# What Does Your Selfie Say About You?

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Highlights:

Selfies contain cues indicating personality traits.
A coding scheme for selfies was developed.
We found cues related to self-report and observer judgment of personality.
Observers made consistent judgment of personality traits from selfies.
Observers accurately predicted openness from selfies.

# What Does Your Selfie Say About You?

## Abstract

Selfies refer to self-portraits taken by oneself using a digital camera or a smartphone. They become increasingly popular in social media. However, little is known about how selfies reflect their owners' personality traits and how people judge others' personality from selfies. In this study, we examined the association between selfies and personality by measuring participants' Big Five personality and coding their selfies posted on a social networking site. We found specific cues in selfies related to agreeableness, conscientiousness, neuroticism, and openness. We also examined zero-acquaintance personality judgment and found that observers had moderate to strong agreement in their ratings of Big Five personality based on selfies. However, they could only accurately predict selfie owners' degree of openness. This study is the first to reveal personality-related cues in selfies and provide a picture-coding scheme that can be used to analyze selfies. We discussed the difference between personality expression in selfies and other types of photos, and its possible relationship with impression management of social media users.

Keywords

selfie, personality, zero-acquaintance judgment, photo, social media

## 1. Introduction

"Selfie" was named the word of the year in 2013 by the Oxford English Dictionary. It refers to a self-portrait picture taken by oneself using a digital camera or a smartphone for posting on social networking sites. When taking a selfie, individuals can view how they look like in the picture and decide what they want to show in the picture. Millions of selfies have been posted on various social networking sites (Unmetric, 2014). They have become a new medium for self-expression and self-representation. While studies on social media have examined how personality is related to the use of Facebook (Amichai-Hamburger & Vinitzky, 2010; Bachrach, Kosinski, Graepel, Kohli, & Stillwell, 2012; Moore & McElroy, 2012; Gosling, Augustine, Vazire, Holtzman, & Gaddis, 2011; Orchard, Fullwood, Galbraith, & Morris, 2014; Ross et al., 2009; Seidman, 2013; Wilson, Gosling, & Graham, 2012) and Twitter (Hughesa, Rowe, Batey, & Lee, 2012; Qiu, Lin, Ramsay, & Yang, 2012), little is known about the relationship between personality and selfie. Do selfies reflect their owners' personality traits? Can people predict others' personality based on their selfies? Answers to these questions can improve our understanding of personality expression and judgment in social media.

Past research has shown that traces of people's personality can be found in their environments and belongings. For example, extraverts' offices are warm, decorated, and inviting, conscientious individuals have neat and well-organized bedrooms, and those who are open to experiences have a great variety of books and magazines in their bedrooms (Gosling, Ko, Mannarelli, & Morris, 2002). Conscientious individuals are less likely to wear high-top shoes, while emotionally stable individuals are more likely to wear shoes with brand names (Gillath, Bahns, Ge, & Crandall, 2012). Studies have also found cues such as facial expression and body posture in photos that

are related to personality (e.g., Borkenau, Brecke, Möttig, & Paelecke, 2009; Naumann, Vazire, Rentfrow, & Gosling, 2009). However, these studies often use portraits taken by others, but not participants themselves for the purpose of self-expression. Research has shown that personality expression differs in different contexts (Gosling et al., 2002). Therefore, personality expression in selfies is likely to be different than those in other types of photos. Furthermore, selfies contain unique cues that are not available in other types of photos. For example, duckface, a facial expression made by pushing lips outward and upward to give the appearance of large and pouty lips, is often seen in selfies but not other types of portraits. Such cues may reveal new personality expression in photos. Therefore, we aim to identify personality-related cues in selfies and examine how people express and judge personality based on selfies.

## 2. Background research

### *2.1 Personality expression in photos*

Past studies have shown that photos contain valid personality-related cues. Nestler, Egloff, Küfner, and Back (2012) focused on standardized photographs and found that extraversion is associated with attractiveness of face, openness is associated with volume of lips, and conscientiousness is associated with femininity of face. These cues are mainly about facial features, and cannot be changed by the user when taking the pictures. Other studies used spontaneous photographs taken by experimenters and found that extraversion was associated with cheerfulness and smiling (Borkenau et al., 2009; Naumann et al., 2009) while narcissism was associated with attractiveness, flashy clothing, and make up (Vazire, Naumann, Rentfrow, & Gosling, 2008). In addition, extraverts stood in more energetic ways

while introverts stood in a tenser manner in full-body photos (Naumann et al., 2009). While photos used in these studies contain cues that can be manipulated by the participants (e.g., facial expression and body posture), they were not taken in a naturalistic setting for the purpose of self-expression.

