



# UNDERSTANDING SELFIES

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# UNDERSTANDING SELFIES

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In the year 2013, 'selfie' was named word of the year by Oxford Dictionaries in recognition of dramatic changes in frequency, prominence, and register of the term. This drastic increase in selfie-taking was spurred by two factors. The first was the advent of smartphones equipped with front cameras and preview screens that made it easy to compose a photographic self-portrait by a process of deliberately exploring one's image, choosing a pose, and finally taking the picture. The second key change contributing to the rise of the selfie age was the increasing availability of internet connections. It is estimated that about 50% of the world population has access to the internet today (2018; <https://www.internetworldstats.com>). At the end of the past century, this percentage was a mere 1%. The growth of the internet infrastructure simultaneously spurred the development of social network applications such as Facebook, Twitter, Snapchat, and Instagram, providing accessible media for sharing photographs including photographic self-portraits. However, despite their tremendous reach and popularity, selfies have so far received relatively little attention by the scientific community, especially within psychology. Thus, we proposed a Frontiers in Psychology Research Topic to expand empirical and theoretical work on the massively popular, yet scientifically unexplored, phenomenon of the selfie. The articles published in this eBook offer a multifaceted insight into current scholarly work on this topic.

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# Editorial: Understanding Selfies

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**Keywords:** selfies, Human Computer Interaction (HCI), internet, social media, facebook, twitter, Tinder, smartphones

## Editorial on the Research Topic

### Understanding Selfies

With the advent of smartphones and of wide-spread Internet, every day thousands of us are taking and sharing photographic self-portraits (“selfies”) for multifarious purposes. As stated by *New York Magazine* critic Jerry Saltz (2014), selfies “have changed [...] public behavior. It’s become a new visual genre [...] This is a very big deal for art.” In launching a research topic on selfies, we were motivated by the belief that selfies are indeed a big deal, not only for art but also for psychology. The opportunity does not come often, for a student of the human mind, to observe a brand new form of social behavior spanning issues in action, perception, cognition, personality, motivation, and social interaction. Yet, selfies have received relatively little attention by the scientific community and especially within experimental psychology. On December 1st, 2016 (before the publication of papers in this research topic), searching for the keyword “selfie” on Google yielded about 400 million hits, but only a meager 22 hits on the specialist database *PubMed*. We attempted to stimulate contributors by listing a series of questions that, to our minds, were worth exploring. What are the motivational, functional, and social factors driving selfie taking and posting? Are there differences between genders, age groups, ethnicities, or cultures? What biological, perceptual, cognitive, and sensorimotor factors affect selfie-taking? How might we use selfies as media tools, as sources of psychological data, or as instruments for assessing personality, stereotypes, or cultural norms? What kind of psychological object is a selfie? How does it relate to painted self-portraits, to mirror images of ourselves, and/or to our body image? Some answers to these questions are provided in this collection. The answers are partial, but interesting. It is our hope that they will stimulate further research in this area.

Theme 1. What are selfies? Do they differ from traditional photographic or painted self-portraits?

Kozinets et al. tackled these questions by focusing on the museum selfie phenomenon. Their results emphasize how the practice of selfies appears to go well beyond the mere narcissistic exhibition of the self, documenting the different

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modalities of communication and the different communicated contents. In a comprehensive historical review, Carbon sought to put contemporary selfies into the context of historical painted and photographic self-portraiture. He suggests that both selfies and traditional self-portraits reflect a desire to maintain and document some aspect of one's life, which, as also highlighted by Kozinets et al. may not necessarily be a narcissistic self-referential act, but rather a complex and rich means of communicating one's inner state.

Theme 2. Does the practice of selfie-taking follow specific compositional principles?

Exploiting a dataset of selfies posted on the dating application *Tinder*, Sedgewick et al. explored one aspect of a selfie's composition – whether a selfie shows the face as seen from above or below the subject. Their results reveal a systematic difference between men's and women's selfies. In selfies that did not present a neutral, frontal view (these were about 50%), men were more than twice as likely to orient the camera from below the face, whereas women tended to prefer orienting the camera from above. Manovich et al. explored another aspect of composition, namely, the choice of horizontal camera position in relation to the subject, which affects whether the selfie presents the face frontally or in three quarter pose. Exploiting a large database of selfies posted on the social network *Instagram*, from six world cities, Manovich et al. report a left cheek bias for the latter, confirming previous reports (Bruno and Bertamini, 2013; Bruno et al., 2015, 2017). In addition, they report higher expressiveness scores in selfies presenting the left cheek, in comparison to the right, for negative, but not for positive emotions. The left cheek bias in selfies was further explored by Lindell. Perusing the social network *Instagram*, Lindell identified 200 users who each posted 10 different selfies and then evaluated intra-individual consistency in selfie posing. Results indicate that selfie takers tend to adopt a preferred pose consistently, with more participants showing an overall left cheek bias in comparison to right. Finally, using computer-graphics techniques, Schneider and Carbon selected 3D face scans of 14 human models and presented them from seven camera perspectives in an online study. Although not obtained from real selfies, their results nonetheless report several potentially generalizable effects on ratings of features such as facial attractiveness, helpfulness, sympathy, dominance, distinctiveness, and intelligence.

Theme 3. Why do people take and post selfies?

Baiocco et al. tackled this question by asking participants to fill out questionnaires assessing personality structure. They report effects of sex, age, sexual orientation, and of various personality traits on selfie posting frequency. Further, analyses by Etgar and Amichai-Hamburger revealed distinct selfie-taking motivations (self-approval, belonging, and documentation) that may be differently related to personality characteristics. In combination with previous studies (e.g., Sorokowska et al., 2015; Sorokowski et al., 2015), these findings contribute to our understanding of factors motivating selfie-posting

and underscore the importance of understanding selfies as a multidimensional phenomenon. Karwowski and Brzeski explored relationships between creativity and selfie posting in a large sample of *Facebook* users. Creative people were more likely to post selfies, but only if their intelligence scores were in the lowest three quartiles. Interestingly, intra-individual variation in selfie-posting increased when participants engaged in creative activities, such as painting or blogging (but not science-related activities), such that the variability in selfie-posting within-individuals more than doubled the differences between them. This work suggests that transient, situational factors may be more important than stable personality traits for understanding selfies. Finally, Dhir et al. addressed a lesser studied deterrent to selfie posting—concern over personal privacy. Privacy concerns correlated with a reduction in selfie behaviors among adult males and females of all ages, but not male adolescents and male young adults. These findings have implications for theories of selfie-related behaviors, but also for policy makers.

Theme 4. Does the format or content of selfies provide cues to personality or otherwise provide information about the taker?

Musil et al. explored how visual cues in selfies may reveal personality characteristics of the selfie-takers. Despite obtaining complex results, these authors failed to identify systematic visual cues to personality characteristics of selfie takers. If their results will be confirmed in later contributions, this will lead to the conclusion that the use of selfies in personality assessment is limited. Krämer et al. examined how viewers evaluate selfies in comparison to regular photographic portraits. Using *Facebook* profile mockups that were either selfies or regular photographs, of female or male subjects, and that included either one individual or groups, they found that selfie takers were rated as less trustworthy, less socially attractive, less open to new experiences, more narcissistic, and more extroverted in comparison to the same individuals when featured in regular photographs. This suggests that selfies may evoke negative assessments more often than selfie takers presuppose. Diefenbach and Christoforakos conducted an online survey assessing selfie-related behaviors. Their results reveal a systematic discrepancy between attitudes to one's own selfies. While own selfies were rated more positively than other's selfies, participants reported more negative consequences of selfies than positive, and had a strong preference for viewing more usual pictures in comparison to selfies on social media. This is an intriguing paradox: respondents claim they dislike selfies, and yet provide justifications for their own selfie-taking. These findings call for more research on social attitudes toward selfies and related mechanisms.

## AUTHOR CONTRIBUTIONS

Conceived and designed the Research Topic: PS, AS, KP, and NB; Wrote the Editorial: NB, KP, PS, and AS.



## REFERENCES

- Bruno, N., and Bertamini, M. (2013). Self-portraits: smartphones reveal a side bias in non-artists. *PLoS ONE* 8:e55141. doi: 10.1371/journal.pone.0055141
- Bruno, N., Bertamini, M., and Protti, F. (2015). Selfie and the City: a World-Wide, Large, and ecologically valid database reveals a two-proged side bias in naive self-portraits. *PLoS ONE* 10:e0124999. doi: 10.1371/journal.pone.0124999
- Bruno, N., Bode, C., and Bertamini, M. (2017). Composition in portraits: selfies and wefies reveal similar biases in untrained modern youths and ancient masters. *Laterality* 22, 279–293. doi: 10.1080/1357650X.2016.1185108
- Saltz, J. (2014). Art at Arms' Length: A History of the Selfie. *New York Magazine*, 47, 71–75.
- Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Pisanski, K., Chmiel, A., and Sorokowski, P. (2015). Selfie and personality: who posts self-portrait photographs. *Pers. Individ. Dif.* 90, 119–123. doi: 10.1016/j.paid.2015.10.037
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviors are associated with narcissism among men. *Pers. Individ. Dif.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004

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# Universal Principles of Depicting Oneself across the Centuries: From Renaissance Self-Portraits to Selfie-Photographs

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Selfie-photography is generally thought of as a cultural mass phenomenon of the early 21st century, inseparably related to the development and triumph of the smartphone with integrated camera. Western culture, however, has been highly familiar with self-depictions since the Renaissance days. Putting the contemporary selfie into this historic context covering more than five centuries of cultural development from Dürer's (1500) famous "Self-Portrait at 28" (also known as "Selbstbildnis im Pelzrock") to today's Instagram galleries allows for identifying central parallels concerning the technical and social antecedents as well as common underlying psychological factors and shared properties of different kinds of self-depiction. The article provides an overview of the types of contemporary photographic selfies and compares them with painted self-portraits. Finally, this historic perspective leads us to the insight that self-portraits as well as selfies are both referring to nothing less than the "conditio humana."

**Keywords:** selfie, art history, self-portrait, Albrecht Dürer, Renaissance, painting, photograph, human condition

When Albrecht Dürer signed his famous self-portrait with his imposing monogram "AD" in 1500 (see **Figure 1**) he did not just finish a masterwork, but set the foundation for a quite persistent cultural phenomenon: the phenomenon of self-depiction or, as we would call it today, the selfie. In the following article I will show that Dürer and other great self-portraitists expressed themselves using universal principles that are also reflected in today's selfie-photography. Taking a historic perspective I will compare self-portraits and selfies in order to elaborate on differences and commonalities, finally showing that these different kinds of self-depiction are referring to nothing less than the "conditio humana"—specifically, the basic cognitive and affective human needs.

## I AM UNIQUE, AM I NOT?

Comparing contemporary selfies and historic self-portraits such as Dürer's Renaissance masterpiece from 1500, we first of all notice a number of clear differences, among them concerning the production process, the medium itself and typical compositions: Self-portrait paintings are created following a sophisticated plan or concept demanding a serial production process ranging from composition and preliminary sketches to colorization and final varnish. Apparently, the effort invested in a self-portrait is quite high, and the same is true for the monetary costs, as the used





**FIGURE 1 |** Albrecht Dürer's "Self-Portrait at 28" from the year 1500, also known as "Selbstbildnis mit Pelzrock"—this picture and its reproduction are in the public domain (Creative Commons CC-BY license).

materials (color pigments, large canvases, or wooden panels) are typically quite expensive. Selfies, in contrast, are produced (i.e., taken) within seconds, usually by means of the deficient add-on camera of a smartphone equipped with a strongly distorting lens and under suboptimal lighting conditions. Compositional factors do not seem to be taken into account, and a special preparation is not required. Most often, selfies are the product of a spontaneous intuition, feeling, or idea, which distinguishes them not only from painted self-portraits but also from professional portrait photography that usually follows a complex set of established compositional principles (Bruno et al., 2014), such as the principle of eye centering (Tyler, 1998), for example.

The differences in production process and costs imply another distinction of self-portrait and selfie which is related to limitation and limitlessness, respectively: While the number of self-portraits an artist can create during his lifetime is rather small (e.g., although considered as being notorious for depicting himself, Diego Velázquez only created about four self-portraits out of his entire oeuvre of approximate 120 paintings; Dürer, who is also known for his self-referential artworks, also painted "only" three self-portraits in oil<sup>1</sup>. There are other cases who are truly prolific

<sup>1</sup>One explanation for this low number is that Dürer was a very economically thinking painter: actually, prints of holy persons, e.g. of Virgin Mary, made much more profit than a singular self-portrait in oil (Hall, 2014)—still a few of these brilliant portraits showing the "artist behind the prints" were also important to underline the extraordinary quality of the creator.

self-portraitists; for instance, Vincent van Gogh who produced more than 43 self-portraits. Similar inclinations toward painting themselves were found in the oeuvres of Egon Schiele, Edvard Munch, and Frida Kahlo<sup>2</sup>, see Belle (2000). The number of selfies one can take, in contrast, is hardly restricted, except for limits set by factors such as storage capacity of the technical device that is used. Painting a self-portrait (or the repro of a self-portrait) takes weeks, but taking a selfie takes merely the blink of an eye and within another blink, each selfie can easily be copied and distributed to the other side of the world via digital social networks, for instance. Additionally, we should not forget that even the single shot of a photographic selfie is rarely one single shot only: selfie-ists often undertake a great number of attempts to reach their goal of presenting themselves in the desired way). Taking this into account, it is quite sensible to ascribe the attribute of being original and unique to an artist's self-portrait, while such an ascription is rather out of question with regards to selfie photographs.

## THE ESSENCE OF SELF-DEPICTIONS

So far, self-portraits and selfies do not seem to have too much in common. But leaving the level of superficial comparison and entering a more phenomenological reflection, we will see the differences vanish. The important question to ask here is: What is the purpose of self-depiction? What exactly is the individual's idea behind painting or photographing oneself?

Essentially, self-portrait and selfie are both based on the idea or wish to freeze, to maintain or to document a fluctuating but significant slice of life. So the primary purpose of these types of self-references is (about) the same even if the quality of execution may be different; namely planned and enduring in the case of the self-portrait but spontaneous and intuitive in the case of the selfie. The notion of "quality" does not evidently mean that selfies are "inferior" to paintings; quality is meant here first of all as being of a "different quality." Here, it is necessary to ask the next question already: Is the typical selfie-photographer's intuition-based spontaneity really so different from the artist's well-planned behavior?

Our intuitive behavior is not actually based on some amorphous, arbitrary and unintelligent procedures but it condenses our knowledge on a topic, on achieving a specific goal. If people use their intuition when taking a selfie, they use their "intelligence of the unconscious" (Gigerenzer, 2007). This means they express by intuition something that they could hardly or not at all explain in an explicit way. Usually, taking a selfie means to follow the wish to express something special—"selfie-ists" want to create or invent themselves, they want to refer to themselves and they want to boil their inner status, mood, feelings and cognitions down to an essence<sup>3</sup> (Freeland, 2010). The art historian Ernst

<sup>2</sup>Probably, Kahlo was one of the most productive self-portraitists of all time as nearly half of her paintings were in fact self-portraits (i.e. 55 out of 143, Freeland, 2010).

<sup>3</sup>Art philosopher Freeland stresses this point, also by using an own word to describe the phenomenon that portraits convey "a person's very essence": the person's "air" (Freeland, 2010, p. 44) which is very much based on Roland Barthes' reflections on photography published in his book "Camera lucida" (Barthes, 1981).

Gombrich wrote in his influential book “Art and Illusion” (which is a key text for art historians as well as perceptual scientists) about the difficulty in coming up with such an essential picture, especially if we use photography:

“In fact only a few snapshots will so satisfy us. We dismiss the majority as odd, uncharacteristic, strange, not because the camera distorts, but because it caught a constellation of features from the melody of expression which, when arrested and frozen, fails to strike us in the same way the sitter does. For expression in life and physiognomic impression rest on movement no less than on static symptoms, and art has to compensate for the loss of the time dimension by concentrating all required information into one arrested image”

(Gombrich, 2002, p. 292).

Within this view, self-portraits or selfies are not just a reference to “pathological narcissism” (Hall, 2014, p. 276), instead they transport the essence of the inner states of a person. As we do not have adequate access to the inner states of the sitter—even if we are portraying ourselves—intuition seems to be a promising avenue for giving these hidden states a readable expression. Self-portraits in the established art-historical sense also want to make explicit the inner states (Billeter, 1986; Freeland, 2010)<sup>4</sup>—at least the way we interpret them (Wegner, 2003)—to the outer world, and they also have to rely—at least in the initial phase of creation—on intuition: Ernst Gombrich described this quite elegantly when he stated that in the process of generating a portrait “making will come before matching, creation before reference” (Gombrich, 2002, p. 85). The used methods to execute the work in the following might be much more sophisticated, but the general program remains quite similar. In the end, just one single picture is shown portraying the (inner) complexity of an individual (Gombrich, 2005)<sup>5</sup>. This does not exclude that self-portraits are also often used to advertise the artist’s skills, to practice the difficult technique of painting herself/himself or just to make clear that the artist is relevant enough to be portrayed. At least with a second, more analytic view on all these rationales it is quite clear that self-portraits also reveal something about the artist who initiated and created the pictures. The web initiative *The Self-Portrait Experience* (selfportrait.eu) sums this up concisely:

“A self-portrait is our inner image, our private image. It is generally produced in a longer lapse of time, in a situation centered on the creative process. It springs from the inner life of the author, who is also subject and spectator. He does not control the image, on the contrary, it’s the creative process which allows the unconscious to speak with the language of art. The self-portrait is a profound dialog with oneself, guided by the author’s vulnerability.”

<sup>4</sup>Art philosopher Cynthia Freeland even adds this quality to the list of three requirements of a portrait: besides the physical delineation and conscious presentation of the self to be conveyed in the resulting artwork, she mentions the “indication of interior states” (Freeland, 2010, p. 17).

<sup>5</sup>Gombrich refers to e.g., Rembrandt as having portrayed himself with “great honesty” (p. 420).

As already mentioned above, intuition might be a promising source of returning such an inner dialog to an explicit expression. In the view of Gigerenzer (2007), intuition is not a deficient, odd-working, and superficial system but a very well adapted mechanism in order to cope with the complexity and uncertainty of the world around. In this sense, intuition is not just a fast but also a powerful and adequate mechanism. This view is quite contrary to the perspective of Kahneman (2003). In his Prize lecture held when awarded with the Nobel Memorial Prize in Economic Sciences in 2002, he proposed that intuition belongs to the two-system model’s *System 1* which is characterized by “systematic errors” (p. 450). Still, Kahneman makes clear that intuitions are capable of dealing with complex problems fast and in parallel, automatically, and associatively. System 1, according to Kahneman, can learn new associations only very slowly, but can apply associated routines fast. That is why intuitions will lead to reliable and systematic outcomes depending on the already learnt associations. In sum, both views, although being contrary to each other in many respects, assume that intuition leads to systematic interpretations and behavior based on them.

## THE BIRTH OF HISTORIC AND CONTEMPORARY SELF-DEPICTION

Early self-portraits emerge in the early to middle Renaissance era, around the beginning of the 15th century (Gombrich, 2005). Some sources have identified the “Portrait of a Man”<sup>6</sup> painted by Jan van Eyck in 1433 as the world’s first self-portrait (see Figure 2). Whether this specific painting or even an earlier one was literally the first one is not essential here, but at some point of art history, around 1400, painters started to depict themselves—note: we can, of course, not exclude the fact that there were other developments in art which have not been documented, but based on the still-existing artworks, the 15th century seems to be a rough estimation of the point at which self-portraits became a general *sujet* of art history. This was not only done for the sake of having an image of their own, but to express a certain state of their own to *others*, to the *public*.

The emergence of self-portraits is closely related to the (re-)introduction of linear perspective in the arts and to technical inventions and advances such as the engineering of the first high-quality mirrors, e.g., mirrors with coating glass and a tin-mercury amalgam in Germany during the early phase of Renaissance (Melchoir-Bonnet, 2001). The breakthrough for a broader market was the establishment of a center for the production of tin amalgam mirrors in Venice around 1507 (Hadsund, 1993). Such highly sophisticated reflecting devices allowed artists to get a “clear” image of themselves before and when painting their own likeness, especially because they were much brighter and larger<sup>7</sup> and also less distorted than those which had been available before

<sup>6</sup>The painting is often misinterpreted as showing a man with a red turban. In fact, the depicted person wears a chaperon, which was a fashionable and prestigious hat worn in all parts of Western Europe in the times of Van Eyck.

<sup>7</sup>It should not be forgotten that despite these technical innovations, ancient mirrors were still relatively small (Melchoir-Bonnet, 2001), making it even more astonishing that painters like Dürer accomplished such large panels (in the case of the 1500 Pelzrock painting, e.g., 49 cm × 67 cm) of their own faces. Such sizes



**FIGURE 2 | (A)** “Portrait of a Man” by Jan van Eyck from the year 1433. The works of art depicted in this image, and the reproduction thereof, are in the public domain worldwide. The reproduction is part of a collection of reproductions compiled by The Yorck Project. The compilation copyright is held by Zenodot Verlagsgesellschaft mbH and licensed under the GNU Free Documentation License. **(B)** An early photograph (daguerreotype) made in November 1839 (Sachse, 1893) by Robert Cornelius depicting himself is widely referred to as the first selfie in world history according to many sources (e.g., Newhall, 1949; Hannavy, 2005)—it seems that it is at least the first self-portrait made by daguerreotype-processing. The picture is in the public domain.

(Hadsund, 1993). Even before these sophisticated mirrors became available, art history refers to some single exemplars of self-portraits, but the generic genre of “self-portraits” had not yet been developed at this point (Harbison, 1995)—we are referring to self-portraits having formed an own and venerated generic artistic category since the 16th century (Hall, 2014). Later on, the development of classic photo cameras in the 1830s (Hirsch, 2000) made it possible to make self-photographs, although this was far more complicated than today, firstly, as exposure time was extremely long (often more than 10 min), and secondly, as the photographer could not see his own depiction while taking the photo—still some of the very early attempts are just stunning, such as the very first selfie in world history<sup>8</sup>: When Robert Cornelius made a photograph of himself, he created a lively, dynamic, off-centered and very contemporary looking selfie (see **Figure 2**)—one reason for this modern touch might be the usage of exterior light which could have effectively reduced the exposure time drastically (Hannavy, 2005)<sup>9</sup>, but mainly this appeal seems to be emerging from the non-symmetrical view and the specific combination of gaze to the right and head direction to the left. Importantly, the limiting factor exposure time was markedly reduced over the following 100 years by using more

light-sensitive photographic emulsions. It should be noted in this context that the inventor of the stereoscope, British physicist Charles Wheatstone (1802–1875), was probably not only a keen photographer but was also the creator of the first self-portrait of a scientist ever (Wade, 2014)—for a depiction of this self-portrait as well as for depictions of other selfie-and-portrait milestones, e.g., a very early stereoscopic self-portraits, see Wade (2016, p. 272). The essential step toward perceiving oneself while taking a photographic self-portrait required further radical inventions later on, such as CMOS active pixel sensor technology in the 2nd half of the 20th century (Prakel, 2009). In the 1990s, digital cameras were developed that were equipped with first displays that allowed to instantly view the photographed pictures. With the arrival of front-view cameras in cell phones and smartphones in the early 2000s true selfie-photographing was possible for the first time (Wheen, 2011): People were now able to directly control the picture and to optimize the statement they wanted to convey, e.g., to show-off, to trigger empathy or just to document themselves in specific social contexts.

## THE CASE OF ALBRECHT DÜRER'S SELF-PORTRAITS

Albrecht Dürer's self-portrait from 1500, fully entitled “Self-portrait at 28 years old wearing a coat with fur collar” (German: “Selbstbildnis im Pelzrock”) is a fine example for a self-depiction with a strong statement. This self-portrait was not Dürer's first self-depiction—at the age of 13 years, he already produced a self-referential depiction, drawn with a silverpoint; this early portrait was followed by a series of further self-depictions with varying techniques such as pen and dark brown ink, oil on parchment

could only have emerged from a successive local painting strategy of the visual information conveyed by a small hand-held mirror.

<sup>8</sup>Newhall documented this case in the 1949 edition of his milestone work “The history of photography,” but he on his own was skeptical whether Cornelius was really the very first person who made a photographic self-portrait: “...one hesitates, in the absence of more complete documentation, to assign to any one of these pioneers the honor of priority” (Newhall, 1949, p. 24).

<sup>9</sup>Newhall already in 1937 mentioned that the specific use of specific lenses made it possible that Cornelius needed “only” five minutes in the reduced overall luminance conditions of October (Newhall, 1937).



and oil on panel (see **Figure 3**). All of these earlier works are of a certain quality resembling nowadays selfie-photographs as they look like some spontaneously taken moments in time. The presence of the depicted person is very strong.

Compared to the spontaneous and lively character of the earlier self-portraits caused by the combination of a  $\frac{1}{4}$  view and direct eye contact with the beholder, Dürer's self-portrait from 1500—composed as a frontal portrait—is clearly less selfie-esque. However, in terms of its symbolic or communicative core this later masterwork anticipates specifics of the contemporary selfie. First of all, Dürer wants to make clear that he is not just another painter, but belongs to a certain and very extraordinary class of people (Koerner, 1990)—contemporary selfies are used to express similar statements: the selfie-ists wants to present themselves as unique and distinct persons, else it would not make sense for them to depict themselves without being pressured to do so. Dürer underlines his message to the recipient using several paraphernalia of high status, e.g., his collar is made of fur from the weasel which was exclusively worn by the elite in the Holy Roman Empire of those days, and even implicated that the wearer was electable for the city council (Bulst et al., 2002). Interestingly enough, Dürer was neither rich nor did he officially belong to the elite of Nuremberg when he worked on this painting (Zitzlsperger, 2012). His economic success actually started only after his 2nd visit to Venice in 1506 (Eaton, 1882).

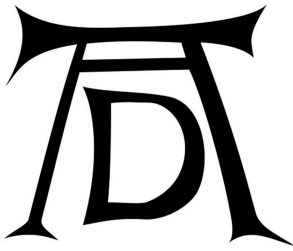
Until the Renaissance era, painters—artists in general—did not have a specific prestige, because the separation of craftsman and artist had not been solidly established yet. The fundament for this emancipation process was laid by Alberti's influential theoretical book on architecture (*Re Aedificatoria*, i.e., “On the art of building,” completed in 1452), which introduced the concepts of minor vs. major arts (Alberti, 1988). In Germany, this emancipation process took a bit

longer and Dürer is one of the prominent protagonists who finally broke with the convention that people who made artwork were just another kind of craftsmen. In fact, he propelled the idea that his artworks were created by extraordinary hands, led by an ingenious mind and inspired by heavenly sent ideas (Hall, 2014). With Dürer, the ingenious “Renaissance man,” the true and pure artist with the aura of a superstar, entered the Northern hemisphere. His self-confident aspiration found expression in his highly symbolic self-portrait signed with “1500 AD” that has preserved its (super)lively quality over the centuries and still puzzles and impresses us today.

Religious references can already be found in Dürer's 1493 self-portrait, where he holds an *eryngium* (a thistle) which is a clear reference to the passion of Christ (Zirpolo, 2008). The 1500 self-portrait, however, goes an essential step further: here, Dürer does not content himself with a mere reference to Christ any more, but downright metamorphoses himself into a depiction of Christ. His stylish golden curls, symmetrically arranged, his enigmatic gaze indicating presence (direct gaze at the viewer) and transcendence (looking through the viewer toward infinity) at the same time, and his dignified hand gesture referring to gestures known from Early Christian iconography (Koerner, 1990) underline his, Dürer's, extraordinary status of being a genius, a true creator presented to the world in this self-portrait. Here, we find Dürer in the tradition of the *divino artista*, the artist who creates just like God, the ultimate creator. His work is not about painting, but creating. Importantly, Dürer's reference to God is not at all to be interpreted in a blasphemous sense, but in a truly Christian understanding of creating on behalf of God and so to continue God's initial process of creation as an image and proxy of God Himself (see Genesis 1:26–27).



**FIGURE 3 | (A)** Dürer's self-portrait from 1493, oil on parchment mounted on canvas. **(B)** Dürer's Self-portrait from 1498, oil on panel. In some publications, the two paintings are also denominated as the *Louvre Self-Portrait* (1493) and the *Prado Self Portrait* (1498); so like with Leonardo's most famous portrait of the Mona Lisa, these two museums share two painted versions of the very same person (cf. Carbon and Hesslinger, 2015). Both pictures belong to the public domain work of art.



**FIGURE 4 |** Albrecht Dürer's monogram which he used from about the year 1497 on—the version here originates from 1498. This work is in the public domain.

Dürer further intensified the message of his 1500 self-portrait by placing a clear indication of authorship in the main focus area of the painting at the eyes' level: to the left of his head, he positioned his signature, to the right, he further qualified that the portrait was about himself and that it was of eternal quality ("I, Albrecht Dürer of Nuremberg, portrayed myself in everlasting colors aged 28 years"; original Latin inscription: "Albertus Durerus Noricus/ipsium me propriis sic effin/gebam coloribus aetatis/anno XXVIII"). Signing a painting and referring to a specific artist was not very common in the time around 1500. Moreover, signing with a monogram that has the particular quality of Albrecht Dürer's one is even more a statement of the importance of the artist; Dürer designed one of the first corporate logos in world history with quite a simplistic, but highly recognizable and memorisable monogram just consisting of two letters: A and D (see **Figure 4**)—showing an interesting ambiguity as it stands for A[lbrecht] D[ürer], but also for A[nno] D[omini], the "year of the Lord." Again, this points to a direct link between Dürer and Christ (Koerner, 1990).

Actually, the self-depiction of Dürer from 1500 became so popular and a common part of everyday culture that it even converted to a symbol and common representation of Christ himself: Out of a set of 160 historic depictions of Jesus Christ from the 4th to the 20th century plus the Dürer painting, naïve participants ( $N = 43$ ) selected the Dürer as the most typical Jesus depiction (Carbon et al., 2010)—although Dürer's work did not really show Christ but only referred to the artist himself (note: many people do indeed interpret this work as depicting Christ, although the idiosyncratic and naturalistic outward appearance of Dürer becomes very clear)!

## SUJETS, SYMBOLS AND MESSAGES IN SELFIE PHOTOGRAPHY AND ARTISTS' SELF-PORTRAITS

As noted above, self-portraits and selfies share the common ground of being born from the idea or wish to freeze a fluctuating but significant slice of life. Considering selfie photography, one will register that the appearance and mise-en-scène of such a slice of life can have a variety of faces. In other words: Selfie photography is quite multi-faceted and knows many different

sujets, ranging from the "classic selfie" showing just one's own face over "Outfit selfies" to "AirSelfies" and so on. **Table 1** sums up typical sujets or types of selfies together with the respective aims related to a specific sujet or type.

Obviously any kind of self-portrait is a self-reference and is capable of documenting a certain moment of life. Selfies are often marked by the (additional) pretense of being authentic. So people depicted on selfies often make us believe that the photo was shot instantly and incidentally when the current situation emerged, although many situations are intuitively initiated just for the sake of making the selfie. Selfie-ists often want to convey a specific image of themselves, a rather euphemistic, self-serving image that is indeed far from authentic. Therefore, certain poses are trained to look slimmer or specific camera perspectives from above are utilized in order to suggest a lower weight (Schneider et al., 2012), for example. Pronouncing attractive or salient body parts can increase the impression of being healthy and sportive—a similar purpose can be identified when certain artifacts, actions, or contexts are used that are typically associated with these values and properties.

Systematizing the aims of the different sujets or types of selfies listed in **Table 1**, shows that these aims circle around three main factors: (A) self-expression, (B) documentation and (C) performance. Interestingly, these main message aims can also be found in painted self-portraits as I will show in the following by reference to several examples.

(A) Self-expression is, self-evidently, the core value of any self-portrait. Why should you make a portrait of yourself, if you did not want to express yourself? Self-expression is about the idea that the depicted person is different, unique, special in a sense of a personality trait—sometimes people just want to convey information on their current mood, or emotional and cognitive state. Certainly, painted self-portraits cannot provide many of such instances in life, just because creating paintings is effortful and expensive. Accordingly, they often refer to extraordinary, especially important or characteristic instances. For example, self-portraits may show or symbolize deep religious feelings, contemplation on something important or thinking about a special problem of the self-depicted artist. Other self-portraits, however, focus on certain fluctuating moments of life, or on expressing a certain mood like in Egon Schiele's "Self-Portrait with Chinese lantern lamp" from 1918 or his "Self-Portrait with physalis" from 1912 (see **Figure 5A**). As has already been shown, Dürer was a master of self-expression. Interestingly, he did not idealize his specific outward appearance in his self-portraits, but depicted it, contrary to the Italian Renaissance tradition (Koerner, 1990), in a literally hyper realistic way. What he indeed idealizes in expressing himself, is his meaning and special status. And this is not so different from many types of selfies where the protagonists try to emphasize or amplify some personality properties or situational specifics.

