# The longitudinal and reciprocal relationships between selfie-related behaviors and self-objectification and appearance concerns among adolescents

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## Abstract

A few cross-sectional studies have found that selfie-related behaviors have positive associations with self-objectification or appearance concerns, but little is known about whether bidirectional relationships exist between selfie behaviors and these body-related variables over time. The present study examined the reciprocal relationships between

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selfie-related behaviors and both self-objectification and appearance concerns among adolescents using a longitudinal design. Chinese adolescent boys and girls completed questionnaires at baseline and at 6-month follow-up. The key constructs included selfie-posting, selfie-editing, selfie-viewing, self-objectification, facial dissatisfaction, and body dissatisfaction. Results indicated that selfie-editing, but not selfie-posting, predicted increases in adolescents' self-objectification and appearance concerns (both body and face) over time. Selfie-viewing predicted increases in self-objectification and facial dissatisfaction, but not body dissatisfaction over time. In the other direction, adolescents' antecedent levels of self-objectification predicted increases in subsequent selfie-related behaviors. In addition, adolescents' facial dissatisfaction positively predicted selfie-viewing and selfie-editing but not selfie-posting over time, whereas body dissatisfaction had no influence on subsequent selfie-related behaviors among adolescents. Findings from this study provide new insights into the reciprocal relationships between selfie-related behaviors and body image.

## Introduction

Social media has become an essential part of people's daily life, especially among young people (Pew Research Center, 2018). For example, there were 673.5 million social media users in China in 2018, which is the highest number in the world and is predicted to increase dramatically in the next 5 years (Statitca, 2019). A popular activity on social media is selfie behavior. Although the specific definition of a "selfie" can vary, a common and widely used definition of selfie is the one that was coined by Oxford dictionary in 2013, which refers to a photograph that one has taken of oneself, typically one taken with a smartphone or webcam and shared via social media (e.g. Kim and Chock, 2017; Stefanone et al., 2019; Warfield, 2015). An interview study with university students indeed showed that most students know that selfie is a photograph taken by the person who is the subject of that image (Katz and Crocker, 2015).

There are different ways that people can engage with selfies within the social media context. Taking and sharing selfies (i.e. selfie-posting) on social media is prevalent among young people and has become a global phenomenon (Senft and Baym, 2015). Another common selfie-related behavior that people engage in is editing the selfie before sharing it with others, providing a sort of virtual makeover for online self-presentation (Chae, 2017). People can remove "unfavorable" aspects of their appearance and add desirable features using photo editing software or applications before posting their selfies online (Stefanone et al., 2019). In addition to taking, editing, and posting their own selfies, people can also view and examine numerous selfies posted by others and the related likes/comments when using social media (i.e. selfie-viewing).

Given the popularity of selfies, this activity has received a great deal of attention from scholars from various disciplines. For example, some communication theorists have been interested in selfies as cultural artifact and social practice (Senft and Baym, 2015).

Other researchers have investigated the phenomenon of (semi-)professional selfie-producers, who are often women, using selfies for financial gain (e.g. Abidin, 2016). Furthermore, psychologists have explored the antecedent factors (e.g. psychological motivations and personality traits) and potential consequences (e.g. self-esteem and life satisfaction) of selfie behaviors (e.g. Kim and Chock, 2017; Sung et al., 2016; Wang et al., 2016). Given the fact that selfies often have an appearance-focus, some researchers have been particularly concerned with the potential relationships between selfie-related behaviors and both self-objectification (i.e. viewing one's body as an object to be looked upon and evaluated based on physical appearance) and appearance concerns (e.g. dissatisfaction with the appearance of one's body or face).

Although a growing body of research has examined the association between selfie-related behaviors and body image concerns, much less is known about the potential reciprocal relationship between selfie-related behaviors and body-related variables. The present study aimed to explore the bidirectional relationships between selfie-related behaviors (i.e. selfie-posting, selfie-editing, and selfie-viewing) and both self-objectification and appearance concerns (i.e. body dissatisfaction and facial dissatisfaction) among adolescents using a longitudinal design. The focus on adolescence is because body-related concerns are prevalent among adolescents, with research suggesting that adolescents start to place more emphasis on their physical appearance (Lindberg et al., 2007), and body dissatisfaction may increase throughout this developmental period (Bucchianeri et al., 2013). Furthermore, adolescents are more likely to engage in selfie-related behaviors than adults (Dhir et al., 2016). In the sections that follow, we review the existing literature on the connection between selfie behaviors and body image concerns, and identify gaps in that literature.

## Selfies, self-objectification, and appearance concerns

According to objectification theory, individuals' daily encounters with objectifying experiences socialize them to internalize an observer's perspective of their own bodies as objects to be looked at and evaluated (i.e. self-objectification) (Fredrickson and Roberts, 1997). From this perspective, selfie-related behaviors may contribute to self-objectification by allowing individuals to monitor their own appearance from an observers' perspective and by viewing images of others. Specifically, people usually invest in their selfies before posting them on social media, such as being concerned about photo quality and how they are portrayed in the photos, as well as carefully choosing which selfies will be posted (McLean et al., 2015; Veldhuis et al., 2018). This investment may lead users to focus on appearance, which in turn may contribute to self-objectification (Cohen et al., 2018). In addition, many people are likely to edit their selfies before sharing them on social media (Chua and Chang, 2016), which may trigger or reinforce feelings of self-objectification because users are treating their own bodies as objects to be manipulated. Furthermore, individuals may compare their appearance with the appearance of others when viewing selfies on social media, which may induce self-objectification because they may focus on their own appearance during the comparison process. Limited research, however, has explored the relationship between selfie-related behaviors and self-objectification. One study found that selfie-posting had no significant association with self-objectification but that selfie-editing was

related to self-objectification (Cohen et al., 2018). In contrast to Cohen et al.'s (2018) finding, other recent studies found that selfie-posting was positively related to self-objectification (Niu et al., 2019; Zheng et al., 2019). Therefore, further research is needed to explore the relationship between selfie-related behaviors and selfie-objectification.

