When the camera does lie: Selfies are dishonest indicators of dominance.

Amberley Gale & Michael B. Lewis*

School of Psychology, Cardiff University, Park Place, CF10 3AT, UK

*For correspondence

Abstract

Photographic self-portraits, or selfies, are used for a variety of reasons. Research has shown that selfies taken from below make the person appear more dominant. The current research explores whether selfies offer an honest depiction of a person's personality. It was also explored how people change the visual properties of selfies for different situations. Seventy five participants took two selfies of themselves in two scenarios: either for a CV for a job application or for a dating website. Participants' personality characteristics of warmth and dominance were also recorded. Differences in the two scenarios showed that participants were more likely to rotate their head slightly for the dating scenario than for the CV scenario and they were also more likely to use a lower camera angle for the CV scenario than the dating scenario suggesting that they were aware that a lower camera angle makes one appear more dominant. Personality characteristics correlated with elevation of the selfies. People who were more dominant tended to use a higher camera angle, which, ironically, previous research shows produces an image that appears less dominant. Selfies, therefore, can be seen as a dishonest depiction of personality.

Keywords: Selfies; dominance; personality; camera elevation angle; head rotation.

Public Significance: Selfies are increasingly forming the first contact with a new person and so judgements about people are often made based on these images. People have control over how these images are taken and here it is shown that people change specific features of the selfie depending on its intended audience. Personality characteristics are often inferred from selfies but here it is shown that, at least with dominance, selfies offer a misleading representation of character.

When the camera does lie: Selfies are dishonest indicators of dominance.

Since the invention of the camera, there has been discussion as to whether it captures an honest representation of the subject. In Boucicault's (1859) *The Octoroon*, Scud says about his camera "the apparatus can't mistake" (a precursor of the modern saying "the camera cannot lie"). The issue of whether an undoctored image of a person accurately portrays them is especially important considering the explosion of social media websites and the use of such platforms for the sharing of photographs that has been seen in recent years. Photographic self-portraits, or selfies, are becoming a common way to represent oneself in the digital environment, whether the site is for social purposes (e.g., Facebook or Twitter) or business networking (e.g. Linkedin or ResearchGate). How one represents oneself within these images is probably as important as first impressions used to be in real world exchanges. Indeed, selfies often contribute to a 'personal brand' in a network economy (Kucharska & Confente, 2017) and the feedback someone gets from their selfies can affect their self-esteem (Burrown & Rainone, 2017). Considered here, is whether the personality information that we get from a selfie is an honest reflection of the personality trait of the subject of the selfie. This was tested by assessing people's personalities and looking at how these factors predict how they take selfies in two different contexts: for a CV and in a dating scenario. The differences between how selfies were taken for these two scenarios were also assessed.

A brief history of the selfie

Self-depiction has seen an exponential increase in occurrence and popularity over the last decade, but it has a long history. Artists have been producing self-portraits for centuries, with some of the earliest self-portraits emerging at the beginning of the 15th century (Gombrich, 2005). However, the first photographic self-portrait was no easy feat. It is said to have been achieved by Robert Cornelius, an amateur chemist and photography enthusiast in 1839. Selfies remained fairly infrequent through the 19th and 20th centuries partly because they required complicated set ups but mostly because society lacked platforms for the viewing or sharing frequent self-portraiture.

The rapid increase in photographic self-portraiture occurred with the introduction of the smartphone with a front facing camera (Quito, 2017), which allowed for the photographer to see the self-image being taken. Soon after the release of the first smartphone with a front facing cameras (e.g. Apple's iPhone4 in 2010) the word 'selfie' was introduced into the public domain, and in 2013 'selfie' was Oxford Dictionary's Word of the Year. The practice of selfie taking has now become an inescapable part of modern society, alongside, the posting of selfies on various social media platforms. The prevalence of digital social media has created a society where it is not uncommon for social interactions to begin or even exist exclusively online (Sedghi, 2014; YouGov, 2014). This revolution in the way that much of the public interacts with each other necessitates research into understanding how impressions of an individual are created from these photographs and also how an individual controls these impressions by controlling the selfie itself.

Head rotation and elevation in portraiture

Humans automatically and immediately form impressions about the character of another person on first perceiving them (Asch, 1946; Zebrowitz, 2017). This instinctive impression formation also extends to forming an opinion about the personality of the subject of a portrait (Hills, Lewis & Honey, 2008; Willis & Todorov, 2006). Portrait artists will portray his or her subject in a particular way and this is deeply considered to provide meaning.

One decision in portraiture is the rotational angle of the face – whether to show a left view, a right view or a front view. McManus & Humphrey (1973) looked at 1,474 painted portraits produced in Western Europe between the 16th and 20th century and found a 60% bias for presenting the left side of the face over the right and front views were particularly rare. The relative rarity of front facing faces may reflect the finding by Lewis (2017) that slightly rotated faces are seen as more attractive than front views. The bias for left-facing portraits even exists for left handed artist such as da Vinci, Michelangelo and Rembrandt and in photographic art (Nicholls, Clode, Wood & Wood, 1999) and has been found in selfies (Manovich, Rerrari & Bruno, 2017). The explanation for the left-side bias in artistic and photographic techniques is that it is used to convey and elicit recognition of emotional

messages. Research suggests that the left side of the face is used to convey emotionality and warmth and the right side of the face is used for more professional and impassive messages (Powell & Schrillo, 2009). The left-cheek pose places the majority of the subject's facial features in the left half of the painting or photograph. Stimuli that are located in the left proportion of the visual field project directly to the right cerebral hemisphere of the brain which contains areas specialised for facial recognition (e.g. the fusiform face area; Kanwisher & Yovel, 2006). Research has also found that the muscles in the left side of the face produce more intense emotional expressions than those in the right and that the left side of the face and is consequently judged to have greater emotional expression (Skinner & Mullen, 1991; Nicholls, Wolfgang, Clode & Lindell, 2002). The right hemisphere has also been indicated to play a superior role in the processing of emotional expression (Powell & Schrillo, 2009). However, the left side of the face is not always preferred by artists. When aiming to represent scientific detachment, artists appear to show no left bias as shown in portraits of fellows of the Royal Society (Nicholls et al. 1999). Nicholls et al. found that the general preference for the left side of the face, especially for emotive communication, can also be observed in non-artists' photographic technique. Undergraduate students (from a pre-smartphone era) were asked to pose for either emotive or passive portraits. They found that participants were significantly more likely to present their left cheek to the camera in the emotive condition than in the impassive condition. This suggests an intrinsic awareness of how manipulating the way you present yourself for a photograph influences the way the audience of photograph perceive you.