(B) Self-depictions also aim to document a certain status quo. In modern times this documentation is often realized by referring to certain achievements in a very explicit way, by use of paraphernalia or symbols: e.g., wearing a graduation cap indicates the success of graduation, showing specific artifacts can document a certain health status (e.g., a plastered arm, a

**TABLE 1 | Overview of typical types of selfies, including a short characterization and main aims often found with people who take such selfies.**

Type of selfie	Characterization	Main aims
Classic selfie	Taking a photo just from the own face without more additional ingredients, looking quite neutral	<ul style="list-style-type: none"> <li>• Self-reference</li> <li>• Documentation</li> </ul>
Situation selfie	Portraying a specific situation in which the selfied person is currently (in the bed, in a miserable situation, with fun)	<ul style="list-style-type: none"> <li>• Authenticity</li> <li>• Humor</li> </ul>
Emotional selfie	Expressing a specific emotion very clearly and explicitly	<ul style="list-style-type: none"> <li>• Emotion</li> <li>• Mood</li> </ul>
Optimization selfie	Posing to optimize the physical appearance (e.g., by shooting from above, trimming the facial shape by muscle activities)	<ul style="list-style-type: none"> <li>• Attractiveness</li> <li>• Idealization</li> </ul>
Celebrity selfie	Integrating a celebrity while taking a selfie	<ul style="list-style-type: none"> <li>• Importance</li> <li>• Identification</li> </ul>
Sports selfie	Taking a selfie while making sports activities (indoor)	<ul style="list-style-type: none"> <li>• Sportiveness</li> <li>• Energeticness</li> <li>• Performance</li> </ul>
Leisure selfie	Taking a selfie being lazy, chilling out	<ul style="list-style-type: none"> <li>• Mood</li> </ul>
Food selfie	Selfie-ing while eating	<ul style="list-style-type: none"> <li>• Authenticity</li> <li>• Passion</li> </ul>
Drink selfie	Selfie-ing while drinking	<ul style="list-style-type: none"> <li>• Authenticity</li> <li>• Passion</li> </ul>
Mirror selfie	Shooting a selfie through a mirror	<ul style="list-style-type: none"> <li>• Spontaneity</li> <li>• Authenticity</li> </ul>
Landmark selfie	Posing in front of a significant landmark (building, landscape)	<ul style="list-style-type: none"> <li>• Exclusivity</li> <li>• Interest</li> </ul>
Outfit selfie	Focusing on new or special outfit	<ul style="list-style-type: none"> <li>• Trendiness</li> <li>• Innovativeness</li> </ul>
Body selfie	Pronouncing specific body parts, especially the belly ("belfie"), muscles, body parts of particular appeal or salience	<ul style="list-style-type: none"> <li>• Sportiveness</li> <li>• Beauty Physical properties</li> </ul>
Car selfie	Taking a selfie while driving a car	<ul style="list-style-type: none"> <li>• Spontaneity</li> <li>• Performance</li> <li>• Personal situation</li> </ul>
Ultimate selfie/ Daredevil selfie	Initiating a stunt in the face of a camera	<ul style="list-style-type: none"> <li>• Performance</li> <li>• Fearlessness</li> </ul>
Purpose selfie	Making clear with the selfie that something important will go on (e.g., by showing a weapon, a claim of responsibility)	<ul style="list-style-type: none"> <li>• Importance</li> <li>• Power</li> </ul>
Fingermouthing selfie	Fingers are in front of the mouth or touch the lips	<ul style="list-style-type: none"> <li>• Spontaneity</li> <li>• Expression</li> <li>• Attractiveness</li> </ul>
Selfie-reference selfie	Making explicitly clear that the photo is a selfie by, e.g., shooting the selfie-ist in a mirror while making the selfie	<ul style="list-style-type: none"> <li>• Self-reference</li> <li>• Creativity</li> </ul>
Selfie-stick	Selfie taken from a farther distance as usual by help of a selfie-stick, a monopod which is typically extensible	<ul style="list-style-type: none"> <li>• Context relationship</li> <li>• Part of the whole</li> <li>• Competence</li> <li>• Mastering of difficult situations</li> </ul>
AirSelfie	Takes the selfie from a device that flies above the selfie-ist, mostly ensured by a camera drone	<ul style="list-style-type: none"> <li>• Competence</li> <li>• Context relationship</li> </ul>
Weefie	Shows not only the selfie-ist, but also other people who are directed toward the camera	<ul style="list-style-type: none"> <li>• Social embedmen</li> <li>• Social relationship</li> </ul>

crook), showing oneself next to one's crashed car indicates "hey, I survived," and so on. In paintings we can see similar documentary attempts, although again the threshold for an event to be painted as a part of a self-portrait is of course much higher, e.g., having crossed the Alps in the case of Dürer's self-portrait from 1498 (see **Figure 3B**), or becoming a member of an exclusive circle, e.g.,

Thérèse Schwartze's "Self-portrait with palette" from 1888 (see **Figure 5B**), or being in a physically or psychologically extreme state like Van Gogh in "Self-portrait with bandaged ear" from 1889 after having cut a portion of his ear (see **Figure 5C**). Another extreme case is the "Self-portrait with the portrait of Dr. Farill" painted by Frida Kahlo in 1951 where she depicts herself





**FIGURE 5 | (A)** Egon Schiele (1912): “Self-portrait with physalis”—public domain, reproduction from The Yorck Project. **(B)** Thérèse Schwartz (1888): “Self-portrait with palette”—public domain. **(C)** Van Gogh (1889): “Self-portrait with bandaged ear” from 1889”—public domain. It is quite interesting to see what a reviewer of this manuscript has observed: Thérèse Schwartz holds the brush in the left hand while keeping the palette in her other hand. It is hard to find any notes on Schwartz’s handedness, but we know that dominance of a hand is an important personal and even identifying property of a painter, so it would be rather extraordinary if she had not compensated for the mirroring of the handedness by the mere usage of a mirror.

being confined to a wheelchair—a painting which is also known as the last one she has ever signed.

(C) The aim of showing performance in a self-portrait is certainly tightly connected with the aforementioned categories, but focuses more strongly on capability and ability aspects of the artist. Paintings belonging to the performance category, besides some paintings portraying the artist in the state of painting, e.g., Van Gogh’s “Self-Portrait in Front of the Easel” from 1888 (cf. type of selfie termed “Selfie-reference selfie” in **Table 1**), seem to be relatively rare in art history. Main reason for this might be the plain fact that the core performance painters show is painting, so the result of their work, the self-portrait, is often sufficient evidence for their performance already. There is an own sujet in art history showing also painters self-portraying themselves while painting: For instance, Velázquez depicting himself while painting the royal family in his masterpiece “Las Meninas” from 1656 or Vermeer’s painting potentially portraying him from behind entitled “Art of painting” from 1666 (see Hall, 2014). Here we observe a painter in his studio who actually draws the model which is also depicted in the painting. Another example was created by René Magritte. In his “Attempting the impossible” (1928), he depicts himself while painting a female nude in life size—interestingly, this painting with this intriguing self-reference has itself been featured in the Belgian Surrealist journal *Variétés* with a selfie-like depiction of the artist in front of the painting, seemingly working on the painting. There are of course also some interesting self-portraits with other performance classes beside painting, e.g., Tamara de Lempicka’s “Tamara in a Green Bugatti,” created in 1929, shows her driving fast in a sports car, or “Self-portrait with horn” (1938) where Max Beckmann paints himself as a musician. Other, even more sophisticated cases where “self-portraits” are composed in such a way that they show only some parts of the artist’s body which would also be naturally be perceived when the correct perspective would be followed. Excellent examples for this perceptually highly interesting sub-group can be found among the works of Robert Pepperell who has created a couple of exemplars where he analyses his own perceptual conditions, for example, by showing

the interior of the room plus the artists feet while lying on a chaise longue and drawing the interior of the room (Robert Pepperell: “Self view with feet after Mach,” painted in 2012).

## CODA: SELF-DEPICTIONS AS A COMPACT FORMAT TO COMMUNICATE COMPLEX INFORMATION

To sum up, although contemporary selfies are clearly produced with high frequency and often quite incidentally, they aim to provide similar messages and show similar types of expression as self-portraits from the domain of artistic painting did for centuries. They reveal something about the creator in particular, but also something about humans in general. Humans want to document their lives, their personality, their outward appearance, and sometimes also their current situation, their mood, feelings or cognition. This is also an expression of the social nature of the human being, wishing others to share one’s experiences and to empathize with these experiences. To communicate this efficiently, statements are often enhanced. Self-portraits of any kind have to deliver these complex and multi-dimensional information in a very compact format, just in one single picture. That we still use such a simple format, although capturing dynamic scenes with modern multimedia-technique would be so easy by technical assistance today, is a sign for the adequateness and power of this format. Obviously, to generate one single picture, sometimes with all its inherent ambiguity, is an ideal way to provide a mixture of concreteness and imagination. On the one hand, transporting a very concrete depiction of oneself to document the current appearance and on the other hand, inviting the beholders to trigger their associations and imaginations to be personally touched and so to empathize with the creator.

## AUTHOR CONTRIBUTIONS

CCC made the research and wrote the entire paper.



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## REFERENCES

- Alberti, L. B. (1988). *De re Aedificatoria on the Art of Building in Books*. Transl. by J. Rykwert, R. Tavernor, and N. Leach. Cambridge, MA: MIT Press.
- Barthes, R. (1981). *Camera Lucida in Reflections on Photography [La Chambre claire]*. Transl. by R. Howard. New York, NY: Hill and Wang.
- Belle, J. (2000). *Five Hundred Self-Portraits*. London: Phaidon Press.
- Billeter, E. (1986). *Self-Portrait in the Age of Photography: Photographers Reflecting their Own Image*. Houston, TX: University of Houston.
- Bruno, N., Gabriele, V., Tasso, T., and Bertamini, M. (2014). 'Selfies' reveal systematic deviations from known principles of photographic composition. *Art Percept.* 2, 45–58. doi: 10.1163/22134913-00002027
- Bulst, N., Lüttenberg, T., and Prieuer, A. (2002). Abbild oder wunschbild? bildnisse christoph ambergers im spannungsfeld von rechtsnorm und gesellschaftlichem anspruch. *Saeculum* 53, 21–74. doi: 10.7788/saeculum.2002.53.1.21
- Carbon, C. C., Gruber, P., and Sommer, P. (2010). On the search for the super-Jesus. which features does a depiction in art history need to be identified as Jesus? *Perception* 39:115.
- Carbon, C. C., and Hesslinger, V. M. (2015). Restoring depth to Leonardo's Mona Lisa. *Am. Sci.* 103, 404–409. doi: 10.1511/2015.117.1
- Eaton, F. A. (1882). *Albert Dürer, His Life and Works*. London: J. Murray.
- Freeland, C. (2010). *Portraits & Persons*. Oxford: Oxford University Press.
- Gigerenzer, G. (2007). *Gut Feelings: The Intelligence of the Unconscious*. New York, NY: Viking Press.
- Gombrich, E. H. (2002). *Art and Illusion. A Study in the Psychology of Pictorial Representation*. London: Phaidon.
- Gombrich, E. H. (2005). *The Story of Art, 16th Edn*. London: Phaidon.
- Hadsund, P. (1993). The tin-mercury mirror: Its manufacturing technique and deterioration processes. *Stud. Conserv.* 38, 3–16. doi: 10.1179/sic.1993.38.1.3
- Hall, J. (2014). *The Self-Portrait: A Cultural History*. London, UK: Thames & Hudson.
- Hannavy, J. (2005). *Encyclopedia of Nineteenth-Century Photography*. New York, NY: Routledge.
- Harbison, C. (1995). *The Mirror of the Artist: Northern Renaissance Art and Its Historical Context, 1st Edn*. New York, NY: Prentice Hall.
- Hirsch, R. (2000). *Seizing the Light: A History of Photography*. New York, NY: McGraw-Hill.
- Kahneman, D. (2003). Maps of bounded rationality: psychology for behavioral economics. *Am. Econ. Rev.* 93, 1449–1475. doi: 10.1257/00028280322655392
- Koerner, J. L. (1990). *Self Portraiture and the Crisis of Interpretation in German Renaissance Art: Albrecht Dürer, Hans Baldung Grien, and Lucas Cranach the Elder*. Doctor of Philosophy Dissertation, University of California, Berkeley.
- Melchoir-Bonnet, S. (2001). *The Mirror: A History*. New York, NY: Routledge.
- Newhall, B. (1937). *Photography 1839-1937*. New York, NY: The Museum of Modern Art.
- Newhall, B. (1949). *The History of Photography from 1839 to the Present Day*. New York, NY: Castle Books.
- Prakel, D. (2009). *The Visual Dictionary of Photography*. Lausanne: AVA Publishing.
- Sachse, J. F. (1893). Share in the development of photography [A lecture delivered before the Franklin Institute, December 16, 1892]. *J. Franklin Inst. State Pa. Promot. Mech. Arts* 135, 271–287.
- Schneider, T. M., Hecht, H., and Carbon, C. C. (2012). Judging body weight from faces: the height-weight illusion. *Perception* 41, 121–124. doi: 10.1068/p7140
- Tyler, C. W. (1998). Painters centre one eye in portraits. *Nature* 392, 877–878.
- Wade, N. J. (2014). The first scientific "selfie"? *Perception* 43, 1141–1144. doi: 10.1068/p4311ed
- Wade, N. J. (2016). *Art and Illusionists*. Cham: Springer.
- Wegner, D. M. (2003). The mind's self-portrait. *Ann. N.Y. Acad. Sci.* 1001, 212–225. doi: 10.1196/annals.1279.011
- Wheen, A. (2011). *DOT-DASH TO DOT.COM: How Modern Telecommunications Evolved from the Telegraph to the Internet*. Heidelberg: Springer.
- Zirpolo, L. H. (2008). *Historical Dictionary of Renaissance Art*. Lanham: Scarecrow Press.
- Zitzlsperger, P. (2012). *Dürers Pelz und das Recht im Bild, Kleiderkunde als Methode der Kunstgeschichte*. Berlin: De Gruyter.

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# The Selfie Paradox: Nobody Seems to Like Them Yet Everyone Has Reasons to Take Them. An Exploration of Psychological Functions of Selfies in Self-Presentation

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Selfies appear as a double-edged phenomenon. Taking, posting, and viewing selfies has become a daily habit for many. At the same time, research revealed that selfies often evoke criticism and disrespect, and are associated with non-authenticity and narcissism. The present study ( $N = 238$ ) sheds further light on the somewhat contradictory phenomenon of selfies and their psychological value. In addition to previous studies on selfies and personality traits, the present research explores relations to popular, habitual self-presentation strategies, self-reflections on own and others' selfie-taking behavior, selfie-related affect, and perceived consequences of selfies, by applying a combination of self-constructed and existing scales [e.g., habitual self-presentation scales (Merzbacher, 2007), Positive and Negative Affect Schedule (Watson et al., 1988)]. Our findings confirmed habitual self-presentation strategies as a relevant factor for understanding selfies: Participants scoring high on self-promotion (promoting one's strength and abilities) and self-disclosure (revealing one's feelings for earning sympathy) felt especially positive while taking selfies, whereas understatement was correlated with negative feelings. Nevertheless, self-presentational motives were rather attributed to others' selfies than to own selfies. Moreover, others were assumed to have more fun and positive feelings while taking selfies whereas own selfies were judged as more authentic and self-ironic. Altogether, participants expressed a distanced attitude toward selfies, with stronger agreement for potential negative consequences (threats to self-esteem, illusory world) than for positive consequences (e.g., relatedness, independence), and a clear preference (82%) for viewing more usual pictures instead of selfies in social media. The revealed selfie-bias, i.e., the systematic discrepancy between judgments on own versus others' selfies, and the reported critical attitude toward selfies allows multiple interpretations. Taking peoples' statements literally, selfies should have never become as popular as they actually are. On the other hand, the selfie bias may fulfill a psychological function. Perceiving one's own selfie behavior as self-ironic and only half-committed, allows to fulfill self-presentational needs without feeling narcissistic. In conclusion,

we suggest that the playful and somewhat ambiguous support of self-presentation may be a key factor for the success of selfies. Relations to biases and mechanisms from social psychology, limitations of the present study and implications for future research are discussed.

**Keywords:** selfies, self-presentation, motivations, affective experience, self vs. other judgments, selfie bias

## INTRODUCTION

Selfies have become enormously popular and it is nearly impossible to visit any social media site without seeing our friends' faces in close-up. A selfie is a self-portrait photograph of oneself (or of oneself and other people), taken with a (phone) camera held at arm's length or pointed at a mirror, that is usually shared through social media (Sorokowski et al., 2015). Though exact data about the worldwide pervasiveness of selfies are not available, the estimations in existing selfie statistics are impressive. For example, the *Google* statistics in 2014 (Brandt, 2014) reported about 93 billion selfies taken per day – counting only *Android* phone users. According to a poll with 3,000 people, among those aged 18–24, every third picture taken is a selfie (Hall, 2013). Selfie accessories, such as selfie-sticks, have been bestsellers, and phone producers have adjusted their products for the sake of selfies. The *Sony Xperia™ C3 PROselfie™ smartphone*, for example, is equipped with a wide-angle front camera with LED flash and real-time selfie apps. Consequently, in 2013, the term “selfie” was officially added to the Oxford English dictionary, defining a selfie as “a photograph that one has taken of oneself, typically one taken with a smartphone or webcam and shared via social media.” The rising presence of selfies within the last years also becomes visible in language, as Bennett (2014) reports, the usage of the term selfie in English language has raised by 17,000% from 2012 to 2014. In short, taking, posting, and viewing selfies has become a daily habit for many and their mere pervasiveness makes it relevant to know more about the psychology of taking selfies and their consequences on an individual and societal level. The present research aims to contribute to a deeper understanding of selfies through the exploration of related motives and psychological variables, and in particular, the ambivalent character and judgments of selfies.

In fact, the current discussion about the value and consequences of selfies is quite diverse. While some highlight the value of selfies as a new material for creative work and the enhanced possibilities to convey emotions, others are primarily concerned about the excessive self-presentation promoted by selfies, and point at related conflicts, threats to self-esteem or decreased mindfulness. Rettberg (2014), for example, analyses selfies from a cultural perspective. She describes how the selfie culture gives rise to experimentation and mutual inspiration, inventing new genres such as serial selfies, or time-lapse selfies. For instance, the award-winning time-lapse video *Me* by Ahree Lee shows selfies taken every day for 3 years.

In contrast, Roman (2014) focuses on the often negative side-effects of selfies for social interaction. While being totally immersed in the mission of taking the perfect selfie, this may diminish the experience of the moment itself or even cause

social conflict. Aiming for the perfect shot of oneself in front of a perfect scenery, people do not seem to care whether they are obstructing the views or disrespecting the needs of others. Selfies, she concludes, “trumped any courtesy, social contract, or even common awareness of the other” (Roman, 2014, p. 314). Another disconcerting phenomenon she sees related to the boom of selfies is the vanishing of natural, candid pictures, and that even young children under 3 years of age are familiar with posing and developing a photo smile. Among adolescents, the enormous focus on taking and sharing pictures of oneself is associated with even more severe effects. For example, sharing selfies among adolescent girls is correlated to overvaluation of shape and weight, body dissatisfaction, as well as thin ideal internalization (McLean et al., 2015), and a high frequency of *Instagram* selfie posting is related to conflict in romantic relationships (Ridgway and Clayton, 2016).

Further reports referred to the relations between selfies and narcissism (Barry et al., 2015; Sorokowski et al., 2015; Weiser, 2015), or the selfie as “a prototype of expressive inauthenticity” (Lobinger and Brantner, 2015). In contrast to “normal,” authentic photographs with natural facial expressions and poses, the participants in the study by Lobinger and Brantner (2015) judged selfies with clearly recognizable poses (e.g., duck face, posing in front of a mirror) as inauthentic way of showing off, often imitating role models from star and celebrity culture rather than showing one's true self. Another typical element of selfies related to inauthenticity judgments was the visibility of the photographic production process, e.g., selfies in which the arm of the depicted person is visible. Such elements highlight that the depicted person deliberately took this photo, destroying any illusion about a selfie as a natural glimpse into a person's life. In this sense, a selfie could never show an authentic, natural snapshot of a person's life. Whatever one was doing, one interrupted this activity to take a selfie. In fact, some self-photographs even play with this aspect and deliberately display inauthenticity, e.g., photos showing a “sleeping” person, but revealing through a mirror that the person has taken the photo<sup>1,2</sup>. On the other hand, this lacking authenticity may be one reason why people state that they prefer seeing other pictures of their friends than selfies (Christoforakos and Diefenbach, 2016).

Taken together, selfies appear as a somewhat mysterious phenomenon. Aside from art and design projects, the discussed consequences of selfies, seem rather negative – breaking social norms, focusing on photographing oneself rather than what is happening around us, causing conflict in relationships, fostering body dissatisfaction, inauthenticity and narcissistic behavior. Still

<sup>1</sup><http://i2.kym-cdn.com/photos/images/original/000/518/574/17c.jpg>

<sup>2</sup><http://i0.kym-cdn.com/photos/images/original/000/604/134/e4b.jpg>

selfies are extremely popular. They seem to be more for people than just a new trendy way of taking photos. Probably, selfies would not have become so popular if not providing specific value beyond “usual” photos. The present paper illuminates this paradox situation through a psychological perspective and deeper insight into the motivations behind selfies. Our research explores how people may benefit from selfies, how they reflect on selfies and see their own position within the selfie culture, and why selfies could be more prevalent than individual statements suggest.

In the following, we first discuss the theoretical background and considerations behind our work, namely, the possible advantages and value that selfies may provide to people, with a focus on self-presentation and impression management. We also discuss first findings on self-reflection on selfies and differences between self and other judgments. We then present an empirical study that explores these phenomena in more detail, followed by a general discussion and implications for future research.

## BACKGROUND

### The Potential Value of Selfies – From Self-Exploration to Self-Presentation

At first, and apart from a social dimension, self-portraiture and selfies may be seen as a means for self and identity exploration. Rutledge (2013) highlights the function of selfies as a trigger for self-study and self-observation, supporting our need to “figure out who we are and what we are . . . whether you are trying to find greater consciousness or figure out what moved you to buy the blue shoes. . . . we can look back on our motives and actions and gain insight we couldn’t get in any other way.” This inward perspective, however, seems only a small part of the picture. In general, the outward orientation and public presentation seems an essential part of selfies, considering that most people do not take selfies just for themselves. More often, the envisioned audience seems already present while taking the selfie, and people deliberately use self-photographs to form a particular impression. Lyu (2016), for example, explored impression management in the context of travel selfies shared via social networks, revealing how tourists strategically adjust photographic images to manage their impressions and highlighting the role of posting selfies as strategic self-presentation behavior. In line with this, existing definitions of selfies in research (Sorokowski et al., 2015) or the Oxford English dictionary, explicitly mention that selfies are usually shared via social media, or describe selfies as “the posting of self-photographs” (Barry et al., 2015).

In order to better understand the value of selfies as a form of online self-presentation, previous research on social media offers a helpful starting points, especially since sharing photos has become a key feature in social networks (Weiser, 2015). For example, studies regarding the example of *Facebook*, already examined the benefits for identity construction and implicit identity claims through one’s profile photo and other pictures (Zhao et al., 2008), the use of self-promotional content features and its relation to narcissism and self-esteem (Mehdizadeh,

2010), the benefit of online social technologies for identity experimentation and self-disclosure (Best et al., 2014), as well as the challenges of managing multiple self-presentations via different services and profiles (Brivio and Ibarra, 2009). Another strand of research explored relations to self-esteem and well-being. Here, studies showed a positive effect of selfies on self-esteem through the possibilities for selective self-presentation in social media, as for example, editing or examining one’s own *Facebook* profile (Gonzales and Hancock, 2011; Toma, 2013). Visiting the *Facebook* profiles of others, however, can have rather negative impact on well-being, especially if *Facebook* friends are not personally known: while neglecting that this selective view does not represent the “true life” of others, one comes to the depressing conclusion that others must be happier and having better lives (Chou and Edge, 2012). Thus, the same effect that boost our self-esteem when pimping our own profile and presenting a highly selective, favorable insight in our life, may fire back when visiting the profiles of others.

In general, online-self presentation via social media profiles, blog posts, etc., is much more controlled than self-presentation in offline environments, since the former can be edited and revised before making it public, with lots of opportunities to manage the image perceived by others (Stănculescu, 2011). Within this, selfies push the opportunities for managing others’ view of oneself to the limit and provide some degree of new independence and control. One can get a quick picture of oneself, anywhere, at any place, without help from others. While taking a photo of oneself via camera held at arm’s length was already possible before the age of smartphones, smartphones and specialized selfie-equipment have brought this form of self-photography to perfection. One not only selects particular pictures for self-presentation but also already starts the ‘management’ process in the very moment of snapshotting one’s life. With the selfie-cam, acting as a mirror, the over controlled self-presentation in social media already starts while taking a photo.

Investigations in relation to individual differences in strategic self-presentation behavior lent further support to self-presentation as a central motive for social media use. Blachnio et al. (2016) explored relations between individual tendencies for different self-presentation styles (e.g., self-promotion, self-depreciation) and *Facebook* usage and found a positive correlation to the individual tendency for self-promotion. Thinking about the specific value of selfies, relations between the individual engagement in taking and posting selfies and individual self-presentation strategies are conceivable as well, as discussed in the following paragraphs.

### Selfies in the Light of Habitual Self-Presentation Strategies

Among the many opportunities of social media, selfies appear as an element with an especially high potential for self-presentation and impression management: *Per se*, selfies put the focus on the self. The selfie cam provides control while taking the picture; photo editing does the rest. With the person’s face in the foreground, selfies can be very expressive pictures, convey emotions and an image as desired. Altogether, selfies thus seem



to provide best opportunities for strategic self-presentations and impression management.

However, selfies may be especially supportive of particular types of self-presentation. Given that people vary in their habitual use of different strategies of self-presentation, the enthusiasm for selfies may also vary with how well selfies as a means for self-presentation fit with individually preferred self-presentation strategies. For example, in the taxonomy of self-presentation strategies suggested by Merzbacher (2007), two strategies in particular seem well in line with what selfies can provide: The first strategy is self-promotion, i.e., highlighting own accomplishments and abilities, to be perceived as capable, intelligent, or talented by others (cf. also Jones and Pittman, 1982; Tedeschi and Norman, 1985). By showing a highly controlled picture of oneself in the way that one wants to be seen by others, selfies provide a ground for self-promotion. The second strategy is self-disclosure, i.e., revealing (selective parts of) one's self and emotions with the aim to convey a likable image and earn sympathy, trust and appreciation from others (cf. also Schlenker, 1980; Tedeschi et al., 1985). In line with this, selfies, "snapshots" of one's life, offer a lightweight possibility to express emotions and revealing insights into one's life. Selfies form a "visual diary," and a way to share emotions with friends and family (Wortham, 2013). In contrast to self-promotion, self-disclosure does not aim to present the best "polished" self, but rather aims for sympathy through openness and "natural" insights into the self (though still being selective insights). Selfie-trends such as the "ugly" selfie or "post shower selfies" may fall into this category.

Other strategies of self-presentation in the taxonomy by (Merzbacher, 2007) seem less compatible with selfies, as for example understatement. Understatement in the sense of a strategic way of self-presentation refers to ostensibly downplaying one's own relevance, abilities and achievements, but implicitly expecting objection from others, finally leading to a positive revaluation of the self. Selfies, however, seem not well compatible with this strategy. Posting any photo of oneself is already some sign of taking oneself seriously. Posting a selfie, i.e., a photo putting the person in the center seems everything but understatement. Moreover, selfies have no implemented feedback channel as required for effectively using understatement as a strategy with positive effect for the self. An important element of understatement as a self-presentation strategy is the interaction partner who will disclaim the modest self-presentation. Hence, people who habitually use understatement should be less enthusiastic about selfies as a tool for self-presentation.

In sum, opportunities for self-presentation may be assumed as a core attractor for the popularity of selfies. However, selfies may not foster all types of different self-presentation strategies in equal degree, so that the enthusiasm for selfies may vary with individual tendencies in habitual self-presentation.

## Self-reflection on Selfies

From an analytical point of view, self-presentation may be one of the most prominent psychological reasons for taking selfies. However, another interesting question is how people reflect on this issue themselves: Do they see selfies primarily as a

tool for self-presentation? Where do they see advantages and disadvantages of selfies in their daily life? How do they reflect on their own and others' selfie taking behavior?

So far, only little research has explored personal reflections and subjective motivations for taking and posting selfies. An exception is the study by Sung et al. (2016), which explored motivations for posting selfies by an online-survey and a prior interview study. The interview study revealed four primary motives, namely attention seeking, communication, entertainment, and archiving, which each were assessed by a 3–6 items in the online-survey. Among the four motive scales, attention seeking (sample items: "To show off," "To be acknowledged by others") seems to have the highest overlap with self-presentation. While the motives attention seeking, communication, and entertainment were positively related to narcissism and selfie-posting frequency, archiving was not.

In an own qualitative study ( $N = 86$ , see also Christoforakos and Diefenbach, 2016), we explored peoples' subjective associations with selfies, thereby distinguishing between perceived positive and negative aspects of selfies. Both aspects were surveyed by an open question format and categorized by qualitative content analysis. Overall, the most common positive associations were independence (taking self-portrait pictures without help from others), meaning/documentation (selfies as a marker of meaning, selfies as memories), relatedness (feeling close to people when seeing their selfies), control/self-staging (control over the picture and the image perceived by others), and positive feelings (e.g., fun, chasing boredom). In contrast, as the most negative consequences of selfies participants named illusion/fake (inauthentic, unnatural pictures, creating a superficial illusionary world), threat to self-esteem (e.g., risking negative reactions from others, vulnerability), negative impression on others (e.g., narcissistic, showy), bad quality pictures, and unnecessary/uninteresting pictures. Hence, our findings on positive associations generally show parallels with the study on selfie motivations by Sung et al. (2016), e.g., relatedness – communication, meaning/documentation – archiving, positive feelings – entertainment. However, the aspect of control and self-staging was brought up more explicitly in our study, and also the aspect of independence as a positive consequence of selfies was not discussed by Sung et al. (2016).

Moreover, an interesting tendency in our qualitative data (Christoforakos and Diefenbach, 2016) was a different form of argumentation when talking about one's own selfie habits (e.g., "for me, it is a form of documentation") versus others taking selfies and general judgments (e.g., "the people get more narcissistic"). Not all statements were clearly indicative of self versus other judgments, since the study did not explicitly ask for this differentiation. However, those statements that did, showed a focus on situational and practical reasons for taking selfies oneself (e.g., "a quick photo without needing help from others," "using the selfie-cam as a mirror") whereas other judgments rather referred to reasons lying in the person (e.g., self-admiring, narcissistic), depicting the prototypical selfie-taker as the "type of character who needs it." We took this, as a hint for a more systematic exploration of judgments for own selfies versus others' selfies and peoples' reflections on selfies as a societal

phenomenon. In general, the exploration of interpretations and attributed reasons for taking selfies can offer deeper insight into the psychology and subjective experience of selfies.

## Aims of the Study

The present empirical study followed several aims:

First, an exploration of psychological functions of selfies with a special focus on selfies as a means of self-presentation as well as the representation of common self-presentation strategies. We focused on the strategies of self-promotion, self-disclosure and understatement, assuming positive relations with selfie-related affect for the two former and negative relations for the latter.

Second, an exploration of the image and perceived consequences of selfies, and relations to personal and societal values. Thus, besides indirect conclusions about the value of selfies (e.g., correlations between selfie-related affect and habitual self-presentation strategies), our study also surveyed explicit reflections about how people perceived selfies and their consequences in our social interaction.

Third, based on the incidences for differences between self-versus other judgments in our previous research (Christoforakos and Diefenbach, 2016), we aimed for a systematic exploration of this effect. In line with a self-serving interpretation, we assumed more likable judgments (e.g., self-ironic) for own selfies, and a more critical view (e.g., non-authentic) of others' selfies.

## MATERIALS AND METHODS

### Participants

Two hundred thirty-eight individuals (167 female) living in Germany, Austria, and Switzerland took part in the study and completed the whole survey. The age range was between 18 and 63 years ( $M = 25.33$ ;  $SD = 7.21$ ).

### Procedure

The study was carried out via online survey with unipark<sup>3</sup>, and participation took about 15 min. All materials were presented in German language. An invitation link to the study was distributed via diverse mailings lists and university panels. As an incentive, three Amazon gift vouchers (50€) were raffled among all participants who completed the survey. Participants' selfie behavior and related variables were assessed by a number of measures, as listed in the next sections.

## Measures

### Selfie Behavior and Preferences

Participants indicated how often they were usually taking selfies and receiving selfies from friends. Both measures were assessed on a 6-point scale (1 = never, 2 = once a month, 3 = once a week, 4 = several times a week, 5 = once a day, 6 = several times a day). In addition, participants rated how much they liked seeing selfies compared to usual (non-selfie) pictures. Preferences were assessed by a 5-point scale (1 = I prefer selfies, 5 = I prefer usual pictures).

<sup>3</sup>unipark.com

### Selfie-Related Affect

Participants described their emotional experience when taking selfies with the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) in German translation by Krohne et al. (1996). Its short form (Mackinnon et al., 1999) consists of five items assessing positive affect (PA, e.g., enthusiastic, inspired) and five items assessing negative affect (NA, e.g., enthusiastic, inspired). The 10 items were presented in random order. Judgments were assessed on a 5-point scale (1 = not at all, 2 = a little, 3 = moderately, 4 = quite a bit, 5 = extremely) and scale values calculated by averaging the according items. Cronbach's Alpha was 0.80 for PA and 0.68 for NA. Despite the low scale reliability for NA, we left the scale in original form to facilitate comparison with previous studies.

### Self-Presentation Strategies

Individual self-presentation strategies were assessed by a selection of items from the habitual self-presentation scales by Merzbacher (2007), who built on the self-presentation tactics scale by Lee et al. (1999). We focused on those facets of self-presentation, which we assumed as particularly relevant in the context of selfies, i.e., self-promotion and self-disclosure. We further assessed understatement, assuming that this strategy is *not* supported through selfies, thus being able to check a potential differential effect. Each strategy (self-promotion, self-disclosure, understatement) was assessed with five statements, e.g., "I tell others about my successes" (self-promotion), "I show my feelings to be well received by others" (self-disclosure), "I deliberately downplay my achievements" (understatement). The 15 statements were presented in random order. Participants judged how well the different statements described their typical behavior on a 9-point scale (1 = never, 9 = most of the time). Scale values were calculated by averaging the according items with satisfying scale reliability (Cronbach's Alphas: self-promotion 0.84, self-disclosure 0.78, understatement 0.78). A principal component analysis (varimax rotation, 58% explained variance) with three components to be extracted revealed a satisfactory solution with the five items assessing one strategy forming one component, and no loadings larger than 0.30 on other components.

### Perceived Consequences of Selfies

Perceived consequences of selfies were assessed based on a previous qualitative study, where we surveyed most prominent positive and negative associations related to selfies (as mentioned in the Background section, see also Christoforakos and Diefenbach, 2016). For the present study, we focused on six aspects, four of them being named as positive effects of selfies (independence, meaning, relatedness, self-staging) and two of them being named as negative effects of selfies (illusionary world, threat to self-esteem). Each aspect was assessed with two items presented in random order. Sample items are "Selfies provide independence" (independence), "Selfies provide opportunities to feel close to others" (relatedness), or "Selfies show an illusionary world" (illusionary world). Participants indicated their agreement on a 5-point scale (1 = not at all agree, 5 = totally agree). Scale values were calculated by averaging the according items, with

scale reliabilities between 0.62 and 0.79. A principal component analysis (varimax rotation, 79% explained variance) with six components to be extracted revealed a satisfactory solution with the two items assessing one aspect forming one component, and no loadings larger than 0.30 on other components.

### Statements on Own versus Others' Selfies

Judgments on own selfies and others' selfies was assessed with 10 statements, relating to five different aspects: self-irony ("My/Other peoples' selfies are often funny or self-ironic"), authenticity ("My/Other peoples' selfies show my/their true personality"), self-presentation ("I/Other people use selfies as a means for self-presentation"), fun ("I/Other people take selfies because it is fun"), situational variability ("My/Other peoples' selfies are very different from one situation to another"). The 10 statements were presented in random order, so that the contrast of judgments on own versus others' selfies may not have been obvious to participants. For each statement, participants indicated their agreement on a 5-point scale (1 = not at all agree, 5 = totally agree).

## RESULTS AND DISCUSSION

### Selfie Behavior and Preferences

Reports on selfie behavior showed a wide range, **Table 1** shows reported frequencies of taking and receiving selfies. For example, 50% declared to take selfies about once a month. A total of 27% stated taking selfies once a week or more often, one participant even several times a day. Statistics for receiving selfies were generally higher, here altogether 49% claimed receiving a selfie at least once a week, and six participants even several times a day. Thus, one seems to receive selfies more often than taking them. Moreover, taking and receiving selfies are positively correlated (non-parametric Spearman correlation  $\rho = 0.56$ ,  $p < 0.001$ ), so that the two activities may be interpreted as a general indicator of selfie engagement. The present high variability in self-reported selfie engagement is in line with previous research using objective counts, and also reporting wide ranges and high standard deviations in selfie statistics (Barry et al., 2015; Sorokowski et al., 2015).