Several recent studies examined profile pictures in social media. Hall and Pennington (2013) revealed that number of friends in Facebook profile picture was associated with extraversion, and friendliness was associated with conscientiousness. Ong et al. (2011) showed that self-rated attractiveness of profile pictures predicted extraversion and narcissism. Krämer and Winter (2008) studied profile pictures on a German social networking site, and found that extraverts tend to use photos with a non-realistic style (e.g., altered color or graphically edited). The above studies provided evidences of personality expression in photos in social media. However, they did not focus on selfies.

Compared to other types of photos, selfies give individuals more freedom of controlling their face visibility, emotional expression, and camera position. Therefore, they may contain new cues, such as duckface and camera height, that are not available in standardized photos. Furthermore, selfies are often posted on social media platforms used for self-presentation (Mehdizadeh, 2010; Papacharissi, 2011). As the motivation for self-expression and freedom of control have been found to result in stronger cues for personality (Gosling et al., 2002), selfies may provide a better view of their owners' personality traits than other photos. However, studies have shown that individuals are likely to be concerned about their online self-image and manipulate their self-presentation to create socially desirable self-image (Ellison, Heino, & Gibbs, 2006; Bazarova, Taft, Choi, & Cosley, 2013; Lin, Tov, & Qiu, 2014; Qiu, Lin, Leung, & Tov, 2012; Strano, 2008). They have been found to promote

themselves and obtain positive feedback from their social networks via profile pictures (Manago, Graham, Greenfield, & Salimkhan, 2008; Mehdizadeh, 2010; Siibak, 2009; Zhao, Grasmuck, & Martin, 2008). This suggests that individuals may create selfies that do not reflect their actual personality. Therefore, it is important to examine which cues in selfies remain predictive of selfie owners' true personality.

*2.2 Zero-acquaintance personality judgment*

An accumulating body of research indicates that personality can be judged by unfamiliar others with reasonable accuracy. Such zero-acquaintance judgments (Kenny & West, 2008) are made possible by the presence of personality-related cues, such as facial expressions (Kenny, Horner, Kashy, & Chu, 1992), physical appearance (Borkenau & Liebler, 1992; Naumann et al., 2009), choices of footwear (Gillath et al., 2012), living environment (Gosling et al., 2002), musical preferences (Rentfrow & Gosling, 2006), and linguistic patterns (Holleran & Mehl, 2008; Mehl, Gosling, & Pennebaker, 2006; Qiu, Lin, Ramsay, & Yang, 2012).

Studies have shown that people can accurately judge personality traits based on photos (Berry & Finch-Wero, 1993; Shevlin, Walker, Davies, Banyard, & Lewis, 2003). Findings demonstrated accurate judgment of extraversion from composite facial images of extraverts or introverts (Little & Perrett, 2006), prediction of agreeableness, extraversion, and neuroticism based on face images (Penton-Voak, Pound, Little, & Perrett, 2006), and accurate judgments of trustworthiness, competence, and aggressiveness after a 100-ms exposure to face portraits (Willis & Todorov, 2006). An even shorter 50-ms exposure to a face was found to be enough for accurate judgment of extraversion (Borkenau et al, 2009). Besides facial images,

Naumann et al. (2009) used full-body photographs as stimuli and found that personality traits such as extraversion could be predicted.

A number of cues have been found to predict accurate judgment. For example, attractiveness of face was used to predict IQ scores from black-and-white photos (Zebrowitz, Hall, Murphy, & Rhodes, 2002). Clothing style was associated with the prediction of openness, and smiling was related to the judgment of extraversion and agreeableness in full-body photographs (Naumann et al., 2009). Fashionable and stylish clothes, neat appearance, and attractiveness were the cues for accurate narcissism judgment (Vazire et al., 2008). While the above studies identified cues used in personality judgment, they were designed to examine the role of facial expression and physical appearance. Their photographs were taken in standard experimental settings and did not include contextual cues such as location information and being alone. Since contextual cues can influence perception of personality and emotion (Ito, Masuda, & Hioki, 2012; Ito, Masuda, & Li, 2013), it is important to investigate how these cues in selfies are related to personality judgment.