Another means by which people can influence the way they are perceived in portraits is through the manipulation of vertical viewing angle. The elevation of point of view in artistic portraiture has not undergone the same degree of analysis as head rotation but there has been some analysis in terms of its use in film and television (e.g. McCain, Chilberg & Wakshlag, 1977). As Baranowski & Hecht (2017) explain, high camera angles are used to diminish an actor's status whereas looking up at someone emphasizes their dominance.

The role of elevation (or vertical camera angle) has also been explored in social media contexts. Sedgewick, Flath & Elias (2017) explored how men and women portray themselves in selfies on the

popular dating application *Tinder* and found that men were more likely to use photographs that were taken from below and women were more likely to use photographs taken from above. Makhanova, McNulty & Maner (2017) assessed gender difference in the context of the selfie's audience. They wanted to investigate whether the audience of the photograph had any influence on how the subject of the photograph would present themselves. They initially compared selfies from a dating site with a professional networking site and found that in both cases, women's selfies were taken from a significantly higher angle than men's. Further, for the men (but not the women), the professional site selfies were lower in camera angle than for the dating site selfies suggesting that male selfie takers may wish to present a more masculine image for prospective employers whereas women consistently use an angle that makes them look most attractive in all contexts. These findings suggest that vertical camera angles are used to elicit a message of hierarchy, in the way that people strategically position themselves as either higher or lower relative to the audience in order to control the impression they create. Makhanova, McNulty & Maner (2017) also assessed the interpretation of vertical angle on dominance and attractiveness of the individual. They found that women were seen as more attractive when photographed from above whereas men were seen as being more dominant when photographed from below.

The findings concerning the perception of vertical angles in selfies relate to common ideas of dominance and vertical position that exist within the Western society. Expressions of power and submission in the English language are related to a difference in vertical position, such as having power 'over' someone in comparison to being 'under' someone's influence (Lakoff & Johnson, 1980). This association has been found to be consistently utilised by the media to convey messages of power within photographic content. Giessner, Ryan, Schubert & Quaquebeke (2011) examined various photographic databases and found that powerful individuals are generally depicted from below and less powerful individuals are depicted from above. They also tested whether this manipulation is endorsed in lay persons' content production. Participants were asked to choose a photograph for either a Chief Executive Officer (CEO) or an interim assistant. It was found that participants were significantly more likely to choose the photograph with the subject depicted from

below for the CEO and the photograph depicted from above for the assistant. In this way, the participants chose the photograph that had a vertical angle congruent with the power of the subject – CEOs being higher than interim assistants. Therefore, research seems to suggest that individuals are aware of distinct communicative signals of dominance and submission, and endorse these signals within their own actions and thinking. Explicit and implicit displays of dominance and submission are important to interpersonal communication and the way individuals define their roles within a relationship (Burgoon & Hale, 1984). It is clear that individuals perceive dominance from a lower vertical angle and submission from a higher angle and that these and other photographic manipulations are regularly employed to influence how the taker of the photograph is perceived.

The research described so far suggests that anyone can manipulate camera angles to produce a more or less dominant image of themselves and also people do vary how they use camera angles in selfies dependent on their audience. What is not known is whether there is a degree of honesty in the portrayal of dominance in selfies. That is, are those people who are more dominant more inclined to use lower camera angles. If so, then selfies would be providing personality information in a useful and honest manner.

The Present Study

The current studied tested whether there is a link between selfie camera angle and personality characteristics. The study also explored whether the people's perceived purpose of the selfie influences how they take the selfie. Participants were asked to imagine that they were taking selfies for their profile on a dating site and the cover page of their curriculum vitae (CV) whilst also being video recorded. The side of the face that they presented to the camera and the angles at which they took the photographs were compared against scores from a personality measure that assessed levels of dominance and warmth.

There were four specific hypotheses: two primarily concerning scenarios and two concerning personality traits. It was predicted (H1) that the side of the face presented to the camera would differ between scenarios. In line with previous research that suggests a preference for the left side of the

face for emotive contexts, it was predicted that the left side of the face would be presented to the camera more often than the right side for the dating site scenario (H1a). It was predicted (H2) that the vertical angles at which the participants took their selfies would differ between scenarios. Specifically, participants were predicted to use a higher camera angle, in relation to the head, in the dating scenario as a means of looking more attractive and youthful to prospective partners; whereas, in the CV scenario participants were predicted to elicit a more neutral or lower angle to appear professional and possibly more dominant and therefore competent to prospective employers (Makhanova, McNulty & Maner, 2017).

The influence of personality traits were investigated with two hypotheses. First, it was hypothesised (H3) that the subject's own levels of dominance would relate to the angle at which they took their selfies. Specifically, individuals that were higher in dominance would take selfies from a lower angle than those with low levels of dominance in order to demonstrate their dominance. Previous research into the link between personality and selfie properties have used natural selfies from which it is difficult to infer or calculate the actual angular properties of the selfie (Musil, Preglej, Robert, Klasinc & Babic, 2017; Qiu, Lu, Yang, Qu & Zhu, 2015). In the current study, a second camera (recording video) was used to obtain objective measurements of the camera elevation as the selfie is taken. Further, in the majority of research on vertical angles on selfies, the focus has been on the angle between the head and the camera relative to the horizontal (this will be referred to as the absolute camera elevation). If the face is rotated up or down, then the absolute camera angle will remain the same but the view of the face will change considerable. This angle will not have an effect on the face itself but only on the position of the face relative to the body with the largest change being the shape of the neck (foreshortened by a high angle or lengthened by a low angle). The other important angle in judging vertical angles in selfies is the angle between the plane of the face and camera, or rather the perpendicular to the plane of the face and the camera (this will be referred to as the relative camera elevation). This is more difficult to calculate as it requires some objective way to assess head elevation. As there are no simple facial landmarks that can be used to assess when the head in facing forwards (rather than slight up or slightly down) comparisons across individuals are difficult;

however, by using fixed points (i.e., the eye and the auditory canal) one can assess whether the head is more or less elevated between different situations. Figure 1 illustrates the difference that changes in either absolute camera angle and relative camera angle has on the appearance of a selfie.