The preference rating for selfies versus non-selfie pictures showed a clear preference for more non-selfie pictures. The mean value on the 5-point scale (1 = I prefer selfies, 5 = I prefer usual pictures) was  $M = 4.30$  ( $SD = 0.83$ ), significantly deviating from the scale midpoint [ $t(237) = 24.14$ ,  $p < 0.001$ ]. Eighty-two percentage gave a 4 or 5 rating, indicating they would like to view more usual pictures instead of selfies in social media. Though one's own selfie engagement was correlated to a higher acceptance of selfies (receiving selfies: non-parametric Spearman correlation  $\rho = -0.22$ ,  $p < 0.001$ ; taking selfies:  $\rho = -0.30$ ,  $p < 0.001$ ), also within the sub-group of those with high selfie engagement, the wish for more usual pictures was still dominant. Even among those taking selfies themselves once a week or more often ( $n = 65$ ), the preference for more usual photos instead of selfies was still significant [ $M = 3.94$ ,  $SD = 0.085$ ,  $t(64) = 8.95$ ,  $p < 0.001$ ]. The same applied to the subgroup of those receiving

selfies once a week or more often [ $n = 116$ ,  $M = 4.16$ ,  $SD = 0.86$ ,  $t(115) = 14.54$ ,  $p < 0.001$ ]. Thus, also people taking many selfies themselves tend not to like viewing others' selfie-pictures and rather wish for a higher number of usual photos. As a first result, this expresses a somewhat paradox situation, where many people are engaged in selfies, but at the same time wish for a reduction of selfies in social media in favor of more non-selfie pictures, expressing a somewhat distanced attitude toward the value of selfies.

### Selfie-Related Affect and Self-Presentation Strategies

The analysis of participants' reported emotional experience while taking selfies showed mean values in the lower scale range for both positive affect ( $M = 2.64$ ,  $SD = 0.83$ ) and negative affect ( $M = 1.40$ ,  $SD = 0.49$ ). Yet, positive affect was significantly more pronounced than negative affect [ $t(237) = 21.41$ ,  $p < 0.001$ ], indicating that, on average, taking selfies is an overall rather positive experience. Selfie-related positive affect was also related to selfie engagement, i.e., positively related to the frequency of taking selfies (non-parametric Spearman correlation  $\rho = 0.32$ ,  $p < 0.01$ ) and receiving selfies (non-parametric Spearman correlation  $\rho = 0.18$ ,  $p < 0.01$ ).

A further analysis revealed that the experienced positivity of taking selfies differed depending on individually preferred self-presentation strategies: An analysis of variance showed general differences between the specification of the three surveyed self-presentation strategies [ $F(2) = 28.73$ ,  $p < 0.001$ ]. Understatement seems to be the least popular ( $M = 4.03$ ;  $SD = 1.46$ ), whereas self-promotion is more popular ( $M = 4.34$ ;  $SD = 1.38$ ) and self-disclosure most pronounced ( $M = 4.93$ ;  $SD = 1.36$ ). As shown in **Table 2**, high values for self-promotion and self-disclosure were correlated with a positive experience of taking selfies but high values for understatement were correlated with a negative experience of taking selfies.

A likely interpretation is that people who tend to understate their successes and competencies when presenting themselves cannot profit from selfies – at least not as a means for self-presentation – and thus associate negative emotions with taking selfies. Taking a selfie, inevitably claiming attention for oneself, is contradictory to such habits of self-presentation. However, for many others, making use of the more popular strategies of self-promotion and self-disclosure, selfies form a suitable means for self-presentation in line with their preferences and, thus, are associated with positive emotions. As discussed above, selfies seem to be a good possibility for selective self-presentation with a focus on strengths, accomplishments, and abilities (self-promotion) as well as displaying emotions, likable openness and insights into one's life (self-disclosure).

In sum, the pattern of correlations suggests that the self-presentation perspective is crucial for understanding the value of selfies. Also, the consideration of habitual self-presentation strategies helps to explain individual differences in selfie-related affect and liking. In line with our expectations, self-promotion and self-disclosure were related to positive selfie-related affect and understatement to negative selfie-related affect. In other

**TABLE 1 | Reported frequencies of taking and receiving selfies.**

Selfie behavior frequencies	Never	Once a month	Once a week	Several times a week	Once a day	Several times a day
Taking selfies	22,7%	50%	18,5%	7,6%	0,8%	0,4%
Receiving selfies	12,6%	38,7%	23,1%	20,2%	2,9%	2,5%

**TABLE 2 | Correlations between individual self-presentation strategies and selfie-related affect.**

Selfie-related affect	Individual self-presentation strategies		
	Self-promotion	Self-disclosure	Understatement
Positive affect	0.16*	0.19**	−0.02
Negative affect	−0.02	0.01	0.33**

\* $p < 0.05$ , \*\* $p < 0.01$ .

words, people who habitually use self-promotion and/or self-disclosure as strategies of self-presentation also appeared as the most passionate about selfies.

The idea of a relation between taking selfies and self-promotion is quite parallel to previous research on using selfies for impression management, such as strategically adjusted travel selfies (Lyu, 2016), or self-promotion as a major driver of Facebook use (Carpenter, 2012; Błachnio et al., 2016). Moreover, also the wide strand of research exploring relations to narcissism already discussed the potential self-promotional aspects of selfies. For example, Barry et al. (2015, p. 3) described selfies as “inherently self focused [photos], with some perhaps being blatant attempts to gain attention from others due to one’s appearance, affiliations, or accomplishments.” (Sorokowski et al., 2015) explored different sub facets of narcissism and revealed admiration demand as the most important predictor of selfie-posting behavior, in fact, the only narcissism subscale that significantly predicted selfie-posting among women.

The relation between posting selfies and self-disclosure as a self-presentation strategy has, to our knowledge, not been addressed empirically so far. Anecdotic reports already highlighted the potential of selfies for expressing and communicating emotions to others, e.g., “it is about showing your friends and family your elation when you’re having a good day or opening a dialog or line of communication using an image the same way you might simply text ‘hi’ or ‘what’s up?’” (Wortham, 2013). Our research, however, suggests that self-disclosure through selfies may also fulfill functions beyond opening a line of communication, namely, self-disclosure to earn sympathy, in the sense of strategic self-presentation (Merzbacher, 2007).

Taken together, selfies appear as a powerful tool for impression management, i.e., “the process by which people control the impressions others form of them” (Leary and Kowalski, 1990). However, the usefulness of that tool depends on individually preferred strategies of self-presentation. While self-promotion and self-disclosure are well supported, understatement and possibly also other strategies (which we did not assess in the present study) are not supported. In consequence, people

preferring understatement rather show an antipathy for selfies and report negative affect while taking selfies.

## Perceived Consequences of Selfies

Mean values of agreement for the studied perceived consequences of selfies are given in **Table 3**. The analysis showed significant agreement for the potential negative effects of selfies (illusionary world, threat to self-esteem) but only partial agreement for the potential positive effects. Among the potential positive effects, the only aspect that reached significant agreement was self-staging, i.e., the possibility to use selfies for presenting an intended image to others. However, fewer participants acknowledged positive effects of selfies regarding independence, meaning, or relatedness, and mean values of agreement remained significantly below the neutral scale midpoint. In fact, only a small part of the sample showed agreement for positive aspects and scored above the scale midpoint (independence: 14%, meaning: 14%, relatedness: 8%), whereas the ratio of participants scoring above the scale midpoint was 62% for self-staging, 62% for threat to self-esteem, and 67% for illusionary world.

An analysis of correlations between perceived consequences of selfies and selfie-related affect as well as selfie behavior (see **Table 4**) showed a plausible pattern: those who frequently take selfies themselves reported higher agreement for the positive and lower agreement for the negative consequences of selfies. Also, agreement for the positive consequences of selfies was related to more positive selfie-related affect, and agreement for the negative consequences of selfies was related to more negative selfie-related affect.

In sum, those frequently taking selfies and feeling good while doing so are also more optimistic about the general consequences of selfies. However, according to our results, the majority of participants sees the most obvious consequences of selfies on the negative side, i.e., threat to self-esteem and creating an illusionary

**TABLE 3 | Mean values of agreement and significance of deviation from scale midpoint (=3) for perceived consequences of selfies.**

Perceived consequences of selfies	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>
Positive					
Independence	2.03	0.94	16.02	237	<0.001
Meaning	2.20	1.02	12.07	237	<0.001
Relatedness	1.99	0.85	18.34	237	<0.001
Self-staging	3.50	1.01	5.51	237	<0.001
Negative					
Illusionary world	3.63	1.01	9.66	237	<0.001
Threat to self-esteem	4.49	0.94	7.96	237	<0.001



**TABLE 4 | Correlations between perceived consequences of selfies, selfie behavior, and selfie-related affect.**

Perceived consequences of selfies	Taking selfies	Selfie-related positive affect	Selfie-related negative affect
Positive			
Independence	0.34**	0.39**	0.16*
Meaning	0.22**	0.29**	0.14*
Relatedness	0.18**	0.23**	0.21**
Self-staging	0.20**	0.25**	0.07
Negative			
Illusionary world	-0.28**	-0.05	0.17*
Threat to self-esteem	0.07	0.08	0.14*

\* $p < 0.05$ , \*\* $p < 0.01$ .

world. This parallels previous research, discussing the potential danger of selfies for one's confidence and self-esteem, emerging from repeated attempts to achieve the "perfect selfie" and the absence of positive feedback (Barry et al., 2015).

On the positive side, the most dominant aspect is self-staging. Other positive aspects such as feelings of relatedness, autonomy or meaning were only experienced by a small part of the participants. Those also appeared as most passionate about selfies, frequently taking selfies and feeling good while doing so. In a way, taking selfies may be a self-intensifying process, where one discovers unexpected positive aspects (besides self-staging) while engaging in the activity and this positive experience encourages further engagement. Nevertheless, the majority showed a rather critical attitude, and among the perceived consequences of selfies, negative aspects clearly predominate. If selfies are good for anything, it is self-staging, at least in the majority's opinion.

For a comprehensive picture of the relationships between participants' individually preferred self-presentation strategies, selfie-related affect, and perceived consequences of selfies, we conducted a *post hoc* path analysis computed with R package lavaan. Considering self-presentation strategies as exogenous person variable and based on the found correlational patterns, the tested model assumed effects of self-presentation strategies on selfie-related affect, and, in turn, effects of selfie-related affect on perceived consequences of selfies (Figure 1). The fit indices indicated a good model fit, CFI = 0.957; RMSEA = 0.046; SRMR = 0.067 (McDonald and Ho, 2002; Beauducel and Wittmann, 2005; Kline, 2015). The  $\chi^2$  test is significant [ $\chi^2(30) = 44.963$ ;  $p = 0.039$ ], yet this is a usual consequence of the high number of participants (Bühner, 2011). In sum, individual self-presentation strategies seem to be deciding whether one experiences taking selfies as positive or negative, and the resulting valence of affect implies a focus on either positive or negative consequences of selfies. While positive selfie-related affect goes along with positive judgments on selfies, highlighting consequences such as relatedness, autonomy, meaning, and self-staging, negative selfie-related affect implies agreement to negative consequences of selfies such as creating an illusionary world and threats to self-esteem. Altogether, the present *post hoc* model, suggesting a path from person variables

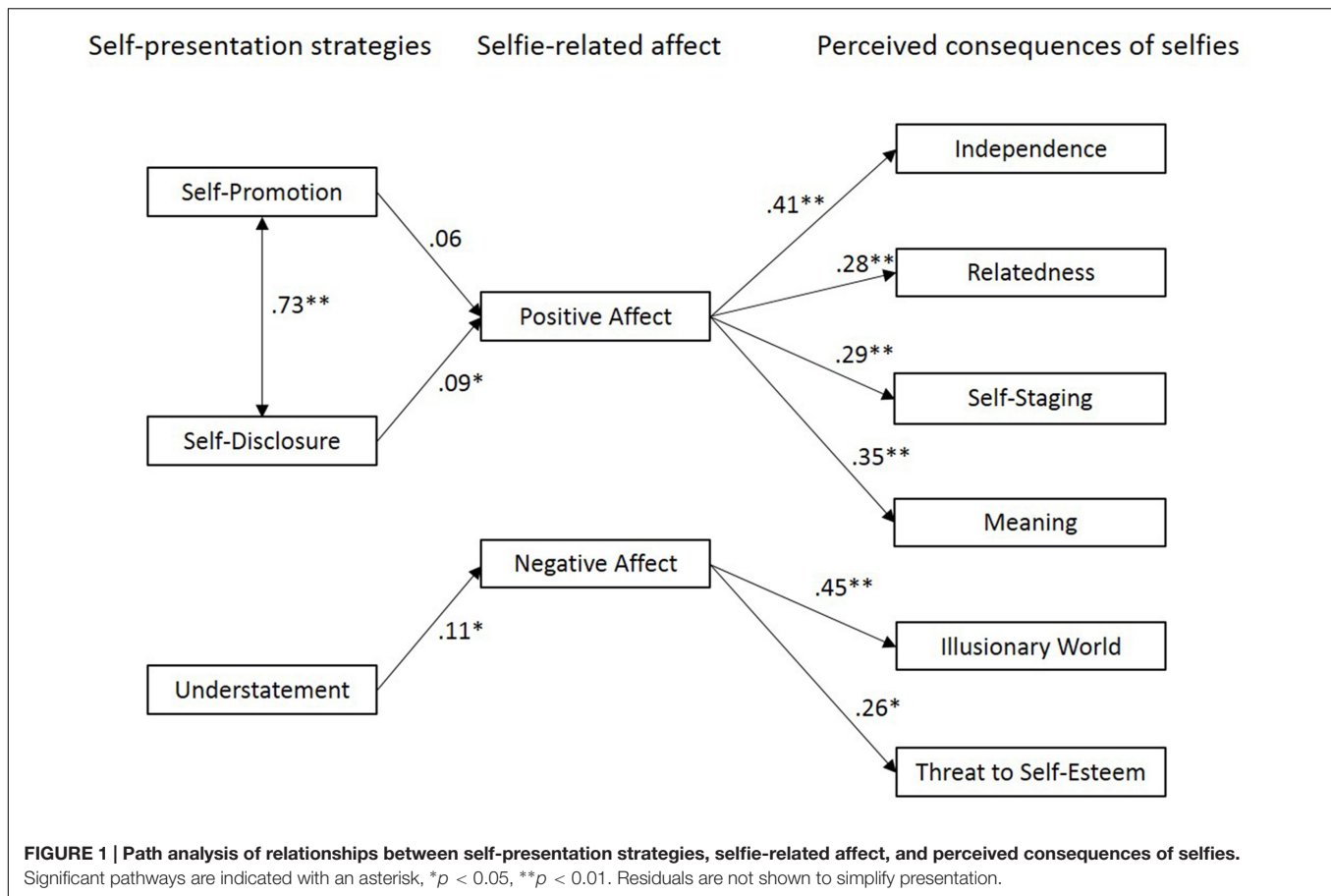
(self-presentation strategies) via affective consequences of selfies to cognitive judgments (i.e., perceived consequences), provides a plausible structure for our data and could be used for further research.

## Statements on Own versus Others' Selfies

Table 5 shows mean values of agreement to statements on own versus others' selfies. Significant differences between own versus other statements occurred for all studied aspects, namely, self-irony, authenticity, self-presentation, fun, and situational variability. Altogether, the findings confirmed our expectations, showing a more likable interpretation of own selfies and a more critical interpretation of others' selfies: Own selfies were rated as more self-ironic and thought of as more authentic than those of others. In contrast, others were assumed to use selfies for self-presentation and have fun while taking selfies to a higher degree than oneself. A further analysis of the ratios of agreement (i.e., number of 4 or 5 ratings) showed the discrepancy between own versus other statements in more detail. For example, 40% claimed self-irony for their own selfies, but only 13% perceived self-irony in others' selfies. In contrast, 90% declared others' selfies as means of self-presentation, but only 46% attested this to own selfies. Obviously, there is a systematic discrepancy in the perception between own versus others' selfies, i.e., a selfie bias.

A non-expected result was that others' selfies were assigned a higher degree of situational variability, e.g., showing different images or poses from one situation to another. In consideration of our previous study (Christoforakos and Diefenbach, 2016), where participants focused on situational and practical reasons for taking selfies oneself but personal factors for others' selfies, we had expected that participants would disregard variations in others' selfies between different situations. This, however, was not the case. Though the agreement for individual aspects (e.g., self-presentational needs, having fun) was indeed higher, people also acknowledged situational variations in others' selfies. A problem in our operationalization might be, however, that our items assessing situational variability only asked for observable variations and not to what degree the situation (in contrast to character) influenced the behavior. One could still imagine that the trigger for taking a selfie lies in the person (self-presentational needs), and the situation is rather used to justify a selfie, and adjusting the pose to the surrounding. In this sense, the lower ratings for situational variability for oneself compared to others may also be a statement that oneself is not taking part in the game. Apart from that, it is plausible, that, along with people's general need for personal control and influence (Frey and Jonas, 2002; Pittman and Zeigler, 2007), one might not want to state situational factors more responsible for one's actions than internal, personal factors.

In summary, peoples' statements on own versus others' selfies suggest a distanced attitude toward taking selfies. In an extreme interpretation, takings selfies may appear below one's standards. It occurs as a superficial activity, good for others to have fun and realize their needs for self-presentation, but oneself does not take the passion for selfies too seriously. While "the others" appear



**TABLE 5 | Mean values of agreement and significance of differences for statements on own versus others' selfies.**

Statement	Agreement own selfies		Agreement others' selfies		<i>t</i>	<i>df</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Self-irony: My/Other peoples' selfies are often funny or self-ironic.	3.08	1.25	2.58	0.84	5.71	237	<0.001
Authenticity: My/Other peoples' selfies show my/their true personality.	2.50	1.05	1.88	0.80	8.12	237	<0.001
Self-presentation: I/Other people use selfies as a means for self-presentation.	3.06	1.35	4.38	0.75	14.10	237	<0.001
Fun: I/Other people take selfies because it is fun.	3.10	1.31	3.97	0.82	9.84	237	<0.001
Situational variability: My/Other peoples' selfies are very different from one situation to another.	3.28	1.24	3.61	1.07	3.88	237	<0.001

as the real selfie-takers, this does not mean one totally refuses engagement in selfies. However, if one takes selfies, these are not the typical ones but more authentic or more self-ironic than those of others. While it is possible, that people have actually difficulties in understanding each other's sense of humor, and can hardly detect signs of self-irony in others' selfies, this pattern is also in line with a self-serving bias and social demand effects. Self-presentation is the dominant impression of others' selfies, but for oneself, more favorable motives are constructed. The explicit reflection on one's selfie behavior, and realizing participation in an activity that one essentially sees as ridiculous, may also be

a classic case of cognitive dissonance through a realized gap between attitude and behavior (Festinger, 1957). This dissonance may be reduced by downplaying the narcissistic parts of it and justifying selfie-taking with self-irony or authentic insights into one's life. Altogether, the present patterns of findings suggests a somehow biased view and romanticization of one's own selfie behavior. However, several mechanisms may play a role and in the present study, and effects of true misperceptions (e.g., not seeing the irony in others' selfies, really seeing own selfies as more authentic) and needs for internal and external justification cannot be separated entirely.

## GENERAL DISCUSSION

The present study provided advanced insights into the psychological motivations and perceived benefits of taking selfies, with a particular focus on self-presentational aspects as well as peoples' reflections on selfies and their consequences on an individual and societal level. In addition to previous research, that explored relations between selfie engagement and personality traits (Barry et al., 2015; Sorokowski et al., 2015; Weiser, 2015), the present study highlighted relations to popular, habitual self-presentation strategies. First previous studies on self-reported motivations to take selfies (Sung et al., 2016) have been advanced by a broader study of perceived consequences and insights into peoples' self-reflections on their own and others' selfie-taking behavior. Our findings confirmed self-presentation as relevant for the popularity and attractiveness of selfies, but also revealed that this kind of attractiveness is hardly reflected in explicit commitment to selfies. A consideration in light of biases and mechanisms described in social psychology may help to understand this seeming contradictory, or, the selfie bias or selfie-paradox. In the following, we summarize our study findings and then discuss alternative interpretations, parallels to selected mechanisms from social psychology and self-presentation research, and following research questions.

In summary, our findings outline selfies as a complex and somewhat conflicting practice, with less general agreement than the wide dissemination of selfies in social media may suggest. Participants' reports on their own selfie-taking behavior showed that a considerable part of participants was regularly taking selfies, however, with different levels of positive affect related to it. Further analysis revealed that the experienced positivity while taking selfies differed depending on individually preferred self-presentation strategies. In line with our expectations, particularly participants who habitually use self-promotion and/or self-disclosure as strategies of self-presentation appeared as the most passionate about selfies. For them, selfies may form a welcome opportunity for supporting their naturally preferred self-presentational behavior. In line with this, the most agreed benefit of selfies was self-staging (62%). Other positive aspects such as independence, meaning, and relatedness (which a prior study had revealed as potential positive consequences of selfies), received lower agreement, and were only acknowledged by small parts of the sample (8–14%). In contrast, a much higher part of participants (62–67%) declared agreement for potential negative consequences, such as selfies creating an illusionary world and threats to self-esteem. This overall rather negative view on selfies was continued with the finding that the vast majority (82%) declared they would like to see more usual pictures instead of selfies in social media. Thus, though (occasionally) being part of the selfie culture themselves, there is also a sense of reflection that more non-selfie pictures could be desirable.

Such reports suggest that people predominantly perceive negative consequences of selfies, and more selfies are taken than the viewers appreciate. Nevertheless, worldwide people take thousands of selfies each day. Moreover, there are systematic differences in perceptions for one's own and others' selfie pictures. As hypothesized, people rated others to have more fun while

taking selfies, and assumed a higher relevance of self-presentation through selfies for others than for oneself. Moreover, others' selfies were rated as less authentic than own selfies, whereas own selfies were assigned a higher degree of self-irony. Though declaring a general wish for less selfies in social media, the single individual seems to find good reasons to take/post selfies from time to time, and interprets own selfies in a way, that make them appear as more justified (authentic, self-ironic) than those of others.

While the present study once more confirmed the self-presentational value of selfies, it seems that understanding their potential for self-presentation is only part of the story of understanding selfies. The even more interesting part is the story that people construct around selfies: The overall critical attitude toward selfies, and wishes for more non-selfie pictures in social media, even among active selfie-takers. When asking the single person, selfies should have never become so popular. Taken together, the above described discrepancy between judgments on own versus others' selfies, the controversial role of self-presentation, and the engagement in an activity that one describes as mainly critical, forms what we denoted as selfie bias, resulting in a paradox: nobody seems to like selfies, yet everyone has reasons to take them.

In a provocative interpretation, the whole sum of selfies may be "exceptional pictures" from people who actually are no fans of selfies. They may just half-heartedly follow the social norms, not wanting to destroy the fun for others. Without taking it seriously or really having a passion for it themselves, they might rather experience selfies as a kind of social obligation, which they secretly hope to stop being popular. If, however, everybody thinks like this yet does not act on it, the observable result is that everybody will further engage in selfies and further contribute to their popularity. This would mean having a mass of people establishing a culture that only few seem fully committed to. In this case, a possible implication could be needing to find ways to free people from taking selfies, since it essentially is an activity that only few can profit from and many see as negative.

An alternative line of interpretation could be that many people actually enjoy taking selfies and profit from it as a way of self-presentation, but downplay this in their reports. People may profit more from self-presentational benefits but construct more favorable motives for their own selfie behavior, in benefit of social demands and their own positive self-view. In this line of interpretation an implication could be that, we need to be aware that selfies are a welcome opportunity to act out self-presentational needs and people even find ways of justification with other hypothetical motivations. In this case, the observed selfie bias may actually fulfill a psychological function. In a way, one may act narcissistic without feeling narcissistic. Beyond this, there are several parallels to described biases and mechanisms in social psychology and self-presentation research which may also help to understand the discrepancy between judgments on own versus others' selfies.

A first parallel refers to attribution biases. One obvious factor for a more sympathetic interpretation of one's own selfie behavior may be a classical self-serving bias, i.e., "an ego-biased attribution," where "we try to explain our behavior in terms

that flatter us and put us in a good light” (Miller and Ross, 1975, p. 213). Self-presentational motivations may be associated with narcissism and regarded as less reputable, and therefore attributed to others rather than to oneself. For oneself, one prefers relations to be more reputable character traits such as self-irony or authenticity. This is also in line with previous research on attributions for inconsistencies between online and offline self-presentations (DeAndrea and Walther, 2011). It showed that the types of attributions people made for online behavior depended on the perspective of the person providing the explanation: People explained their own online behavior more favorably than the online behavior of both friends and acquaintances. In short, selfie-takers may protect their self-esteem through claiming socially desirable reasons to take selfies for oneself, instead of less reputable reasons (e.g., narcissistic ambitions) they suspect in others.

Also the fundamental attribution error, i.e., the tendency to focus on internal characteristics (character or intention) in explaining another person’s behavior and situational factors when interpreting one’s own behavior (Jones and Harris, 1967), could play a role for judgments on own versus others’ selfies. While for oneself, one claims that selfies provide authentic insight into real life situations, for others, the inner wish for self-presentation is assigned as more relevant. However, a finding speaking against this interpretation is that people also assigned a higher situational variability to other peoples’ selfies, so that they acknowledge variations from situation to situation. Altogether, the general tendency for self-serving attributions appears as a more obvious factor than the failure to account for situational influences when explaining the behavior of others.

Another relevant factor may be the disregard of bidirectional influences in self-presentational behavior. For example, typical selfie poses, often a bit showy and narcissistic, just become the established way of how to present one self in a selfie and meet our expectations of what a typical selfie looks like. Even if for one self, one may pick the showy pose just “for fun,” does not mean it seriously and rather claims to express self-irony – it is also an invitation for others, to imitate that pose (with the same idea of self-irony), adding to a process of escalating each other’s selfie behavior. People may interpret others’ selfie behavior as mainly driven by self-presentational needs, but underestimate that their own behavior may also have inspired people to such poses. In short, they may neglect, the effects of own self-presentation on self-presentation of others and thus fail to make adequate interpretations of others’ behavior in selfies. This bias has already been described in other contexts. For example, Baumeister et al. (1989) described how people inferred their partners’ self-esteem levels directly from the partners’ behavior, without correcting for how protagonists themselves had altered the partners’ behavior. They then concluded that people may fail to make adequate interpretive adjustments when their self-presentations alter the behavior of others. Again it also shows that people tend to neglect situational influences when evaluating other’s actions.

Though surely not exhausting, the above parallels to popular biases in previous research may help to understand the general importance to understand social media – as inherently social environment – through the lens of social psychology.

## LIMITATIONS AND FUTURE RESEARCH

The present study has several limitations to be addressed in future research. First, the present discussion is only one way of interpretation of correlational results and the overall pattern of findings. This needs to be advanced by (quasi)experimental studies in the future that will allow more accurate interpretations and possibly causal attributions. For example, the described selfie bias is, as most of the described biases in psychology, at first a mere description of systematic shifts between judgments, attributions, or behavior from one context to the other. On the one hand, theoretical analysis, the empirical correlations between habitual self-presentation strategies and selfie-related affect, as well as judgments on others’ selfies suggest their potential for self-presentation to be a prime factor for their wide success. On the other hand, people rather minimize the impact of self-presentation for themselves, and instead, highlight irony and authenticity as more prevalent in their own than others’ selfies. An interesting question for future research would be to gain deeper insight into underlying processes and the relations between these two findings: (1) is there a conscious process underlying? Do people consciously downplay the self-presentational potential of selfies? Do they feel ashamed of their self-presentational needs and try to make up more justified reasons for taking selfies? Or (2) does the observed selfie bias reflect a lack of capability for self-reflection? Do they really perceive their own selfies as more authentic or self-ironic than others’ selfies? Are people not aware of what really attracts them about selfies and may presume other motives for posting selfies than they may actually have? Could the unclear motivation of selfies, open to multiple interpretations, even be a cause for their popularity? Of course, also positions in between are plausible. Future studies could help to get a deeper understanding of the revealed selfie bias and related mechanisms.

Second, our study is based on self-reports and did not include objective data of taking and receiving selfies. We chose this approach due to our main interest in self-reflection and, thus, a lightweight approach to studying the subject. More important than exact information about one selfie more or less was how people perceived their own and others’ selfie behavior and the mental constructions around it. Hence, we aimed to avoid any additional pressure of justification, which might be induced by the study of hard usage data. Along with this, it has to be noted that according to self-reports, our sample was not an overly active sample of selfie-takers, and ambitious selfie-takers with frequencies of several times a week (or more often) formed the minority. Despite this limitation, the found effects are notable, and may be even stronger in a more selfie-focused sample. This, however, has to be validated in future studies, including a higher proportion of heavy selfie takers. In addition, the inclusion of objective usage data could help to advance the present findings and get a more differentiated picture of single phenomena, e.g., the value of sharing selfies versus selfies as a means of documentation for one self. Moreover, methods such as experience sampling (Hektner et al., 2007), a daily diary approach that asks people to report on the nature and quality of their experience related to daily life events, may be adjusted to the



context of selfies. Data may be easily collected via smartphone, i.e., the natural object related to taking a selfie. Surveying peoples' real time-experiences while taking, posting or receiving a selfie will allow deeper insights about which moment actually evokes most positive affect and relevant context factors.

Third, our findings are limited to a European sample, and studying potential intercultural differences for the experience and acceptance of selfies could be an interesting subject for further research. For example, research could contrast individualistic versus collectivistic cultures regarding their selfie culture. One could intuitively assume that selfies, as a highly individual-centered type of photograph may be more accepted in individualistic cultures. On the other hand, especially in many mainly collectivistic Asian countries, placing a high value on interdependence and developing identity through relationship, selfies seem to be quite popular.

It may be that there is another form of interpretation of selfies between different cultures. In our study, most of the participants refused the relation between selfies and relatedness to others and highlighted self-presentation as the most relevant factor. Other cultures may have a different view, and, for example, focus on the collective activity of taking selfies together or posting selfies as an act of creating contact and highlighting togetherness. First hints in that direction can be found in the study by Sung et al. (2016), where communication appeared as main driver of selfie-posting intention, and more individual-centered factors such as attention seeking or narcissism appeared as less relevant. Another aspect could be the high value of social acceptance in collectivist cultures, and liking others' selfies could be a relevant practice. Instead of an egoist, self-presentational act, the selfie may be interpreted as a sign of appreciation of others' opinion and asking for confirmation through others.

Forth, future research could examine individual differences that are relevant for the use of self-presentation strategies, and thus, may affect the individual attractiveness of selfies as a self-presentational tool as well. For example, core self evaluation traits (Deci and Ryan, 2002) could play a role, especially the individual autonomy orientation, which reflects a general tendency to base behaviors on core interests and integrated values and to experience true choice in one's behavior. Given that, people with high autonomy orientation generally make less use of self-presentation strategies (Lewis and Neighbors, 2005), a high autonomy orientation may also diminish the interest in selfies or other forms of self-presentation in social media.

Finally, our study of relations between selfies and habitual self-presentation strategies was limited to a particular set of self-presentation strategies. Aiming for a parsimonious research design, which focused on those strategies we assumed as most fitting or non-fitting for selfies. However, future research could include further self-presentation strategies. This could also include the study of relations to different motivations behind self-presentation. For example, a prominent distinction of self-presentational motivations is self-construction/self-fulfillment versus obtaining rewards from others, and, thus, pleasing the audience (Baumeister, 1982). This distinction also shows parallels to different researchers' positions on the value of selfies, such as that selfies are a means for self and

identity exploration (Rutledge, 2013), selfies as a practice of freedom, or self-therapeutic and awareness-raising practice (Tiidenberg and Cruz, 2015) in contrast to others promoting the impression management motivation and the fabrication of selfies to disseminate desired impressions to others (Lyu, 2016).

## CONCLUSION

As the present study showed, self-presentation may be a central factor for the attractiveness of selfies but at the same time is downplayed in self-reports. While many people are contributing to the success of selfies, only few declare true commitment. In the end, however, the combination of these two factors, an opportunity for self-presentation without an obvious revelation of self-presentational needs, may also be part of the secret of their success. What we here called the selfie paradox and selfie bias could also be a key factor for their popularity. Forming a lightweight possibility for self-presentation, that allows people to strategically adjust and experiment with the impression they make on others, but still in a playful and somewhat ambiguous manner, that is even interpreted as self-irony (at least by the selfie-takers themselves).

Clever experimental studies will surely shed further light on the exact motivations behind selfies. But in daily life, one's specific motivations for taking a selfie usually remain uncovered. Others, and possibly even oneself, can never have full and final insight into what motivates taking a selfie, and this might actually be what attracts people. In this sense, the present research also adds to a deeper understanding of success factors for social media in general. In the end it might be all about fulfilling basic human needs (here: popularity, self-expression) in a way that feels good for people, does not reveal too much about deeper motivations and allows them to keep a positive self-view and image to others.

## ETHICS STATEMENT

An ethics committee approval was not requested. The study was conducted via online survey and did not include any experimental manipulation or deception about the study's purpose. Participants were free to stop participation at any time.

## AUTHOR CONTRIBUTIONS

SD and LC designed and conducted the research. SD analyzed the data and drafted the manuscript, LC critically revised the manuscript. Both authors approved the final version of the manuscript for submission.