Selfie-related behaviors may also lead to appearance concerns. Based on the tripartite influence model, sociocultural influences (i.e. media, family, and peers) can lead to body dissatisfaction through the mediating roles of appearance comparisons and internalization of the beauty ideal (Thompson et al., 1999). Of particular relevance to selfie-related behaviors, people might become aware of the flaws in their appearance and thus feel dissatisfied with their appearance when editing their selfies. Furthermore, this process may result in users internalizing the beauty ideal, which in turn increases appearance concerns. The potential negative influence of selfie-editing on body image has been supported by the existing research. Previous studies showed that selfie-editing was related to body dissatisfaction among both adolescent girls and young men and women (Lonergan et al., 2019; McLean et al., 2015). Cohen et al. (2018) also found that selfie-editing was linked to thin-ideal internalization, although it was not associated with body satisfaction and drive for thinness among young women. Another experimental study showed that women who could retake and retouch their selfies before posting them on social media reported feeling less physically attractive afterward compared to those in the control group (Mills et al., 2018).

Viewing others' selfies on social media may also lead to appearance concerns as a result of upward comparisons (i.e. comparison to someone better than oneself; Festinger, 1954). Selfie-viewing could spur upward comparisons because most selfies have been carefully selected and modified (Chae, 2017), making it difficult for an individual to compare favorably against these idealized images, which in turn would be associated with appearance dissatisfaction (Fardouly et al., 2017). Another important mechanism explaining the link between selfie-viewing and appearance concerns is the internalization of ideals when viewing others' idealized selfies and related interactions (e.g. likes and comments) based on the tripartite influence model (Thompson et al., 1999). Three studies have investigated the influence of selfie-viewing on body image. One correlational study found that individuals who report frequently seeing selfies had somewhat lower body esteem compared to those who see selfies less frequently (Porch, 2015). Another study showed that selfie-viewing was positively associated with facial dissatisfaction (Wang et al., 2019). Finally, a recent experimental study also showed that viewing idealized selfies led to more facial concerns among young women (Fardouly and Rapee, 2019).

The relationship between selfie-posting and appearance concerns might be more complex than the relationship between selfie-viewing and appearance concerns. On the one hand, selfie-posting and the subsequent interactions may contribute to the internalization of beauty ideals, which in turn may increase appearance concerns. For example, McLean et al. (2015) found that selfie-posting was related to thin-ideal internalization among adolescent girls. An experimental study also reported the negative effects of selfie-posting on young women's body image (Mills et al., 2018). On the other hand, selfie-posting may have a positive effect on body image. If people receive positive feedback after posting selfies on social media (Porch, 2015), they may experience a boost in their appearance

satisfaction. This argument is supported by previous finding that selfie-posting was posi-
tively associated with body satisfaction among young women (Cohen et al., 2018; Wang
et al., 2018a). Note, however, that other studies have found no significant associations
between selfie-posting and thin-ideal internalization, drive for thinness (Cohen et al.,
2018), or body dissatisfaction (McLean et al., 2015). Therefore, it is unclear whether
selfie-posting has a positive, negative, or no influence on appearance concerns.

Most of the studies described above have focused on the associations between selfie-
related behaviors and concerns with one's body. However, the relationships between
selfie-related behaviors and appearance concerns may be more relevant to facial appear-
ance given that selfies predominantly include portrait photos rather than full-bodied
images (Cohen et al., 2018). Fardouly and Rapee (2019) also found that viewing ideal-
ized selfies on social media specifically impacted women's face appearance concerns,
rather than concerns about their overall physical appearance. Thus, it is important to
investigate the effects of selfie-related behaviors on both overall body dissatisfaction and
facial dissatisfaction.

## Self-objectification, appearance concerns, and selfies

Although selfie-related behaviors may have some influence on self-objectification and
appearance concerns, it is also possible that initial levels of self-objectification and
appearance concerns may affect subsequent selfie-related behaviors on social media.
Such a proposition is based on the selectivity paradigm of media use, which is further
elaborated into two theoretical perspectives: selective exposure theory (Zillmann and
Bryant, 2013) and uses and gratifications theory (Ruggiero, 2000). Selective exposure
theory posits that audience members seek information that is supportive of their own
attitude (Zillmann and Bryant, 2013). Based on this point of view, individuals high in
self-objectification and appearance concerns may seek out more appearance-related
information on social media because appearance attributes are important to them. In
that way, they may be likely to view others' selfies and the interactions attached to
these selfies in order to monitor beauty standards and get inspiration for makeup. Thus,
self-objectification and appearance concerns may spur individuals to view others' self-
ies on social media.

Uses and gratifications theory provides a perspective to understand people's media
consumption, which is that users are active in their choice of media and engage in certain
activities to seek gratifications of specific needs (Ruggiero, 2000). Individuals high in
self-objectification have learned to value themselves based on their appearance
(Fredrickson and Roberts, 1997), which means that seeking gratification of their appear-
ance is likely to be particularly important for those people. Selfie-posting may provide a
good way for individuals to present themselves and to display their ideal selves in order
to seek positive feedback from others (Porch, 2015). In this way, it seems likely that peo-
ple high in self-objectification may post more selfies to seek appearance related gratifica-
tion (Veldhuis et al., 2018). Likewise, individuals high in appearance concerns may also
post more selfies to gain favorable feedback as a means of fulfilling appearance gratifica-
tion (Veldhuis et al., 2018). It is important to note, however, that the opposite perspective
is also possible: Individuals who are more satisfied with their physical appearance may be

more likely to post selfies on social media for self-promotion purposes (Fox and Vendemia, 2016; Ridgway and Clayton, 2016). Given these inconsistent findings, it is necessary to explore the predictive role of appearance concerns on selfie-posting.

Body-related concerns may also have an influence on selfie-editing. Specifically, individuals high in self-objectification prioritize their appearance, and thus may engage in more appearance investments. Following this rationale, these people may make efforts to manage their appearance before self-presenting on social media, such as selfie-editing. According to impression management theory (Goffman, 1978), people are inclined to present the positive aspects of themselves in order to give positive impressions and gain approval from others. Drawing from this perspective, individuals who are dissatisfied with their own appearance may be particularly inclined to modify their selfies to make themselves look better before posting these selfies on social media in order to gain approval from their friends and followers. Thus, it is important to also examine whether self-objectification and appearance concerns may spur people's selfie-editing behavior.