Finally, it was hypothesised (H4) that the use of either the left or the right side of the face would be related to the personality characteristics of warmth, such that the higher a participant's warmth score, the more they would present the left side of their face. Facial images showing the right side are seen as more emotional and so it could be expected that warmer and more emotionally open people would be more willing to show that side of their face in a selfie.

Method

Design

The design was mixed factorial with within-subject independent variable of the scenario for the selfie (CV or dating) and between-subject quasi-independent variables (or non-manipulated independent variables) of personality (two continuous variables of dominance and warmth) and gender (male or female). The dependent variables were: the relative and absolute elevations of the camera (continuous variables in degrees) during the selfies and also the side of the face presented to the camera (categorical: left, right or centre). All participants took two selfies (plus the practice one) and the order in which the selfie scenarios were presented was counterbalanced between participants. There were no other measures, manipulations or exclusions. The protocol was considered and approved by the Cardiff University, School of Psychology research ethics committee and all procedures were compliant with the ethical principles of the American Psychological Association.

Participants

Eighty three undergraduate Psychology students were recruited for this study. Eight of the participants' data had to be excluded because accurate angles could not be calculated from their screenshots, due to their ears being obscured in the recordings. Of the 75 participants included, 65

were female with a mean age of 19.5 (SD= 0.85) and 10 were male with a mean age of 19.6 (SD= 0.97). The overall mean age of the sample was 19.51 (SD= 0.86).

Materials

Recording equipment set up

A Sony Xperia X mobile phone was used to take the selfies. Audio on the phone was turned on so there was an audible click when the selfie was taken. All other features were disabled during the procedure. The participants used the front-facing camera so they could view the photograph they were taking.

A video recorder was used to record the participants form the side during the selfies. Participants sat on an adjustable chair facing forwards and holding the phone. The video recording camera was set up on the participants' right such that the upper torso (approximately waist up) and head of the participants were clearly in view, with adequate room in the frame for the participants to extend their arm to take the selfies. The wall to the participants' left contained a horizontal line that was used to establish absolute camera angles in the video recordings. See Figure 2 for a depiction of the set up.

Scenarios

Two scenarios were used to elicit different selfie styles from the participants. These were taking a photograph that will be used as a profile photo for a dating site and taking a photo that will be attached to the cover sheet of a curriculum vitae (CV). For the Dating site scenario, the participants were given the following description to read "I want you to imagine that the photograph you are about to take will be used as your profile picture for a dating site. When taking this photograph, you may want to consider how you can present yourself to look most appealing to potential partners." For the CV scenario, the description given to the participants read as follows "I want you to imagine that the photograph you are about to take will be attached to your CV for a job application. When taking this

photograph, you may want to consider how you can present yourself to look most appropriate for potential graduate-level employers."

Personality measure

The Revised Interpersonal Adjectives Scale (IAS-R; Wiggins, Trapnell & Phillips, 1988) was used as a measure of personality. The original scale has 8 octants that cover a range of personality characteristics. However, due to the focus of the current study, only the dominance, submissiveness, warmth and coldness measures were included. In this study, participants were presented with a list of 32 single adjectives (e.g. "assertive") and asked to rate how accurately they believed each adjective described their personality on an eight-point Likert scale ranging from "extremely inaccurate" to "extremely accurate". The order of the adjectives was randomised. As with any self-report measure of personality, there will be room for subjectivity or bias; however, this type of scale has been used for over 30 years to explore the effects of personality differences on a range of tasks. This type of adjective-based measure of personality shows good coherence with other measures of personality (e.g., see Widiger & Trull, 1997). Also, Trapnell and Wiggins (1990) showed that this measure had good convergent validity and discriminant validity.

Procedure

Participants were tested individually. Each participant was asked to tuck any hair behind their right ear, so it was clearly in view for the recording camera. The participant was shown how to use the front camera of the phone and took a 'practice selfie' to familiarise themselves with the layout of the phone (this was not used in the analysis). The participant was then asked to read the first scenario and verbalise that they understood the proposed purpose of the first selfie. After the participant verbalised that they were ready to take the selfie, the experimenter started the video recording. The experimenter stopped the recording once they had seen that the participant had taken the photograph or when they heard the click of the phone that signified a photograph had been taken. This was repeated for the second scenario. The participants were allowed only one attempt at taking each photograph. The

participants were then asked to fill in the IAS-R questionnaire. Once this was completed the participants were debriefed.

Data handling

Face rotations

The selfies taken were categorised for which side was being presented. The side of the face presented to the camera by each participant in each scenario was categorically judged to be either right (coded as -1), left (coded as 1) or central (coded as 0).

Camera elevations

From the video recordings, stills were collected at the point when the selfie was taken as indicated by the auditory response from the phone. Three markers were used to calculate the camera elevations for the selfies. These were the position of the camera, the position of the front of the eye and the centre of auditory canal (see Figure 3). The absolute camera elevation was calculated as the angle between the centre of the eye and the front camera of the mobile phone relative to the horizontal (a positive angle indicated the camera was higher than the eye). The relative camera elevation angle was calculated as 180 degrees minus the clockwise angle at the eye from auditory canal to the camera on the phone (hence, tilting the face forward while keeping the hand still would increase this elevation). Therefore, the absolute angle illustrates the overall height of the mobile phone in relation to the height of the participant's eye. The relative angle considers the absolute angle in relation to any compensatory vertical head rotation the participant makes.

IAS-R Scores

The IAS-R scores were converted into simple scores for dominance and for warmth by reverse coding the scores for submissiveness and coldness. A final score for dominance was the average score for the eight dominance adjectives and the eight reverse coded submissiveness adjectives. The final score for warmth was the average score for the eight warmth adjectives and the eight reverse coded coldness adjectives.

Results

The effect of scenarios

Figure 4 shows the distribution of horizontal head rotations during the taking of selfies in the two scenarios. In the CV condition, a front view is almost exclusively used whereas a rotated head is employed almost half of the time for the dating scenario. A chi squared analysis testing H1 found this difference to be significant, $\chi^2(1) = 26.15$, $p < .001$, showing that using a front view was significantly more common in the CV scenario than in the dating scenario. Within the dating scenario, there was a slight preference over showing the left side of the face to the right side but this was not significant, $p = .108$, showing limited support for H1a.