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## REFERENCES

- Barry, C. T., Doucette, H., Loflin, D. C., Rivera-Hudson, N., and Herrington, L. L. (2015). "Let me take a selfie": associations between self-photography, narcissism, and self-esteem. *Psychol. Pop. Media Cult.* doi: 10.1037/ppm0000089
- Baumeister, R. F. (1982). A self-presentational view of social phenomena. *Psychol. Bull.* 91, 3. doi: 10.1037/0033-2909.91.1.3
- Baumeister, R. F., Hutton, D. G., and Tice, D. M. (1989). Cognitive processes during deliberate self-presentation: how self-presenters alter and misinterpret the behavior of their interaction partners. *J. Exp. Soc. Psychol.* 25, 59–78. doi: 10.1016/0022-1031(89)90039-5
- Beauducel, A., and Wittmann, W. W. (2005). Simulation study on fit indexes in CFA based on data with slightly distorted simple structure. *Struct. Equat. Model.* 12, 41–75. doi: 10.1207/s15328007sem1201\_3
- Bennett, S. (2014). *A Brief History of the #Selfie*. Available at: <http://www.adweek.com/socialtimes/first-ever-selfie-history/499920>
- Best, P., Manktelow, R., and Taylor, B. (2014). Online communication, social media and adolescent wellbeing: a systematic narrative review. *Child. Youth Serv. Rev.* 41, 27–36. doi: 10.1016/j.childyouth.2014.03.001
- Blachnio, A., Przepiorka, A., Boruch, W., and Balakier, E. (2016). Self-presentation styles, privacy, and loneliness as predictors of Facebook use in young people. *Personal. Individ. Differ.* 94, 26–31. doi: 10.1016/j.paid.2015.12.051
- Brandt, R. (2014). *Google Divulges Numbers at I/O: 20 Billion Texts, 93 Million Selfies and More*. Available at: <http://www.bizjournals.com/sanjose/news/2014/06/25/google-divulges-numbers-at-i-o-20-billion-texts-93.html> [Accessed 07.07.2016 2016]
- Brivio, E., and Ibarra, F. C. (2009). Self presentation in blogs and social networks. *Stud. Health Technol. Inform.* 144, 113–115.
- Bühner, M. (2011). *Einführung in die Test-und Fragebogenkonstruktion*. Hallbergmoos: Pearson Deutschland GmbH.
- Carpenter, C. J. (2012). Narcissism on Facebook: self-promotional and anti-social behavior. *Personal. Individ. Differ.* 52, 482–486. doi: 10.1089/cyber.2009.0257
- Christoforakos, L., and Diefenbach, S. (2016). "Das Selfie-Paradoxon – Kaum einer mag sie, alle tun es," *Poster presentation at the German Psychological Society (DGPs) Congress, Leipzig*.
- Chou, H.-T. G., and Edge, N. (2012). "They are happier and having better lives than I am": the impact of using Facebook on perceptions of others' lives. *Cyberpsychol. Behav. Soc. Netw.* 15, 117–121. doi: 10.1089/cyber.2011.0324
- DeAndrea, D. C., and Walther, J. B. (2011). Attributions for inconsistencies between online and offline self-presentations. *Commun. Res.* 38, 805–825. doi: 10.1177/0093650210385340
- Deci, E. L., and Ryan, R. M. (2002). *Handbook of Self-Determination Research*. Rochester, NY: University Rochester Press.
- Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Palo Alto, CA: Stanford University Press.
- Frey, D., and Jonas, E. (2002). "Die Theorie der kognitiven Kontrolle," in *Theorien der Sozialpsychologie*, eds D. Frey and M. Irle (Bern: Huber), 13–50.
- Gonzales, A. L., and Hancock, J. T. (2011). Mirror, mirror on my facebook wall: effects of exposure to facebook on self-esteem. *Cyberpsychol. Behav. Soc. Netw.* 14, 79–83. doi: 10.1089/cyber.2009.0411
- Hall, M. (2013). *Family Albums Fade as the Young Put Only Themselves in Picture*. *Telegraph*. Available at: <http://www.telegraph.co.uk/technology/news/10123875/Family-albums-fade-as-the-young-put-only-themselves-in-picture.html>
- Hektner, J. M., Schmidt, J. A., and Csikszentmihalyi, M. (2007). *Experience Sampling Method: Measuring the Quality of Everyday Life*. Thousand Oaks, CA: Sage.
- Jones, E. E., and Harris, V. A. (1967). The attribution of attitudes. *J. Exp. Soc. Psychol.* 3, 1–24. doi: 10.1016/0022-1031(67)90034-0
- Jones, E. E., and Pittman, T. S. (1982). Toward a general theory of strategic self-presentation. *Psychol. Perspect. Self* 1, 231–262.
- Kline, R. B. (2015). *Principles and Practice of Structural Equation Modeling*. New York, NY: Guilford publications.
- Krohne, H. W., Egloff, B., Kohlmann, C.-W., and Tausch, A. (1996). Investigations with a German version of the Positive and Negative Affect Schedule (PANAS). *Diagnostica* 42, 139–156.
- Leary, M. R., and Kowalski, R. M. (1990). Impression management: a literature review and two-component model. *Psychol. Bull.* 107, 34. doi: 10.1037/0033-2909.107.1.34
- Lee, S.-J., Quigley, B. M., Nesler, M. S., Corbett, A. B., and Tedeschi, J. T. (1999). Development of a self-presentation tactics scale. *Personal. Individ. Differ.* 26, 701–722. doi: 10.1080/00221325.2010.526975
- Lewis, M. A., and Neighbors, C. (2005). Self-determination and the use of self-presentation strategies. *J. Soc. Psychol.* 145, 469–490. doi: 10.3200/SOCP.145.4.469-490
- Lobinger, K., and Brantner, C. (2015). In the eye of the beholder: subjective views on the authenticity of selfies. *Int. J. Commun.* 9, 1848–1860.
- Lyu, S. O. (2016). Travel selfies on social media as objectified self-presentation. *Tour. Manag.* 54, 185–195. doi: 10.1016/j.tourman.2015.11.001
- Mackinnon, A., Jorm, A. F., Christensen, H., Korten, A. E., Jacomb, P. A., and Rodgers, B. (1999). A short form of the positive and negative affect schedule: evaluation of factorial validity and invariance across demographic variables in a community sample. *Personal. Individ. Differ.* 27, 405–416. doi: 10.1016/S0191-8869(98)00251-7
- McDonald, R. P., and Ho, M.-H. R. (2002). Principles and practice in reporting structural equation analyses. *Psychol. Methods* 7, 64. doi: 10.1037/1082-989X.7.1.64
- McLean, S. A., Paxton, S. J., Wertheim, E. H., and Masters, J. (2015). Photoshopping the selfie: self photo editing and photo investment are associated with body dissatisfaction in adolescent girls. *Int. J. Eat. Disord.* 48, 1132–1140. doi: 10.1002/eat.22449
- Mehdizadeh, S. (2010). Self-presentation 2.0: narcissism and self-esteem on facebook. *Cyberpsychol. Behav. Soc. Netw.* 13, 357–364. doi: 10.1089/cyber.2009.0257
- Merzbacher, G. (2007). *Personality Description from Self-presentation- and Trait-Theoretical Perspective*. Bamberg: University of Bamberg.
- Miller, D. T., and Ross, M. (1975). Self-serving biases in the attribution of causality: Fact or fiction? *Psychol. Bull.* 82, 213–225. doi: 10.1037/h0076486
- Pittman, T. S., and Zeigler, K. R. (2007). "Basic human needs," in *Social Psychology: Handbook of Basic Principles*, eds A. W. Kruglanski and E. T. Higgins (New York, NY: Guilford Press), 473–489.
- Rettberg, J. W. (2014). *Seeing Ourselves Through Technology*. Basingstoke: Palgrave Macmillan.
- Ridgway, J. L., and Clayton, R. B. (2016). Instagram unfiltered: exploring associations of body image satisfaction, instagram# selfie posting, and negative romantic relationship outcomes. *Cyberpsychol. Behav. Soc. Netw.* 19, 2–7. doi: 10.1089/cyber.2015.0433
- Roman, M. W. (2014). Has "Be Here Now" become "Me Here Now"? *Issues Ment. Health Nurs.* 35, 814–814. doi: 10.3109/01612840.2014.954069
- Rutledge, P. B. (2013). "#Selfies: Narcissism or Self-Exploration?" in: *Psychology Today: Health, Help, Happiness*. Available at: <https://www.psychologytoday.com/blog/positively-media/201304/selfies-narcissism-or-self-exploration>
- Schlenker, B. R. (1980). *Impression Management: The Self-Concept, Social Identity, and Interpersonal Relations*. Monterey, CA: Brooks/Cole.
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviors are associated with narcissism among men. *Personal. Individ. Differ.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004
- Stănculescu, E. (2011). "Online self-presentation from the cyberpsychology perspective," in *Proceedings of the 7th international Scientific Conference eLearning and Software for Education «eLSE»*, (Bucharest: Universitatea Nationala de Aparare Carol I), 155–160.
- Sung, Y., Lee, J.-A., Kim, E., and Choi, S. M. (2016). Why we post selfies: understanding motivations for posting pictures of oneself. *Personal. Individ. Differ.* 97, 260–265. doi: 10.1016/j.paid.2016.03.032
- Tedeschi, J. T., Lindskold, S., and Rosenfeld, P. (1985). *Introduction to Social Psychology*. Eagan MN: West Publishing Co.
- Tedeschi, J. T., and Norman, N. (1985). Social power, self-presentation, and the self. *Self Soc. Life* 293, 322.
- Tiidenberg, K., and Cruz, E. G. (2015). Selfies, image and the re-making of the body. *Body Soc.* 21, 77–102. doi: 10.1177/1357034X15592465
- Toma, C. L. (2013). Feeling better but doing worse: effects of Facebook self-presentation on implicit self-esteem and cognitive task performance. *Media Psychol.* 16, 199–220. doi: 10.1080/15213269.2012.762189

- Watson, D., Clark, L. A., and Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *J. Pers. Soc. Psychol.* 54, 1063–1070. doi: 10.1037/0022-3514.54.6.1063
- Weiser, E. B. (2015). # Me: narcissism and its facets as predictors of selfie-posting frequency. *Personal. Individ. Differ.* 86, 477–481. doi: 10.1016/j.paid.2015.07.007
- Wortham, J. (2013). *My Selfie, Myself*. *The New York Times*. Available at: <http://www.nytimes.com/2013/10/20/sunday-review/my-selfie-myself.html>
- Zhao, S., Grasmuck, S., and Martin, J. (2008). Identity construction on facebook: digital empowerment in anchored relationships. *Comput. Hum. Behav.* 24, 1816–1836. doi: 10.1016/j.chb.2008.02.012

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# Beware of Selfies: The Impact of Photo Type on Impression Formation Based on Social Networking Profiles

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Users of social networking sites such as Facebook frequently post self-portraits on their profiles. While research has begun to analyze the motivations for posting such pictures, less is known about how selfies are evaluated by recipients. Although producers of selfies typically aim to create a positive impression, selfies may also be regarded as narcissistic and therefore fail to achieve the intended goal. The aim of this study is to examine the potentially ambivalent reception of selfies compared to photos taken by others based on the Brunswik lens model Brunswik (1956). In a between-subjects online experiment ( $N = 297$ ), Facebook profile mockups were shown which differed with regard to picture type (selfie vs. photo taken by others), gender of the profile owner (female vs. male), and number of individuals within a picture (single person vs. group). Results revealed that selfies were indeed evaluated more negatively than photos taken by others. Persons in selfies were rated as less trustworthy, less socially attractive, less open to new experiences, more narcissistic and more extroverted than the same persons in photos taken by others. In addition, gender differences were observed in the perception of pictures. Male profile owners were rated as more narcissistic and less trustworthy than female profile owners, but there was no significant interaction effect of type of picture and gender. Moreover, a mediation analysis of presumed motives for posting selfies revealed that negative evaluations of selfie posting individuals were mainly driven by the perceived motivation of impression management. Findings suggest that selfies are likely to be evaluated less positively than producers of selfies might suppose.

**Keywords:** selfies, group selfies, sex difference, social networking sites, impression formation, attractiveness, extraversion, narcissism

## INTRODUCTION

The trend of uploading selfies appears to be a growing form of self-presentation and self-promotion in social networking sites (SNS) such as Facebook. A selfie can be described as a self-portrait that a person has taken of oneself, typically with a smartphone or a webcam, and which is frequently shared with others on social media (Sorokowski et al., 2015). Within the last years, taking selfies has become an extremely popular activity, especially among young people. In a survey, 98% of the 18–24-year-old interviewees stated that they had taken selfies at least once in their lives and 46% revealed that they had shared a selfie that day (Katz and Crocker, 2015). Young adults (aged 20–30) are even more likely to engage in selfie taking and sharing compared to adolescents and adults (Dhir et al., 2016). While researchers have begun to investigate individuals' social and



psychological motivations for taking and sharing selfies online (e.g., Weiser, 2015; Sung et al., 2016; Barry et al., 2017; Wang et al., in press), very little is known about the perception of selfies. Despite the apparent popularity of taking selfies, the reception of selfies may seem to be predominantly negative. First empirical evidence for this assumption is presented by Re et al. (2016). As a side result of their empirical investigation on the differences between selfie takers' self-ratings and external raters' judgments, they demonstrated that persons in selfies were rated more negatively than the same persons in photos taken by others. However, as the authors were not focusing on this specific difference, the finding warrants further investigation and needs to be addressed in a systematic study that targets potential mechanisms and explanations for this interesting phenomenon. At first glance, the assumption of negative outcomes may be in contrast to the broad popularity of selfies. For example, Pounders et al. (2016) found that selfie takers are motivated to share selfies in order to create a positive self-image by expressing happiness or a positive physical appearance. More importantly, the assumption of negative outcomes is in contrast with findings that pictures with faces and selfies on Instagram tend to generate a high number of likes (Bakhshi et al., 2014; Souza et al., 2015). However, it could be argued that greater attention and positive feedback from close contacts who wish to maintain a positive relationship with the profile owner (Lee et al., 2014, 2016; Scissors et al., 2016) do not necessarily preclude a negative interpretation by a larger audience.

First results on selfies also suggest that gender is an important variable which might need to be considered when trying to explain the perception and evaluation of selfies. In this respect, several studies indicate a behavioral difference between males and females in taking and sharing selfies, with females being found to be much more active than males (Sorokowski et al., 2015, 2016; Dhir et al., 2016; Sorokowska et al., 2016). These findings on the production of selfies enable hypotheses to be derived regarding the perception of selfies, as observers' evaluations will vary according to their general expectations, which are based on viewing habits.

Another relevant question is whether potential detrimental effects of selfies compared to photos taken by others will also apply to group selfies. Here, mechanisms might differ (a) because less narcissism is attributed when a person is not presenting him/herself alone and (b) because—in general—it has been shown that a person is evaluated as more attractive when she or he is located close to an attractive friend (Kernis and Wheeler, 1981). This has also been demonstrated in a similar form for photos on Facebook (Walther et al., 2008).

The aim of this study is therefore to examine the reception of selfies in comparison to photos taken by other persons while taking sex and number of displayed persons into account. To understand the mechanisms of person perception based on selfies, in line with the general assumptions of the Brunswik lens model (Brunswik, 1956), an array of dependent variables will be assessed that will help to disentangle the attributions made by observers of selfies. With regard to terminology, we will use the term photo for photos that are not taken by any of the shown individuals. If we are not drawing any

distinction between selfies and classic photos, we will use the term picture.

## Impression Formation

The perceived impressions of individuals' personality in SNSs seem to be largely accurate. For example, Back et al. (2010) found that self-assessment and external assessment ascribed after looking at a social media self-presentation were predominantly consistent. These predictions of personality could be explained by various behaviors in SNSs, which indeed correspond with certain types of personality (e.g., Correa et al., 2010; Moore and McElroy, 2012). The Brunswik lens model (Brunswik, 1956) can be used to describe why and how individuals form impressions based on a limited amount of information when observing others' online behavior. According to this model, it can be reasoned that whenever an individual forms an impression, she or he has several cues or indicators which may or may not apply as aids in the process. In addition, humans tend to use cues systematically even if the cues may possess no real predictive power (Dudycha and Naylor, 1966). The lens model assumes that individuals consider every given piece of information about another person to build an impression about that person's personality. Previous studies investigating impression formation on Facebook based on the lens model discovered that various types of information affect the impression formation process. One study detected a relationship between the number of friends and extraversion insofar as the more friends a person has, the more extraversion is attributed (although only up to the number of ~500 friends), while social attractiveness is rated highest when around 300 friends are displayed, but evaluated lower with fewer or more friends (Tong et al., 2008). Another study similarly showed that the number of friends on Facebook is associated with extraversion, whereas positive affect as well as family-talk in status updates are associated with conscientiousness (Hall and Pennington, 2013). It can be assumed that the type of picture shown is also an important cue that leads to specific attributions about a person's character and personality. In this respect, the specific form of the selfie has already been shown to play a role: Based on different facial expressions or backgrounds, selfies are able to transport personality traits like extraversion, neuroticism and conscientiousness (Qiu et al., 2015). Given that the aim of the present study is not to analyze the differential effects of specific selfie cues but to identify the effects related to this picture form *per se*, the next section refers to different types of pictures more generally.

## Type of Picture

To explain potential differences in ratings between selfies compared to photos taken by others, the warranting principle (Walther and Parks, 2002) can be drawn upon. Simply put, this principle assumes that individuals mistrust information that can easily be manipulated. In the context of selfies, one can argue based on the warranting principle that individuals should distrust selfies to a greater extent than photos because selfies are apparently easier to manipulate than photos. Research investigating the warranting principle in the context of Facebook found that information generated by individuals other than the

profile owner can increase the profile owner's social and task attractiveness and credibility (Walther et al., 2008) and his or her physical attractiveness as well as extraversion and introversion, respectively (Walther et al., 2009).

Besides the warranting principle and in relation to the lens model, it can be assumed that recipients will be able to attribute those personality characteristics that are actually related to posting selfies. For instance, Sorokowska et al. (2016) identified extraversion to be a predictor of selfie-posting behavior. The authors concluded that extroverted individuals might use selfies as a means to keep friends informed about oneself. In addition, Kim and Chock (in press) identified extraversion to be a predictor of posting group selfies, whereas narcissism predicted greater levels of posting solo selfies. Additionally, extroverts are often found to be more active on SNSs than introverts (Nadkarni and Hofmann, 2012), which might also explain differences in posting behavior. Another personality trait that might be associated with sharing selfies in SNSs is openness to new experiences. Researchers have found that individuals who score high on openness participate in many different activities in SNSs such as Facebook (Ross et al., 2009; Gosling et al., 2011), which could include uploading selfies. Moreover, posting photos might be seen as "outdated," whereas posting selfies is clearly a newer phenomenon and might therefore lead to attributions of higher openness. However, Moore and McElroy (2012) did not find any significant results suggesting that openness leads to a specific kind of behavior on Facebook.

Based on the findings regarding personality traits and SNS behavior (Ross et al., 2009; Gosling et al., 2011; Nadkarni and Hofmann, 2012; Sorokowska et al., 2016), we assume that recipients ascribe those characteristics which are actually related to selfie-posting, and hypothesize that individuals in selfies are rated (*H1a*) as more extroverted and (*H1b*) as more open than individuals in photos taken by others. Furthermore, based on the warranting principle (Walther and Parks, 2002) and the aforementioned study findings (Walther et al., 2008, 2009; Re et al., 2016), we assume that persons in selfies are rated as (*H1c*) less physically attractive, (*H1d*) less socially attractive, (*H1e*) more narcissistic, and (*H1f*) less trustworthy than persons in photos taken by other persons.

## Effects of Gender of the Profile Owner

Previous studies have shown that there might be a gender difference in SNS usage, especially regarding self-presentation (Haferkamp et al., 2012). It has been found that male users tend to use SNS primarily for information purposes, whereas female users place greater value on a diverse self-presentation. These findings are supported by studies indicating that female Facebook users are more active and put greater effort into impression management via their profile pictures (McAndrew and Jeong, 2012). Moreover, females seem to put more effort into emotional expressions in their posted pictures than males (Zheng et al., 2016). Studies investigating selfie-posting behavior suggest a gender-related distortion in selfie-sharing behavior, with females posting twice as many selfies as males (Sorokowski et al., 2015, 2016; Sorokowska et al., 2016). In addition, Dhir et al. (2016) found that female individuals not only post more selfies in SNSs

but also take more selfies in general than male individuals. In sum, these observations lead to the assumption that sharing selfies in SNSs is a behavior that can be expected more from females than from males. This difference in behavior alone might lead to different evaluations of the same behavior according to expectations. For example, research on the perception of smiles shows that smiling behavior, when it is not expected (i.e., from male individuals, who do not usually smile as much as female individuals), leads to more positive evaluations than when it is the perceived norm (Deutsch et al., 1987). Moreover, past studies have shown that female and male selfie-takers differ concerning some personality attributes. Results on the production and sharing of selfies revealed that narcissism (Fox and Rooney, 2015; Sorokowski et al., 2015; Weiser, 2015), psychopathy (Fox and Rooney, 2015), and histrionic personality (Sorokowski et al., 2016) were able to predict the number of posted selfies, particularly among men.

If taking and sharing selfies can be seen as a more expected behavior of female individuals than male individuals, and if, according to the lens model, participants are able to infer the personality attributes related to selfie posting (Fox and Rooney, 2015; Sorokowski et al., 2015; Weiser, 2015), participants should rate males in selfies (*H2a*) higher on narcissism and (*H2b*) as less trustworthy than females in selfies.

## Effects of Single Persons vs. Groups in Pictures

So far, we have focused on the perception of selfies that one individual has taken of her- or himself. In addition to single selfies, it has been indicated that group selfies, i.e., selfies that present at least two persons, are the most popular picture category to share on Instagram (Hu et al., 2014). Moreover, Wang et al. (in press) showed that participants prefer Facebook for sharing group selfies rather than other social media platforms (e.g., Instagram, Twitter, Snapchat). To our knowledge, no previous study has examined the distinct perception and evaluation of group selfies and single selfies.

As it is suggested that in the context of online presence, persons are evaluated by any given social information (Walther, 2007), one could expect the perception of group selfies to differ from single selfies insofar as a group selfie includes more social cues (e.g., relationship with other people, behavior in groups). One important social characteristic that is often used to gain a first impression about a person is physical attractiveness, and the assessment of facial attractiveness is highly influenced by the observation of other faces in the environment (Pegors et al., 2015). In this context, it was shown that a person is regarded as more attractive when she or he is located close to an attractive friend (Kernis and Wheeler, 1981). Walther et al. (2008) found this effect to be also true for photos on Facebook—although it should be noted that in this study, the faces of the others were not as close as in a joint or combined photo. Likewise, Walker and Vul (2014) found evidence that faces appear to be more physically attractive when persons are photographed in a group rather than pictured alone. To explain their findings, the authors referred to research on ensemble coding in the visual system as well as the

characteristics of average faces (e.g., Ariely, 2001; Langlois and Roggman, 1990; Brady and Alvarez, 2011) and argued that an interplay of three cognitive phenomena is causative: (a) various objects are calculated as an ensemble by the visual system, (b) the average of this ensemble biases individual objects, and (c) average faces are evaluated as more physically attractive.

In the sense of the halo effect, an attractive physical appearance has been shown to have numerous positive side effects. Physical attractiveness is linked to the attribution of positive character traits such as intelligence, healthiness, popularity and social skills (for a review see Langlois et al., 2000). This phenomenon is also called the attractiveness halo effect (Kaplan, 1978). Besides this effect, there might also be a more direct route of attributing social attractiveness on Facebook: Hong et al. (2012) found evidence that a higher number of social cues in Facebook profile pictures is positively related to social attractiveness and popularity.

Based on the findings that people in groups are considered as more attractive, and are also perceived as more socially attractive due to the attractiveness halo effect, we hypothesize further that (*H3a*) individuals in group photos are perceived as more physically attractive, and (*H3b*) individuals in group photos are perceived as more socially attractive than individuals in single photos. In line with this, we also assume that (*H3c*) individuals in group selfies are perceived as more physically attractive and (*H3d*) individuals in group selfies are perceived as more socially attractive than individuals in single selfies.

## Influence of Perceived Motives

Despite a growing scientific interest in the mechanisms underlying selfie-taking and -sharing behavior, the motivational aspect of such behavior has largely been neglected. While motives for using SNS have been identified based on the uses and gratification approach (e.g., maintaining existing relationships, entertainment, impression management, need to belong; Joinson, 2008; Krämer and Winter, 2008; Sheldon, 2008; Papacharissi and Mendelson, 2011; Smock et al., 2011; Nadkarni and Hofmann, 2012; Tosun, 2012), Sung et al. (2016) began to explore the motivational factors behind selfie-posting behavior. Based on uses-and-gratification assumptions, they emphasized the importance of motivation as a determinant of SNS usage and also as necessary for a better understanding of the mechanisms behind selfie-posting behavior. Four unique motivations were identified by Sung et al. (2016): Attention seeking, communication, archiving, and entertainment. Regarding our research goal of determining the factors which affect the perception of selfies, however, it is more important to not only identify selfie takers' and sharers' actual motivation, but to also assess the motives that are attributed by the recipients. Previous research on person perception based on self-disclosure on SNS demonstrates that the evaluation of an (intimate) posting and its sender is dependent on the reasons for posting that are attributed by the recipients. If impression management is assumed to be the motivation for posting an intimate message, this is more detrimental than when the ascribed reason is support seeking (Krämer et al., 2014). On a theoretical level, this can be explained by the Brunswik lens model (Brunswik, 1956): When forming

an impression of an individual's personality, it is very likely that perceivers take motives into account in order to generate a more accurate perception of the person. Accordingly, we suggest that the attributed motives mediate the relationship between the assessment of personality and the type of picture.

Therefore, in a first step, we argue that it is necessary to systematically assess which motives observers assume when perceiving selfies. In order to fill this gap in the literature, we ask (*RQ1*) which motivations for picture sharing are attributed to the picture producers.

With regard to the assessment of personality, it seems most reasonable to focus on narcissism, as narcissism has been found to be relevant with regard to both the production and the perception of selfies. Concerning perception, narcissism has been shown to be strongly related to selfie-related activities (Fox and Rooney, 2015; Sorokowski et al., 2015; Weiser, 2015), to picture-related activities (Kapidzic, 2013), and to Facebook usage in general (Mehdizadeh, 2010). In terms of the perception of selfies, Re et al. (2016) suggest that perceived narcissism might be causative for their side finding that people in selfies are perceived as less positive as people in photos. This, however, has to be analyzed more systematically and taking the presumed motives for the selfie-posting behavior into account.

Therefore, we hypothesize that (*H4*) the relationship between type of picture and ascribed narcissism (as stated in *H1e*) is mediated by the presumed motives for picture posting.

## METHODS

### Design

In this study, a 2 (type of picture: Selfie vs. photo taken by other persons) x 2 (gender of pictured person: Female vs. male) x 2 (number of pictured persons: Single vs. group) between-subjects design was used and tested in an online survey ( $N = 297$ ).

### Stimulus Material

The online survey consisted of a Facebook profile mockup that was presented at the beginning and followed by questionnaires. In order to ensure that results would not only hold for one specific target person, six actors (three female actors, three male actors) were presented identically in various pictures, including the profile picture and three posted pictures, for each condition. Selfies were taken by the actors themselves and photos were taken by the experimenters. A smartphone (Samsung Galaxy S5) was used to take these pictures in order to remain authentic. Three different locations were chosen to take the pictures. At every location, a single photo and a single selfie were taken for each person. Furthermore, group pictures and group selfies were taken showing all three actors at two of the venues and two of the actors at the third venue. Facial expressions were moderately friendly for all conditions. Clothing was altered at each location to create an impression of authenticity. To make the pictures and selfies comparable, the posing for every condition was the same and was instructed by the experimenters (e.g., no specific selfie-posing such as duckfacing). Besides the profile pictures and the three person-related pictures that were manipulated, the Facebook profile mockup contained three additional neutral

photos showing a dessert (waffles) and a mountain landscape as wall postings as well as a typical underground sign from London as the cover photo in order to create a realistic setting. For the neutral photos, we referred to Hu et al. (2014), who revealed the most commonly posted photo contents on Instagram. We chose those common contents which we considered as gender neutral. In summary, the Facebook profile mockups each consisted of 1 neutral cover photo, 1 personal profile picture, 3 person-related pictures, and 2 neutral pictures as wall postings. In the first person-related picture, the actors for all conditions were sitting in a green area with a gray building in the background on campus. In the second person-related picture, the actors were standing in front of a forest and green bushes, and in the third person-related picture, they were sitting on a window sill. The profile picture was always taken in front of a white background. The profile owner was named “Alex Müller” in all profile mockups because “Alex” is a German unisex first name and “Müller” is a very common German surname. Irrelevant information, like comments, likes or time of posting, was implemented, but was blurred to avoid unwanted effects. For an illustration of the material, see **Figure 1**. In total, 24 different mockups were set up (8 conditions with three different actors each), to which participants were randomly allocated.

## Sample

436 participants began the study, of whom 127 were excluded due to incomplete data. A further eight datasets were not considered further because the participants reported that they knew the person on the Facebook profile. Another four datasets were excluded because the Facebook profile was observed for less than 5 s.

The final sample thus consisted of a total of 297 participants (205 females, 91 males, 1 did not specify gender) aged 15 to 66 ( $M = 27.34$ ,  $SD = 7.98$ , 1 missing value). The sample was split into three different age groups: The first age cohort ( $n = 231$ ) was aged between 15 and 29 years ( $M = 23.95$ ,  $SD = 2.81$ , 77.78% of the sample), and reported taking the highest number of selfies per week ( $M = 1.72$ ,  $SD = 4.42$ ). The second age cohort ( $n = 54$ ) was aged between 30 and 49 years ( $M = 35.85$ ,  $SD = 5.20$ , 18.18% of the sample) and stated taking fewer selfies per week ( $M = 0.98$ ,  $SD = 2.62$ ) than the first cohort. The third age cohort ( $n = 12$ ) was aged between 50 and 66 years ( $M = 54.42$ ,  $SD = 4.70$ , 4.04% of the sample). These individuals took the lowest amount of selfies ( $M = 0.25$ ,  $SD = 0.45$ ). Each of the 24 mockups was rated at least 12 or 13 times (resulting in every condition having at least been viewed by 36 participants). Most interviewees (88.2%) stated that they had a Facebook account. Participants were primarily recruited online via several forums and Facebook groups, but were also addressed personally at a large German university. As a supplementary incentive to participate in the study, they were able to take part in a raffle to win gift vouchers.

## Measures

Each participant completed all of the following questionnaires, which were adapted to the particular conditions (e.g., “he”/“she”; “selfie”/“photo”). All the English-language questionnaires were translated into German.

## Trustworthiness

To assess the participants’ perception of the profile owner’s credibility, the five-item trustworthiness subscale of the Source Credibility Scale (SCS; Ohanian, 1990) was used. The SCS consists of bipolar items rated on a seven-point Likert scale (e.g., “trustworthy”—“untrustworthy”). The internal consistency (Cronbach’s alpha) was 0.89.

## Attractiveness

The Interpersonal Attraction Scale (McCroskey and Richmond, 1979) measures different types of attraction on a seven-point Likert scale (from 1 = *strongly disagree* to 7 = *strongly agree*). In the present study, the social attraction and the physical attraction subscales were used. The social attraction subscale consists of 12 items (e.g., “likeable”—“unlikeable”) and its internal consistency (Cronbach’s alpha) was 0.85 for both adapted versions for females and males. The physical attraction subscale comprises 11 items (e.g., “attractive”—“unattractive”) and its internal consistency was 0.94, for both versions for females and males.

## Narcissism

To assess the participants’ impression of the profile owner’s level of narcissism, a German version of the short Narcissistic Personality Inventory (NPI-15; Spangenberg et al., 2013) was slightly adapted. The original NPI-15 measures an individual’s perceived narcissism of the self, which is why an adjustment to the impression of the profile owner was necessary. One item had to be excluded because it would have been pointless to rate an unfamiliar person with this specific item. The NPI-15 consists of bipolar items, one of which measures perceived narcissism and its internal consistency (Cronbach’s alpha) was 0.84. To ensure that the NPI-15 is able to measure another person’s perceived narcissism, a single item called “the profile owner is narcissistic” was also presented on a seven-point Likert scale (from 1 = *does not apply at all* to 7 = *does definitely apply*). The correlation ( $r = 0.46$ ,  $p < 0.001$ ) between the NPI-15 sum score and this single item provides a hint that it can be used to assess an individual’s impression of another person’s narcissism.

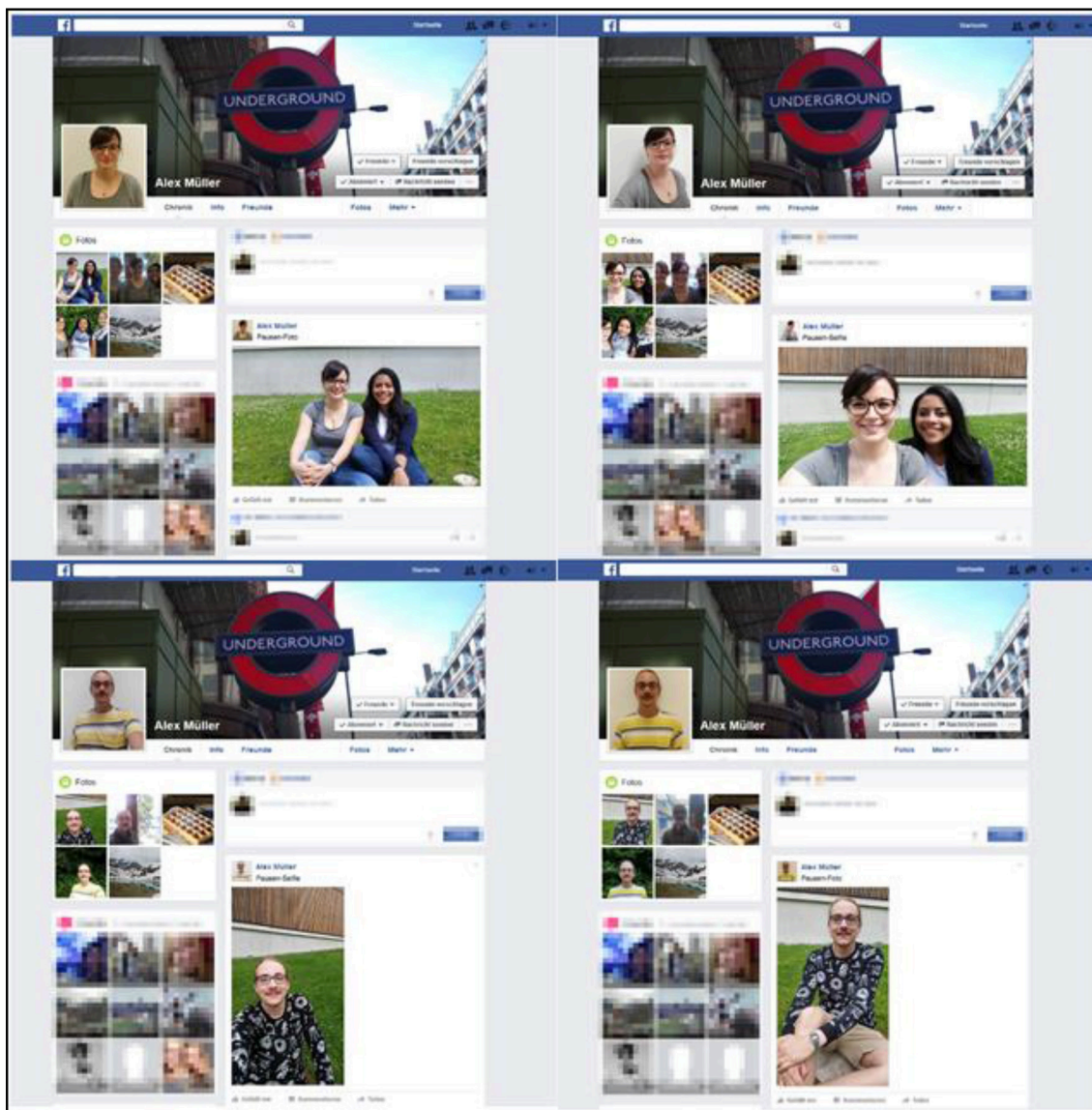
## Openness and Extraversion

The participants’ perceptions of the profile owner’s extent of openness and extraversion were measured by the openness and extraversion subscales of the German version of the Big Five Inventory (BFI-44; Lang et al., 2001). Items of the BFI-44 are rated on a five-point Likert scale (from 1 = *does not apply at all* to 5 = *does definitely apply*) and were adapted to the perceived personality of the profile owner. The internal consistency (Cronbach’s alpha) was 0.79 and 0.82 for openness and extraversion, respectively.

## Presumed Motives

To find out which motivational factors the participants attributed to the profile owners’ photo- and selfie-sharing behavior, a questionnaire with 20 items (six-point Likert scale from 1 = *strongly disagree* to 6 = *strongly agree*) was used, and was the same for the selfie condition and the photo condition (Szczyka et al., 2015). According to the condition to which the participants





**FIGURE 1 | Partial Facebook Mockups for conditions: Female Group Photo (upper left), Female Group Selfie (upper right), Male Single Selfie (bottom left), and Male Single Photo (bottom right).**

were assigned, the words “selfie” and “photo” were interchanged. Presented motives included a variety of possible attributions (e.g., “I think the profile owner shares selfies to present his body” or “I think the profile owner shares photos because she feels lonely”).