*2.3 The lens model of personality judgment*

Brunswik's (1956) lens model provides a useful framework for conceptualizing and studying interpersonal judgment. It has been widely applied in personality judgment research (e.g., Küfner, Back, Nestler, & Egloff, 2010; Nestler et al., 2010; Rodriguez, Holleran, & Mehl, 2010). According to the model, a given criterion variable (e.g., a personality trait such as extraversion) can be thought of as a function of several observable cues (e.g., tendency to smile, physical attractiveness). Meanwhile, the subjective judgment of that criterion variable (e.g., observer ratings of extraversion) can also be considered as a function of the same cues. Cue validity is

the degree of association between a given cue and the criterion variable, with a stronger correlation indicating higher validity. Cue utilization is the degree of association between a given cue and the resulting judgment, with a stronger correlation indicating greater utilization of that cue when forming personality judgments. The lens model is particularly useful because it decomposes the notion of accuracy – how closely the judgment matches the criterion variable – into two distinct components: cue validity and cue utilization. For a personality judgment to be accurate, a cue must be (a) related to the criterion variable, and (b) successfully utilized. In essence, cues can be considered as mediators of the criterion-judgment relationship.

The lens model offers an ideal platform for studying the relationships between selfies, personality, and interpersonal perception. We adopted this model to examine how personality is expressed in selfies and what cues people might use when making personality judgments.

### *2.4 The present research*

The goals of the present study are threefold. We aim to (1) examine if zero-acquaintance personality judgments can be accurately made from selfies, (2) identify valid cues in selfies associated with self-report personality traits, and (3) identify potential cues observers may rely on to make personality judgments.

## 3. Method

### *3.1 Participants*

Participants were recruited via two ways. We developed a software program and crawled 1,953,485 users from Sina Weibo (a popular microbloging website similar to

Twitter in China). We then randomly selected 50,000 users and sent each user a participation request. A total of 505 users participated in return for payment of RMB30 (US$4.8) per person. The low response rate was likely due to the huge amount of spam on Sina Weibo that made users frequently ignore participation requests. Meanwhile, we recruited 107 Chinese students who were Sina Weibo users from a large university in Singapore. Each student received S$5 (US$4.03) for their participation.

*3.2 Procedure*

All participants completed a two-part online survey. The first part comprised of the 44-item Big Five Personality Inventory (BFI; John, Donahue, & Kentle, 1991). The second part asked participants about their Sina Weibo user names, usage frequency, and demographic information (i.e., gender, age, country of residence, and ethnicity).

Then, we downloaded the profile pictures of all participants. Two independent raters identified which of these profile pictures were selfies and non-selfie portraits. A total of 123 pictures were identified as selfies by both raters. Among their owners, 89 (72.4%) are females and 34 are males. Eleven (8.9%) are below 18 years old, 59 (48%) are between 18 and 20 years old, 44 (35.8%) are between 21 and 25 years old, and 9 (7.3%) are above 26 years old. A total of 110 pictures were identified as non-selfie portraits. Among their owners, 59 (53.6%) are females and 51 are males. Seven (6.3%) are below 18 years old, 26 (23.6%) are between 18 and 20 years old, 52 (47.2%) are between 21 and 25 years old, and 25 (22.7%) are above 26 years old. Overall, selfie owners were more likely to be females and younger than non-selfie owners.

To code the selfies, we first selected picture-coding cues that are appropriate for coding selfies from past research (Hall & Pennington, 2013; Krämer & Winter, 2008; Nestler et al., 2012; Wang, 2012). Then, we added cues that are unique for selfies. This results in a total of thirteen cues: duckface (0 = *not duckface*, 1 = *duckface*), pressed lips (0 = *not pressed lips*, 1 = *pressed lips*), emotional positivity (0 = *negative emotion*, 1 = *neutral*, 2 = *positive emotion*), eyes looking at the camera (0 = *not looking at camera*, 1 = *looking at the camera*), camera height (0 = *below head*, 1 = *same level of head*, 2 = *above head*), camera in front (0 = *not in front*, 1 = *in front*), face visibility (0 = *no face*, 1 = *part of face*, 2 = *complete face*), amount of body (0 = *face only*, 1 = *include body from breast or shoulder up*, 2 = *include body from waist up*), alone (0 = *not alone*, 1 = *alone*), location information (0 = *no location information*, 1 = *have location information*), public location (e.g., wilderness, city, party, business setting; 0 = *not public location*, 1 = *public location*), private location (e.g., bedroom, apartment; 0 = *not private location*, 1 = *private location*), and photoshop editing (0 = *no Photoshop editing*, 1 = *Photoshop editing*). Two independent raters coded these cues in the selfies. The averaged percentage agreement of their coding was 90.81%. If an item received inconsistent coding from the two raters, another rater re-coded the item and made the final judgment. Following Nestler et al. (2012), good-looking of face was coded on a 5-point scale (1 = *not at all*, 5 = *very much*) by the two raters to control for the effect of attractiveness of the selfie owner. Its inter-rater reliability was .57, $p < .001$. The pair of coders' ratings was aggregated to form a composite rating for good-looking face.