Figure 5 shows the absolute camera elevation and the relative camera elevation for the two scenarios. The figure shows that the absolute angles are negative for both CV scenario and dating scenario but they were more negative for the CV condition. A mixed-design ANOVA was performed with a between-participant factor of gender and a within-participant factor of scenario. Only scenario was a significant factor, $F(1,73) = 11.118$, $p = .001$, partial $\eta^2 = .132$, $BF_{10} = 657.018$[1], supporting H2. Gender was non-significant, $F(1,73) = 0.029$, $p = .865$, partial $\eta^2 < .001$, $BF_{10} = 0.355$, as was the interaction between gender and scenario, $F(1,73) = 0.180$, $p = .673$, partial $\eta^2 = .002$, $BF_{10} = 0.323$. The relative elevations were even lower than the absolute elevations but there was a similar effect of scenario with the CV being more negative than the dating condition. Similarly, an ANOVA was performed with factors of gender and scenario but only scenario was a significant factor, $F(1,73) = 9.902$, $p = .002$, partial $\eta^2 = .119$, $BF_{10} = 681.694$. Gender was non-significant, $F(1,73) = 0.552$, $p =$

[1] BF_{10} refers to the Bayes factor defining the likelihood ratio for hypothesis relative to the null hypothesis (Dienes, 2011). Jeffreys (1961) suggests that a value above 10 provides strong evidence for the hypothesis whereas under 0.1 provides strong evidence for the null hypothesis – a value above 3 provides substantial evidence for the hypothesis. Bayes factors were calculated using JASP (Love, Selker, Marsman, Jamil, Dropmann, Verhagen, Gronau, Smira, Epskamp, Matzke, Rouder, Morey & Wagenmaker, 2015). One advantage of this type of analysis is that it is not susceptible to *p*-hacking which is important here as the research was exploratory and so no power analysis was possible. However, the data were not analysed until all the data had been collected.

.460, partial η^2 = .008, BF_{10} = 0.467, as was the interaction between gender and scenario, $F(1,73)$ = 0.023, p = .881, partial η^2 < .001, BF_{10} = 0.303.

Correlations with personality scores

The personality scores were assessed for each participant. The average dominance score was 4.48 (on a 1 to 8 scale, standard deviation = 0.878) and a Cronbach alpha analysis gave a reliability score of .855. The average warmth score was 5.679 (on a 1 to 8 scale, standard deviation = 0.878) and a Cronbach alpha analysis gave a reliability score of .796. The correlation between dominance and warmth was r = -.333. The dominance and warmth scores were analysed for correlations with head rotation and the angles of camera elevation for the two scenarios (and a measure combining the scores on the two scenarios) and using both the absolute and the relative values. All of these correlations are presented in Table 1. Both the absolute camera elevations and the relative camera elevations were significantly correlated with dominance but not warmth. Looking at the separate scenarios, the CV scenario showed a significant negative correlation between absolute camera elevation and warmth and a significant positive correlation with dominance. The positive correlation between camera elevation and dominance was in the opposite direction than predicted by H3 and means that those with a more dominant character tended to use a higher camera angle than those with a more submissive character. The personality measure of warmth correlated with the head position measures for the CV scenarios. The patterns of correlations were explored for males and females separately. The personality correlations with absolute camera elevations in the CV scenario were only present for female participants. For male participants, dominance correlated with relative camera angle for the dating scenario and also the head rotation in that scenario. Head rotation did not correlate with warmth and so the results do not provide support for H4.

Discussion

This study investigated the effect that particular scenarios have on selfie taking and whether the selfies taken in these scenarios are affected by the person's personality characteristics. The first finding is that the scenario does affect the preferred angle of the selfie. As predicted in H1, a selfie

taken for a dating profile is more likely to contain a face that is horizontally rotated away from the camera than one that is taken for a CV. This may reflect a belief that a person looks more attractive when orientated slightly away from centre – a belief that appears to be held by artists historically with many artists preferring to paint slightly rotated faces (McManus & Humphrey, 1973). A more frontally oriented face may be preferred for a CV because it might suggest being purposeful and getting a job done although this is speculation. The pattern of results was consistent with the left side of the face being the preferred side to be displayed in the dating scenario, consistent with the preferences shown by portrait artists, however, this difference was not significant.

The scenario for taking the selfie also had an effect on the absolute elevation of the camera: while the camera was, on average, just below the eye line in the dating scenario, it was 5 degrees lower in the CV scenario. This difference was predicted in H2 and is consistent with the idea that one wants to appear superior and dominant when applying for a job but more approachable when looking for a partner. A difference of about 4 degrees was found when looking at relative camera elevation between CV and dating scenarios. This pattern suggests that the participants' head orientation in space was fairly constant between the two scenarios and it was only the position of the camera that moved as a result of the change in scenario: what changed between the scenarios was where the camera was held, not how the head was held. These findings are consistent with previous research that shows how people use different camera angles to strategically position themselves either higher or lower relative to the observer in order to control the impression they form (Giessner et al., 2011; Makhanova et al., 2017; Sedgewick, et al., 2017).

Two aspects of personality were explored as to whether they affect the way a person depicts him/herself in a selfie. The first one considered is dominance. High dominance has been shown to be inferred in a selfie if the camera angle is low (Makhanova et al., 2017). If selfie taking offers an honest communication of dominance then a person with higher dominance will use a lower camera angle to produce a more dominant looking selfie (H3). The results here found the opposite correlation: higher dominance correlated with a higher camera elevation. This finding suggests that selfies are a misleading or dishonest indicator of dominance with more dominant individuals producing selfies of

themselves that appear more submissive than less dominant people. This is based on the previous evidence that selfies taken from a lower angle make a person look more dominant (Makhanova et al., 2017). There is, of course, a possible (*post-hoc*) explanation for this link between camera elevation and dominance – it takes a confident and dominant person to lift their phone high to take a selfie whereas a submissive person might take a selfie from their lap. This explanation is supported by research into dominance. Burgoon, Johnson & Koch (1998) define dominance as a personality construct that encompasses a constellation of attributes including confidence, animation and dynamism. They suggest that dominant personalities use and range of expressive, relational-based strategies and communicative acts through which they exert their power and influence. Some of the non-verbal indicators of dominant personalities are greater use of space and more active movements, whereas, some of the non-verbal indicators of submissive personalities are constricted movement and limited use of space (Burgoon & Dunbar, 2000; Schwartz, Tesser & Powell, 1982). In relation to the observations of this study, one could posit that the individuals that are higher in dominance use higher angles because they are simply more willing to use up more room in their environment than their submissive counterparts.