Research exploring the influence of self-objectification and appearance concerns on selfie-related behaviors is scarce. Initial support for the existence of a relationship between self-objectification and selfie-related behaviors was found in three cross-sectional studies (Fox and Rooney, 2015; Lyu, 2016; Veldhuis et al., 2018). Research on the relationship between appearance concerns and selfie-posting is mixed. Some studies found that body dissatisfaction had no relationship with selfie-posting among young women (Veldhuis et al., 2018; Wagner et al., 2016), whereas another two studies showed a positive association between body satisfaction and selfie posting among male and female adults (Fox and Vendemia, 2016; Ridgway and Clayton, 2016). In addition, Fox and Vendemia (2016) found that positive feelings about one's body were negatively related to selfie-editing. Similarly, another study also showed appearance dissatisfaction was associated with selfie-editing (Lyu, 2016). In contrast, other studies found that appearance concerns had no effect on selfie-editing (Chae, 2017; Veldhuis et al., 2018). Again, as we suggested above, facial dissatisfaction may be particularly relevant when it comes to the influence of appearance concerns on selfie-related behaviors given the portrait feature of selfies (Cohen et al., 2018; Porch, 2015).

## The present study

The present study aimed to explore the reciprocal relationships between selfie-related behaviors and both self-objectification and appearance concerns among adolescents using a longitudinal design, which could add to the existing literature in this area in three ways.

First, previous research has examined the associations between selfie-related behaviors and self-objectification or body image and findings of these studies suggest that a reciprocal relationship may exist. However, most of these studies are cross-sectional or experimental, and thus cannot examine the bidirectional relationships. Therefore, a longitudinal design is needed to investigate the reciprocal relationships between selfie-related behaviors and both self-objectification and appearance concerns.

Second, previous research on the relationships between selfie-related behaviors and self-objectification or appearance concerns have only focused on one or two selfie-related

behaviors, making them unable to compare the differences in the relationships between different selfie-related behaviors and body-related variables. Thus, the second aim of the present study was to simultaneously explore the relationships between three types of selfie-related behaviors (i.e. selfie-posting, selfie-editing, and selfie-viewing) and both self-objectification and appearance concerns. It should be noted that in this study selfie-viewing was defined as viewing both the image and associated likes and comments on other peoples' selfie posts on social media. Furthermore, given the portrait feature of selfies (Cohen et al., 2018; Porch, 2015), the present study examined facial dissatisfaction in addition to overall body dissatisfaction as an indicator of appearance concerns.

Third, previous research has mainly focused on young adult women, with one study focusing on adolescent girls (McLean et al., 2015). Furthermore, although several previous studies focused on or included males, the participants in those studies were adults (Fox and Rooney, 2015; Fox and Vendemia, 2016; Lonergan et al., 2019; Ridgway and Clayton, 2016). Only one cross-sectional study focused on both adolescent boys and girls (Wang et al., 2019). Adolescents are more likely to engage in selfie-related behaviors (Dhir et al., 2016) and are also in an important period of physical development (Lindberg et al., 2007), making them more focused on their physical appearance. Thus, it is important to explore the relationships between selfie-related behaviors and self-objectification and appearance concerns among adolescent boys and girls.

Based on the theoretical perspectives and literature reviewed above, we proposed the following hypotheses:

> **Hypothesis 1**: Selfie behaviors would have a positive relationship with self-objectification over time.
>
> **Hypothesis 2**: Selfie-editing and selfie-viewing would have a positive relationship with appearance concerns over time.
>
> **Hypothesis 3**: Higher levels of self-objectification would have positive relationships with the three types of selfie behaviors over time.
>
> **Hypothesis 4**: Higher levels of appearance concerns would have positive relationships with selfie-editing and self-viewing over time.

For other associations, previous literature is unclear and thus no firm hypotheses were made. Specifically, it is unclear whether selfie-posting has a positive or negative influence on body image, thus no specific predictions were made. Similarly, no predictions were formulated for the impact of appearance concerns on selfie-posting given the inconsistent findings of previous research.

## Method

### Participants

Participants were recruited from two middle schools and two high schools in China. A total of 886 adolescent boys and girls aged between 12 and 19 years old participated in the survey at Time 1 (T1). Some students that participated at T1 did not participate at

Time 2 (T2). Absence from the survey at T2 was mainly due to illness, training out of school, and relocation from the area. The final sample consisted of 767 (86.57% of T1) participants that completed the survey at both T1 and T2. Power analysis conducted with the software GPower (Erdfelder et al., 1996) showed that the study had more than 80% statistical power to detect moderate to large effect sizes, and close to adequate statistical power (79%) to detect small effects.

In the final sample, 384 were girls (50.1%). At T1, the participants aged 12–19 years old ($M = 15.78$; standard deviation [$SD$] = 1.96). The mean body mass index (BMI: kg/m$^2$) of the participants was 20.53 ($SD = 3.66$). There were no differences on any of the variables between participants who remained at T2 ($n = 767$) and those who had no data at T2 ($n = 119$), $ps > .05$.

## Measures

*Selfie-posting.* Selfie-posting was measured by asking "How often would you say that you post selfies on social media?" (Sung et al., 2016). Participants responded to this item using a 6-point scale (1 = *very infrequently*, 6 = *several times a day*), with higher scores indicating higher selfie-posting frequencies. This measure has been successfully used in previous studies and among Chinese samples (Fox and Vendemia, 2016; Wang et al., 2018a, 2018b).