Finally, eight undergraduate research assistants (1 male, 7 females; age: $M = 21$, $SD = 1.77$) viewed each selfie and rated their impression of the selfie owner's personality using the same BFI that was used by the participants.

## 4. Results

### *4.1 Consensus and accuracy*

Table 1 shows the Big Five personality traits of selfie owners. We found no significant difference between selfie and non-selfie owners' personality traits after controlling for age and gender (*p*s > .24). Intra-class correlations of single and average observers were calculated to measure judgment consensus of selfie owners' personality traits (Vazire & Mehl, 2008). Averaged observers' ratings reached a moderate

**Table 1** Self and observer rating of personality: consensus, accuracy, and vector correlation

| | Self-rating | | | ICC | | accuracy | | vector correlation |
|---|---|---|---|---|---|---|---|---|
| | M | SD | Cronbach's α | average | single | aggregate | single | |
| Extraversion | 3.27 | .59 | .69 | .84*** | .40*** | .02 | .01 | .38 |
| Agreeableness | 3.59 | .51 | .63 | .67*** | .21*** | .06 | .03 | .39 |
| Conscientiousness | 3.16 | .52 | .68 | .69*** | .22*** | .10 | .05 | -.12 |
| Neuroticism | 3.10 | .61 | .67 | .72*** | .25*** | .07 | .04 | .58* |
| Openness | 3.64 | .54 | .71 | .60*** | .16*** | .21* | .12 | .70*** |

*Note*. Aggregated observer accuracy is the correlation between the aggregated observers' rating and self-report personality. Single observer accuracy is the average of correlations between a single observer's rating and self-report personality. Vector correlation is the correlations between cue-utilization correlations and cue-validity correlations after Fisher's *r*-to-Z transformation.
* $p < .05$, ** $p < .01$, *** $p < .001$.

to strong consensus on all five personality dimensions. This suggested that observers were consistent in predicting participants' personality, and might utilize similar cues for judgment. Extraversion showed the highest consensus, consistent with previous zero-acquaintance judgment results based on pictures (Borkenau et al., 2009; Kenny, Albright, Malloy, & Kashy, 1994; Kenny et al., 1992).

Regarding judgment accuracy, results showed significant correlation between self-report and aggregated observers' ratings on openness. This suggests that

observers can accurately predict openness based on selfies, and this result is also consistent with previous studies on judgment based on spontaneous pictures (Naumann et al., 2009). However, our results showed that observers were not accurate in predicting other four personality dimensions. In addition, when accuracy was examined for the single observer, none of the five dimensions could be judged accurately. This suggests that multiple observers are needed to improve judgment accuracy.

*4.2 Cue validity*

**Table 2** A Brunswik (1956) lens model analysis of judgments based on selfies: Cue-validity correlation

| | Cue-validity correlation | | | | | | |
|---|---|---|---|---|---|---|---|
| | Extra. | Agree. | Cons. | Neur. | Open. | Gender | Age |
| duckface | -.07 | -.12 | -.03 | .21* | -.16 | .23** | -.22* |
| pressed lips | .02 | .09 | .13 | -.09 | -.06 | -.17 | .01 |
| emotional positivity | .10 | .18* | .00 | -.06 | .22* | .26** | .21* |
| eyes looking at the camera | -.14 | -.03 | .02 | .06 | -.08 | .17 | .16 |
| camera height | -.05 | -.20* | -.18 | -.03 | .04 | .24** | .08 |
| camera in front | .08 | -.08 | -.09 | .15 | .02 | .15 | -.13 |
| face visibility | .00 | -.02 | .01 | .00 | -.03 | -.03 | .18* |
| amount of body | -.01 | .02 | -.08 | .04 | -.01 | -.23* | .00 |
| alone | -.08 | -.03 | -.15 | .09 | -.06 | .19* | -.06 |
| location information | .00 | .13 | -.14 | -.13 | -.02 | -.26** | .07 |
| public location | -.04 | .13 | .05 | -.14 | -.02 | -.09 | .07 |
| private location | .03 | .04 | -.20* | -.04 | -.01 | -.22* | .03 |
| Photoshop editing | -.07 | .01 | .06 | .12 | .10 | .21* | -.13 |