On the basis of the gained data ( $N = 297$ ), we performed two factor analyses in order to reduce the quantity of items and to extract the number of factors. A priori, three items were excluded after examining the descriptive values concerning item difficulty. An exploratory factor analysis (EFA) with principal component analysis and varimax rotation was then conducted. Horn’s parallel analysis (Horn, 1965) was used for selecting the appropriate number of factors to retain. The results suggested a three-factor solution. In the next step, EFAs with principal axis analysis and promax rotation were computed in order

to consider factor loadings. Items with low loadings on the main factor ( $<0.50$ ) and/or high loadings on the other factors ( $>0.20$ ) were removed progressively to improve the quality of the questionnaire. Moreover, two items were excluded due to contextual considerations. This procedure resulted in a three-factor solution with 11 remaining items and good reliability (Cronbach’s  $\alpha = 0.87$ ). In line with our assumption, the first factor (5 items, Cronbach’s  $\alpha = 0.84$ ) revealed items that are mostly related to impression control and was named “impression management.” As the second factor (3 items, Cronbach’s  $\alpha = 0.86$ ) consists of items related to feelings of loneliness and insecurity, it was named “negative emotions.” The third factor (3 items, Cronbach’s  $\alpha = 0.79$ ) was called “coquetry,” because the items deal with the presentation of physical appearance. A

significant correlation was found between all factors (“impression management” and “negative emotions”:  $r = 0.40$ ,  $p < 0.001$ , “impression management” and “coquetry”:  $r = 0.46$ ,  $p < 0.001$  and “negative emotions” and “coquetry”:  $r = 0.44$ ,  $p < 0.001$ ). Items, factor loadings and descriptive values are presented in Table 1.

### Additional Measurements

To find out what people think about the profile owners in general, a semantic differential was used, consisting of 14 items with a seven-point Likert scale. Items included, for example “helpful—uncooperative” or “dominant—inferior.” To achieve proper factors, we performed the same procedure as described for the presumed motives. The EFA, additionally taking into account Horn’s parallel analysis (Horn, 1965), suggested a two-factor solution. After excluding items based on low loadings on the main factor and high loadings on the other factor, 11 items remained on two factors, with a good reliability (Cronbach’s  $\alpha = 0.80$ ). The first factor (7 items, Cronbach’s  $\alpha = 0.90$ ) was named “self-seeking” and was closely related to characteristics of narcissism. The other factor (3 items, Cronbach’s  $\alpha = 0.59$ ) can be summarized by “authority.” Due to the poor reliability of the factor authority, this factor was excluded from further analyses. As the factor self-seeking seemed to be appropriate as a supplementary measure of narcissism, it was used as an additional dependent variable. Items, factor loadings and descriptive values are presented in Table 2. Moreover, participants answered a few general questions concerning selfies and provided demographic data.

The general questions addressed on the one hand the general attitude toward selfies and photos using six items rated on a five-point Likert scale (from 1 = *strongly disagree* to 5 = *strongly agree*), and on the other hand how many selfies and photos participants take and post weekly. Example items on general attitude toward selfies and photos were: “I would never post a selfie of mine on Facebook” or “taking selfies is really fun.” Items for taking and posting selfies and photos were “How many selfies do you take weekly?” and “How many photos of yourself do you post weekly?” As a manipulation check, the participants were also asked how many selfies and how many “photos of persons (not selfies)” they had seen on the presented Facebook profile. With these questions, we aimed to ensure that the stimulus material served its purpose and participants recognized the pictures, according to the conditions, as photos taken by another person or as selfies. Moreover, participants were asked whether they knew any of the presented persons. If participants stated that they knew one of the shown actors, they were excluded from the analysis, as we expected that this would have a significant effect on the evaluation of the pictured person.

### Procedure

The online survey was implemented using SoSci Survey (Leiner, 2014) and was provided via [www.sosicisurvey.de](http://www.sosicisurvey.de). The procedure took ~10 min. After a general introduction, the participants were told that they were going to see a Facebook profile of a person. They were free to determine for how long they would look at the Facebook profile but were instructed to

**TABLE 1 | Descriptive values of items and Factor loadings for EFA with principal axis analysis.**

Item	Factor			M	(SD)
	1	2	3		
IMPRESSION MANAGEMENT					
To get attention	0.863	−0.006	−0.029	3.85	(1.31)
To be represented positively	0.787	−0.041	−0.049	4.23	(1.30)
To control other people's impressions about her-/himself	0.673	0.032	0.107	3.53	(1.43)
To be liked	0.631	0.036	−0.016	4.08	(1.29)
To receive feedback	0.586	−0.005	0.066	3.74	(1.38)
NEGATIVE EMOTIONS					
When she/he has self-doubts	0.019	0.900	0.006	2.25	(1.20)
When she/he feels lonely	0.024	0.860	−0.066	2.55	(1.38)
When she/he feels insecure	−0.045	0.702	0.094	2.23	(1.20)
COQUETRY					
To present her/his haircut	−0.073	0.014	0.914	2.27	(1.30)
Because she/he is vain	0.057	−0.029	0.821	2.27	(1.32)
When she/he changes her/his look	0.076	0.043	0.509	2.86	(1.47)

All items started with “I think the profile owner shares photos/selfies of her-/himself ...”. Values of the main factors are in bold.

**TABLE 2 | Descriptive values of items and Factor loadings for EFA with principal axis analysis (N = 297).**

Item	Factor		M	(SD)
	1	2		
SELF-SEEKING				
Uncooperative	0.815	0.082	2.90	(1.05)
Haughty	0.788	0.081	2.84	(1.28)
Intransigent	0.786	0.132	3.03	(1.04)
Arrogant	0.764	−0.215	3.36	(1.19)
Disrespectful	0.740	0.146	2.99	(1.06)
Egoistic	0.720	0.011	3.58	(0.99)
Egocentric	0.680	−0.254	3.69	(1.35)
AUTHORITY				
Weak	0.156	0.718	3.76	(1.15)
Inferior	−0.265	0.588	4.31	(1.01)
Passive	0.078	0.490	3.08	(1.37)

Values of the main factors are in bold.

build an impression of the person. The questionnaires began with the assessment of attractiveness followed by the evaluation of credibility, the general personality descriptions, narcissism, openness, and extraversion. Subsequently, the participants were asked to rate potential motives for the selfie-/photo-sharing behavior of the profile owner. At the end of the experiment, the participants were questioned about their general attitude toward selfies as well as their own selfie-taking behavior. Additionally, the manipulation check was administered. In a debriefing, the participants were informed about the purpose of this study and

had the chance to enter their email address in order to take part in the prize draw.

## RESULTS

All analyses were conducted using IBM SPSS 22.0. Before testing the hypotheses, the descriptive values of the additional measurements were computed. The means for average weekly taken selfies by the participants ( $M = 1.53$ ,  $SD = 4.07$ ) were higher than for posting selfies in the same period ( $M = 0.19$ ,  $SD = 1.26$ ). In line with this, the means for average weekly taken photos of oneself ( $M = 3.88$ ,  $SD = 9.77$ ) were higher than for posted photos of oneself ( $M = 0.34$ ,  $SD = 1.81$ ). The manipulation check revealed that in the photo condition ( $n = 148$ ), the participants believed on average that they had seen 3.49 photos ( $SD = 1.41$ ) and 2.35 selfies ( $SD = 1.38$ ). In the selfie condition ( $n = 149$ ), the participants thought on average that they had seen 3.86 selfies ( $SD = 1.05$ ) and 2.44 photos ( $SD = 1.44$ ). These results are worthy of discussion, as each participant was only presented with either selfies or photos, but not both in one profile. However, focusing on the differences between the two conditions, a  $t$ -test for unrelated samples revealed that participants remembered significantly more selfies in the selfie condition [ $t_{(295)} = 10.59$ ,  $p < 0.001$ ] than in the photo condition and likewise more photos in the photo condition than in the selfie condition [ $t_{(295)} = -6.34$ ,  $p < 0.001$ ]. These results will be highlighted in the discussion.

### Differences between Perceptions

To analyze the hypotheses  $H1a$ – $H3b$ , a MANOVA was performed with the between-subject variables type of picture, gender, and number of pictured persons. The means, standard deviations and confidence intervals of the dependent variables perceived narcissism, perceived trustworthiness, perceived openness, perceived extraversion, as well as perceived social and physical attractiveness can be seen in Table 3.

First, the differences between the perception of selfies and photos ( $H1a$ – $H1f$ ) were considered. The results revealed a significant difference between selfies and photos with regard to perceived extraversion. Persons in selfies were rated as more extroverted than those in photos [ $F_{(1, 289)} = 15.90$ ,  $p < 0.001$ ,  $\eta^2_p = 0.052$ ], which supported  $H1a$ . There was also a significant difference for perceived openness [ $F_{(1, 289)} = 8.73$ ,  $p = 0.003$ ,  $\eta^2_p = 0.029$ ]. However, this turned out to contradict  $H1b$ , which assumed that persons in selfies would be evaluated as more open than persons in photos. With regard to  $H1c$ , no significant difference emerged between the perceived physical attractiveness of individuals in selfies and photos [ $F_{(1, 289)} = 0.93$ ,  $p = 0.336$ ,  $\eta^2_p = 0.003$ ]. However, a significant difference was detected for perceived social attractiveness between selfies and photos [ $F_{(1, 289)} = 7.60$ ,  $p = 0.006$ ,  $\eta^2_p = 0.026$ ], supporting  $H1d$ . Consequently, persons in selfies were rated as less socially attractive than persons in photos. In support of  $H1e$ , individuals in selfies were perceived as more narcissistic than in photos [ $F_{(1, 289)} = 27.06$ ,  $p < 0.001$ ,  $\eta^2_p = 0.086$ ]. Furthermore, a significant difference was found for the perception of

trustworthiness between selfies and photos: Persons in selfies were rated as less trustworthy than persons in photos [ $F_{(1, 289)} = 19.67$ ,  $p < 0.001$ ,  $\eta^2_p = 0.064$ ]. Beyond the hypothesis, the above-mentioned factor “self-seeking” was included in the model. A significant difference in terms of type of picture can be seen, insofar as persons in selfies were rated as more “self-seeking” than persons in photos [ $F_{(1, 289)} = 28.82$ ,  $p < 0.001$ ,  $\eta^2_p = 0.091$ ].

Next, we focused on the question whether the gender of the pictured person affects the attribution of narcissism and trustworthiness depending on the portrayal in a selfie or photo ( $H2a$  and  $H2b$ ). In general, we found a significant difference between the observation of females and males concerning perceived narcissism and perceived trustworthiness. Accordingly, males in pictures were rated as more narcissistic than females in pictures overall [ $F_{(1, 289)} = 4.55$ ,  $p = 0.034$ ,  $\eta^2_p = 0.016$ ]. Additionally, males were rated as less trustworthy than females [ $F_{(1, 289)} = 7.63$ ,  $p = 0.006$ ,  $\eta^2_p = 0.026$ ]. However, there were no significant effects regarding the interaction of gender and type of photo—either for perceived narcissism [ $F_{(1, 289)} = 0.05$ ,  $p = 0.824$ ,  $\eta^2_p = 0.000$ ] or for trustworthiness [ $F_{(1, 289)} = 0.16$ ,  $p = 0.692$ ,  $\eta^2_p = 0.001$ ]. Therefore, although males were indeed rated as more narcissistic and less trustworthy in selfies, the same was true for photos. Therefore, hypotheses  $H2a$  and  $H2b$  were not supported. Again, the additional measure “self-seeking” revealed a significant difference, as males in both photos and selfies were rated as more “self-seeking” than females [ $F_{(1, 289)} = 5.59$ ,  $p = 0.019$ ,  $\eta^2_p = 0.019$ ]. Additionally, there were significant differences regarding physical attractiveness [ $F_{(1, 289)} = 51.28$ ,  $p < 0.001$ ,  $\eta^2_p = 0.151$ ], social attractiveness [ $F_{(1, 289)} = 12.8$ ,  $p < 0.001$ ,  $\eta^2_p = 0.042$ ], and openness [ $F_{(1, 289)} = 5.03$ ,  $p = 0.026$ ,  $\eta^2_p = 0.017$ ]. Recipients perceived females in pictures as more physically attractive, more socially attractive, and more open than males in pictures.

To test hypotheses  $H3a$ – $H3d$ , we examined the main effects of the condition “number of displayed persons” on perceived physical attractiveness as well as perceived social attractiveness. The MANOVA revealed no significant differences to support our assumptions. Profile owners who post group pictures were not evaluated as more physically attractive [ $F_{(1, 289)} = 0.28$ ,  $p = 0.596$ ,  $\eta^2_p = 0.001$ ], and nor as more socially attractive [ $F_{(1, 289)} = 1.53$ ,  $p = 0.218$ ,  $\eta^2_p = 0.005$ ], than isolated individuals in pictures. Also, the interactions between the number of shown persons and the type of picture were insignificant [ $F_{(1, 289)} = 1.46$ ,  $p = 0.228$ ,  $\eta^2_p = 0.005$  for perceived physical attractiveness and  $F_{(1, 289)} = 0.17$ ,  $p = 0.685$ ,  $\eta^2_p = 0.001$  for perceived social attractiveness]. Additionally, no significant result for the “self-seeking” factor was found [ $F_{(1, 289)} = 1.09$ ,  $p = 0.299$ ,  $\eta^2_p = 0.004$ ].

Although we did not expect to find specific interactions between all variables, a significant three-way interaction with regard to trustworthiness emerged [ $F_{(1, 289)} = 5.84$ ,  $p = 0.016$ ,  $\eta^2_p = 0.02$ ]. Among the single pictures, females were evaluated as more trustworthy when they showed photos, whereas both sexes were regarded as less trustworthy when showing selfies. Among the group pictures, selfies by male profile owners led to the lowest evaluations of trustworthiness.



**TABLE 3 | MANOVA: Proportion of the dependent variables for the between-subject conditions ( $N = 297$ ).**

Characteristic	Type of picture		Number of people shown		Gender	
	Photo ( $n = 148$ )	Selfie ( $n = 149$ )	Single ( $n = 148$ )	Group ( $n = 149$ )	Female ( $n = 149$ )	Male ( $n = 148$ )
	<i>M</i> ( <i>SD</i> ), [95% CI]	<i>M</i> ( <i>SD</i> ), [95% CI]	<i>M</i> ( <i>SD</i> ), [95% CI]	<i>M</i> ( <i>SD</i> ), [95% CI]	<i>M</i> ( <i>SD</i> ), [95% CI]	<i>M</i> ( <i>SD</i> ), [95% CI]
Perceived narcissism	16.59 (2.65), [16.08, 17.11]	18.50 (3.62), [17.99, 19.01]	17.49 (3.32), [16.99, 18.01]	17.61 (3.31), [17.09, 18.10]	17.16 (3.08), [16.65, 17.67]	17.94 (3.49), [17.43, 18.45]
Perceived trustworthiness	26.48 (4.25), [25.74, 27.20]	24.13 (4.97), [23.41, 24.87]	24.88 (4.76), [24.13, 25.60]	25.72 (4.74), [25.01, 26.47]	26.01 (5.15), [25.30, 26.76]	24.58 (4.23), [23.84, 25.31]
Perceived openness	27.09 (4.56), [26.35, 27.81]	25.54 (4.48), [24.81, 26.27]	26.29 (4.76), [25.55, 27.01]	26.33 (4.40), [25.62, 27.07]	26.89 (4.54), [26.17, 27.62]	25.72 (4.55), [25.00, 26.45]
Perceived extraversion	21.94 (4.15), [21.21, 22.65]	24.00 (4.68), [23.27, 24.71]	23.01 (4.54), [22.28, 23.72]	22.93 (4.54), [22.20, 23.64]	23.13 (4.40), [22.39, 23.83]	22.82 (4.67), [22.09, 23.53]
Perceived physical attractiveness	51.25 (13.48), [49.18, 53.27]	49.83 (13.77), [47.77, 51.85]	50.28 (13.74), [48.08, 52.17]	50.80 (13.54), [48.87, 52.94]	55.76 (11.55), [53.73, 57.80]	45.28 (13.56), [43.22, 47.31]
Perceived social attractiveness	62.70 (9.85), [61.03, 64.32]	59.42 (10.84), [57.78, 61.06]	60.38 (9.66), [58.67, 61.96]	61.73 (11.21), [60.14, 63.42]	63.14 (10.20), [61.52, 64.80]	58.96 (10.35), [57.29, 60.58]
Perceived self-seeking	20.51 (5.86), [19.55, 21.48]	24.24 (6.20), [23.27, 25.20]	22.86 (6.47), [21.91, 23.84]	21.91 (6.13), [20.91, 22.84]	21.58 (6.60), [20.59, 22.52]	23.19 (5.91), [22.23, 24.16]

CI, confidence interval.

## Mediation Analysis

The INDIRECT macro for SPSS (Preacher and Hayes, 2008) was supplementarily utilized to test the mediation hypothesis. We assumed that the impact of the independent variable type of picture on the dependent variable perceived narcissism would be mediated by the perceived motivations for posting pictures. The macro was used to calculate OLS regression analyses in order to examine whether possible indirect effects are still demonstrated by using bootstrapping. A significant indirect effect is given when the bootstrap confidence interval does not include zero, based on 5,000 bootstrap samples (with a percentile-based 95% CI; Preacher and Hayes, 2004). Following the recommendation by Darlington and Hayes (2016), we report unstandardized coefficients by using dichotomous independent variables. The mediation model is shown in **Figure 2**.

In the mediation model, all three motivational factors that were obtained by the EFA were included (impression management, negative emotions, coquetry). The independent variable type of picture predicted all mediators significantly. Likewise, the mediators were significantly related to the dependent variable perceived narcissism. The type of picture also predicted perceived narcissism significantly. A partial mediation effect was found for the relationship between type of picture and perceived narcissism. This effect occurred when controlling for the presumed motives as mediators, in that the impact of type of picture on perceived narcissism became smaller ( $b = -1.04$ ,  $p = 0.003$ ). Based on the bootstrap sample (5,000), the indirect effect was  $-0.88$  (95% CI =  $[-1.34, -0.48]$ ) for the overall model. In this respect, the presumed motive impression management showed an indirect effect of  $-0.27$  (95% CI =  $[-0.52, -0.06]$ ) and the presumed motive coquetry  $-0.78$  (95% CI =  $[-1.21, -0.42]$ ). The indirect effect of the presumed motive negative emotions was not significant  $0.17$  (95% CI =  $[-0.003, 0.40]$ ). In sum, the results demonstrate that the presumed motive

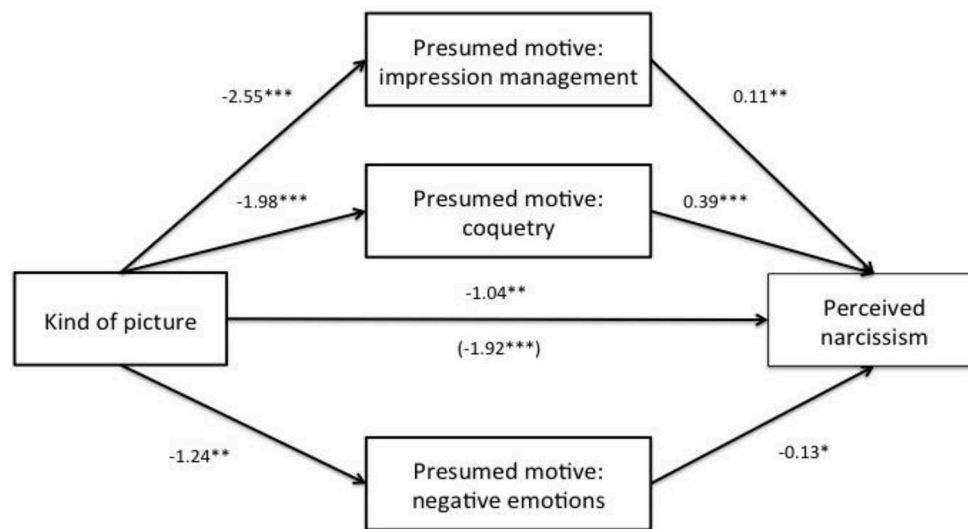
impression management and the presumed motive coquetry mediate the relationship between the independent variable type of picture and the dependent variable perceived narcissism.

## DISCUSSION

The present study aimed to examine the potentially ambivalent reception of selfies in comparison to conventional photos. While there is an emerging body of research on taking selfies, this is one of the first studies to investigate the facet of perception and the question of how observers evaluate people shown in selfies. Our experiment employed mockups of Facebook profiles that varied in the type of picture (selfie vs. photo), sex of the profile owner, and the number of displayed persons.

The results reveal several notable differences between the reception of selfies and photos taken by other persons. In sum, people in selfies are perceived to be more extroverted, less open, less socially attractive, less trustworthy, and more narcissistic compared to the pictures that are photos taken by another person. In line with the Brunswik lens model (Brunswik, 1956), one could argue that the picture type is an important cue for the impression formation of a person's profile on Facebook and that posting selfies could thus be seen as a positive cue for extraversion and narcissism and as a negative cue for openness, social attractiveness and trustworthiness. The findings reveal that persons in selfies were perceived as more extroverted than those in photos. While it has been previously demonstrated that extraversion is indeed a predictor of selfie-posting behavior (Sorokowska et al., 2016), it is remarkable that observers seem to sense this. However, previous research already suggested that people use cues (in this case the number of friends) to infer extraversion of the profile owner (Hall and Pennington, 2013). Selfies, therefore, seem to be taken as a similar indicator of extraversion, which is also in line with general findings that





**FIGURE 2 | Presumed motives for posting pictures as mediators of the effect of type of picture on perceived narcissism.** The value within parentheses represents the effect of the relation between the independent variables on the dependent variable before controlling for the mediator variables. Unstandardized coefficients are reported. \* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

show an actual relation between people's degree of extraversion and their posting behavior (Correa et al., 2010). With regard to openness to new experiences, we found the opposite effect of what we expected: Persons in photos taken by others were rated as more open than persons in selfies. As selfie-taking can be regarded as a comparatively new experience, it is remarkable that in this study, persons in regular photos were perceived as more open to new experiences. The fact that persons can control the way they appear in selfies to a greater extent than in regular photos might explain this lower level impression of openness: A person who is more willing to share pictures with uncertain outcomes may be seen as more open. Future research should therefore try to replicate this finding and address how it might be explained.

With regard to the question of whether the portrayal in selfies also yields a different evaluation than the portrayal in photos, we assessed perceived physical and social attractiveness, assumed narcissism, and assumed trustworthiness. While results regarding social attractiveness, narcissism and trustworthiness consistently, and in line with the hypotheses, show that people posting selfies are rated less favorably, there was no difference concerning physical attractiveness. This lack of difference is in contrast to findings of Re et al. (2016), who revealed that individuals in photos are rated as more (physically) attractive than individuals in selfies. Nevertheless, it is important to mention that in the study by Re et al. (2016), participants had to rate a wide range of individuals in selfies and photos taken by others. In our study, we presented each participant with only one person in the form of a Facebook profile owner. This might be a more accurate method, as it was shown that previously viewed faces affect the perception of attractiveness of other faces (Cogan et al., 2013; Pegors et al., 2015). Furthermore, Re et al. (2016) mixed the selfie and photo condition during the rating sessions, which

might have caused an awareness of the research topic, and thus influenced the rating behavior. Another explanation may lie in the poses that were shown on the pictures in our study: In order to isolate the effect of the mere picture type, our models were instructed to show the same facial expression in the selfie and the photo. As a consequence, there were no selfie-typical gestures (e.g., perspectives, posing, duckfacing, hand gestures) and the selfies were more similar to the photos. Related to physical attractiveness, this would mean that the differences in perceived attractiveness might not be due to photo type but might result from selfie-specific poses.

Given this experimental control, by which we tried to isolate photo type from selfie-specific behavior, our results on perceived social attractiveness, narcissism and trustworthiness are all the more remarkable. The results show that observers are indeed suspicious when they sense that people are presenting themselves by means of a self-taken picture—even when the pose with which they present themselves is identical. This can be interpreted as in line with the warranting principle, as suggested by Walther et al. (2009). In our study, participants might have identified selfies as self-generated and photos as other-generated information. Following this line of reasoning, persons would distrust selfies more than photos taken by others because selfies seem to be easier to manipulate as they are generated by the profile owner her or himself.

The probably most important effect was observable on narcissism, as this dependent variable yielded the largest effect sizes. The results indicate that people might view individuals who post selfies as more narcissistic. The finding is in accordance with Re et al. (2016), who found the same difference in ratings of photos and selfies concerning narcissism but no difference in self-reported narcissism values. The latter authors suggested that selfies, with their self-promotional

nature, transmit the impression that their producers are narcissistic.

With regard to narcissism, the mediation analysis revealed that the perceived motivations for picture posting partially account for finding that people posting a selfie rather than a photo are perceived as more narcissistic. In line with our theoretical considerations, the assumption that impression management is the motive for posting selfies leads to detrimental effects in the sense that increased narcissism is attributed. Furthermore, it is unsurprising that the presumed motive of coquetry contributed to explaining the relationship between picture type and perceived narcissism. Presumed emotional motives, however, do not seem to play a major role. Altogether, our findings show that motivational aspects not only play an important role regarding SNS usage (e.g., Krämer and Winter, 2008; Nadkarni and Hofmann, 2012; Tosun, 2012; Sung et al., 2016), but are also a factor that individuals take into account when forming an impression about other SNS users, and should therefore not be neglected in future studies. In this respect, external motivators like social expectations or peer pressure should also be taken into account.

Unlike the hypotheses on evaluation of selfies vs. photos, our assumptions on the interaction of gender and picture type were not supported. Although males in selfies were indeed rated as less trustworthy than females in selfies, this was also true for male and female profile owner in photos taken by others. Nevertheless, this main effect with regard to gender might fit the (production-related) finding that females post (Dhir et al., 2016) and take more selfies than males (Sorokowski et al., 2015, 2016; Sorokowska et al., 2016). Here, future research should try to replicate this finding that gender differences are more pronounced than potential interaction effects of gender and picture type.

Furthermore, the number of the displayed persons in selfies and photos did not lead to differences in the perceived physical and social attractiveness of the persons, which was contrary to our expectation. Persons in group photos and group selfies were not perceived as more physically attractive than single persons in photos and selfies—which is in contrast to results by Walker and Vul (2014), who showed that individual persons in group photos are viewed as more attractive than the same persons isolated in one photo. In addition, group photos and group selfies were not perceived as more socially attractive. These results contradict previous findings that the number of social cues in profile photos on Facebook is positively correlated with the perceived social attractiveness (Milyavskaya et al., 2010; Hong et al., 2012). One possible explanation for our finding might be that we asked the participants to concentrate on the evaluation of the profile owner. It is possible that this request caused participants to blank out the other persons in the group selfies and group photos. Moreover, the profile owner was pictured alone in the main profile photo in all conditions. The profile photo certainly has a special importance. This picture is usually the first impression and can be seen by anybody regardless of privacy settings (Hum et al., 2011). Profile pictures are thus the most important attempt to present oneself to the community (Ellison et al., 2006). In turn, this might have led SNS users (in our sample, 88.2% indicated

having a Facebook account) to pay special attention to other people's profile photos. Since the assessment of attractiveness in our study occurred retrospectively and not while viewing the stimulus material, it is conceivable that this picture was the most present heuristic in order to evaluate the profile owners' attractiveness. Nevertheless, these findings remain surprising given the number of studies which have indicated a "cheerleader effect" (Walker and Vul, 2014) and should be explored further.

Considering the attention-grabbing nature of selfies (Souza et al., 2015) it can be speculated that the usage of feedback features (e.g., likes or comments) in case of selfies is not necessarily related to the individual perception and may therefore serve rather as a social strategy as opposed to a strategy for expressing honest evaluations (c.f. Lee et al., 2014, 2016). However, selfies are an aspect of the current pop culture (Barry et al., 2017) and our results do not preclude that they also might lead to positive outcomes. Future research should therefore explore the possibility of both positive and negative effects of selfies for those who post selfies. While in the case of our study participants evaluate selfies of strangers, it is conceivable that individuals evaluate selfies of familiar persons more positively. Nevertheless, selfie takers should be beware that selfies might not lead to desired attributions.

## Limitations and Future Research

As the present study is one of the first to investigate the perception of selfies, the presented findings should be treated with caution. Although we were able to corroborate previous results (Re et al., 2016) using a more controlled and systematic investigation, and found a consistent pattern of results regarding the detrimental effects of selfies, future research is required to replicate our findings. As the Brunswik lens model (Brunswik, 1956) would predict, selfies serve as a positive cue for the producer's extraversion and narcissism and as a negative cue for the producer's openness, social attractiveness and trustworthiness from the recipient's perspective. Future research should investigate how these cues interact with other cues which are positively correlated with social attractiveness and extraversion, such as number of friends (Tong et al., 2008; Hall and Pennington, 2013). To this aim, future research should concentrate on combining both perspectives—the recipient's and the producer's view—in a multi-method approach. Such an approach could additionally reveal how perceived and self-assessed personality traits might differ when comparing selfies and photos—similar to the investigation by Re et al. (2016).

Regarding the age distribution of the participants, more than 75% of participants were young adults between 15 and 29 years. Therefore, results cannot be generalized for the whole population. Future studies need to include more users older than 29 years. Still, the sample does not necessarily have to represent the whole population as the relevant user groups who will primarily get in touch with selfies on SNS are younger than the general population. Also, the results revealed only small to moderate effect sizes. It should also be noted that the sample contained more female participants than male participants, which might have skewed the results. Moreover, the time for which the participants viewed the profile needs to be considered.

In this sample, a cut-off score of 5 s or less was set. It might be questioned whether 5 s are sufficient to build an impression of a person's profile. Most importantly, the data of the manipulation check suggest that participants did not perceive the profiles as predominantly composed of selfies vs. photos. Although the conditions did differ with regard to the remembered number of selfies/photos, participants believed that they remembered a substantial number of photos in the selfie condition, and conversely, a relatively high number of selfies in the photo condition. The main reason for this might be an artifact provoked by the corresponding items: Participants were asked in both conditions how many photos and how many selfies they had seen. Therefore, it is likely that they believed that both types of picture were presented to them. If these data are not merely an artifact but an indication that the number of selfies and photos was not consciously perceived by the participants, the obtained results would be all the more impressive.

In summary, our results reveal a counterintuitive pattern: Although selfies are a highly popular means of impression management, the findings suggest that they are less successful in achieving the goal of a positive impression than conventional photos. Therefore, when taking out their smartphones, SNS users who are striving for positive self-presentation and positive

evaluations should be aware that their selfie might backfire—and they might be best advised to ask someone to take a photo of them.

## ETHICS STATEMENT

All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the local institutional review board of the Department of Computer Science and Applied Cognitive Science.

## AUTHOR CONTRIBUTIONS

Conceptualization: NK. Formal analysis: MF, JK, YM, and MR. Investigation: MF, JK, YM, and MR. Methodology: SW, NK, MF, JK, YM, and MR. Resources: NK. Supervision: SW and NK. Writing—original draft: MF, JK, YM, and MR. Writing—review and editing: NK and SW.