The gender-based analysis gives a slightly different result. In the current sample there were only 10 males and so the general trends observed mostly reflect female performance. Males show additional correlations between dominance and both relative camera angle and rotation of the head. More dominant men, therefore, are more inclined to drop their heads forward and to rotate their head from the midline when taking a selfie in a dating context. It is possible that such poses would make the person appear more approachable but it is not clear why dominant individuals are more inclined to use this strategy. Given that this is based on just 10 participants and an explanation for this correlation is currently speculative, it would be useful to follow up these findings with further research.

The second personality characteristic that was investigated was warmth. This was investigated as it has been suggested that an image taken of the left side of the face portrays more warmth than a central view. If a selfie is to be an honest communication of warmth then those that show more warmth should also show the left side of the face more (H4). In fact, no significant correlations were found

between warmth and either whether the left side of the face was shown or whether either side of the face was found. The only significant correlation was a negative one with camera elevation suggesting warmer people used a lower camera angle (although the relationship was restricted to female participants). One conclusion from these results is that showing a slightly rotated face is neither an honest nor dishonest communication of warmth. However, there are other explanations: maybe the personality measure was not sufficient to measure a person's warmth, or maybe the angle of rotation was not measured to a sufficiently fine degree.

Conclusions

The current findings require us to re-evaluate the personality inferences that we make from selfies. Whilst it appears that levels of dominance do predict the angle at which selfies are taken, they do so in the opposite way to what one would expect from the literature. It has been well documented that there is an implicit association between verticality and dominance. This association is apparent in judgements where the subjects of photographs taken from a low angle are perceived to be more dominant than the subjects of photographs taken from a high angle (Makhanova, McNulty & Maner, 2017). If one assumes that people display an authentic representation of their personalities in selfies, then one would expect individuals high in levels of dominance to automatically utilise a low angle and individuals high in submissiveness to use a higher angle in their selfie taking in order to reflect their personalities. Yet, this study found the exact opposite. Instead, it was found that the more dominant an individual was, the higher was the angle at which they took their selfie. It seems that although the association between height and dominance is exploited by the media and is well accepted by the public, it may not be reflected in actual behaviour. This may be accidental or it could be strategic with more dominant people wishing to represent themselves in a less dominant manner.

Overall these findings show that people do use rotational manipulations in selfies to influence how they will be perceived and to change the properties of the selfie for different audiences. These changes are mostly in the position of the camera in space rather than in the orientation of the head towards the camera. Also, while personality correlates with the production of a selfie, it does so in a way that

leads to the dishonest depiction of that personality trait. So when it comes to the depiction of dominance in a selfie, it appears that the old saying “a camera never lies” does not apply.

References

Asch, S. E. (1946). Forming impressions of personality. *The Journal of Abnormal and Social Psychology*, 41(3), 258.

Baranowski, A. M., & Hecht, H. (2018). Effect of camera angle on perception of trust and attractiveness. *Empirical Studies of the Arts*, 36(1), 90-100.

Burgoon, J. K., & Dunbar, N. E. (2000). An interactionist perspective on dominance-submission: Interpersonal dominance as a dynamic, situationally contingent social skill. *Communications Monographs*, 67(1), 96-121.

Burgoon, J. K., & Hale, J. L. (1984). The fundamental topoi of relational communication. *Communication Monographs*, 51(3), 193-214.

Burgoon, J. K., Johnson, M. L., & Koch, P. T. (1998). The nature and measurement of interpersonal dominance. *Communications Monographs*, 65(4), 308-335.

Burrow, A. L., & Rainone, N. (2017). How many likes did I get?: Purpose moderates links between positive social media feedback and self-esteem. *Journal of Experimental Social Psychology*, 69, 232-236.

Carbon, C. C. (2017). Universal principles of depicting oneself across the centuries: from renaissance self-portraits to selfie-photographs. *Frontiers in Psychology*, 8, 245.

Dienes, Z. (2011). Bayesian versus orthodox statistics: Which side are you on?. Perspectives on *Psychological Science*, 6(3), 274-290.

Giessner, S. R., Ryan, M. K., Schubert, T. W., & van Quaquebeke, N. (2011). The power of pictures: Vertical picture angles in power pictures. *Media Psychology*, 14(4), 442-464.

Gombrich, E. H. (2005). *The Story of Art*, 16th Edn. London: Phaidon.

Hills, P. J., Lewis, M. B., & Honey, R. C. (2008). Stereotype priming in face recognition: Interactions between semantic and visual information in face encoding. *Cognition*, 108(1), 185-200.

Jeffreys, H. (1961). *Theory of Probability*. Oxford University Press.

Kanwisher, N., & Yovel, G. (2006). The fusiform face area: a cortical region specialized for the perception of faces. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 361(1476), 2109-2128.

Kucharska, W., & Confente, I. (2017). Selfie and Personal Branding Phenomena in the Context of the Network Economy. A Literature Review. *Handel Wewnętrzny*, 6 (371), 161-169.

Lakoff, G., & Johnson, M. (1980). The metaphorical structure of the human conceptual system. *Cognitive science*, 4(2), 195-208.

Lewis, M. B. (2017). Fertility affects asymmetry detection not symmetry preference in assessments of 3D facial attractiveness. *Cognition*, 166, 130-138.

Love, J., Selker, R., Marsman, M., Jamil, T., Dropmann, D., Verhagen, A. J., Ly, A., Gronau, Q. F., Smira, M., Epskamp, S., Matzke, D., Wild, A., Rouder, J. N., Morey, R. D. & Wagenmakers, E.-J. (2015). *JASP (Version 0.7)* [Computer software].

Manovich, L., Ferrari, V., & Bruno, N. (2017). Selfie-Takers Prefer Left Cheeks: Converging Evidence from the (Extended) selfiecity Database. *Frontiers in psychology*, 8, 1460.

Makhanova, A., McNulty, J. K., & Maner, J. K. (2017). Relative Physical Position as an Impression-Management Strategy: Sex Differences in Its Use and Implications. *Psychological science*, 28(5), 567-577.

McCain, T. A., Chilberg, J., & Wakshlag, J. (1977). The effect of camera angle on source credibility and attraction. *Journal of Broadcasting & Electronic Media*, *21*(1), 35-46.