*Selfie-viewing.* Three items were used to measure selfie-viewing. Participants were asked the frequency with which they usually view selfies from others on social media. Response options ranged from 1 = *very infrequently* to 6 = *several times a day* (Diefenbach and Christoforakos, 2017). Similar to previous research (Lee and Sung, 2016), the second and third items assessed the degree to which one observes others' selfies by asking "Do you carefully examine others' selfies?" and "Do you carefully examine the comments and number of 'likes' on others' selfies?" Responses to these two items ranged from 1 = *not at all* to 7 = *very much*. All items were standardized using *z*-scores because the three items used different response scales. Items were then averaged to form a scale score, with higher scores indicating higher levels of selfie-viewing. This measure has been successfully used among a Chinese sample (Wang et al., 2019). The Cronbach's alpha in this study was .65 and .67 for T1 and T2, respectively.

*Selfie-editing.* Selfie-editing behavior was assessed using three items (Fox and Rooney, 2015; Fox and Vendemia, 2016). Participants were asked to indicate how frequently they used three methods to improve their appearance before posting selfies on social media: "cropping or cutting parts of yourself out of pictures," "using photographic filters," and "using photo editing software or applications." The three items were rated on a 5-point scale with response options ranging from 1 = *never* to 5 = *always*. Items were averaged to form a scale score with higher scores indicating more frequent selfie-editing. The measure has been previously validated among a Chinese sample (Meng et al., 2017). In the present study, Cronbach's alpha was .80 and .82 for T1 and T2, respectively.

*Self-objectification.* The Body Surveillance Scale of the Objectified Body Consciousness Scale—Youth (OBC-Youth; Lindberg et al., 2006) was used to assess self-objectification. Participants were asked to report their level of agreement with four statements. A represent item was "During the day, I think about how I look many times." Responses were made on a 7-point scale from 1=*strongly disagree* to 7=*strongly agree*. Items were averaged to form a scale score with higher scores indicating greater focus on the appearance of the body. This scale has been validated in previous research, including a Chinese sample (Jackson and Chen, 2015; Tiggemann and Slater, 2013). In the present study, Cronbach's alpha was .88 and .86 for T1 and T2, respectively.

*Facial dissatisfaction.* Facial dissatisfaction was measured by the Facial Appearance Concern (FAC) subscale of the Negative Physical Self Scale (NPSS; Chen et al., 2006). The FAC subscale is a 5-point scale which consists of 11 items. Response options ranged from 0=*never* to 4=*always*. Mean score of the items was calculated with higher scores on FAC indicates greater facial dissatisfaction. The FAC subscale has been validated among Chinese samples (Chen et al., 2006). For the current study, Cronbach's alpha was .91 (T1) and .90 (T2).

*Body dissatisfaction.* The Body Areas Satisfaction Scale (BASS), a subscale of Multidimensional Body-Self Relations Questionnaire (MBSRQ; Cash, 2000), was used to measure body dissatisfaction. Participants were enquired about satisfaction with nine features about their physical appearance. Responses ranged from 1=*very satisfied* to 5=*very dissatisfied* with higher scores on the BASS indicating greater body dissatisfaction. This measure has been validated among Chinese samples in previous research (Wang et al., 2018a, 2018b). In this study, Cronbach's α was .86 and .88 for T1 and T2, respectively.

*Covariates.* Considering that social media use is related to self-objectification and body image (Fardouly et al., 2018), we controlled for overall social media use in the present study. To assess social media use intensity, six items developed by Ellison et al. (2007) were used. In the present study, we replaced "Facebook" in the original scale with "social media" to assess social media use intensity more broadly. Items were rated on a 5-point scale with response options ranging from 1=*strongly disagree* to 5=*strongly agree.* Items were averaged to form a scale score with higher scores indicating higher social media use intensity. This scale has been successfully used among a Chinese sample (Wei et al., 2017). In the present study, Cronbach's alpha was .83 (T1).

## Procedure

Data collections were occurred at two time points, with T1 in March 2018 and T2 in September 2018. Ethical approval for the study procedure was gained from the first researcher's University Ethics Committee and by the boards of participating schools. The survey was advertised as research about social media use and mental health. Participants filled out paper-and-pencil questionnaires in classrooms during regular school hours. Informed consent was obtained from participants and their parents. Before the questionnaires were filled out, all participants were assured that their participation

was voluntary and their privacy would be protected. Participants were free to withdraw from the study at any time. Participants were asked to complete a list of demographic questions (e.g. gender, age, height, and weight) in addition to all of the study variables. BMI was calculated based on participants' self-reported height and weight.

## Analyses

First, descriptive statistics for the variables of interest and bivariate correlations between variables at both T1 and T2 were calculated. Second, to test the bidirectional relationships between selfie-related behaviors and adolescents' self-objectification, facial dissatisfaction, and body dissatisfaction, we conducted three autoregressive cross-lagged models using M-*plus* 8. All variables at T2 were predicted by the values of their respective independent variables at T1 and their own values at T1. We further estimated paths from the control variables to the study variables at T2. In addition, we allowed covariances between control variables and the study variables at T1 and covariances between study variables at the same time point.

# Results

## Preliminary analyses

Descriptive statistics and bivariate correlations among all study variables at T1 and T2 are presented in Table 1. Zero-order correlations showed that all study variables were correlated with each other within-time at T1 and T2, except that there was no significant association between body dissatisfaction and either selfie-posting or selfie-viewing. Across time, selfie-related behaviors were positively associated with self-objectification, facial dissatisfaction, and body dissatisfaction, except for the relationships between body dissatisfaction and both selfie-posting and selfie-viewing. In addition, T1 social media use was related to all selfie-related behaviors, self-objectification, and facial dissatisfaction, but not body dissatisfaction. Age and gender were associated with some of the selfie-related behaviors and body-related variables. Consistent with previous research (Dhir et al., 2016; Fardouly et al., 2018), T1 social media use, age, and gender were correlated with selfie-related behaviors, self-objectification, or body image in the present study, and were thus entered as covariates in the following analyses.

## Cross-lagged model

Three autoregressive cross-lagged models were conducted separately to analyze the reciprocal relationships between selfie-related behaviors and self-objectification, facial dissatisfaction, and body dissatisfaction.

