.04
SM intensity > Thin internalization > Comparisons > Well-being	-.04**	.01	-.06, -.02
SM intensity > Muscular internalization > Comparisons > Well-being	-.00	.00	-.01, .00
Appearance-focused SM > Thin internalization > Body satisfaction	-.02*	.01	-.04, -.00
Appearance-focused SM > Muscular internalization > Body satisfaction	.00	.01	-.00, .01
Appearance-focused SM > Comparisons > Body satisfaction	-.07**	.02	-.02, -.04
Appearance-focused SM > Thin internalization > Comparisons > Body satisfaction	-.03*	.01	-.05, -.01
Appearance-focused SM > Muscular internalization > Comparisons > Body satisfaction	-.00	.00	-.00, .00
Appearance-focused SM > Thin internalization > Well-being	-.00	.00	-.01, .00
Appearance-focused SM > Muscular internalization > Well-being	.00	.00	-.00, .01
Appearance-focused SM > Comparisons > Well-being	-.04**	.01	-.07, -.02
Appearance-focused SM > Thin internalization > Comparisons > Well-being	-.02*	.01	-.03, -.00
Appearance-focused SM > Muscular internalization > Comparisons > Well-being	.00	.00	-.00, .00

Note. SM = social media. * $p < .05$, ** $p < .001$

SOCIAL MEDIA ENGAGEMENT

Author contributions:

Hannah Jarman: Conceptualization, Formal analysis, Investigation, Methodology, Data Curation, Project administration, Software, Visualization, Writing - original draft.

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