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## REFERENCES

- Ariely, D. (2001). Seeing sets: representation by statistical properties. *Psychol. Sci.* 12, 157–162. doi: 10.1111/1467-9280.00327
- Back, M. D., Stopfer, J. M., Vazire, S., Gaddis, S., Schmukle, S. C., Egloff, B., et al. (2010). Facebook profiles reflect actual personality, not self-idealization. *Psychol. Sci.* 21, 372–374. doi: 10.1177/0956797609360756
- Bakhshi, S., Shamma, D. A., and Gilbert, E. (2014). “Faces engage us: Photos with faces attract more likes and comments on Instagram,” in *Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems*, (Toronto: ACM), 965–974.
- Barry, C. T., Doucette, H., Loflin, D. C., Rivera-Hudson, N., and Herrington, L. L. (2017). “Let me take a selfie”: associations between self-photography, narcissism, and self-esteem. *Psychol. Pop. Media Cult.* 6, 48–60. doi: 10.1037/ppm0000089
- Brady, T. F., and Alvarez, G. A. (2011). Hierarchical encoding in visual working memory ensemble statistics bias memory for individual items. *Psychol. Sci.* 22, 384–392. doi: 10.1177/0956797610397956
- Brunswick, E. (1956). *Perception and the Representative Design of Psychological Experiments*. Berkeley, CA: University of California Press.
- Cogan, E., Parker, S., and Zellner, D. A. (2013). Beauty beyond compare: effects of context extremity and categorization on hedonic contrast. *J. Exp. Psychol. Hum. Percept. Perform.* 39, 16. doi: 10.1037/a0031020
- Correa, T., Hinsley, A. W., and Gil de Zúñiga, H. (2010). Who interacts on the Web?: the intersection of users' personality and the social media use. *Comput. Hum. Behav.* 26, 247–253. doi: 10.1016/j.chb.2009.09.003
- Darlington, R. B., and Hayes, A. F. (2016). *Regression Analysis and Linear Models: Concepts, Applications, and Implementation*. New York, NY: Guilford Publications.
- Deutsch, F. M., LeBaron, D., and Fryer, M. M. (1987). What's in a smile? *Psychol. Women Q.* 11, 341–352.
- Dhir, A., Pallesen, S., Torsheim, T., and Andreassen, C. S. (2016). Do age and gender differences exist in selfie-related behaviours? *Comput. Hum. Behav.* 63, 549–555. doi: 10.1016/j.chb.2016.05.053
- Dudycha, L. W., and Naylor, J. C. (1966). Characteristics of the human inference process in complex choice behavior situations. *Organ. Behav. Hum. Perform.* 1, 110–128. doi: 10.1016/0030-5073(66)90008-0
- Ellison, N., Heino, R., and Gibbs, J. (2006). Managing impressions online: self-presentation processes in the online dating environment. *J. Comput. Media. Commun.* 11, 415–441. doi: 10.1111/j.1083-6101.2006.00020.x
- Fox, J., and Rooney, M. C. (2015). The Dark Triad and trait self-objectification as predictors of men's use and self-presentation behaviors on social networking sites. *Pers. Individ. Dif.* 76, 161–165. doi: 10.1016/j.paid.2014.12.017
- Gosling, S. D., Augustine, A. A., Vazire, S., Holtzman, N., and Gaddis, S. (2011). Manifestations of personality in online social networks: self-reported facebook-related behaviors and observable profile information. *Cyberpsychol. Behav. Soc. Netw.* 14, 483–488. doi: 10.1089/cyber.2010.0087
- Haferkamp, N., Eimler, S. C., Papadakis, A. M., and Kruck, J. V. (2012). Men are from mars, women are from venus? examining gender differences in self-presentation on social networking sites. *Cyberpsychol. Behav. Soc. Netw.* 15, 91–98. doi: 10.1089/cyber.2011.0151
- Hall, J. A., and Pennington, N. (2013). Self-Monitoring, honesty, and cue use on Facebook: the relationship with user extraversion and conscientiousness. *Comput. Hum. Behav.* 29, 1556–1564. doi: 10.1016/j.chb.2013.01.001
- Hong, S., Tandoc, E., Kim, E. A., Kim, B., and Wise, K. (2012). The real you? The role of visual cues and comment congruence in perceptions of social attractiveness from Facebook profiles. *Cyberpsychol. Behav. Soc. Netw.* 15, 339–344. doi: 10.1089/cyber.2011.0511
- Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika* 30, 179–185. doi: 10.1007/BF02289447
- Hu, Y., Manikonda, L., and Kambhampati, S. (2014). “What we Instagram: a first analysis of Instagram photo content and user types,” in *Proceedings of ICWSM* (Ann Arbor).
- Hum, N. J., Chamberlin, P. E., Hambright, B. L., Portwood, A. C., Schat, A. C., and Bevan, J. L. (2011). A picture is worth a thousand words: a content analysis of Facebook profile photographs. *Comput. Hum. Behav.* 27, 1828–1833. doi: 10.1016/j.chb.2011.04.003
- Joinson, A. N. (2008). “Looking at, looking up or keeping up with people? Motives and use of facebook,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (ACM), 1027–1036.
- Kapadizic, S. (2013). Narcissism as a predictor of motivations behind Facebook profile picture selection. *Cyberpsychol. Behav. Soc. Netw.* 16, 14–19. doi: 10.1089/cyber.2012.0143

- Kaplan, R. M. (1978). Is beauty talent? Sex interaction in the attractiveness halo effect. *Sex Roles* 4, 195–204. doi: 10.1007/BF00287500
- Katz, J. E., and Crocker, E. T. (2015). Selfie and photo messaging as visual conversation: reports from the United States, United Kingdom and China. *Int. J. Commun.* 9, 1861–1872. Retrieved from: <http://ijoc.org/index.php/ijoc/article/view/3180/1405>
- Kernis, M. H., and Wheeler, L. (1981). Beautiful friends and ugly strangers radiation and contrast effects in perceptions of same-sex pairs. *Pers. Soc. Psychol. Bull.* 7, 617–620. doi: 10.1177/014616728174017
- Kim, J. W., and Chock, M. (in press). Personality traits and psychological motivations predicting selfie posting behaviors on social networking sites. *Telematics Informatics*. doi: 10.1016/j.tele.2016.11.006
- Krämer, N. C., and Winter, S. (2008). Impression management 2.0: the relationship of self-esteem, extraversion, self-efficacy, and self-presentation within social networking sites. *J. Media Psychol.* 20, 106–116. doi: 10.1027/1864-1105.20.3.106
- Krämer, N. C., Klatt, J., Jers, C., Joinson, A., Maas, W., and Taddicken, M. (2014). “Effects of public self-disclosure on the Internet,” in *Paper presented at the Conference of the International Communication Association*, Seattle.
- Lang, F. R., Lüdtkke, O., and Asendorpf, J. B. (2001). Testgüte und psychometrische Äquivalenz der deutschen Version des Big Five Inventory (BFI) bei jungen, mittelalten und alten Erwachsenen. *Diagnostica* 47, 111–121. doi: 10.1026/0012-1924.47.3.111
- Langlois, J. H., and Roggman, L. A. (1990). Attractive faces are only average. *Psychol. Sci.* 1, 115–121. doi: 10.1111/j.1467-9280.1990.tb00079.x
- Langlois, J. H., Kalakanis, L., Rubenstein, A. J., Larson, A., Hallam, M., and Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychol. Bull.* 126:390. doi: 10.1037/0033-2909.126.3.390
- Lee, E., Kim, Y. J., and Ahn, J. (2014). How do people use Facebook features to manage social capital? *Comput. Hum. Behav.* 36, 440–445. doi: 10.1016/j.chb.2014.04.007
- Lee, S. Y., Hansen, S. S., and Lee, J. K. (2016). What makes us click “like” on Facebook? Examining psychological, technological, and motivational factors on virtual endorsement. *Comput. Commun.* 73, 332–341. doi: 10.1016/j.comcom.2015.08.002
- Leiner, D. J. (2014). *SoSci Survey (Version 2.5.00-i) [Computer software]*. Available online at: <https://www.sosicurvey.de>
- McAndrew, F. T., and Jeong, H. S. (2012). Who does what on Facebook? Age, sex, and relationship status as predictors of Facebook use. *Comput. Hum. Behav.* 28, 2359–2365. doi: 10.1016/j.chb.2012.07.007
- McCroskey, J. C., and Richmond, V. P. (1979). *The Reliability and Validity of Scales for the Measurement of Interpersonal Attraction and Homophily*. Philadelphia: In Eastern Communication Association Convention.
- Mehdizadeh, S. (2010). Self-presentation 2.0: narcissism and self-esteem on Facebook. *Cyberpsychol. Behav. Soc. Network.* 13, 357–364. doi: 10.1089/cyber.2009.0257
- Milyavskaya, M., Reoch, J., Koestner, R. F., and Losier, G. F. (2010). Seeking social connectedness: interdependent self-construal and impression formation using photographic cues of social connectedness. *J. Soc. Psychol.* 150, 689–702. doi: 10.1080/00224540903365406
- Moore, K., and McElroy, J. C. (2012). The influence of personality on Facebook usage, wall postings, and regret. *Comput. Hum. Behav.* 28, 267–274. doi: 10.1016/j.chb.2011.09.009
- Nadkarni, A., and Hofmann, S. G. (2012). Why do people use Facebook? *Pers. Individ. Dif.* 52, 243–249. doi: 10.1016/j.paid.2011.11.007
- Ohanian, R. (1990). Construction and validation of a scale to measure celebrity endorsers’ perceived expertise, trustworthiness, and attractiveness. *J. Advert.* 19, 39–52. doi: 10.1080/00913367.1990.10673191
- Papacharissi, Z., and Mendelson, A. (2011). *12 Toward a New (er) Sociability: Uses, Gratifications and Social Capital on Facebook*. New York, NY: Routledge.
- Pegors, T. K., Mattar, M. G., Bryan, P. B., and Epstein, R. A. (2015). Simultaneous perceptual and response biases on sequential face attractiveness judgments. *J. Exp. Psychol. Gen.* 144, 664–673. doi: 10.1037/xge0000069
- Pounders, K., Kowalczyk, C. M., and Stowers, K. (2016). Insight into the motivation of selfie postings: impression management and self-esteem. *Eur. J. Market.* 50, 1879–1892. doi: 10.1108/EJM-07-2015-0502
- Preacher, K. J., and Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav. Res. Methods Instrum. Comput.* 36, 717–731. doi: 10.3758/BF03206553
- Preacher, K. J., and Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav. Res. Methods* 40, 879–891. doi: 10.3758/BRM.40.3.879
- Qiu, L., Lu, J., Yang, S., Qu, W., and Zhu, T. (2015). What does your selfie say about you? *Comput. Hum. Behav.* 52, 443–449. doi: 10.1016/j.chb.2015.06.032
- Re, D. E., Wang, S. A., He, J. C., and Rule, N. O. (2016). Self indulgence: self-favoring biases in perceptions of selfies. *Soc. Psychol. Pers. Sci.* 7, 1–9. doi: 10.1177/1948550616644299
- Ross, C., Orr, E., Sisic, M., Aseneault, J. M., and Simmering, M. G. (2009). Personality and motivations associated with Facebook use. *Comput. Hum. Behav.* 25, 578–586. doi: 10.1016/j.chb.2008.12.024
- Scissors, L., Burke, M., and Wengrovitz, S. (2016). “What’s in a Like?: Attitudes and behaviors around receiving Likes on Facebook,” in *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (San Francisco, CA: ACM), 1501–1510.
- Sheldon, P. (2008). Student favorite: Facebook and motives for its use. *Southwestern Mass Commun. J.* 23, 39–53. Retrieved from: [https://www.researchgate.net/profile/Pavica\\_Sheldon/publication/273145319\\_Student\\_Favorite\\_Facebook\\_and\\_Motives\\_for\\_its\\_Use/Student\\_Favorite\\_Facebook\\_and\\_Motives\\_for\\_its\\_Use/links/54fa9d530cf23e66f0324681.pdf](https://www.researchgate.net/profile/Pavica_Sheldon/publication/273145319_Student_Favorite_Facebook_and_Motives_for_its_Use/Student_Favorite_Facebook_and_Motives_for_its_Use/links/54fa9d530cf23e66f0324681.pdf)
- Smock, A. D., Ellison, N. B., Lampe, C., and Wohn, D. Y. (2011). Facebook as a toolkit: a uses and gratification approach to unbundling feature use. *Comput. Hum. Behav.* 27, 2322–2329. doi: 10.1016/j.chb.2011.07.011
- Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Pisanski, K., Chmiel, A., and Sorokowski, P. (2016). Selfies and personality: who posts self-portrait photographs? *Pers. Individ. Dif.* 90, 119–123. doi: 10.1016/j.paid.2015.10.037
- Sorokowski, P., Sorokowska, A., Frackowiak, T., Karwowski, M., Rusicka, I., and Oleszkiewicz, A. (2016). Sex differences in online selfie posting behaviors predict histrionic personality scores among men but not women. *Comput. Hum. Behav.* 59, 368–373. doi: 10.1016/j.chb.2016.02.033
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviors are associated with narcissism among men. *Pers. Individ. Dif.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004
- Souza, F., de Las Casas, D., Flores, V., Yoon, S., Cha, M., Quercia, D., et al. (2015). “Dawn of the selfie era: The whos, wheres, and hows of selfies on Instagram,” in *Proceedings of the 2015 ACM on Conference on Online Social Networks* (Palo Alto, CA: ACM), 221–231.
- Spangenberg, L., Romppel, M., Hofmeister, D., Brähler, E., and Strauß, B. (2013). Psychometrische Überprüfung einer Kurzform des Narcissistic Personality Inventory (NPI-15): Dimensionalität und psychometrische Eigenschaften des NPI-15 in einer repräsentativen Bevölkerungsstichprobe. *Psychother. Psychol. Med.* 63, 341–347. doi: 10.1055/s-0032-1333288
- Sung, Y., Lee, J. A., Kim, E., and Choi, S. M. (2016). Why we post selfies: understanding motivations for posting pictures of oneself. *Pers. Individ. Dif.* 97, 260–265. doi: 10.1016/j.paid.2016.03.032
- Szczuka, J. M., Weiss, J., Fazlali, S., and Krämer, N. (2015). “Me, Myselfie and I - Motivational factors and the influence of sociodemographic and personality variables,” in *Paper Presented at the Conference of the International Communication Association* (Puerto Rico).
- Tong, S. T., Van Der Heide, B., Langwell, L., and Walther, J. B. (2008). Too much of a good thing? the relationship between number of friends and interpersonal impressions on Facebook. *J. Comput. Media. Commun.* 13, 531–549. doi: 10.1111/j.1083-6101.2008.00409.x
- Tosun, L. P. (2012). Motives for Facebook use and expressing “true self” on the Internet. *Comput. Hum. Behav.* 28, 1510–1517. doi: 10.1016/j.chb.2012.03.018
- Walker, D., and Vul, E. (2014). Hierarchical encoding makes individuals in a group seem more attractive. *Psychol. Sci.* 25, 230–235. doi: 10.1177/0956797613497969
- Walther, J. B. (2007). Selective self-presentation in computer-mediated communication: hyperpersonal dimensions of technology, language, and cognition. *Comput. Hum. Behav.* 23, 2538–2557. doi: 10.1016/j.chb.2006.05.002
- Walther, J. B., and Parks, M. R. (2002). “Cues filtered out, cues filtered in,” in *Handbook of Interpersonal Communication*, eds M. L. Knapp, and J. A. Daly (Thousand Oaks, CA: Sage Publications), 529–563.



- Walther, J. B., Van Der Heide, B., Hamel, L. M., and Shulman, H. C. (2009). Self-generated versus other-generated statements and impressions in computer-mediated communication a test of warranting theory using Facebook. *Commun. Res.* 36, 229–253. doi: 10.1177/0093650208330251
- Walther, J. B., Van Der Heide, B., Kim, S. Y., Westerman, D., and Tong, S. T. (2008). The role of friends' appearance and behavior on evaluations of individuals on Facebook: are we known by the company we keep? *Hum. Commun. Res.* 34, 28–49. doi: 10.1111/j.1468-2958.2007.00312.x
- Wang, R., Yang, F., and Haigh, M. M. (in press). Let me take a selfie: exploring the psychological effects of posting and viewing selfies and groupies on social media. *Telematics Informatics*. doi: 10.1016/j.tele.2016.07.004
- Weiser, E. B. (2015). #Me: Narcissism and its facets as predictors of selfie-posting frequency. *Pers. Individ. Dif.* 86, 477–481. doi: 10.1016/j.paid.2015.07.007
- Zheng, W., Yuan, C. H., Chang, W. H., and Wu, Y. C. J. (2016). Profile pictures on social media: gender and regional differences. *Comput. Hum. Behav.* 63, 891–898 doi: 10.1016/j.chb.2016.06.041

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# Do Online Privacy Concerns Predict Selfie Behavior among Adolescents, Young Adults and Adults?

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Selfies, or self-portraits, are often taken and shared on social media for online self-presentation reasons, which are considered essential for the psychosocial development and well-being of people in today's culture. Despite the growing popularity and widespread sharing of selfies in the online space, little is known about how privacy concerns moderate selfie behavior. In addition to this, it is also not known whether privacy concerns across age and gender groups influence selfie behavior. To address this timely issue, a survey assessing common selfie behaviors, that is, frequency of taking (individual and group selfies), editing (cropping and filtering), and posting selfies online, and social media privacy concerns (over personal data being accessed and misused by third parties) was conducted. The web-survey was administered to 3,763 Norwegian social media users, ranging from 13 to 50 years, with a preponderance of women ( $n = 2,509$ , 66.7%). The present study investigated the impact of privacy concerns on selfie behaviors across gender and age groups (adolescent, young adult, and adult) by use of the structural equation modeling approach. The results suggest that young adults have greater privacy concerns compared to adolescents and adults. Females have greater privacy concerns than males. Greater privacy concerns among female social media users were linked to lower engagement in selfie behavior, but privacy concerns did not influence selfie behavior in the case of male adolescents and young adults. Overall, privacy concerns were more consistently and inversely related to selfie behavior (taking and posting) among females than males. The study results have theoretical as well as practical implications for both researchers and policy makers.

**Keywords:** age, gender, privacy, social media, self-presentation and selfie behavior

## INTRODUCTION

People turn to online social media for various reasons including communication and self-expression, connecting, observing others, and establishing new and strengthening existing relationships (Dhir and Tsai, 2017; Dhir et al., 2017a,b). Most important of all, people use online social media to present themselves in the computer-mediated space (see Haferkamp and Krämer, 2010). Online self-presentation refers to the process of sharing content (e.g., photos, status updates, videos, and web-links) with the motive of influencing the impression formed by the people around

the individual (Haferkamp and Krämer, 2010). Psychologists have argued that self-presentation is important for an individual's well-being since it addresses their fundamental need to continuously obtain positive reactions and leave positive impressions on others (Goffman, 1959; Leary and Kowalski, 1990; Leary, 1995).

Digital photos are popularly utilized to practice online self-presentation on social media platforms (Dhir, 2016a,b). This is clearly evident from the ever-increasing growth in the number of photos shared on online social media. For example, every day nearly two billion Facebook photos alone are shared (Facebook Newsroom, 2015). Although selfies may be taken and shared in computer-mediated spaces for a number of reasons, e.g., obtaining feedback, experimentation with surrounding, etc. (Kiprin, 2013), very often selfies are shared for self-presentation reasons (Katz and Crocker, 2015). We define a selfie as a photo taken of oneself without the assistance of anyone else. Recent studies suggest that selfies have received global prominence in a short time frame (Kiprin, 2013; Katz and Crocker, 2015). The popularity of selfie sharing can be gauged from the fact that on social media, millions of selfies are shared on a daily basis. According to Weiser (2015), over 238 million photos had the hashtag #selfie, and 128 million photos had the hashtag #me on Instagram. Similarly, Svelander and Wiberg (2015) mentioned that 193 million Instagram photos and videos contain the #selfie and #selfies hashtags. This statistical evidence suggests that selfie sharing is now a dominant activity on different online social media platforms. The possible reasons behind this increase in selfie sharing on social media include identification and self-presentation (Katz and Crocker, 2015), experimentation with one's surroundings (Kiprin, 2013), and obtaining feedback from friends, family, and peers (Katz and Crocker, 2015).

The concepts of self-presentation and self-disclosure in online social media are highly relevant, and are also strongly interrelated with each other (Haferkamp and Krämer, 2010). The precondition of online self-presentation is, to some extent, to self-disclose private information online (Boyd, 2008; Haferkamp and Krämer, 2010). However, scholars have observed a phenomenon called the "privacy paradox" which is a discrepancy between self-disclosure and privacy concerns in the computer-mediated space (Barnes, 2006). On one hand, people tend to present themselves in online space by sharing their interests, likes, tastes, hobbies, places they visit, physical appearance, etc. But on the other hand, they are wary of the potential social privacy threats (e.g., unintended exposure to a hostile or unknown audience, theft and misuse of photos) and have some degree of "privacy concern" (Livingstone, 2008). In addition to this privacy paradox, complex tensions between privacy issues and online self-presentation in a computer-mediated space also exist (Dhir, 2016a). For example, van Dijck (2008) observed that when private photos are shared in the computer-mediated space, they easily turn into public property. This rapid transformation of content from private to public space forming the desire to self-present actually results in tensions between the tendency to self-disclose and privacy concerns that are complex in nature. Similar observations were made by Boyd (2008) who found that when social media users self-disclose more personal information, it sometimes also

disturbs their self-presentation choices because of social privacy issues. The different social privacy threats to personal online self-presentation goals include exposure to unknown people, negative criticism from peers, and being tagged in an unattractive, inaccurate, undesirable, and/or low quality self-presentation (Lang and Barton, 2015; Dhir et al., 2016a). Scholars have also emphasized that such social privacy disturbances in online self-presentation goals also result in online regret (i.e., negative cognitive experience) (Wang et al., 2011; Kaur et al., 2016a), and negative feedback on perceived social and self-identity (Lang and Barton, 2015). It can even affect continuous service use and customer retention (Dhir, 2016a). These studies have found that privacy concerns and privacy issues significantly influence users' online self-presentation choices and decisions. However, it is currently unknown to what extent "privacy concerns" predict specific online self-presentation behavior or acts.

According to the privacy paradox phenomenon, selfie sharing also involves some degree of self-disclosure of current activities, emotions, hobbies, and interests. At the same time, however, it makes those people wary of their actions, and they also have some degree of privacy concern. Furthermore, when private selfies are shared in the computer-mediated space, they turn into public property and generate tensions, which are complex in nature, between privacy concerns, self-presentation goals and social privacy threats. Despite the fact that "privacy concerns" can possibly affect user experience and different choices pertaining to online self-presentation, surprisingly little is known about the relationship between self-presentation and online privacy concerns. Furthermore, selfie sharing in the computer-mediated space is becoming more and more popular; yet, it is not known how privacy concerns influence selfie-related behavior. It is important to understand this relationship because it informs the researchers and practitioners of how privacy concerns predict online self-presentation-related behavior, which is considered a dominant activity in online social media. Furthermore, better understanding of this relationship can potentially provide new insights into the complex relationship between online privacy concerns and self-disclosure (i.e., the privacy paradox) in computer-mediated systems (see Boyd, 2008; Madden and Smith, 2010; McLaughlin and Vitak, 2012). This study has addressed this open research gap through the investigation of the relationship between privacy concerns and selfie-related behavior as a means of online self-presentation. To date, scholars have investigated different issues pertaining to online self-presentation and privacy, but the novelty of the current study lies in its investigation of the relationship between privacy concerns and user behavior pertaining to online self-presentation, which has not as yet been studied. Hence, the current study contributes to the emerging literature on selfie-related behavior as well as the extant literature on online self-presentation and privacy.

The prior social media literature has been criticized due to its overemphasis on United States (US) based study participants (Dhir et al., 2015; Dhir, 2016a; Kaur et al., 2016b). However, the vast majority of social media users are actually based outside of the US; for example, over 84.2% of Facebook users are in fact based outside of the US (Facebook Newsroom, 2015). Another limitation of the previous literature is the emphasis on

the social media behavior of young-adult samples only (Dhir, 2016a). However, significant age differences in social media usage patterns have been reported. For example, adolescents differ from young and older adults in their use of social media (Andreassen et al., 2016; Dhir and Torsheim, 2016). Similarly, these groups also differ in terms of selfie-posting (Sorokowski et al., 2015; Dhir et al., 2016b) and online privacy behavior (Madden and Smith, 2010; Xie and Kang, 2015). Due to these two inherent shortcomings, only limited understanding of social media behavior (particularly selfie-related and online privacy) across age and cultures is available. Furthermore, only a few studies have set out to investigate the differences in the social media behavior of different age groups; for example, adolescents vs. young adults vs. older adults. Consequently, the transferability of the prior study findings across a broad age range is not known.

The current study has addressed these research gaps by examining the impact of privacy concerns on selfie behavior in the context of three target user groups: adolescent, young-adult, and adult social media users. This study also addresses the pressing need to investigate the selfie behavior of mixed age/gender groups (Albury, 2015) since the overwhelming majority of the prior literature has focused on single gender samples only (Nelson, 2013; Nguyen, 2014; Warfield, 2014). The main research questions of the current study are: **RQ1.** How do adolescents, young adults, and adults differ in their privacy concerns regarding social media? **RQ2.** How do males and females differ in their privacy concerns regarding social media? **RQ3.** How do privacy concerns across genders (male and female) and age groups (adolescent, young adult, and adult) predict selfie behavior (taking, editing, and posting selfies)?

## BACKGROUND LITERATURE

### Online Privacy Concerns and Age Differences

The prior computer-mediated communication literature suggests significant age differences in privacy behavior. Young-adult social media users possess high levels of privacy concern, and they tend to disclose less information than both older and younger (e.g., adolescent) users (Nosko et al., 2010). The study by Madden and Smith (2010) found that young-adult social media users (18–29 years) have more experience of managing privacy of online shared content, and are more likely to use privacy-preserving strategies (e.g., changing default privacy settings, limiting access to the shared content, and cropping photos to hide personal information) than older (50–64 years) social media users (41% vs. 18%). This is also consistent with the observations of Strano and Wattai (2010) who found that privacy-preserving strategies (e.g., untagging) are more popular among young adults (aged 18–21 years), compared to older (above 31 years) social media users (66.4% vs. 14.5%). Similarly, Dhir et al. (2016a) claimed that older adolescents are more likely to untag compared to their younger counterparts. Lang and Barton (2015) found that young adults actively engage in management of their social privacy. In comparison to young adults, adolescents are known to self-disclose themselves more often on social media compared to

when they are offline (Schouten et al., 2007). Feng and Xie (2014) also suggested that adolescent social media users have lower social privacy concerns and therefore have greater willingness to self-disclose online compared to young adults. Several studies have indicated that, compared to young adults, adolescents tend to disclose more personal information and do so more frequently (Livingstone et al., 2010; Xie and Kang, 2015). Similarly, Madden et al. (2013) observed that adolescents with high privacy concerns actually post more content online. The possible reasons could be that adolescents lack up-to-date understanding of the different privacy-related settings (Christofides et al., 2012), they may face technical glitches when managing their online content (Brandtzæg et al., 2010), or there may be differences in the use of computer-mediated technologies among younger and older users (Hayes et al., 2015). However, despite all of these studies, it is not known at present how these three user groups, adolescents, young adults, and adults, differ in their privacy concerns regarding social media. Therefore, we propose the following hypotheses based on the prior literature:

H1: Young-adult social media users possess greater privacy concerns than adult users.

H2: Adult social media users possess greater privacy concerns than adolescent users.

### Online Privacy Concerns and Gender Differences

Similar to age differences, several studies have suggested significant gender differences in privacy behavior. Young-adult men are known to self-disclose relatively more personal information online since they do not foresee associated social privacy concerns (Fogel and Nehmd, 2009), and are likely to experience online regret due to high self-disclosure (Moore and McElroy, 2012) compared to female young-adult users. Similar observations have been made in the case of adolescents, as males disclose more personal information online than female adolescents (Xie and Kang, 2015). In terms of privacy-preserving strategies, Dhir et al. (2016a) found that female adolescents are less likely to use privacy-preserving strategies (e.g., untagging) than male adolescents. This is contrary to the case of young adults, as female young adults have been found to be more likely to use privacy-preserving strategies compared to male young adults (McLaughlin and Vitak, 2012; Tufekci, 2012). However, how this compares with the gender differences in privacy behavior among adults (aged 30–50 years) is presently unknown. There is still a lack of understanding of how males and females across the three age groups (adolescent, young adult, and adult) differ in their privacy concerns regarding social media. Based on the limited available literature, we propose the following hypotheses:

H3: Female adolescents possess greater privacy concerns than male adolescents.

H4: Female young adults possess greater privacy concerns than male young adults.

H5: Female adults possess greater privacy concerns than male adults.



## Age and Gender Differences in Selfie Behavior

Selfies are popular among adolescents (Senft and Baym, 2015) as well as among young adults (Katz and Crocker, 2015). Using a convenience sample, Katz and Crocker (2015) found that 96% of 20- to 23-year-old young adults had taken selfies in the recent past, while 25% had taken a selfie only the day before. Furthermore, 98% of 18- to 24-year-olds had taken selfies, 46% had shared selfies only the day before, while 69% of the young people shared selfies 3–20 times per day. Similarly, Dhir et al. (2016b) found that adolescents were the most active and adults were the least active social media users in taking and posting selfies. These studies articulate that taking and sharing selfies are very popular pastimes and are part of the daily routine of adolescents and young adults. However, how this compares with the popularity of selfies among adults (aged 30–50 years) is presently unknown. A handful of recent studies have suggested significant age differences in selfie behavior. The older population is less likely to take selfies compared to their younger counterparts (Qiu et al., 2015) due to less of a desire to fulfill their narcissistic objectives (Weiser, 2015). Furthermore, young adults are less concerned as to how posting selfies on social media will affect them in the future compared to older adults (Katz and Crocker, 2015). Several studies have indicated a positive relationship between online self-presentation and selfie taking and posting in the context of adolescent social media users (Senft and Baym, 2015).

Selfies are taken and shared for the identification of gender and self-presentation reasons (Katz and Crocker, 2015), and several studies have suggested significant gender differences in selfie behavior. Albury (2015) also emphasized that selfie taking and posting behavior is a gendered process in which females tend to receive unfair criticism and are inappropriately targeted and scrutinized due to their provocative selfie posting (Albury, 2015). Similarly, Burns (2014) argued that females are typically viewed as objects of consumption, while males are not subjected to such surveillance or scrutiny. On this issue, Williams and Marquez (2015) argued that due to gender role stereotypes (e.g., Rudman and Glick, 2001), people who tend to violate the gender code (i.e., Anderson, 1999) actually receive negative feedback from their peers.

Scholars have found that selfies are relatively more popular among females, and that they are more likely to take selfies than males (Qiu et al., 2015). To begin with, Sorokowski et al. (2015) found that females post more personal and group selfies compared to men. Albury (2015) also found the existence of gender differences in the linguistic aspects of any selfie post. Poe (2015) noticed that high self-esteem was associated with posting of more selfies among young-adult women, while Cao and Halloran (2014) observed that, compared to men, selfies taken by women were more personal in nature. Young women (18- to 29-year-olds) tend to share selfies to obtain positive feedback (Nguyen, 2014). Nelson (2013) found that young women use the hashtags #me, #selfie, and #self in their selfies for self-presentation reasons (e.g., obtaining positive feedback).

Furthermore, young women tend to worry after sharing selfies if they fail to attract sufficient positive feedback (e.g., number of likes) (Nelson, 2013). In a recent study, Dhir et al. (2016b) found that female social media users are more likely to take personal and group selfies and to post personal selfies. Similarly, Warfield (2014) found that “policing” selfie-taking and sharing are popular among younger women (aged 16–28 years). In comparison to these findings, Fox and Rooney (2015) observed that men who are self-objectifying are more likely to spend time on social media and to frequently edit photos. Furthermore, men who are relatively more narcissistic and psychopathic are more likely to share edited photos and selfies and to engage in impulsive posting of selfies on social media, which tends to attract the attention of their peers. This review of the prior literature clearly suggests the importance of age and gender in selfie behavior.

## Online Privacy Concerns and Self-Presentation

The prior findings on the empirical linkages between online privacy concerns and self-disclosure are not consistent, as some studies have indicated that there is no significant relationship between them (Stutzman and Kramer-Duffield, 2010; Forest and Wood, 2012). However, in comparison, a recent study by Xie and Kang (2015) observed that social media users with high levels of privacy concern actually disclose more personal information, consistent with the ‘privacy paradox’ phenomenon. The relationship between privacy concerns and activities pertaining to online self-presentation is also unclear. For example, people with high privacy concerns do not necessarily maintain a low self-presentation profile, but usually conceal part of the content shared online (e.g., cropping or hiding) (Haferkamp and Krämer, 2010). Therefore, it is currently unknown how privacy concerns predict different user activities pertaining to online self-presentation. Similarly, it is also not known how gender and age differences impact the influence of privacy concerns on the online self-presentation behavior of the three different age groups, that is, adolescent, young-adult, and adult social media users. These issues are addressed in the present study. Based on the prior literature on “age and gender differences” in online privacy (see “Background Literature”), we propose the following hypotheses:

- H6: Privacy concerns do not play any significant role in influencing the selfie behavior of male adolescents.
- H7: Privacy concerns play a significant role in influencing the selfie behavior of male young adults.
- H8: Privacy concerns play a significant role in influencing the selfie behavior of male adults.
- H9: Privacy concerns do not play any significant role in influencing the selfie behavior of female adolescents.
- H10: Privacy concerns play a significant role in influencing the selfie behavior of female young adults.
- H11: Privacy concerns play a significant role in influencing the selfie behavior of female adults.

## MATERIALS AND METHODS

### Study Participants and Procedure

This current study is based on a large-scale national cross-sectional web-survey, which explored several on-/offline behaviors of the general population in Norway. The survey was broadcast (July–August 2015, for a period of 1 week) by two nationwide news media delivering news to the general public (i.e., a television news broadcast and an online newspaper).

The survey featured and focused on the use and overuse of online social media (with no specific reference to selfie behavior or privacy concerns regarding social media). Respondents could enter the survey by clicking on an open-access web-link providing access to the survey. The first page provided the complete details of the study, that is, study objectives and process, ethical considerations, and anticipated outcomes. In order to participate, the respondents were required to confirm by actively entering “yes” (the other option was “no” which led to a page just thanking them for their interest). At the end of the survey, immediate feedback on scores was used to design engaging obtainer experiences, to which each participant was given informative content of general and specific interest. There were no other incentives for participation. Consent to participate was considered as “given” if a participant successfully completed the questionnaire. The responses obtained from the participants were stored in the database of the Internet survey company and were later passed over to our researchers. In conducting the study, we followed the Norwegian Health Research Act and the ethical guidelines of the Helsinki Declaration. According to the guidelines of the Norwegian Health Research Act, if the data collection is anonymous (voluntary and non-interventional) then approval from the Norwegian Social Science Data Service and the Regional Committee for Medical and Health Related Research Ethics is not required.

A total of 4,126 social media users ( $M_{\text{age}} = 30.45$ ,  $SD_{\text{age}} = 13.00$ , range 13–82 years) participated in the study. Out of the total valid sample, 3,763 ( $M_{\text{age}} = 27.79$ ,  $SD_{\text{age}} = 10.05$ ) social media users represented three groups: adolescents ( $M_{\text{age}} = 16.96$ ,  $SD_{\text{age}} = 1.74$ , range 13–19 years, 398 males and 570 females), young adults ( $M_{\text{age}} = 24.18$ ,  $SD_{\text{age}} = 3.07$ , range 20–30 years, 478 males and 994 females), and adults ( $M_{\text{age}} = 39.73$ ,  $SD_{\text{age}} = 5.66$ , range 31–50 years, 378 males and 945 females). This data-set was also used in another study for investigating the age and gender differences in selfie-related behavior (Dhir et al., 2016b).

### Study Measures

#### Selfie Behavior

Selfie behavior was assessed using five items. The first two addressed the frequency of selfie-taking: “How frequently do you take individual selfies” and “How frequently do you take group selfies.” Both of these items were taken from Sorokowski et al. (2015). The third item examined the frequency of selfie-posting: “How frequently do you post individual selfies on social media.” This item was taken from the prior selfie literature (Fox and

Rooney, 2015; Weiser, 2015). The last two items assessed photo-editing behavior and were adapted from Fox and Rooney (2015): “How frequently do you post photos on social media that are cropped in order to make you look better,” and “How frequently do you post photos on social media after using photographic filters to make you look better.” These items were evaluated using a 5-point response scale ranging from 1 (*never*) to 5 (*always*).

#### Social Media Privacy Concerns

Social media privacy concerns were evaluated using four items based on the work of Dinev and Hart (2006). The items were: “I am concerned that the information I share on social media could be misused,” “I am concerned that others can find private information about me on social media,” “I am concerned about providing personal information on social media, because of what others might do with it,” and “I am concerned about sharing personal information on social media, because it could be used in a way I did not foresee.” The four items are addressed using the following descriptive statements throughout the manuscript – “Fear of information misuse,” “others find private information,” “others might use my private information,” and “use of private information is unforeseen.” The social media privacy concerns were evaluated on a 5-point response scale ranging from 1 (*completely disagree*) to 5 (*completely agree*).

### Data Analysis

The statistical software Mplus was used for the data analysis. The data did not deviate strongly from a normal distribution across the three age groups because skewness and kurtosis were in the range of  $\pm 1$  (Byrne, 2001; George and Mallery, 2003). All Z-scores were below 3.29 (recommended threshold limit), hence the data were considered free from any potential outliers (Tabachnick and Fidell, 2007). Multigroup structural equation modeling (SEM) was performed in order to examine how privacy concerns influence different selfie behaviors across age and gender groups. It was postulated that the four items on privacy concerns reflected a common latent privacy concerns factor. According to the model, privacy concerns predicted the five dependent variables on selfie behaviors, namely individual selfie-taking, group selfie-taking, selfie-sharing frequency, photo-cropping, and use of photographic filters. The theoretical model of the study is presented in **Figure 1** (omitting error terms). In line with previous validation studies, the theoretical model was used as baseline model. To evaluate sources of model misspecification, modification indices (Sörbom, 1989) were computed. Strong modification indices would suggest a need for model revision. Prior SEM literature suggests that scholars should evaluate the goodness of model fit for the baseline model and revisions of the baseline model (Khazaal et al., 2011, 2012). This is important to address the possible discrepancy between the empirical data and the hypothetical model which tends to exist in most scenarios.