First, we tested the bidirectional relationships between selfie-related behaviors and self-objectification. The cross-lagged model, presented in Figure 1, showed a good fit, $\chi^2 = 50.666$, $df = 11$, $p < .001$, root mean square error of approximation (RMSEA) = .069, comparative fit index (CFI) = .978, and standardized root mean squared residual

**Table 1.** Means, standard deviations, and zero-order correlations for main study variables.

| Variables | M (SD) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. T1 Selfie-posting | 1.64 (0.92) | 1 | | | | | | | | | | | | | | |
| 2. T1 Selfie-viewing | 0.00 (0.74) | .30** | 1 | | | | | | | | | | | | | |
| 3. T1 Selfie-editing | 2.25 (0.97) | .38** | .41** | 1 | | | | | | | | | | | | |
| 4. T1 Self-objectification | 3.28 (1.10) | .23** | .37** | .36** | 1 | | | | | | | | | | | |
| 5. T1 Facial dissatisfaction | 1.05 (0.76) | .13** | .15** | .19** | .51** | 1 | | | | | | | | | | |
| 6. T1 Body dissatisfaction | 2.79 (0.73) | -.04 | -.02 | .11** | .13** | .45** | 1 | | | | | | | | | |
| 7. T2 Selfie-posting | 1.78 (0.99) | .59** | .27** | .42** | .25** | .09* | -.03 | 1 | | | | | | | | |
| 8. T2 Selfie-viewing | -0.00 (0.79) | .30** | .52** | .38** | .38** | .18** | .01 | .36** | 1 | | | | | | | |
| 9. T2 Selfie-editing | 2.40 (1.06) | .33** | .34** | .67** | .34** | .20** | .11** | .44** | .47** | 1 | | | | | | |
| 10. T2 Self-objectification | 3.40 (1.26) | .25** | .36** | .37** | .56** | .32** | .03 | .32** | .51** | .41** | 1 | | | | | |
| 11. T2 Facial dissatisfaction | 0.89 (0.71) | .11** | .21** | .23** | .44** | .65** | .32** | .14** | .25** | .31** | .48** | 1 | | | | |
| 12. T2 Body dissatisfaction | 2.77 (0.75) | .01 | -.01 | .14** | .15** | .38** | .63** | -.02 | -.00 | .10** | .10** | .41** | 1 | | | |
| 13. T1 Social media use | 3.16 (0.91) | .24** | .46** | .33** | .40** | .23** | .05 | .22** | .37** | .23** | .35** | .25** | .05 | 1 | | |
| 14. Age | 15.78 (1.96) | .23** | .29** | .20** | .18** | .04 | -.03 | .29** | .30** | .19** | .17** | .11** | -.05 | .23** | 1 | |
| 15. Gender | 0.50 (0.50) | .19** | .10** | .46** | .07 | .03 | .22** | .23** | .13** | .40** | .10** | .07 | .21** | .06 | -.03 | 1 |

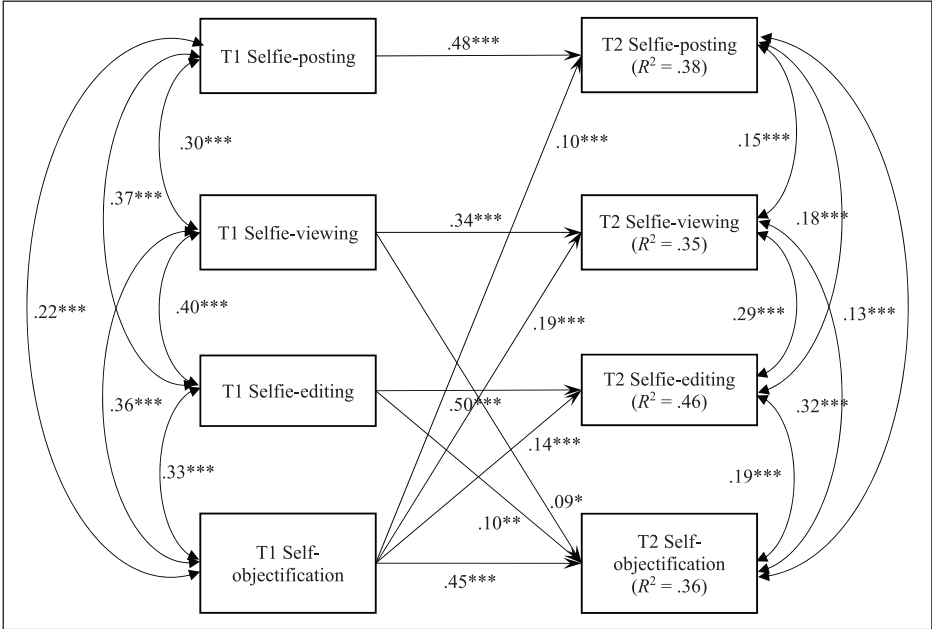Gender was dummy coded such that male = 0 and female = 1.
*p < .05. **p < .01.

**Figure 1.** Cross-lagged model with longitudinal and reciprocal relations between selfie-related behaviors and self-objectification.

All the reported parameters are standardized. T1 social media use, age, and gender were controlled for in the analysis. For clarity, the control variables and non-significant paths are not presented in the figure.

*$p < .05$. **$p < .01$. ***$p < .001$.

(SRMR) = .031. As shown in Figure 1, auto-aggressive paths were significant for selfie-posting, selfie-viewing, selfie-editing, and self-objectification across time. Within-time correlations between selfie-related behaviors and self-objectification were significant at both T1 and T2. As for cross-lagged pathways, T1 selfie-viewing and T1 selfie-editing positively predicted T2 self-objectification but the cross-lagged pathway from T1 selfie-posting to T2 self-objectification was not significant. For the other direction, T1 self-objectification positively predicted T2 selfie-posting, T2 selfie-viewing, and T2 selfie-editing.