*Note*. Cue-validity correlations indicate the correlations between cues and self-report personality. Extra., Extraversion; Agree., Agreeableness; Cons., Conscientiousness; Neur., Neuroticism; Open., Openness. Gender: 0 = male, 1 = female.
* $p < .05$, ** $p < .01$, *** $p < .001$.

We assessed cue validity by correlating participants' self-report personality with cues in the selfies (see Table 2). Extraversion was not related to any cue, different from previous finding where extraversion was related to positive emotional expression (Borkenau et al., 2009; Naumann et al., 2009). This is likely because individuals tend to show positive emotion in their selfies due to their impression management concerns, regardless of their degree of extraversion. Agreeableness was

associated with emotional positivity (.18), replicating past findings (Naumann et al., 2009). It was also negatively associated with camera height (-.20), suggesting that more agreeable individuals are more likely to take pictures from below. Conscientiousness was negatively correlated to private location (-.20), suggesting that more conscientious individuals are less likely to reveal their personal space in the background. The avoidance of showing personal spaces reflects conscientious individuals' characteristics of being cautious (Costa & McCrae, 1992, 1996) and concerned about their privacy (Junglas, Johnson, & Spitzmuller, 2008). Neuroticism was related to duckface (.21), suggesting that neurotic individuals tend to make duckface in their selfies. Openness was related to emotional positivity (.22), a relationship that has not been documented in previous studies.

**Table 3** A Brunswik (1956) lens model analysis of judgments based on selfies: Cue-utilization correlation

| | Cue-utilization correlation | | | | |
|---|---|---|---|---|---|
| | Extra. | Agree. | Cons. | Neur. | Open. |
| duckface | -.03 | -.11 | -.31** | .25** | -.14 |
| pressed lips | -.19* | -.06 | -.06 | .16 | -.22* |
| emotional positivity | .29** | .50** | .25** | -.40** | .21* |
| eyes looking at the camera | -.05 | .24** | .06 | .01 | -.01 |
| camera height | .13 | .04 | -.06 | .00 | .10 |
| camera in front | .03 | .10 | -.03 | .06 | .06 |
| face visibility | .14 | .14 | .08 | -.21* | -.26** |
| amount of body | .14 | -.03 | .14 | -.22* | -.03 |
| alone | -.17 | .03 | -.12 | .22* | .06 |
| location information | -.07 | .09 | .30** | -.19* | -.06 |
| public location | .06 | -.01 | .25** | -.13 | .00 |
| private location | -.12 | .11 | .14 | -.11 | -.07 |
| Photoshop editing | -.01 | -.03 | -.20* | .09 | .12 |

*Note*. Cue-utilization correlations indicate the correlations between cues and observer ratings. Extra., Extraversion; Agree., Agreeableness; Cons., Conscientiousness; Neur., Neuroticism; Open., Openness.
* $p < .05$, ** $p < .01$, *** $p < .001$.

### *4.3 Cue utilization*

We correlated aggregated observers' ratings and selfie cues to identify possible cues that observers used when judging personality (see Table 3). Past research has

shown that extravert tend to be more sociable, talkative, and express more positive emotion than introverts (House & Howell, 1992; McCrae & Costa, 1987; Qiu et al., 2012). Ratings of extraversion were correlated with emotional positivity (.29). This is consistent with the characteristics of extraversion, supporting the relationship between smiling and judgment of extraversion in previous studies (Naumann et al., 2009). Extraversion rating was also negatively related to the facial cue of pressed lips (-.19), possibly because having pressed lips can be considered a sign of shyness.

Agreeable individuals are kind, cooperative and trusting, and they value social affiliation (Bono & Judge, 2004; Nadkarni & Herrmann, 2010). Observers' ratings of agreeableness were associated with emotional positivity (.50), suggesting that individuals showing more positive emotion in selfies were rated as more agreeable. Agreeableness ratings were also associated with eyes looking at the camera (.24), indicating that observers considered participants who had direct eye contact with them as more agreeable than those who did not.