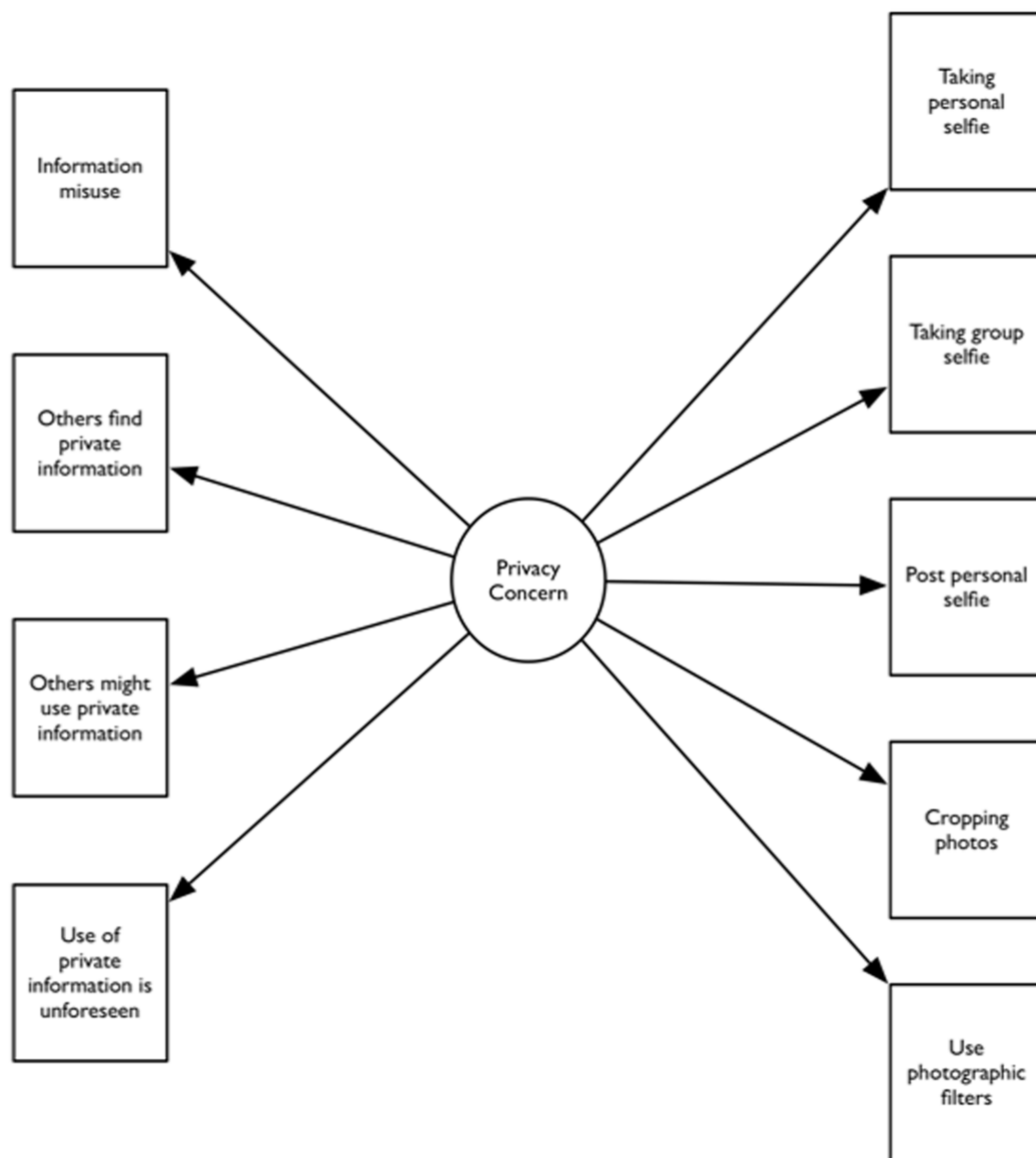


FIGURE 1 | Privacy concerns and selfie behavior model.

## RESULTS

**Table 1** presents the mean and standard deviation values for selfie behavior across age and gender groups.

The baseline structural equation model (**Figure 1**) resulted in a poor model fit where  $\chi^2 = 1585.71$ ,  $df = 132$ ,  $\chi^2/df = 12.01$ , comparative fit index ( $CFI$ ) = 0.92, Tucker–Lewis Index ( $TLI$ ) = 0.86, and root mean square error of approximation ( $RMSEA$ ) = 0.13. The recommended values for goodness of model fit are as follows:  $\chi^2/df < 3$ ,  $CFI \geq 0.92$ ,  $TLI \geq 0.92$ , and  $RMSEA < 0.08$  (Hu and Bentler, 1999; Byrne, 2001). The modification index between the error terms of the “fear of information misuse” and “others find private information” items was very high, suggesting a possible discrepancy between the

empirical data and the hypothetical model. The revised model, including correlated error terms of “fear of information misuse” and “others find private information,” revealed a good model fit where  $\chi^2 = 199.48$ ,  $df = 125$ ,  $\chi^2/df = 1.60$ ,  $CFI = 0.996$ ,  $TLI = 0.993$ , and  $RMSEA = 0.03$ . **Table 2** presents the standardized factor loadings for the “privacy concern” items in the revised measurement model.

**Figure 2** presents the estimated latent mean scores of privacy concerns across age and gender groups. Young-adult social media users had greater privacy concerns in comparison to the other two age groups, and the adult social media users had greater privacy concerns than the adolescent social media users. For the gender variable, the study results suggest that females have greater privacy

**TABLE 1 | Means (M) and Standard Deviations (SD) for selfie behavior.**

Selfie behavior	M(SD)					
	Male			Female		
	Adolescents	Young adults	Adults	Adolescents	Young adults	Adults
Taking personal selfies	2.46 (1.06)	2.33 (0.92)	2.05 (0.77)	3.09 (0.99)	2.82 (0.87)	2.36 (0.82)
Taking group selfies	2.26 (0.91)	2.11 (0.88)	1.83 (0.76)	3.08 (0.90)	2.58 (0.85)	2.22 (0.77)
Posting personal selfies	1.85 (0.89)	1.77 (0.84)	1.76 (0.76)	2.49 (0.90)	2.17 (0.83)	2.01 (0.75)
Cropping photos	1.74 (1.01)	1.82 (1.07)	1.68 (0.85)	2.48 (1.12)	2.29 (1.04)	1.96 (0.91)
Using photographic filters	2.13 (1.18)	2.03 (1.08)	1.56 (0.84)	3.08 (1.14)	2.70 (1.20)	1.79 (0.94)

**TABLE 2 | Standardized factor loadings for privacy concern in the constrained measurement model.**

Privacy concern	Standardized estimate					
	Male			Female		
	Adolescents	Young adults	Adults	Adolescents	Young adults	Adults
Fear of information misuse	0.71	0.76	0.75	0.67	0.67	0.70
Others find private information	0.79	0.81	0.82	0.75	0.72	0.76
Others might use my private information	0.88	0.93	0.91	0.91	0.90	0.89
Use of private information is unforeseen	0.83	0.89	0.88	0.87	0.88	0.87

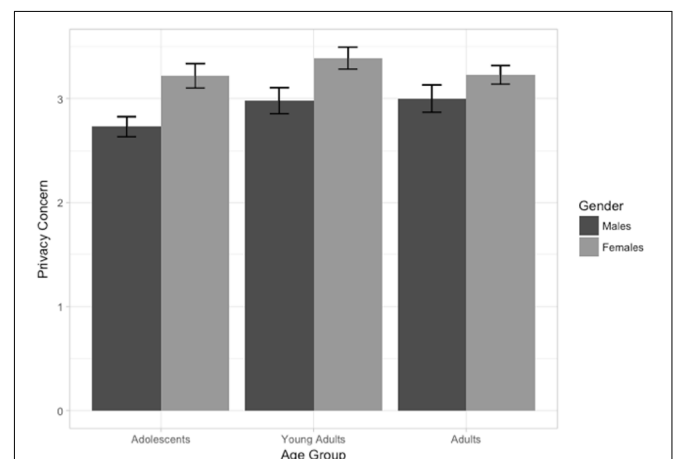
concerns than male social media users across all three age groups.

**Table 3** presents the regression weights for selfie behaviors as observed dependent variables regressed on latent privacy concern. The SEM results revealed that privacy concerns did not significantly predict selfie behaviors of the male adolescents and young adults. However, privacy concerns significantly predicted “taking group selfies” ( $p < 0.01$ ) and “remaining selfie behavior” ( $p < 0.05$ ) among male adult users. In comparison to this, privacy concerns significantly predicted taking personal selfies, cropping or editing photos, and use of photo-filters among the adolescent, young-adult and adult female social media users. However, privacy concerns significantly predicted posting personal selfies only among young-adult and adult females. Furthermore, privacy concerns significantly predicted taking group selfies only among adult female social media users (see **Table 3**).

## DISCUSSION

The present study investigated the role of online privacy concerns in influencing selfie behavior of social media users across gender and age groups, that is, adolescent, young-adult, and adult social media users. A large self-selected sample of online social media users based in Norway was recruited in order to investigate the three main research questions of the current study. The novelty of this work lies in the focus on two important yet less studied variables: age-gender differences in selfie behavior in the computer-mediated space. The present study further examined the complex, obscure, and rarely studied relationship between privacy concerns and online self-presentation (i.e., selfie behavior

in this study). Such investigation is timely as well as being much needed since it addresses the urgent demand to understand the differences in selfie behavior across gender and broader age groups [see the recent work by Sorokowski et al. (2015)]. Furthermore, the current study also addresses the long-standing demand of prior computer-mediated literature to examine social media behavior among culturally and geographically diverse groups of users (Dhir et al., 2015; Kaur et al., 2016b). The study results suggest that (a) young adults have greater privacy concerns compared to both adults and adolescents, (b) greater privacy concerns among females were not linked to lower engagement in selfie behavior, and (c) privacy concerns among male adolescents



**FIGURE 2 | Mean of Privacy concerns across age groups and gender.**  
Limits of error bars denote 95% confidence interval for the mean.



**TABLE 3 | Standardized regression weights from structural equation model of selfie behaviors regressed on privacy concerns.**

DV: Selfie behavior	Beta values for IV: Privacy concerns					
	Male			Female		
	Adolescents	Young adults	Adults	Adolescents	Young adults	Adults
Taking personal selfies	−0.06	−0.03	−0.11*	−0.11*	−0.13**	−0.09**
Taking group selfies	−0.10	−0.01	−0.16**	−0.06	−0.07	−0.15**
Posting personal selfies	−0.09	−0.01	−0.13*	−0.09	−0.09**	−0.16**
Cropping photos	−0.02	−0.04	−0.11*	−0.17**	−0.08*	−0.14**
Using photographic filters	−0.06	−0.02	−0.11*	−0.14**	−0.10**	−0.08*

\*  $p < 0.05$  and \*\*  $p < 0.01$ ; IV, independent variable; DV, dependent variable.

and young adults did not influence their selfie behavior. In addition to this, the study findings indicate that privacy concerns were more consistent and inversely related to the selfie behavior of female social media users than of their male counterparts.

The first research question (RQ1) investigated the differences in the perceptions of privacy concerns among adolescent, young-adult, and adult social media users. The results suggest that young-adult (20–30 years of age) social media users have greater privacy concerns compared to the other age groups, and that adult social media users are much more concerned about their privacy compared to adolescent users. Therefore, both hypotheses H1 and H2 were supported. These findings are consistent with the findings reported in the prior literature. For example, scholars have observed that young-adult social media users are more experienced in managing their online privacy (Madden and Smith, 2010; Young and Quan-Haase, 2013; Lang and Barton, 2015), and in utilizing privacy-preserving strategies (Strano and Wattai, 2010), as well as having a greater level of privacy concerns (Nosko et al., 2010) than older adults. Similarly, the prior literature also suggested that adolescent social media users possess lower online privacy concerns (Feng and Xie, 2014), self-disclose themselves online more often (Schouten et al., 2007), post content more frequently (Livingstone et al., 2010; Xie and Kang, 2015), and post more online content despite their privacy concerns (Madden et al., 2013; Feng and Xie, 2014) than young adults. These findings also suggest that “age differences in privacy concerns” are similar to age differences in the management of online privacy and related issues. Possible explanations for these findings include: First, adolescents do not possess sufficient understanding of “privacy concerns” (Christofides et al., 2012), and face technical problems in understanding and later in the translation of their privacy concerns into practice (Brandtzæg et al., 2010). Second, young adults have a better understanding of online privacy-related issues due to which they have greater “privacy concerns.”

The second research question (RQ2) examined the differences in the privacy concerns of male and female social media users. The study results suggest that female users have greater privacy concerns than male users across all three age groups. Therefore, hypotheses H3, H4, and H5 were supported. These findings are consistent with the prior literature, in that male young adults tend to self-disclose more and to have relatively lower privacy

concerns (Fogel and Nehmd, 2009; Moore and McElroy, 2012) compared to female young adults. Similarly, male adolescents are known to self-disclose more personal information online compared to their female counterparts (Xie and Kang, 2015). These findings suggest that: (1) female social media users have greater privacy concerns across all three age groups, and (2) The use of privacy management strategies has no influence on the degree of privacy concerns among male and female social media users. For example, the prior literature suggests that male young adults are less likely (Hoy and Milne, 2010; McLaughlin and Vitak, 2012; Tufekci, 2012), and male adolescents are more likely to engage in privacy-preserving strategies than their respective female counterparts (Dhir et al., 2016a).

The third research question (RQ3) investigated how privacy concerns across the three age groups (adolescents, young adults, and adults) and the two gender groups (male and female) influence selfie behavior (i.e., selfie-taking, sharing, and photo-editing).

The study results indicate that for male adolescents and male young adults, privacy concerns play an insignificant role in influencing selfie behavior. However, in the case of adult social media users, greater privacy concerns translate into lower engagement in selfie-taking and sharing frequency, and in photo-editing behavior. Therefore, H6 and H8 were supported but H7 was not supported. The study finding that privacy concerns among male adolescents and young adults do not influence their selfie behavior is consistent with the prior literature, which has also indicated that male social media users self-disclose much more and have relatively lower privacy concerns (Fogel and Nehmd, 2009; Moore and McElroy, 2012; Xie and Kang, 2015). The study findings also indicate that although male adults have relatively greater privacy concerns than adolescents and lower privacy concerns than young adults, the privacy concerns of adults tend to moderate their selfie behavior because their greater concerns lead to lower engagement in selfie behavior. These findings suggest that: (1) greater privacy concerns do not necessarily translate into lower or higher engagement in selfie-related behavior (i.e., online self-presentation), and (2) adult social media users were the least active of the three age groups in terms of selfie behavior, and had lower privacy concerns than young adults, but their privacy concerns still translated into lower engagement in selfie-related behavior.

In the case of female social media users, the results suggest that greater privacy concerns result in lower engagement in taking personal selfies, cropping photos (i.e., a privacy-preserving strategy) and use of photographic filters among all three age groups, including adolescent, young-adult, and adult female social media users. Therefore, H10 and H11 were supported, but H9 did not receive support from the results. This is consistent with the findings of the prior literature which indicated that female social media users are relatively active in terms of monitoring their privacy settings (Hoy and Milne, 2010), and engage in privacy-preserving strategies (Pempek et al., 2009; Strano and Wattai, 2010). However, the present study results extend this understanding because it indicates that privacy concerns moderate the selfie-related behavior (i.e., online self-presentation) of female social media users, where greater privacy concerns result in lower engagement in taking personal selfies, cropping/editing photos, and use of photo-enhancement filters.

In terms of group selfie-taking, the study results suggest that privacy concerns among female adolescent and young-adult social media users were a non-significant predictor, unlike the case of female adult users. A possible explanation for this could be that female adolescents and young-adult social media users actively engage in group selfie-taking as a means of showcasing as well as strengthening peer membership because it is part of their self-identity development, and is considered very important to them (see Senft and Baym, 2015). Due to their urge to engage in peer membership via group selfies, privacy concerns do not influence their group selfie behavior.

Regarding personal selfie posting behavior, the study results suggest that privacy concerns were statistically non-significant in the case of female adolescents, but were a statistically significant predictor in the case of female young-adult and adult social media users. One possible reason could be that adolescent females tend to post personal selfies as a means of experimenting with self-identity and self-presentation (Gibbs et al., 2014) due to which they are not bothered about their privacy concerns. Therefore, privacy concerns among female adolescents do not influence their personal selfie posting behavior.

Comparing the two gender groups across the three age groups, the results for the adolescent social media users suggest that privacy concerns did not influence group selfie taking or personal selfie posting behavior among either male or female users. This suggests that group selfie taking and personal selfie posting are part of the online self-presentation behavior that is considered very important for the well-being and development of adolescents (Dhir, 2016b). Due to their desire to self-present themselves in the computer-mediated space, privacy concerns do not influence their online self-presentation choices. In terms of taking personal selfies, cropping photos, and using photographic filters, the results suggest that privacy concerns were a significant predictor among female but not male adolescents. This suggests that privacy concerns among female adolescents are a significant predictor of privacy-preserving strategies (e.g., cropping of photos) and online self-presentation (i.e., taking personal selfies), which is consistent with the prior literature (see McLaughlin and Vitak, 2012; Tufekci, 2012).

In the case of young-adult social media users, privacy concerns did not predict group selfie-taking among either male or female young adults. As mentioned before, one possible reason could be that group selfies are associated with peer membership, which is important for young adults. Due to this reason, young adults are less bothered about privacy concerns when it comes to taking group selfies. In comparison, privacy concerns did not influence taking and posting selfies, cropping photos, or using photographic filters among male young adults, whereas they did for female young adults. This is again consistent with the findings of the prior literature, which suggests that females are more concerned about online privacy than male social media users (Pempek et al., 2009; Hoy and Milne, 2010).

Finally, in the case of adult social media users, the results suggest that privacy concerns resulted in lower engagement in selfie-taking and selfie-sharing frequency and in photo-editing behavior across both male and female users. The possible reasons could be that older adults are more concerned that selfie taking and posting will affect them negatively in the future (Katz and Crocker, 2015).

## Study Implications

The present study has different theoretical and practical implications for both scholars and practitioners. In terms of its theoretical implications, the current study findings contribute significantly to the interdisciplinary literature on human-computer interaction, new media, computer-mediated communication, as well as developmental psychology. Second, the present findings complement the available qualitative findings (e.g., Nelson, 2013; Nguyen, 2014; Warfield, 2014) on the age and gender differences in selfie behavior with quantitative results. Similarly, the study results also contribute to the sporadic literature on age and gender differences in the computer-mediated communication space. Third, the study findings provide new understandings of the social media use and selfie behavior of the lesser-studied cultural group of Norwegian social media users. Therefore, it contributes to broadening the limited literature on cross-cultural studies on social media use behavior. Fourth, this study has addressed the long-standing need to investigate the social media use behavior (including selfie behavior) of mixed age and gender groups because the prior literature focused on young-adult social media users only. Fifth, the study findings provide deeper insights into the age and gender differences in privacy concerns among social media users. Furthermore, the study results provide crucial insights into how privacy concerns influence online self-presentation choices, that is, selfie behavior in the present study. Sixth, the present study concludes with insightful findings on the influence of privacy concerns across gender (male and female) and age groups (adolescent, young adult, and adult) in predicting the selfie-related behavior of social media users. The practical implications of the current study include: New insights and knowledge for the various stakeholders such as social media and service companies, startups, online service and mobile application designers, developmental psychologists and researchers, and developers who are interested in capitalizing on the popularity of selfie behavior for business gains. Second, the study results can

help these different stakeholders to understand the importance of age and gender differences among social media users, which will enable them to tap age- and gender-specific user markets with ease. Consequently, the study findings will enable them to understand their existing as well as prospective customers. Third, the study findings may motivate scholars to investigate the age and gender differences in the important issues concerning the computer-mediated communication space, including user-generated content, online communities, and massive online sharing and tagging. Similar investigations will bring more clarity to and understanding of the obscure and complex age and gender differences existing in the computer-mediated space. Fourth, the present study findings could possibly offer innovative space and also initiate discussion for redefining the discourse on social, personal, legal and policy-making discussions regarding online self-presentation (consistent with Albury, 2015) and the relevant age and gender related differences in the use of computer-mediated platforms.

## Study Limitations and Future Work

The main limitation of the current study is the self-selected nature of the sample, which was recruited via two leading online news media. Due to this, it is likely that two user groups, namely young adults and adults, were over-represented. This is mainly because online newspapers are particularly popular among young adults and adult Internet users. However, the sample sizes across the three groups were comparable. Of note, the two news entities are nationwide rather than local news media, which increases the possibility of reaching out to a broad range of Norwegian people. Norwegians are also known for being heavy newsreaders, as well as having broad access to the Internet. Nevertheless, we still recommend that other scholars validate the study findings using more representative study samples. Any future investigation with similar research questions should also try to generalize the findings to other age groups, particularly adults older than 50 years. In addition to this, other possible future directions include expanding the study focus to other aspects of selfie behavior such as selfies classified as public, private, and romantic (coined by Sorokowski et al., 2015). Similarly, other aspects of selfie behavior related to online self-presentation should be investigated in future studies. One example is studies on how social media users attribute personality traits to other users based on photos and other displayed social network profile characteristics (Mazza et al., 2015), and also to which extent

the users' self-reported personality matches the attributed traits. We would also like to emphasize the dynamic nature of social media. Therefore, future investigations should investigate the longitudinal effect on the user patterns in selfie and social media behavior.

## CONCLUSION

Overall, the present study offers important insights into the relationship between privacy and self-presentation, including selfie behavior in the computer-mediated communication space. It further highlights the importance of studying age and gender differences in selfie behavior. In addition to this, the study complements and extends the available findings in the context of age and gender differences in computer-mediated environments, privacy concerns, and selfie behavior among adolescent, young-adult, and adult social media users.

## AUTHOR CONTRIBUTIONS

SP, CA, and AD led the conception and design of the study. CA led the data collection. AD led the literature search, analysis, interpretation of the data, drafting, writing, and revising the work. All authors contributed to the design (AD, CA, SP, and TT), analysis (AD, SP, and TT), interpretation of data (AD, CA, SP, and TT), and/or writing and revising the work critically for important intellectual content (AD, CA, SP, and TT). All authors read and approved the final version of the work to be published (AD, CA, SP, and TT), and agreed to be accountable for all aspects of the work in ensuring that questions to the accuracy of any part of the work are appropriately investigated and resolved (AD, CA, SP, and TT).

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## REFERENCES

- Albury, K. (2015). Selfies, sexts, and sneaky hats: young people's understandings of gendered practices of self-representation. *Int. J. Commun.* 9, 1734–1745.
- Anderson, E. (1999). *Code of the Street: Decency, Violence, and the Moral Life of the Inner City*. New York, NY: W. W. Norton & Company.
- Andreassen, C. S., Pallesen, S., and Griffiths, M. D. (2016). The relationship between addictive use of social media, narcissism, and self-esteem: findings from a large national survey. *Addict. Behav.* 64, 287–293. doi: 10.1016/j.addbeh.2016.03.006
- Barnes, S. B. (2006). A privacy paradox: social networking in the United States. *First Monday* 11,
- Boyd, D. (2008). *Taken Out of context: American Teen Sociality in Networked Publics*. Ph.D. dissertation, University of California-Berkeley, Berkeley, CA.
- Brandtzaeg, P., Lüders, M., and Skjetne, J. (2010). Too many facebook friends? Content sharing and sociability versus the need for privacy in social network sites. *Int. J. Hum. Comput. Interact.* 26, 1006–1030. doi: 10.1080/10447318.2010.516719
- Burns, A. (2014). *A Handy Summary of What We Know So Far*. Available at: <https://thecarceralnet.wordpress.com/2014/07/11/a-handy-summary-of-what-we-know-so-far>
- Byrne, M. B. (2001). *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming*. New York, NY: Routledge.

- Cao, Y., and Halloran, K. O. (2014). Learning human photo shooting patterns from large-scale. Community Photo Collections. *Multimed. Tools Appl.* 74, 1–21.
- Christofides, E., Muise, A., and Desmarais, S. (2012). Hey mom, what's on your Facebook? Comparing Facebook disclosure and privacy in adolescents and adults. *Soc. Psychol. Pers. Sci.* 31, 48–54. doi: 10.1177/1948550611408619
- Dhir, A. (2016a). *Exploring Online Self-Presentation in Computer-Mediated Environments: E Motives and Reasons for Photo-Tagging and Untagging*. Doctoral Dissertation. Aalto University, Finland.
- Dhir, A. (2016b). Why do young people avoid photo tagging? A new service avoidance scale. *Soc. Sci. Comput. Rev.* doi: 10.1177/0894439316653636
- Dhir, A., Chen, G. M., and Chen, S. (2015). Why do we tag photographs on facebook? Proposing a new gratifications scale. *New Media Soc.* 19, 1–18.
- Dhir, A., Kaur, P., Lonka, K., and Nieminen, M. (2016a). Why do adolescents untag photos on facebook? *Comput. Hum. Behav.* 55, 1106–1115. doi: 10.1016/j.chb.2015.11.017
- Dhir, A., Kaur, P., Lonka, K., and Tsai, C. C. (2017a). Do psychosocial attributes of well-being drive intensive Facebook use? *Comput. Hum. Behav.* 68, 520–527. doi: 10.1016/j.chb.2016.11.023
- Dhir, A., Khalil, A., Lonka, K., and Tsai, C. C. (2017b). Do educational affordances and gratifications drive intensive Facebook use among adolescents? *Comput. Hum. Behav.* 68, 40–50. doi: 10.1016/j.chb.2016.11.014
- Dhir, A., Pallesen, S., Torsheim, T., and Andreassen, C. S. (2016b). Do age and gender differences exist in selfie-related behaviours? *Comput. Hum. Behav.* 63, 549–555. doi: 10.1016/j.chb.2016.05.053
- Dhir, A., and Torsheim, T. (2016). Age and gender differences in photo tagging gratifications. *Comput. Hum. Behav.* 63, 630–638. doi: 10.1016/j.chb.2016.05.044
- Dhir, A., and Tsai, C. C. (2017). Understanding the relationship between intensity and gratifications of Facebook use among adolescents and young adults. *Telemat. Informat.* 34, 350–364. doi: 10.1016/j.tele.2016.08.017
- Dinev, T., and Hart, T. (2006). An extended privacy calculus model for e-commerce transactions. *Inform. Syst. Res.* 17, 61–80. doi: 10.1287/isre.1060.0080
- Facebook Newsroom (2015). *Company Information*. Available at: <http://newsroom.fb.com/company-info> [accessed March 11, 2016].
- Feng, Y., and Xie, W. (2014). Teens' concern for privacy when using social networking sites: an analysis of socialization agents and relationships with privacy protecting behaviors. *Comput. Hum. Behav.* 33, 153–162. doi: 10.1016/j.chb.2014.01.009
- Fogel, J., and Nehmd, E. (2009). Internet social network communities: risk taking, trust, and privacy concerns. *Comput. Hum. Behav.* 26, 1120–1127. doi: 10.1016/j.chb.2008.08.006
- Forest, A. L., and Wood, J. V. (2012). When social networking is not working individuals with low self-esteem recognize but do not reap the benefits of self-disclosure on facebook. *Psychol. Sci.* 23, 295–302. doi: 10.1177/0956797611429709
- Fox, J., and Rooney, M. C. (2015). The Dark Triad and trait self-objectification as predictors of men's use and self-presentation behaviors on social networking sites. *Pers. Ind. Dif.* 76, 161–165. doi: 10.1016/j.paid.2014.12.017
- George, D., and Mallery, P. (2003). *SPSS for Windows Step by Step: A Simple Guide and Reference. 11.0 Update*, 4th Edn. Boston, MA: Allyn & Bacon.
- Gibbs, M., Carter, M., Nansen, B., and Kohn, T. (2014). Selfies at funerals: remediating rituals of mourning. *Sel. Papers Int. Res.*
- Goffman, E. (1959). *The Presentation of Self in Everyday Life*. New York, NY: Doubleday.
- Haferkamp, N., and Krämer, N. C. (2010). Social comparison 2.0: Examining the effects of online profiles on social-networking sites. *Cyber Psychol. Behav. Soc. Network.* 14, 309–314. doi: 10.1089/cyber.2010.0120
- Hayes, M., van Stolk, K., and Muench, F. (2015). Understanding Facebook use and the psychological affects of use across generations. *Comput. Hum. Behav.* 49, 507–511. doi: 10.1016/j.chb.2015.03.040
- Hoy, M. G., and Milne, G. (2010). Gender differences in privacy-related measures for young adult Facebook users. *J. Interact. Adv.* 10, 28–45. doi: 10.1080/15252019.2010.10722168
- Hu, L. T., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model.* 6, 1–55. doi: 10.1080/10705519909540118
- Katz, J. E., and Crocker, E. T. (2015). Selfies and photo messaging as visual conversation: reports from the United States, United Kingdom, and China. *Int. J. Commun.* 9, 1861–1872.
- Kaur, P., Dhir, A., Chen, S., and Rajala, R. (2016a). Understanding online regret experience using the theoretical lens of flow experience. *Comput. Hum. Behav.* 57, 230–239. doi: 10.1016/j.chb.2015.12.041
- Kaur, P., Dhir, A., Chen, S., and Rajala, R. (2016b). Flow in context: development and validation of the flow experience instrument for social networking. *Comput. Hum. Behav.* 59, 358–367. doi: 10.1016/j.chb.2016.02.039
- Khazaal, Y., Chatton, A., Atwi, K., Zullino, D., Khan, R., and Billieux, J. (2011). Arabic validation of the compulsive internet use scale (CIUS). *Subst. Abuse Treat. Prev. Policy* 6:32. doi: 10.1186/1747-597X-6-32
- Khazaal, Y., Chatton, A., Horn, A., Achab, S., Thorens, G., Zullino, D., et al. (2012). French validation of the compulsive internet use scale (CIUS). *Psych. Q.* 83, 397–405. doi: 10.1007/s11126-012-9210-x
- Kiprin, B. (2013). *Go Selfie Yourself*. Available at: <http://borislavkiprin.com/2013/12/13/go-selfieyourself/>
- Lang, C., and Barton, H. (2015). Just untag it: exploring the management of undesirable Facebook photos. *Comput. Hum. Behav.* 43, 147–155. doi: 10.1016/j.chb.2014.10.051
- Leary, M. R. (1995). *Self-Presentation: Impression Management and Interpersonal Behavior*. Madison, WI: Brown & Benchmark.
- Leary, M. R., and Kowalski, R. M. (1990). Impression management: a literature review and two-component model. *Psychol. Bull.* 107, 34–47. doi: 10.1037/0033-2909.107.1.34
- Livingstone, S. (2008). Taking risky opportunities in youthful content creation: teenagers' use of social networking sites for intimacy, privacy and self-expression. *New Media Soc.* 10, 393–411. doi: 10.1177/1461444808089415
- Livingstone, S., Haddon, L., Görzig, A., and Ólafsson, K. (2010). Risks and safety for children on the Internet: the UK report. *Politics* 6:1.
- Madden, M., Lenhart, A., Duggan, M., Cortesi, S., and Gasser, U. (2013). *Teens and Technology 2013*. Washington, DC: Pew Internet & American Life Project.
- Madden, M., and Smith, A. (2010). *Reputation Management and Social Media*. Washington, DC: Pew Internet & American Life Project. Available at: <http://www.pewinternet.org/2010/05/26/reputation-management-and-social-media> [accessed February 22, 2016].
- Mazza, F., da Silva, M. P., Le Callet, P., and Heynderickx, I. (2015). What do you think of my picture? Investigating factors of influence in profile images context perception. *Hum. Vision Electron. Imag.* 20:93940D.
- McLaughlin, C., and Vitak, J. (2012). Norm evolution and violation on facebook. *New Media Soc.* 14, 299–315. doi: 10.1177/1461444811412712
- Moore, K., and McElroy, J. C. (2012). The influence of personality on facebook usage, wall postings and regret. *Comput. Hum. Behav.* 28, 267–274. doi: 10.1016/j.chb.2011.09.009
- Nelson, O. (2013). Dark undercurrents of teenage girls' selfies. Available at: <http://www.theage.com.au/comment/dark-undercurrents-of-teenage-girls-selfies-20130710-2pqbl.html#ixzz2h9I59rtY>
- Nguyen, A. J. (2014). *Exploring The Selfie Phenomenon: The Idea of Self-Presentation and Its Implications Among Young Women*. Master thesis. Smith College School for Social Work, Northampton. Available at: <https://dspace.smith.edu/bitstream/handle/11020/24476/NguyenAFinal.pdf>
- Nosko, A., Wood, E., and Molema, S. (2010). All about me: disclosure in online social networking profiles: the case of Facebook. *Comput. Hum. Behav.* 26, 406–418. doi: 10.1016/j.chb.2009.11.012
- Pempek, T. A., Yermolayeva, Y. A., and Calvert, S. L. (2009). College students' social networking experiences on facebook. *J. Appl. Dev. Psychol.* 30, 227–238. doi: 10.1016/j.appdev.2008.12.010
- Poe, J. (2015). "The link between "likes" and self-worth: how women use selfies on Instagram for self-presentation and the effects of social comparison," in *Proceedings of the 14th annual celebration for undergraduate research and creative performance*, Holland, 24.
- Qiu, L., Lu, J., Yang, S., Qu, W., and Zhu, T. (2015). What does your selfie say about you? *Comput. Hum. Behav.* 52, 443–449. doi: 10.1016/j.chb.2015.06.032
- Rudman, L. A., and Glick, P. (2001). Prescriptive gender stereotypes and backlash toward agentic women. *J. Soc. Issues* 57, 743–762. doi: 10.1111/0022-4537.00239
- Schouten, A. P., Valkenburg, P. M., and Peter, J. (2007). Precursors and underlying processes of adolescents' online self-disclosure: developing and testing an



- "Internet-attribute-perception" model. *Media Psychol.* 10, 292–314. doi: 10.1080/15213260701375686
- Senft, T. M., and Baym, N. K. (2015). What does the selfie say? investigating a global phenomenon. *Int. J. Commun.* 9, 1588–1606.
- Sörbom, D. (1989). Model modification. *Psychometrika* 54, 371–384. doi: 10.1007/BF02294623
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviors are associated with narcissism among men. *Pers. Ind. Dif.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004
- Strano, M. M., and Wattai, J. (2010). "Covering your face on facebook: managing identity through untagging and deletion," in *Proceedings of the 7th International Conference on Cultural Attitudes Towards Technology and Communication*, Perth, WA: Murdoch University, 288–299.
- Stutzman, F., and Kramer-Duffield, J. (2010). "Friends only: examining a privacy enhancing behavior in Facebook," in *Proceedings of the 28th international conference on human factors in computing systems*, Atlanta, GA: ACM, 1553–1562.
- Svelander, A., and Wiberg, M. (2015). The practice of selfies. *Interactions* 22, 34–38. doi: 10.1145/2770886
- Tabachnick, B. G., and Fidell, L. S. (2007). *Using Multivariate Statistics*. New York, NY: Pearson.
- Tufekci, Z. (2012). "Facebook, youth and privacy in networked publics," in *ICWSM 2012—Proceedings of Sixth International AAAI Conference on Weblogs and Social Media*, Dublin, 338–345.
- van Dijck, J. (2008). Digital photography: communication, identity, memory. *Vis. Commun.* 7, 57–76. doi: 10.1177/1470357207084865
- Wang, Y., Komanduri, S., Leon, P., Norcie, G., Acquisti, A., and Cranor, L. (2011). "I regretted the minute I pressed share: a qualitative study of regrets on Facebook," in *Proceedings of the 7th Symposium on Usable Privacy and Security*, Pittsburgh, PA, 1–16.
- Warfield, K. (2014). *Making Selfies/Making Self: Digital Subjectivities in the Selfie*. Berlin: Image Conference.
- Weiser, E. B. (2015). #Me: narcissism and its facets as predictors of selfie-posting frequency. *Pers. Ind. Dif.* 86, 477–481. doi: 10.1016/j.paid.2015.07.007
- Williams, A. A., and Marquez, B. A. (2015). The lonely selfie king: selfies and the conspicuous presumption of gender and race. *Int. J. Commun.* 9, 1775–1787.
- Xie, W., and Kang, C. (2015). See you, see me: teenagers' self-disclosure and regret of posting on social network site. *Comput. Hum. Behav.* 52, 398–407. doi: 10.1016/j.chb.2015.05.059
- Young, A. L., and Quan-Haase, A. (2013). Privacy protection strategies on Facebook. *Inform. Commun. Soc.* 16, 479–500. doi: 10.1016/j.jadohealth.2014.03.005

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# What Is Seen Is Who You Are: Are Cues in Selfie Pictures Related to Personality Characteristics?