Second, we examined the bidirectional relationships between selfie-related behaviors and facial dissatisfaction. The cross-lagged model had adequate fit, $\chi^2 = 72.322$, $df = 13$, $p < .001$; RMSEA = .077; CFI = .967; SRMR = .036. As depicted in Figure 2, auto-aggressive paths were significant for selfie-posting, selfie-viewing, selfie-editing, and facial dissatisfaction. Every within-time correlation was significant except the relationship between T2 selfie-posting and T2 facial dissatisfaction. In terms of cross-lagged pathways, T1 selfie-viewing and T1 selfie-editing positively predicted T2 facial dissatisfaction while the pathway form T1 selfie-posting to T2 facial dissatisfaction was not significant. For the other direction, T1 facial dissatisfaction positively predicted T2 selfie-viewing and T2 selfie-editing. The prediction of T1 facial dissatisfaction on T2 selfie-posting was not significant.
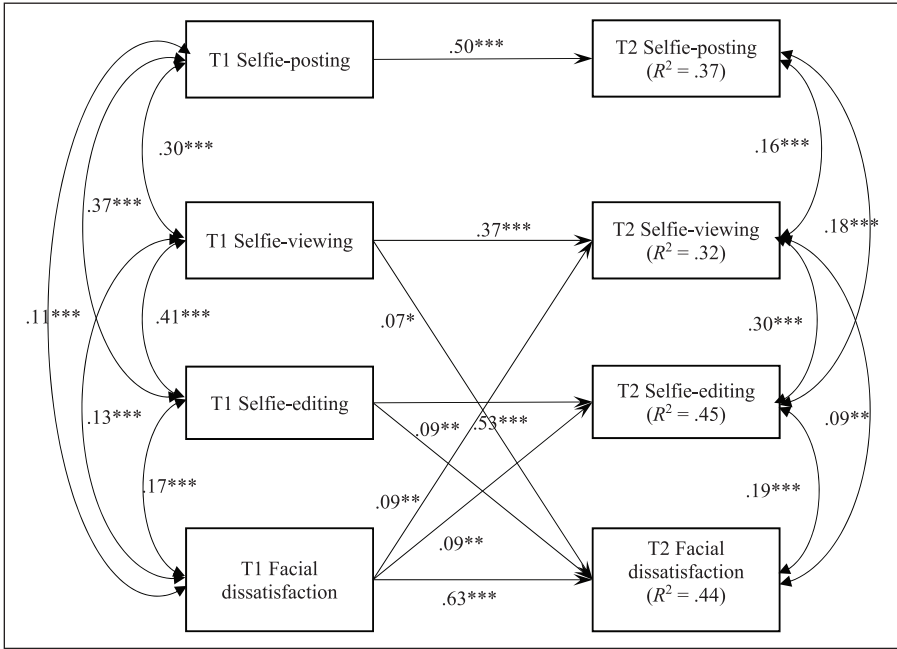
**Figure 2.** Cross-lagged model with longitudinal and reciprocal relations between selfie-related behaviors and facial dissatisfaction.
All the reported parameters are standardized. T1 social media use, age, and gender were controlled for in the analysis. For clarity, the control variables and non-significant paths are not presented in the figure.
*$p < .05$. **$p < .01$. ***$p < .001$.

Third, bidirectional relationships between selfie-related behaviors and body dissatisfaction were examined. The model had adequate fit, $\chi^2 = 76.817$, $df = 14$, $p < .001$, RMSEA $= .076$, CFI $= .963$, SRMR $= .034$. As shown in Figure 3, auto-aggressive paths were significant for selfie-posting, selfie-viewing, selfie-editing, and body dissatisfaction. All of the within-time correlations were significant except for the associations between T1 body dissatisfaction and both T1 selfie-posting and T1 selfie-viewing and the links between T2 body dissatisfaction and all selfie-related behaviors at T2. In regard to cross-lagged paths, only the path from T1 selfie-editing to T2 body dissatisfaction was significant.

## Discussion

The present study was the first to use a longitudinal design to systematically examine the bidirectional relationships between three selfie-related behaviors and self-objectification, facial dissatisfaction, and overall body dissatisfaction among adolescents. Generally, the present study found that selfie-viewing and selfie-editing had significant longitudinal associations with the body-related variables, but selfie-posting did not. These results will be discussed in turn.
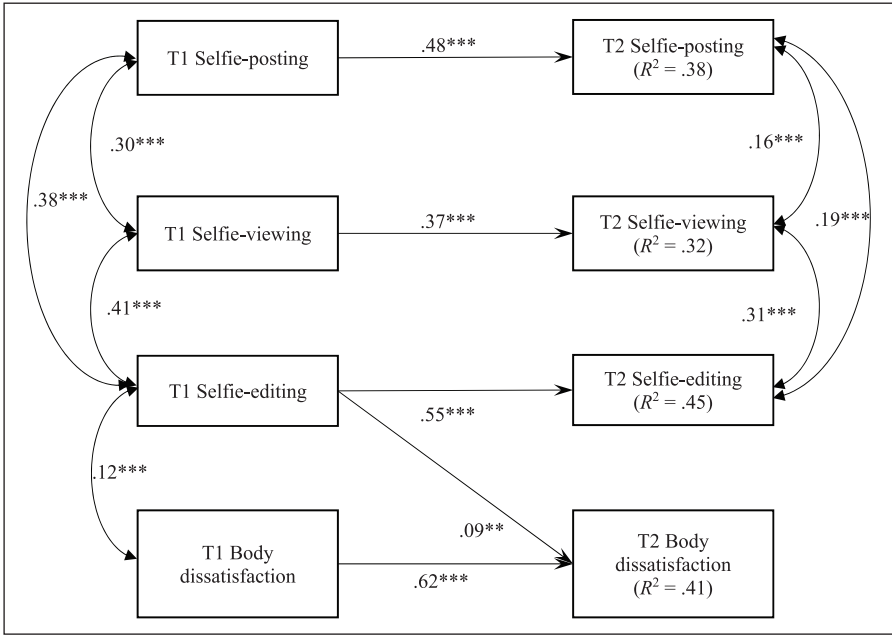
**Figure 3.** Cross-lagged model with longitudinal relations between selfie-related behaviors and body dissatisfaction.
All the reported parameters are standardized. T1 social media use, age, and gender were controlled for in the analysis. For clarity, the control variables and non-significant paths are not presented in the figure.
**$p < .01$. ***$p < .001$.