McManus, I. C., & Humphrey, N. K. (1973). Turning the left cheek. *Nature*, 243(5405), 271.

Musil, B., Preglej, A., Ropert, T., Klasinc, L., & Babič, N. Č. (2017). What Is Seen Is Who You Are: Are Cues in Selfie Pictures Related to Personality Characteristics?. *Frontiers in psychology*, 8, 82.

Nicholls, M. E., Clode, D., Wood, S. J., & Wood, A. G. (1999). Laterality of expression in portraiture: putting your best cheek forward. *Proceedings of the Royal Society of London B: Biological Sciences*, 266(1428), 1517-1522.

Nicholls, M. E. R., Wolfgang, B. J., Clode, D., & Lindell, A. K. (2002). The effect of left and right poses on the expression of facial emotion. *Neuropsychologia*, 40, 16621665.

Powell, W. R., & Schirillo, J. A. (2009). Asymmetrical facial expressions in portraits and hemispheric laterality: A literature review. *Laterality*, 14(6), 545-572.

Qiu, L., Lu, J., Yang, S., Qu, W., & Zhu, T. (2015). What does your selfie say about you? *Computers in Human Behavior*, 52, 443-449.

Quito, A., (2017). *Front facing cameras were never intended for selfies*. Retrieved April 12, 2018, from https://qz.com/1104742/front-facing-cameras-were-never-intended-for-selfies/

Robert Cornelius' Self-Portrait: The First Ever "Selfie" (1839). (n.d.). Retrieved April 3, 2018, from https://publicdomainreview.org/collections/robert-cornelius-self-portrait-the-first-ever-selfie-1839/

Schwartz, B., Tesser, A., & Powell, E. (1982). Dominance cues in nonverbal behavior. *Social Psychology Quarterly*, 114-120.

Sedgewick, J. R., Flath, M. E., & Elias, L. J. (2017). Presenting Your Best Self (ie): The Influence of Gender on Vertical Orientation of Selfies on Tinder. *Frontiers in psychology*, 8, 604.

Sedghi, A. (2014). *Facebook: 10 years of social networking, in numbers*. Retrieved April 7, 2018, from https://www.theguardian.com/news/datablog/2014/feb/04/facebook-in-numbers-statistics

Skinner, M., & Mullen, B. (1991). Facial asymmetry in emotional expression: A meta-analysis of research. *British Journal of Social Psychology,* 30, 113124.

Trapnell, P. D., & Wiggins, J. S. (1990). Extension of the Interpersonal Adjective Scales to include the Big Five dimensions of personality. *Journal of Personality and Social Psychology*, 59(4), 781.

Widiger, T. A., & Trull, T. J. (1997). Assessment of the five-factor model of personality. Journal of Personality Assessment, 68(2), 228-250.

Wiggins, J. S., Trapnell, P., & Phillips, N. (1988). Psychometric and geometric characteristics of the Revised Interpersonal Adjective Scales (IAS-R). *Multivariate Behavioral Research*, 23(4), 517-530.

Willis, J., & Todorov, A. (2006). First impressions: Making up your mind after a 100-ms exposure to a face. *Psychological science*, 17(7), 592-598.

YouGov. (2014). Online Dating Services. Retrieved April 7, 2018, from http://yougov.co.uk/news/2014/02/13/seven-ten-online-dating-virgins-willing-tryfindin/

Zebrowitz, L. A. (2017). First impressions from faces. *Current directions in psychological science*, 26(3), 237-242.

Table 1. Pearson correlations of size of camera elevations and head rotations with the four personality traits of the IAS-R.

	Warmth			Dominance		
	All (N = 75)	Female (N = 65)	Male (N = 10)	All (N = 75)	Female (N = 65)	Male (N = 10)
CV scenario						
Absolute camera elevation	-.261*	-.269*	-.217	.358*	.345*	.524
Relative camera elevation	-.120	-.175	.427	.202	.221	.160
Head rotation	-.102	-.119	.000	-.047	-.038	.000
Dating scenario						
Absolute camera elevation	-.096	-.090	-.127	.226	.188	.604
Relative camera elevation	-.187	-.185	-.269	.213	.178	.733*
Head rotation	-.069	-.044	-.399	.109	.070	.787*
Combined scenarios						
Absolute camera elevation	-.163	-.161	-.167	.292*	.260*	.610
Relative camera elevation	-.175	-.179	-.064	.228*	.213	.581
Head rotation	-.100	-.088	-.399	-.001	.041	-.787*

* $p < 0.05$ and $BF_{10} > 3$.