Conscientious individuals tend to be cautious, intolerant of ambiguity, hardworking, and disciplined (Costa & McCrae, 1992, 1996). Ratings of conscientiousness were associated with location information (.30) and public location (.25), suggesting that observers rated those taking selfies in public as more conscientious. Ratings of conscientiousness were also positively correlated with emotional positivity (.25), and negatively correlated with Photoshop editing (-.20) and duckface (-.31).

Neuroticism is associated with anxiety, moodiness, low self-esteem, and more negative emotions (Judge, Bono, Ilies, & Gehardt, 2002; McCrae & Costa, 1987). Therefore, it is reasonable for observers to negatively associate emotional positivity (-.40) with their ratings of neuroticism. In addition, duckface (.25) and face visibility (-

.21) were related to the neuroticism ratings, suggesting that making duckface and not showing full face were perceived as being moody. Observers also considered participants who zoomed in on their faces as more neurotic. Therefore, their ratings of neuroticism were negatively correlated with amount of body (-.22) and location information (-.19), and positively correlated with being alone (.22).

Openness to experience is related to creativity, curiosity, risk-taking, and preference for novelty and variety (Herrmann & Nadkarni, 2013; McCrae & Costa, 1987; Tetlock, 1983). Thus, it is reasonable that observers judged selfies with normal full faces as lower degree of openness (-.26). Participants with pressed lips were rated as less open (-.22), suggesting that making pressed lips was perceived as a facial expression of closeness. Ratings of openness were also related to emotional positivity (.21), supporting previous finding of smiling as a cue for openness judgment (Naumann et al., 2009).

*4.4 Sensitivity*

The match between the pattern of cue utilization and cue validity indicates a sensitivity of observers towards valid cues (Borkenau & Liebler, 1992; Funder & Sneed, 1993). We performed vector correlations using the method proposed by Funder and Sneed (1993). After Fisher's *r*-to-z transformation, correlations of cue-utilization and cue-validity were correlated across all the cues. Previous findings suggest that traits that are accurately judged are associated with high vector correlations (e.g., Back et al. 2010; Qiu et al, 2012). Our results reflected similar patterns (see Table 1). Strong vector correlation was found for openness, indicating that observers used valid cues to generate accurate judgment of openness. A moderate vector correlation was found for neuroticism. The other three dimensions (i.e.,

extraversion, agreeableness, and conscientiousness) did not obtain significant vector correlations.

We tested the mediating role of emotional positivity in self-other agreement for openness, since it is the only cue correlated with both observer and self-rating. Preacher and Hayes' (2008) INDIRECT macro was used to test the mediation model. The total effect of self-report openness on observers' judgment was significant ($B$ =.10, $SE$ =.04, $p$ =.02). The indirect effect was significant (CI = [.0001, .0582], excluding zero), while the direct effect of self-report openness on observers' judgment was not significant ($B$ =.08, $SE$ =.04, $p$ =.07). Overall, the mediation model was significant, $F$ (2, 120) = 4.62, $p$ = .01, $R^2$ = .07. Our results indicated that emotional positivity fully mediated the accuracy for the judgment of openness.

*4.5 Gender and age effect*

Individuals with different gender and age varied in how they present themselves in selfies (see Table 2). It is possible that the observed cue-validity correlations might be contingent on these two variables. Thus, we calculated partial cue-validity correlations by controlling gender and age. All initial significant cue-validity correlations remained, suggesting that these cues were directly related to personality traits.

Previous research suggested that observers might judge personality based on stereotypes of age and gender (Gosling et al., 2002; Kenny et al., 1992). Thus, partial correlations controlling for age and gender were calculated for cue-utilization to test this possibility. Among the initial 18 significant correlations, three of them became insignificant (i.e., photoshop editing and conscientiousness, face visibility and neuroticism, and location information with neuroticism). This suggests that observers'

judgment were mainly based on photo cues rather than the stereotypes of gender and age.

*4.6 Effect of good-looking face*

If observers' judgment did not rely on stereotypes of gender and age, would they rely on other properties of the participants, such as good-looking faces? To test this possibility, we calculated partial cue-utilization by controlling the rating for good-looking face. Results showed that two of the initial eighteen significant correlations (i.e., the correlation between face visibility and neuroticism and the correlation between face visibility and openness) became insignificant. This is likely because face visibility is related to the perception of good-looking face. Overall, these results indicated that observers judged personality mainly based on cues that were not related to the attractiveness of the participants.