## Selfie-viewing, self-objectification, and appearance concerns

Consistent with our hypothesis, the results showed that higher levels of selfie-viewing at T1 predicted an increase in self-objectification at T2 among adolescents, which is coincident with objectification theory (Fredrickson and Roberts, 1997). That is, viewing others' selfies and the likes/comments those selfies receive may increase users' focus on their appearance and encourage them to scrutinize their own appearance from an observer's perspective. At the same time, we also found that higher self-objectification predicted an increase in selfie-viewing among adolescents. This finding can be interpreted by selective exposure theory which posits that audience members seek information that is supportive of their own attitude (Zillmann and Bryant, 2013). Specifically, for individuals high in self-objectification, appearance is the most important attribute on which they evaluate themselves (Fredrickson and Roberts, 1997), thus they may seek out more appearance-related information on social media, for example, by viewing and examining others' selfie posts and related likes/comments. These results indicate that the association between selfie-viewing and self-objectification may be bidirectional and mutually reinforcing such that selfie-viewing could contribute to people's self-objectification and, in turn, those high in self-objectification may seek out more selfies and the attached likes/comments on social media.

Our results also showed that higher levels of selfie-viewing at T1 predicted more facial dissatisfaction at T2. This finding can be explained by the tripartite influence model (Thompson et al., 1999). That is, when viewing other's selfies and the likes/comments received by these selfies on social media, people may compare their appearance to the person in the image and internalize ideal facial beauty, which in turn may lead to facial dissatisfaction. This explanation is supported by a recent study, which found that the positive link between selfie-viewing and facial dissatisfaction was mediated by general attractiveness internalization (Wang et al., 2019). For the other direction, adolescents' facial dissatisfaction also predicted their selfie-viewing behavior. Selective exposure theory (Zillmann and Bryant, 2013) could be used to interpret this result such that adolescents with high facial dissatisfaction may care more about their facial appearance and seek out other people's selfies in order to gain more information about facial beauty standards and techniques to improve facial attractiveness (e.g. through makeup use). These results suggest that a vicious circle might exist between selfie-viewing and facial dissatisfaction in which viewing selfies and the related feedback may lead to facial dissatisfaction, which in turn further spurs adolescents to view more selfies of other people.

In contrast to the results for facial dissatisfaction, selfie-viewing did not predict overall body dissatisfaction among adolescents. Similarly, body dissatisfaction had no effect on selfie-viewing over time. These null results may be due to selfies mainly focusing on the face not body shape, body size, or overall appearance (Cohen et al., 2018; Porch, 2015). This speculation is accordant with previous experimental findings that selfie behaviors had no effect on weight or body size concerns (e.g. drive for thinness, feelings of fatness, and satisfaction with one's body size) or overall appearance satisfaction (Fardouly and Rapee, 2019; Mills et al., 2018).

## *Selfie-editing, self-objectification, and appearance concerns*

Consistent with our hypothesis, adolescents' selfie-editing frequencies predicted an increase in their self-objectification over time. Specifically, when adolescents retouch their selfies they treat their own bodies as objects to manipulate, which may trigger or reinforce their feelings of self-objectification (Fox and Rooney, 2015; Mills et al., 2018). Furthermore, we also found that adolescents with high self-objectification were more likely to edit and enhance their selfies over time, which is consistent with previous cross-sectional studies which revealed that self-objectification was positively associated with selfie-editing (Fox and Rooney, 2015; Lyu, 2016; Veldhuis et al., 2018). This finding can be interpreted by objectification theory. That is, individuals high in self-objectification treat themselves as objects from an observer's perspective (Fredrickson and Roberts, 1997), which may lead them to edit their selfies as if they were objects.

Furthermore, we found that the initial levels of selfie-editing among adolescents also predicted their subsequent facial dissatisfaction. This finding is accordant with a previous experimental study which found that women who could retake and edit their selfies before posting them reported less feelings of physical attractiveness afterward than those in the control group (Mills et al., 2018). A possible explanation for this result may be that selfies perform as a mirror (Warfield, 2015). We inspect ourselves in a mirror to find the aspects

that we are dissatisfied with. Similarly, selfies provide a self-reflection of ourselves and thus the process of manipulating selfies could increase adolescents' focus on their own faces and their facial inadequacies, which in turn results in facial dissatisfaction. More importantly, adolescents may internalize the ideal facial beauty in the process of modifying their selfies based on the sociocultural standards about facial beauty, which may further reinforce their facial dissatisfaction if they perceive there to be a discrepancy between their actual and ideal faces. In addition, the relationship in the other direction in which facial dissatisfaction predicted the frequencies of selfie-editing over time was also significant. In other words, adolescents who are more dissatisfied with their facial appearance were more likely to edit their selfies. This finding, however, conflicts with the result of another longitudinal study focusing on young adult women (Chae, 2017). A possible explanation for this inconsistence might be that adolescents are in an important period of physical development (Lindberg et al., 2007) and thus may pay more attention to their physical appearance compared to adults whose self-developments are more mature and stable. As a result, the influence of satisfaction of facial appearance on selfie-editing might be more pronounced for adolescents. Of course, this is just a speculation and more longitudinal research focusing on more diverse samples is needed to investigate the impact of facial dissatisfaction on selfie-editing and potential moderators, such as age.

In contrast to the null result association between selfie-viewing and body dissatisfaction, our study did find that selfie-editing predicted body dissatisfaction, although the predictive role of body dissatisfaction on selfie-editing was non-significant. This finding highlights that the process of selfie-editing before posting them on social media may be more important for dissatisfaction with one's overall appearance compared to other selfie-related behaviors. This speculation was in line with a previous correlational finding that selfie-editing was associated with body dissatisfaction among adolescent girls while selfie-taking and selfie-posting were not (McLean et al., 2015). This finding could also be interpreted by the mirror effect of selfies (Warfield, 2015). In this case, the process of selfie-editing could increase people's self-consciousness (Cohen et al., 2018), which in turn would make them realize their flaws on the whole body and amplify their body dissatisfaction. Further longitudinal and experimental research is needed to investigate the effect of selfie-editing on appearance concerns.