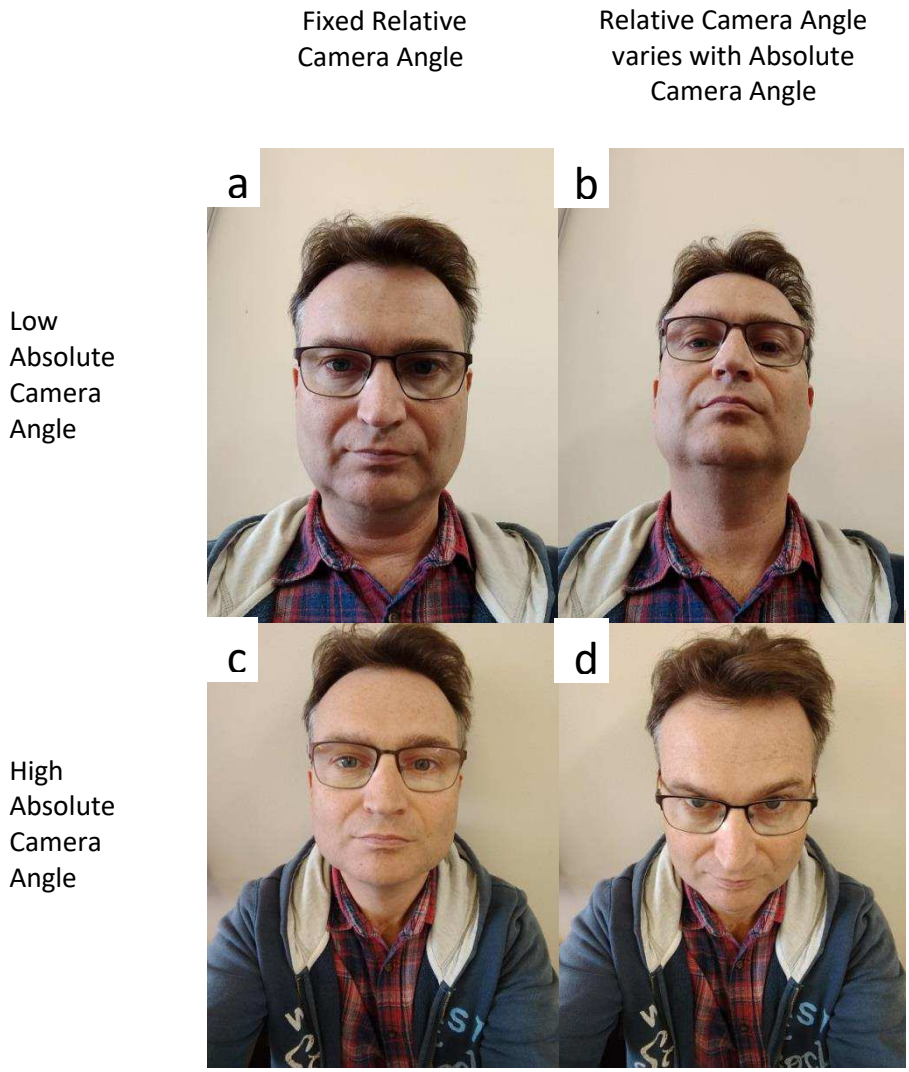

Figure 1. Illustrations of selfies under different camera elevations. In a and b, the camera is below the height of the eyes and so they have a low absolute camera angle. In a, the face is oriented towards the camera and so the relative camera angle is close to zero whereas in b, the face is facing forward and so the relative camera angle is low like the absolute camera angle. In c and d, the camera is above the height of the eyes and so they have a high absolute camera angle. In c, the face is oriented towards the camera and so the relative camera angle is close to zero whereas in d, the face is facing forward and so the relative camera angle is high like the absolute camera angle. Notice that changing the absolute camera angle while keeping the relative camera angle constant (i.e., comparing a and c) has little effect on the projected view of the face.

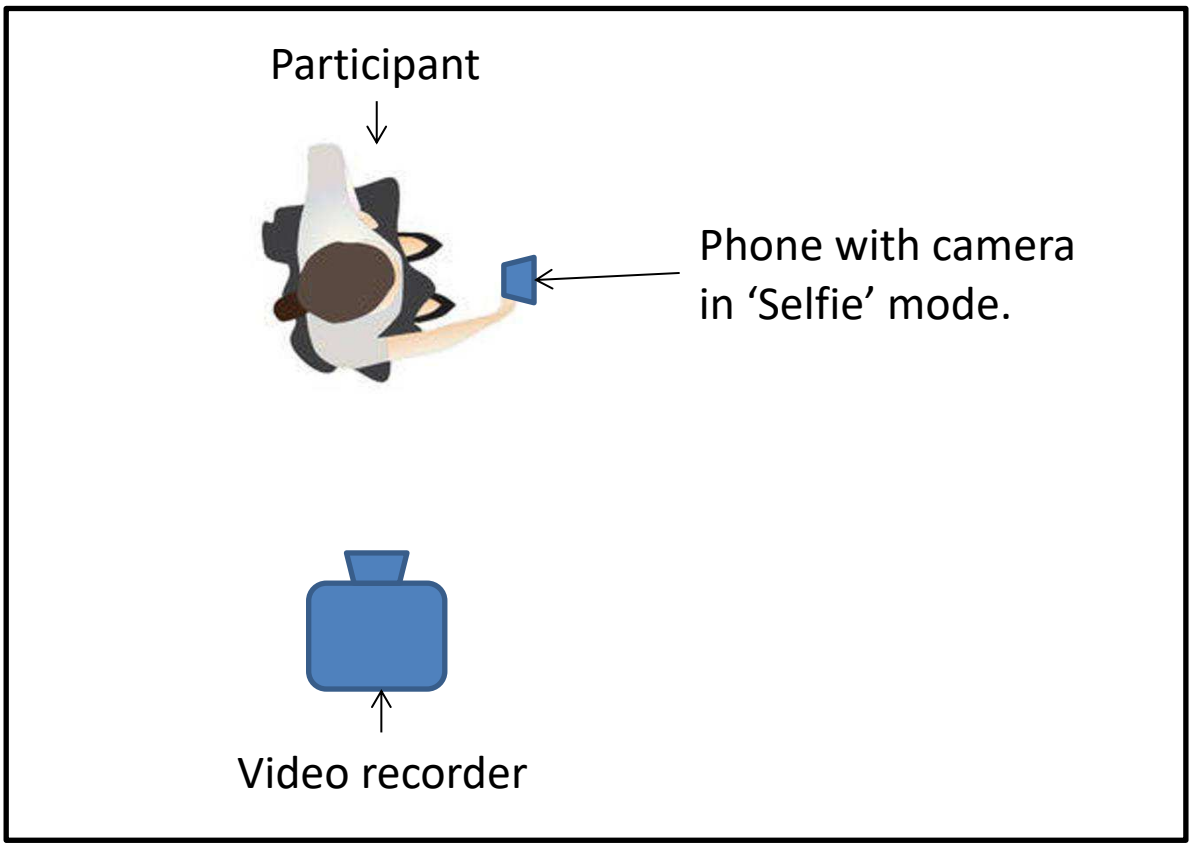

Figure 2. Simple depiction of the set up. A phone in selfie mood was held by the participant while a video camera recorded the activity of taking a selfie form a perpendicular angle.