## 5. Discussion

The current study contributes to existing research on personality and social media use by examining personality expression and judgment in the context of selfies, a new form of self-portraits in social media. We applied the lens model (Brunswik, 1956) and identified cues that reflected selfie owners' personality traits, and cues associated with observers' judgment of personality. This is the first study that examines the relation between personality and selfies. It has important implications.

Our study shows that selfies reflect their owners' personality traits. We identified a number of personality-related cues. For example, emotional positivity predicts agreeableness and openness, duckface indicates neuroticism, and private location in the background indicates less conscientiousness. These cues reflect the

characteristics of their corresponding personality traits. While past study has shown the connection between personality and photo-related activities such as number of photo uploads and albums on Facebook (Eftekhar, Fullwood, & Morris, 2014), our study revealed specific cues in self-portraits related to personality.

Although selfies contain cues that predict personality, observers could only accurately judge selfie owners' degree of openness. This is different from previous findings where observers could form accurate prediction of extraversion, agreeableness, openness, and neuroticism (marginally) from spontaneous full-body photo (Naumann et al., 2009), and accurately judge extraversion, agreeableness, and neuroticism from facial images without expression (Penton-Voak et al., 2006). The poor judgment found in our study was reflected in the asymmetry of cue-validity and cue-utilization, suggesting that observers used invalid cues to judge personality. We found that emotional positivity was used to judge all five personality traits, a phenomenon that has been documented in past research (Naumann et al., 2009). Several new cues were found to be related to personality judgment. For example, duckface was related to the judgment of conscientiousness and neuroticism, pressed lips were associated with the judgment of extraversion and openness, public location in the background was related to the judgment of conscientiousness, and being alone was related to neuroticism ratings.

Why do selfies contain limited personality-related cues and are difficult for accurate zero-acquaintance personality judgment? There could be several reasons. First, selfies allow individuals to have full control of their appearance. Individuals can easily manipulate their facial expression and eye contact to appear different from how they normally look. Second, selfies are often taken for sharing on social networking sites. Previous research on impression management found that individuals could

accurately perceive norms, expectations, and social desirability from their social networks (Siibak, 2009). It is possible that selfies are manipulated to present a positive social image, so that typical associations such as the correlation between smiling and extraversion (Naumann et al., 2009) become invalid. Thirdly, since selfies are taken by individuals themselves, most of them only contain faces. This prevents important cues, such as body posture and style of clothing, to appear in the picture. Previous studies showed that standing pose provides information about extraversion (Naumann et al., 2009) and clothing styles are indicative of extraversion and conscientiousness (Albright, Kenny, & Thomas, 1988; Kenny et al., 1992; Naumann et al., 2009). Thus, the lack of informative cues in selfies might result in poor accuracy. However, it is important to note that even with possible impression management strategies, people still inadvertently leave cues that predict their agreeableness, conscientiousness, neuroticism, and openness.

Our research has important practical implications. With selfies becoming extremely popular, there is great interest in understanding how they reflect personality. By identifying valid cues related to selfie owners' personality traits, our research provides important information for future work to improve the accuracy of human or machine prediction of personality from selfies. For example, computer programs can be developed to detect duckface to help predict neuroticism. One limitation of the current study is that we used photos from a microblogging website. As different online social networking sites have different user characteristics and usage patterns (Wilson, Gosling, & Graham, 2012), future research needs to examine if our findings can be generalized to other social networking sites.

## 6. Conclusion

The current study extends research on personality expression and judgment by examining selfies, a new form of self-portraits in social media. We identified cues in selfies that are related to selfie owners' degree of agreeableness, conscientiousness, neuroticism, and openness. These cues included facial cues such as duckface and emotion, and contexual cues such as background location. In addition, we examined zero-acquaintance judgement and found that observers had moderate to strong agreement on their prediction of all Big Five personality traits based on selfies. However, they could only accurately predict selfie owners' degree of openness. Our study is the first to reveal personality-related cues in selfies, and suggests that the difference between personality expression in selfies and other types of photos might be due to impression management of social media users. We provided the first coding scheme specific for selfies. Future studies in psychology, communication, and human–computer interaction can use it to process selfies and further understand how they reflect users' characteristics and psychological processes.

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