## Selfie-posting, self-objectification, and appearance concerns

In contrast to our hypothesis, no support was found for the predictive role of selfie-posting on self-objectification. This lack of significant relationship may relate to the variant motives that people have for posting selfies. People post selfies for different reasons, including attention seeking, communication, archiving, and entertainment (Sung et al., 2016). In particular, for adolescents who post selfies to seek others' attention (e.g. through their attractive appearance), selfie-posting may make them pay continuous attention to their appearance, which in turn may increase their self-objectification. In contrast, adolescents who have other motives (e.g. archiving and entertainment) may not focus on their physical appearance when posting selfies, their self-objectification thus may not be affected by selfie-posting. Another explanation for the lack of relationship between selfie-posting and self-objectification is that some personal characteristics may

moderate this relationship. For example, in one study, the link between selfie-posting and self-objectification was stronger for young women high in imaginary audience ideation (Zheng et al., 2019).

For the other direction, the present study found that higher self-objectification predicted an increased frequency of selfie-posting over time among adolescents, which is consistent with our hypothesis and previous findings that self-objectification was positively associated with the frequency of posting self-images and self-sexualization in profile photographs (Bell et al., 2018). This result can be explained by objectification theory (Fredrickson and Roberts, 1997). That is, adolescents high in self-objectification pay more attention to their physical appearance, which in turn may spur them to engage in more appearance-related activities, such as posting more selfies on social media to seek appearance-related feedback.

In contrast to the results for selfie-viewing and selfie-editing, selfie-posting had no relation to facial dissatisfaction or body dissatisfaction over time. For the other direction, adolescents' facial dissatisfaction and body dissatisfaction also played no predicting role in the subsequent selfie-posting. These results suggest that the relationship between selfie-posting and appearance concerns may be weaker than those between selfie-viewing or selfie-editing and appearance concerns. A possible explanation for these results may be that compared with selfie-posting, the process of selfie-viewing and selfie-editing could make people invest more in their physical appearance and thus cause them to activate their appearance self-schema (Markus, 1977), which in turn can have a negative influence on appearance satisfaction (Ahadzadeh et al., 2017; Hargreaves and Tiggemann, 2002). Note that our study is the first to examine the bidirectional association between selfie-posting and appearance concerns using a longitudinal design. We thus recommend that more future studies should replicate our findings using longitudinal designs in order to better understand this issue.

## Limitations and suggestions for future research

Several limitations in the present study should be noted. First, this study only focused on adolescents in China. Future research should attempt to investigate this phenomenon in different samples, including those in varied age groups and cultures. Second, although the longitudinal design in this study helped us to investigate bidirectional relationships, the time interval between T1 and T2 was only 6 months and there were only two waves of data collection. Future research could be conducted over longer time intervals with more time points, which would allow for mediators of these relationships to be examined. In addition, based on the theoretical framework that we used, the present study examined the influence of selfie-related behaviors on body image dissatisfaction, which is an indicator of negative body image. However, positive body image is not merely the absence of negative body image but has its own unique components, such as body appreciation, functional body satisfaction, and body image flexibility (Tylka and Wood-Barcalow, 2015). Therefore, examining the relationship between selfie-related behaviors and positive body image would be a valuable pursuit for future research.

Another limitation concerns the definition and measures of selfie used in the present study. The present study focused on the broad concept of selfies without distinguishing

different types of selfie, such as solo selfies and group selfies (Kim and Chock, 2017) as well as good-looking selfies and ugly selfies (Bennett, 2014), or the different functions of selfies (i.e. the reasons why the selfies were posted; Sung et al., 2016). Future studies could give further consideration to these issues. In terms of selfie-posting, the measure only consisted of a single frequency item. The investment in one's own selfies before posting, such as being concerned about photo quality, deliberate selection, and deliberately posting (McLean et al., 2015; Veldhuis et al., 2018) and the comments and likes received by selfies (Butkowski et al., 2019) would be worth investigating in future research. In addition, the alpha value of the selfie-viewing measure was low in the present study because the measure contained items assessing a variety of behaviors (i.e. viewing and examining the selfies and the related comments/likes). Regarding selfie-editing, a recent study found that composition-editing (i.e. editing the facial features of the subject) had a positive association with relationship satisfaction, while subject editing (i.e. editing the facial features of the subject) had a negative relationship with relationship satisfaction (Stefanone et al., 2019). Future research could examine the relationships between both types of self-editing and body image/self-objectification.

## Conclusion

Extending previous cross-sectional research, our longitudinal study suggests that the relationships between selfie-related behaviors (i.e. selfie-viewing and selfie-editing) and both self-objectification and appearance concerns are bidirectional. Furthermore, our results showed that selfie-posting had no predicting role on self-objectification or appearance concerns and the paths from appearance concerns to selfie-posting were not significant. These findings suggest that compared with selfie-viewing or selfie-editing, posting selfies on social media may be less harmful to appearance-related concerns and less indicative of those concerns. In addition, considering the relationships between selfie-related behaviors and overall body dissatisfaction were much weaker than those between selfie-related behaviors and facial dissatisfaction, the importance of focusing on facial appearance should be highlighted when conducting research on selfie-related behaviors.

Our findings extend previous literature about media effects (e.g. traditional mass media) on body image concerns by focusing on a specific activity on social media (i.e. selfie-related behaviors). Notably, social media use in general (and selfie behaviors in particular) is different to traditional media in that the media is user created (and edited). Furthermore, the images in traditional media tend to include full bodies and the related research focuses on the effects of exposure to these images on body dissatisfaction, such as weight and body shape dissatisfaction. Our results indicate that viewing selfies on social media has particular influence on facial dissatisfaction, which is similar to the experience with traditional media but highlights the importance of facial appearance in the context of social media (and selfie behaviors in particular). Furthermore, the present study highlights the need for social media and body image intervention programs for adolescents. Adolescents are digital natives and thus may have high media literacy (Burnette et al., 2017). Therefore, social media literacy interventions are needed that specifically focus on the impact of social media on body image and ways to mitigate these potential negative impacts (Burnette et al., 2017; McLean et al., 2017).

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