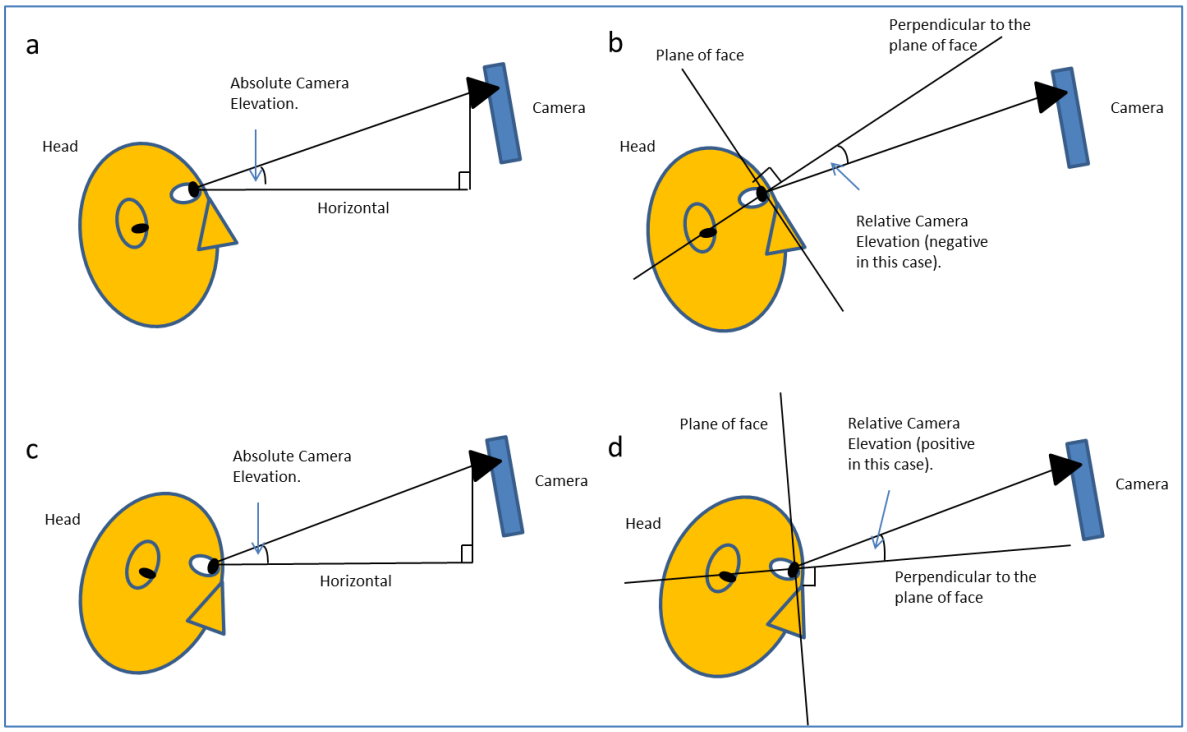

Figure 3. Calculation of the absolute camera elevation (a and c) and the relative camera elevation (b and d). For the absolute camera elevation the position of the camera and the pupil of the eye was used along with horizontal defined by gravity. For the relative camera elevation, the positions of the camera, the pupil and the auditory canal was used. In the bottom figures the head has been tilted forward, which has no effect on the absolute camera elevation but does change the relative camera elevation with the elevation being negative in b but positive in d.

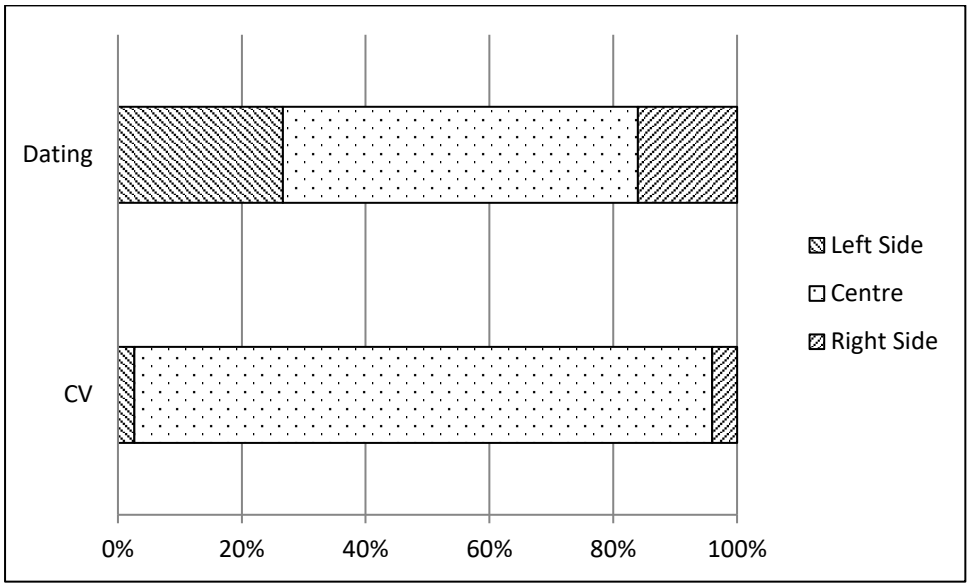

Figure 4. Percentage of selfies showing each type of head rotation in the two different scenarios of Dating and CV.

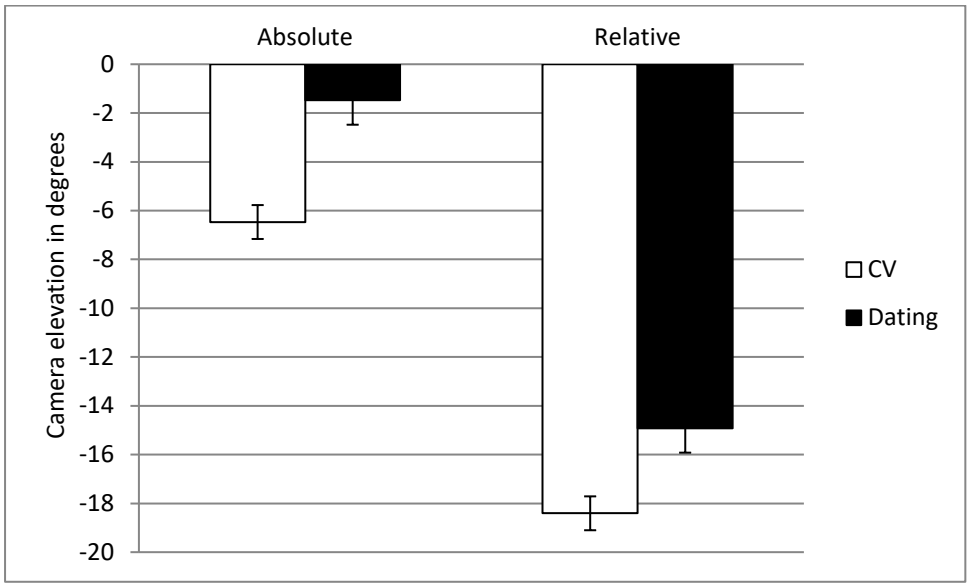

Figure 5. The average absolute camera elevations and the average relative camera elevations for the two scenarios of CV and dating. A more negative value means a lower camera angle. The error bars show +/- one standard error.