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Developments and innovation in the areas of mobile information technology, digital media and social networks foster new reflections on computer-mediated communication research, especially in the field of self-presentation. In this context, the selfie as a self-portrait photo is interesting, because as a meaningful gesture, it actively and directly relates the content of the photo to the author of the picture. From the perspective of the selfie as an image and the impression it forms, in the first part of the research we explored the distinctive characteristics of selfie pictures; moreover, from the perspective of the potential reflection of a selfie image on the personality of its author, in the second part we related the characteristics of selfie pictures to various personality constructs (e.g., Big Five personality traits narcissism and femininity-masculinity). Important aspects of selfies especially in relation to gender include the tilt of the head, the side of the face exhibited, mood and head position, later related also to the context of the selfie picture. We found no significant relations between selfie cues and personality constructs. The face-ism index was related to entitlement, and selfie availability to neuroticism.

**Keywords:** selfie, self-presentation, social media, selfie coding, personality assessment

## INTRODUCTION

Developments in mobile information technology, digital photography and social networks have stimulated the formulation of new research agendas in the field of human computer interaction, computer mediated communication and cyber-psychology. In particular, self-presentation as an aspect of behavior facet has considerable potential to interact with new communication technologies. In the context of self-presentation, the medium of photography, and in particular the self-portrait as a subtype of photography, is particularly interesting. The popularity of this kind of photography has resulted in a new word: “selfie.” This became the word of the year in 2013 (Oxford Dictionaries, 2013).

Some researchers link the popularity of the selfie to the global proliferation of mobile phones containing a camera and their integration with social networks (SNS) (Gunthert, 2014; Senft and Baym, 2015). However, the technology itself does not determine behavior; therefore, we should understand selfies as more than merely technological artifacts. Instead, selfies could be understood as a means of communication, as symbolic gestures with their own purpose (Senft and Baym, 2015). The technical understanding of a photograph as a mechanical imprint of physical reality should be replaced by its cultural form, taking into account a variety of purposes and meanings (Lister, 1995).

At the same time, smart phones that have cameras and are linked to SNS represent an important context which separates the selfie from other forms of self-portraits (Tifentale and Manovich, 2015) and makes it interesting as a research topic.

## Personality, Social Networks, and Selfie

Personality is a major predictor of human behavior in online environments (Błachnio et al., 2013; Orchard et al., 2014). Studies show significant links between the Big Five personality traits (McCrae and John, 1992) and several dimensions of SNS usage, like motivation (Orchard et al., 2014), self-monitoring (Hall and Pennington, 2013), impression management (Leary and Hoyle, 2009; Rosenberg and Egbert, 2011; Wang, 2013), communication patterns (Balmaceda et al., 2014) and social media language (Park et al., 2015). Online behavior could also be linked to personality traits known as the Dark triad—narcissism, Machiavellianism and psychopathy—and a tendency to self-objectification (Amichai-Hamburger et al., 2002; Fox and Rooney, 2015). Additionally, psychological traits could be linked to the posting of photography on the Internet (Eftekhar et al., 2014) and selfie posting behavior (Qiu et al., 2015; Weiser, 2015; Sorokowska et al., 2016).

When the selfie initially appeared on social networks, it was intuitively considered, especially in popular media, as a sign of pathology (e.g., narcissism) in SNS users. However, research does not support this intuition, and selfie posting behavior shows weak links to some specific facets of narcissism in combination with sex (Fox and Rooney, 2015; Sorokowski et al., 2015; Weiser, 2015; Barry et al., 2017). Selfie posting is recognized as normative behavior practiced by the majority of SNS users (Barry et al., 2017). At the same time, the frequency of selfies online is relatively low in comparison to the quantity of other photographs (Tifentale and Manovich, 2015).

The research summarized above mostly targets the expression and recognition of personality traits from online behavior, based on data mining techniques and on a huge amount of information. These studies count various items available online, trying to reconstruct the digital footprint of the users. Examples of such items include the number of social network posts, the number of images posted or comments received, the number of “friends” and likes received, the frequency of profile image updates, etc. Recognition of personality traits from this complex digital footprint (Hall and Pennington, 2013) or from image posting behavior (Eftekhar et al., 2014; Sorokowski et al., 2015; Sorokowska et al., 2016) proved to be possible and very accurate. Some authors claim that it could be even more accurate than reporting by close relatives or even self-reporting (Youyou et al., 2015). On the other hand, these approaches require a large amount of data from user profiles. It can also be noted that quantitative research usually omits the content of any available messages or images. A similar deficiency has also been recognized by Shelton and Skalski (2014) with regard to Facebook research in general. The studies by Eager and Dann (2016) and Qiu et al. (2015), which focus on selfie content analysis related to the self-presentation process or personality traits, are exceptions in this regard.

## Picture: Analysis of the Selfie as Photography

Although the selfie is linked to the context of mobile devices and social networks by definition, in its basic form it remains photography. Therefore, it makes sense to consider the selfie as a photographic genre and interpret it via concepts of photographic theory, like index, composition and reflexivity (Frosh, 2015).

However, it should be noted that the selfie is not primarily an art form. In some rare cases it is indeed used as a tool for artistic expression, but in general it is a casual snapshot. The snapshot represents the most widespread type of photograph. It has not only esthetic value but also a specific social purpose (Batchen, 2008). Therefore, a selfie is a gestural image with a direct communicative purpose. It is an index showing the activity of its author, and its meaning could be interpreted as “see me showing you me” (Frosh, 2015, p. 1610).

From the above, the selfie’s potential for recognition of the personality characteristics of its author could be anticipated. Frosh (2015) additionally explains this potential through identification of the selfie as a photographic genre of personal reflexivity, where attention is focused on the context and self-presence of the author. The spatial distribution of particular elements in the image, the composition, is influenced by the technology as well as by body limitations and sensorimotor coordination skills (Frosh, 2015). For this reason, the selfie could be seen as distinct in comparison to other forms of self-portraiture. The selfie is an expressive gesture by its author. Because it is not considered as an artistic expression, we should interpret its content and composition through the function it serves. The way the message is forwarded and the content of the message in selfies are both linked to the author present in the image. Therefore, we assume that a selfie, as a meaningful picture, can potentially reveal some personality aspects of its author.

## Reflection: Personality Projection in the Self-Portrait

Personality related cues can be retrieved from a person’s photographs, objects and behavior and provide a solid basis for personality judgments by unfamiliar others (overview in Qiu et al., 2015). In this regard, the process of personality assessment is similar to the basic logic of projective techniques. Those techniques are based on observation and interpretation of a person’s responses to stimulation of the imaginative processes (Murray, 1938).

From this perspective, a selfie could be compared to constructive tests in the scope of projective techniques. In constructive tests, the respondent creates some previously non-existent object in response to a few very broad directions (Bornstein, 2007). A selfie is a construction used by an author to explore and share his/her own identity. This is similar to a respondent in a Draw-a-Person (DAP) test (Machover, 1951), who constructs a drawing that represents the author himself (Craddick, 1963). In projective drawing, psychomotor activity is captured on paper (Hammer, 1968), and in the case of a selfie, the same is captured in a snapshot. The content of the output is

determined by conscious and unconscious perceptions of the self and the environment (Hammer, 1968).

One stimulus that initiates construction of the selfie is one's intention to present oneself before some audience. Hence, the author of the selfie intentionally expresses him or herself in such a way as to achieve a certain impression. However, besides the intentionally given expression, the same act also "gives off" an expression that is unintentionally revealed (Goffman, 1959). In the interaction at hand, such expressions play an important role in impression management and contribute to our understanding of the messages received. Behind this interplay of expressions, we assume that personality traits will provide a structure for what is projected.

## The Present Studies

Based on the previous research, the phenomenon of the selfie can be explored meaningfully from three perspectives: the selfie as picture, the selfie as reflection and the selfie as impression. From the first perspective, the selfie can be analyzed in the context of (self-portrait) photography, with the main focus on the visual elements or cues in the picture, their position and relations; from the second perspective, distinct cues in the selfie picture can be related to the personality characteristics of the author of the picture; and from the last perspective, the selfie is interpreted in the context of the impression formation created in others by the selfie picture.

In this context, we invited students to participate in a series of psychological studies exploring personality concepts, self-presentation and information technology use and focused our investigation on the first two perspectives of selfie exploration.

In the first part of the investigation (Study 1), the concept of the selfie was defined to students, and they were asked to each submit a freely chosen selfie with information about its availability to others (from private to completely available). With this strategy, we allowed students to reflect before deciding which selfie they should send; thus, we potentially fostered a more active relation between the author of the selfie and the product (the selfie picture).

The research focus of Study 1 was on the first perspective—i.e., the selfie as picture, aimed at answering the question of whether it is possible to analyze selfies systematically to build a valid and reliable coding scheme. According to the resulting coding categories, we further analyzed selfies in relation to gender and degree of availability to others.

After a delay (8–12 weeks), the same groups of students were asked to participate in the second part of the investigation (Study 2). They were asked to complete the survey battery, comprising a range of personality concepts and concepts related to information technology use. The special focus of Study 2 is thus exploration of potential relations between the coding of the selfies (according to the coding scheme from Study 1) and selected personality concepts (see Measures in Study 2) and indicators of information technology use.

Our approach to analysing selfies was similar to those used in previous research (e.g., Qiu et al., 2015; Eager and Dann, 2016). In line with Qiu et al. (2015), we used a more elaborate coding scheme and more personality constructs. We focused more on

the visual cues of selfie pictures (i.e., what is shown) and on the relations of these cues to the personality characteristics of their authors and not on the impression created by the selfie, as was the case in a study by Eager and Dann (2016), which focused on what is seen and the story behind it.

Next, our research deliberately refrained from discussing the validity of projective techniques, which have been extensively criticized, especially in the US, while still attracting scholarly interest and value in clinical settings (Piotrowski, 2015a,b). This study aims to check personality projection into a selfie by using established psychological instruments.

Based on the literature review and the relative lack of comparative studies, we formulated some initial hypotheses:

In the context of Study 1, we expected that, according to the study of Qiu et al. (2015):

*H1: Selfie pictures could be objectively and reliably decomposed into distinct visual cues and that a subsequent coding scheme could be elaborated.*

In the context of the selfie as photography and, according to Tifféret and Vilnai-Yavetz (2014), we presupposed:

*H2: More women would have selfies exhibiting eye contact and positive mood,*

*H3: Men would have more selfies made in the public sphere.*

Studies by Bruno et al. (see Bruno and Bertamini, 2013; Bruno et al., 2015) showed that there exists an unconscious, culture-independent preference for displaying one's left cheek. This results in a left-cheek bias in the case of standard selfies, whereas mirror-style selfies have right-cheek bias. According to Bruno, this effect originates from lateral asymmetries in processing faces. We further presupposed that, in the majority of standard-style selfies:

*H4: The left side of the face in standard-style selfies would be emphasized.*

In accordance with Döring et al. (2016), we expected:

*H5: Women in selfies would more often tilt their heads or bodies.*

Initial studies of face-ism (e.g., Archer et al., 1983; Szillis and Stahlberg, 2007) indicated that women would have pictures with a smaller proportion of the face to the total picture. However, contrary to the above-mentioned assumption of the sexual objectification of women, selfies as self-portraits are also a potential means for women's emancipation (e.g., Warfield, 2014) and consequently we expected:

*H6: There would be no gender differences in selfies regarding face-ism.*

Relating characteristics of selfie pictures to psychological concepts and concept of NPI (Narcissistic Personality Inventory), in accordance with Giessner et al. (2011), we expected:



*H7: Selfies with lower camera position would be related to higher scores on the authority factor.*

A similar trend can be expected for the concept of masculinity or, in the opposite direction, for femininity:

*H8: Selfies with lower camera position are related to higher scores on masculinity and lower scores on femininity.*

Finally, all assumptions about camera position can be attributed to the head position in the selfie pictures:

*H9: Selfies with the head in the upper regions of the pictures are related to higher scores on authority and masculinity and lower scores on femininity.*

## STUDY 1

### Method

#### Participants

Initially, 234 students were invited to participate in the investigation. They were recruited from a range of fields of study [psychology (30.3%), sociology (14.5%), pedagogy (14.6%), architecture (19.7%) and civil engineering (20.9%)] from the public university in Slovenia (University of Maribor). There were 73.5% females, and the mean age for the total sample was 20.34 years ( $SD = 1.43$ ).

One hundred and sixty-five students from the initial groups of students sent selfies and thus actively participated in the study (70.5% response rate from the initial group). There were 76.4% females, and the mean age in the sample was 20.30 years ( $SD = 1.4$ ). The participants received no financial compensation for their involvement in the study.

#### Procedure

The researcher explained the concept of the selfie to the target groups of students, and they were invited to participate in the study by submitting one freely chosen selfie picture. With this strategy, students were allowed to reflect before choosing which selfie they should send; thus, we potentially fostered a more active relation between the author of the selfie and the product (the selfie picture). Participants were also asked to provide information about the availability of the selfie, i.e., who could have access to the selfie, and received an individual code to provide for anonymity of the participants in later data processing phases. Selfie availability was later divided into two groups: an intimate circle (people close to the author) and a social network (available to everyone using SNS). Independent raters coded each selfie picture according to the coding scheme developed during the study (detailed description in the next section). Ethical review and approval was not required for this study in accordance with the national and institutional guidelines.

We tested H1 with measures of interrater reliability, Fleiss' kappas, and we used Chi square statistics for analysing H2, H3, H4, and H5. We ran each analysis separately. We tested H6 using the *t*-test. For analysing context and head position, we used the Mann-Whitney test.

### Coding

The coding of the selfies followed the general principles of grounded theory (Glaser and Strauss, 1967). In the initial brainstorming phase, the researchers composed a set of categories for coding the selfies. In the second phase, three raters individually coded a small set of selfies (testing sample) and discussed each coded selfie collectively. The result of this phase was the elaborated scheme for coding the selfies.

In the subsequent phase, three independent raters individually coded all selfies received. In the process of coding, any potential new category for coding was discussed collectively and, with the consent of raters, added to the coding scheme and to the re-coding of already coded selfies. In the next phase, data from all raters were collected, inter-rater reliabilities were calculated (Fleiss' kappas) and selfies with less than 2/3 agreement were collectively discussed to achieve consensus among the raters. The coding scheme from this phase includes the following categories:

#### Background brightness

We used dichotomous coding (1-light; 2-dark) to determine the brightness of each photo.

#### Context

We identified seven codes for the different contexts in which participants took their selfies. Codes were 1 (room), 2 (free time), 3 (outside), 4 (car), 5 (recreation—sportslike activities), 6 (bathroom), and 7 (public transportation). Some selfies could be placed under more than one code, on account of featuring multiple contexts. In these cases, we picked the category that stood out the most and that had been chosen by the majority of the raters. Subsequently, we merged the seven categories into two: 1 (inside) and 2 (outside).

#### Tilt of the body

We coded the position of the body with the help of diagonals. Left diagonal (LD) reached from the upper left corner of the photo to the right bottom corner. Right diagonal (RD) reached from the upper right corner to the left bottom corner of the photo. We coded as follows: Center (C), body not inclined to either side; LD, body leaning in accordance with the left diagonal; RD, body leaning in accordance with the right diagonal.

#### Tilt of the head

As with the previous category, we coded the position of the head but we didn't use diagonals. If the head was not inclined, we coded as center (C). If the head was tilted to the left so that the left ear was approaching the left shoulder, we coded as a left tilt (L); the same criterion went for a right tilt (R). If the head was bent forward and the chin directed toward the chest, we coded forward (F), and if the head was tilted back, we coded back (B). Rotation of the head either to the left or right side was coded as "C" only if the head wasn't tilted. If the head was tilted, we coded as described here.

#### Part of the face

We coded the side of the face (L or R) which was in the spotlight and more visible to the viewer. If neither side was prevalent, we coded center (C).

### Eye contact

If the gaze was directed to the person looking at the photo, we coded this as eye contact. Additionally, we coded if the person wore glasses, sun glasses, ski goggles or something else. For further analysis, we used dichotomous coding: 1 (eye contact) and 2 (no eye contact).

### Frame of the picture

We coded the orientation of picture frame. These codes were horizontal, vertical and square.

### Head position

We divided the photo with horizontal and vertical line and then determined the position of the head. These codes are as follows: Left up and down (LU and LD); right up and down (RU and RD), center up, down, and center (CU, CD, and C) and center left and right (CL and CR).

### Mood

We coded three different expressions: positive, negative and neutral. By positive expression, we mean a smile or expressions resembling a smile (a positive mood). The category negative was assigned to expressions expressive of sadness, disgust etc. The neutral category included all other expressions that weren't explicitly positive or negative, a "serious face."

### Social distance

According to Hall and Pennington (2013; see also Kress and van Leeuwen, 2006), we coded six social distances. At intimate distance (INT) we see the face or head only. At close personal (CP) distance, we see the head and shoulders. At far personal distance (FP), we see the person from the waist up; at a close social distance (CSD), we see the whole figure. At far social distance (FSD), we see the whole figure with the space around it, and at public distance (PD), we can see the torsos of at least four or five people.

### Camera position

This represents the camera position from which the selfie is taken. The codes are as follows: Right side up, center and down (RU, RC, and RD); left side up, center and down (LU, LC, and LD) and central (front) position up, center and down (FU, FC, and FD).

### Face-ism

From the concept of face-ism (Archer et al., 1983), a ratio was calculated of (a) the distance from the top of the head to the lowest point of the chin, and (b) the distance from the top of the head to the lowest visible part of the body in the photo. When the body axis of the person depicted in the photo was tilted, prior to measurement the photo was rotated. The face-ism index was measured with Fiji software (Schindelin et al., 2012).

### Other

This category reflects observations of the particularities of the selfies that could not be classified by any of the previously mentioned coding categories [e.g., specific expression, pose, touching hair; number of other persons in group selfies (groupies)]. Special cases involved effects that participants used

to alter the selfie or their self-presentation (e.g., black/white, color filter).

In a subsequent phase, coding categories with low interrater reliability (*Tilt of the body*, *Tilt of the head*, *Head position*, and *Camera position*) were coded once again by two independent raters in the image processing package Fiji, with horizontal, vertical and diagonal lines indicated on the selfie pictures. Cohen's kappas for two raters were calculated. An example of a selfie picture is shown in **Figure 1**.

## Results and Discussion

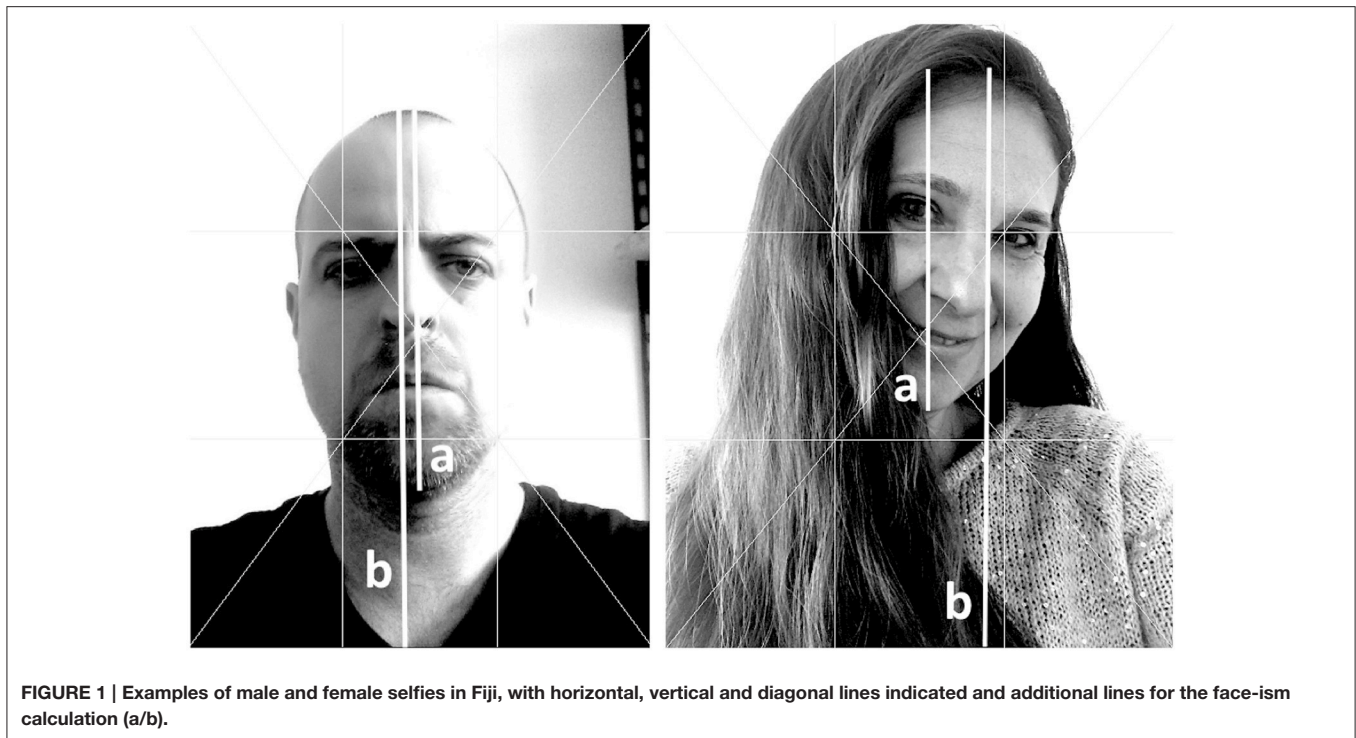
**Table 1** shows the results of the selfie coding, i.e., main categories with frequencies and percentages for each sub-category of the coding scheme, with the most frequent sub-categories in bold. For each category of coding the result of interrater reliability (Fleiss' kappa) is in the last column.

According to the modal values of sub-categories, the modal selfie from our sample is in a vertical frame, with a light background, taken in an inside context (a room). Generally, body and head are not tilted, and the face is centrally exhibited (C). The head is in the central (C) to central upper (CU) position in the picture, and the camera is in the left down (LD) or left center (LC) position. The actors in the selfies are at a close personal distance (CP), with eye contact and mostly exhibiting a positive mood.

On average, the measures of inter-rater reliability, Fleiss' kappas, show good agreement between raters (see Fleiss et al., 2003). However, there are differences between categories. *Frame of the picture*, *eye contact*, *context*, and *social distance* are categories with high kappa values, consequently reflecting a high level of agreement among raters; while the *tilt of the body*, *camera position*, and *head position* categories have relatively low kappa values from the first phase of coding and reflect less agreement between raters. In the subsequent phase, using Fiji, the kappas of coding categories that initially had relatively low kappas and the use of additional lines to improve the coding, substantively improve, with the exception of *camera position*, which we excluded from all subsequent analyses.

In the additional category *Other*, there were particular attributes or qualities of the selfies that could not be classified by the existing coding categories.

In our sample ( $N = 165$ ) one selfie (0.6%) was taken in a mirror; one participant (0.6%) took a selfie with an animal; 1.8% ( $f = 3$ ) of participants wore a mask in their selfie; 2.4% ( $f = 4$ ) of participants wore a helmet; 4.8% ( $f = 8$ ) of participants touched their hair while taking the selfie. 3% ( $f = 5$ ) of participants sent us a group selfie (groupies), which means that the selfie included 3 or more people. 3.6% ( $f = 6$ ) of the selfies in the study were not taken by a participant in the study. Despite the criterion in the definition that a selfie must be taken by the subject (actor) in the picture, we decided not to exclude these selfies from the study. They still represented the perception of study participants about what a selfie means to them and were thus representations of themselves, even though not meeting the technical criterion of a selfie.



**FIGURE 1 |** Examples of male and female selfies in Fiji, with horizontal, vertical and diagonal lines indicated and additional lines for the face-ism calculation (a/b).

A special case in the category *Other* were those selfies where the participants (actors) used effects to alter the appearance of the selfie. Some selfies were probably taken by mobile phones that have effects built into their default camera applications and these effects discreetly enhance the selfie. In this group of visibly altered selfies (19.4%,  $f = 32$ ) there were three sub-groups. Most participants (7.3%,  $f = 12$ ) altered their selfie by adding a black and white effect; 6.7% ( $f = 11$ ) of participants altered their selfie by adding a portrait effect; some participants (5.5%,  $f = 9$ ) altered their selfie by adding a color effect. Because of the heterogeneity of this category, we didn't include it in the coding scheme, and preliminary statistical analysis didn't indicate any significant relation to other coding categories or other constructs in Study 2. Additionally, there were no indices of selfie stick use, and four participants made mirror-style selfies with all actors in the pictures in a central position for the body, head and part of the face.

### Selfie by Gender and Context

In the following section we analyze selfie pictures by gender of the actor and context in the selfie using the Chi square and Mann-Whitney test in IBM SPSS 23. Both these factors can be interpreted as contextualized or input variables, i.e., who took the selfie and in what kind of context the selfie was taken.

For further analysis, categories from the initial coding scheme in **Table 1**, *tilt of the head*, *context* and *social distance*, were dichotomized (center vs. tilted for *tilt of the head*, inside vs. outside for *context*, personal vs. social for *social distance*); and the initial category *head position* was transformed into dimensional categories (*head position – abscissa*, *head position – ordinate*).

More detailed analysis of the sub-categories of the coding scheme indicates that male and female selfies differ, especially in the categories *tilt of the head*, *part of the face*, *head position*, and *mood*.

The statistical analysis, yielded a significant association between gender and head tilting  $\chi^2_{(1)} = 13.75$ ,  $p < 0.001$ . A moderate association emerged between males with their heads in the center and females tilting their heads Cramer's  $V = 0.28$ ,  $p < 0.001$ . None of the male participants tilted their heads, while more than half the female participants tilted their heads either to the right or to the left.

We found a difference in gender and the representation of the side of the face. Males preferred looking straight at the camera, resulting in a more central position of the face than for females [ $\chi^2_{(2)} = 9.3$ ,  $p < 0.01$ ]. Women preferred either the right side (32.5%) or the left side (27.8%) of the face.

Head position in males differed significantly from that in females  $U = 1835$ ,  $p < 0.01$ ,  $r = -0.21$ . Male heads were positioned in the center of the selfie, while females positioned their heads in the upper region of the selfie.

In the category of mood, we found a significant association between men and neutral expressions and an association between women and positive mood [ $\chi^2_{(1)} = 15.82$ ,  $p < 0.001$ ]. There is a moderate association between men and neutral expressions and women and positive expressions (Cramer's  $V = 0.31$ ,  $p < 0.001$ ).

In sum, in contrast to the typical female selfie, the head of the actor in the male selfie is not tilted; the face is more centrally located and placed in the center of the picture, with the actor exhibiting neutral to positive mood. In **Figure 1**, the left-hand picture represents a typical male selfie and the right-hand picture, a typical female selfie.

**TABLE 1 | Selfie coding categories and subcategories.**

Main category	Sub-category	Frequency	Percentage	Kappa <sup>a</sup>
Background brightness	Light	<b>137</b>	<b>83</b>	0.68
	Dark	27	16.4	
Context	Room	<b>98</b>	<b>59.4</b>	0.82
	Free time	19	11.5	
	Outside	16	9.7	
	Car	15	9.1	
	Recreation	10	6.1	
	Bathroom	5	3.0	
	Public transport	1	0.6	
Tilt of the body	LD	29	17.6	0.88 (0.25) <sup>c</sup>
	RD	37	22.4	
	C	<b>99</b>	<b>60</b>	
Tilt of the head	L	12	7.3	0.67 (0.50) <sup>c</sup>
	R	23	13.9	
	C	<b>130</b>	<b>78.8</b>	
Part of the face	L	38	23	0.66
	R	52	31.5	
	C	<b>75</b>	<b>45.5</b>	
Eye contact	Yes	<b>105</b>	<b>63.6</b>	0.88
	No	29	17.6	
	Glasses	13	7.9	
	Sun glasses	2	1.2	
	Ski goggles	16	9.7	
Frame of the picture	Horizontal	40	24.2	0.91
	Vertical	<b>99</b>	<b>60</b>	
	Square	26	15.8	
Head position	LU	4	2.4	0.97 (0.32) <sup>c</sup>
	LD	2	1.2	
	RU	1	0.6	
	RD	2	1.2	
	CU	57	34.5	
	CD	1	0.6	
	CL	21	12.7	
	CR	8	4.8	
	C	<b>69</b>	<b>41.8</b>	
Mood	Positive	<b>121</b>	<b>73.3</b>	0.60
	Negative	–	–	
	Neutral	44	26.7	
Social distance	INT	2	1.2	0.82
	CP	<b>120</b>	<b>72.7</b>	
	PD	5	3.0	
	CSD	1	0.6	

(Continued)

**TABLE 1 | Continued**

Main category	Sub-category	Frequency	Percentage	Kappa <sup>a</sup>
	FSD	19	11.5	0.23 (0.30) <sup>c</sup>
	FP	18	10.9	
Camera position	RU	3	1.8	0.23 (0.30) <sup>c</sup>
	RC	11	6.7	
	RD	17	10.3	
	LU	15	9.1	
	LC	35	21.2	
	LD	<b>40</b>	<b>24.2</b>	
	CU	8	4.8	
	CC	24	14.5	
	CD	12	7.3	
Face-ism index <sup>b</sup>		0.55	0.12	

Bold numbers represent modal values in each category.

<sup>a</sup>Fleiss' kappa.<sup>b</sup>Values in the columns are mean and standard deviation.<sup>c</sup>Cohen's kappa values of two raters using Fiji and initial Fleiss' kappa values in brackets (first coding).

Analysis of the context of the pictures revealed only that head position differed statistically according to context  $U = 1994$ ,  $p < 0.01$ ,  $r = -0.23$ . When in an outside context ( $Mdn = 1$ ), the participant's head was in the lower part of the selfie, while for an inside context ( $Mdn = 2$ ), the head was in the upper part of the selfie.

However, in accordance with our initial assumption, there were no significant differences between male ( $M = 0.53$ ,  $SE = 0.01$ ) and female ( $M = 0.55$ ,  $SE = 0.01$ ) selfies in face-ism  $t_{(73)} = -0.69$ ,  $p = 0.48$ .

## STUDY 2

### Method

#### Participants

128 students (78.1% females) who had initially sent us selfie pictures (Study 1) participated in the second part of the study (77.6% response rate from Study 1). The mean age for this sample was 20.30 years ( $SD = 1.41$ ); participants ranged from 19 to 28 years old.

#### Procedure

The participants were asked to complete the survey battery, comprising a range of personality concepts and concepts related to information technology use. They marked the instrument with the same individual code they had received in the previous study. Data from both studies were merged according to the codes by an independent researcher who did not participate in the data gathering phases of either study.

In statistical analysis, we used  $t$ -tests, but we didn't analyse H7 and H8, owing to low interrater reliability of the category camera



position. Independent *t*-tests were performed, with groups according to coding categories and variation of psychological constructs in each test. We also corrected the significance level according to the number of analyses which included the same grouping variable (i.e., Bonferroni correction). For analysing H9, we used Spearman's rho correlation coefficient. Pearson correlation was used to determine possible connections between psychological constructs and the face-ism index.

## Measures

The complete survey battery in the second part of the investigation comprised of the Narcissistic Personality Inventory (NPI; Raskin and Terry, 1988), part of the Self-Description Questionnaire III (SDQ-III; Marsh and O'Neill, 1984), the Bem Sex-Role Inventory (BSRI; Bem, 1974), the Big Five Inventory (BFI; John and Srivastava, 1999) and the Facebook Intensity Scale (FBI; Ellison et al., 2007). For the survey battery, we used the all the questionnaires, as described below, except for SDQ III. For the purposes of our study, we used only the subscale "physical appearance" from SDQ III, which comprises 10 items.

NPI (Raskin and Terry, 1988) is a 40-item self-report questionnaire for assessing narcissism as a personality characteristic. Each item consists of a pair of narcissistic and non-narcissistic statements, but for the purpose of our study, we measured statements on a 5-point rating scale (1 = strongly disagree; 5 = strongly agree). According to the authors of the NPI (Raskin and Terry, 1988), the questionnaire consists of 7 dimensions. Cronbach alphas for our sample were as follows: authority (8 items;  $\alpha = 0.80$ ), exhibitionism (7 items;  $\alpha = 0.62$ ), superiority (5 items;  $\alpha = 0.56$ ), entitlement (6 items;  $\alpha = 0.60$ ), exploitativeness (5 items;  $\alpha = 0.62$ ), self-sufficiency (6 items;  $\alpha = 0.46$ ) and vanity (3 items;  $\alpha = 0.72$ ). Unlike Raskin and Terry (1988), we experienced some difficulties with the NPI structure in our sample, like many other authors (Emmons, 1987; Kubarych et al., 2004; Ackerman et al., 2011). Reviewing research findings by other authors (Emmons, 1987; Kubarych et al., 2004; Corry et al., 2008; Ackerman et al., 2011), one finds that the dimensions of authority and exhibitionism are the most frequently reoccurring ones. As in the study by Raskin and Terry (1988) authority and exhibitionism have the biggest positive correlation value and one of the highest internal consistency score among all dimensions. Because of the greater comparability of our findings to other (potential) studies, we included all the original NPI dimensions, but focused special attention on the dimensions of authority and exhibitionism in subsequent analyses.

BFI (John and Srivastava, 1999) is a 44-item questionnaire measuring five personality traits. All items are measured on a 5-point rating scale (1 = strongly disagree; 5 = strongly agree). Reliability for each dimension in our sample was as follows: extraversion (8 items; Cronbach's  $\alpha = 0.82$ ), openness (10 items;  $\alpha = 0.83$ ), conscientiousness (9 items;  $\alpha = 0.77$ ), agreeableness (9 items;  $\alpha = 0.72$ ) and for neuroticism (8 items;  $\alpha = 0.79$ ).

BSRI (Bem, 1974) is a short version, which consists of 30 personality characteristics. For the purpose of our study we used a 5-point Likert scale ranging from 1 (never or almost never true) to 5 (always or almost always true). Ten of the characteristics are

stereotypically feminine, ten are stereotypically masculine, and ten are considered neutral. Reliability for our sample for feminine items is ( $\alpha = 0.82$ ), for masculine ( $\alpha = 0.76$ ) and for neutral ( $\alpha = 0.40$ ). In all our analyses we used subscales of femininity and masculinity.

SDQ III (Marsh and O'Neill, 1984) is a self-report questionnaire designed to measure 13 factors of self-concept. For the current research purposes, we used 10 items on a 5-point rating scale, ranging from 1 (definitely false) to 5 (definitely true). Cronbach alpha for physical appearance in our sample was 0.87.

FBI (Ellison et al., 2007) is used to measure Facebook use. The first six items are measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The seventh and eighth items are self-report, open-ended questions about the number of friends and amount of time spent on Facebook. Following the recommendations of the FBI authors, we transformed open-ended responses into five approximately equal groups, from low to high intensity users (with respect to number of friends and time spent on Facebook). Cronbach alpha for our sample was 0.84.

## Results and Discussion

In **Table 2** are the descriptive statistics for psychological constructs (NPI, BFI, BSRI, SDQ - physical appearance) and related concepts (FBI), according to the sub-categories from the coding scheme of selfies. From the initial coding scheme (Study 1) we used dichotomized categories for *tilt of the head*, *context* and *social distance*; and for the category *head position*, dimension categories (*head position - abscissa*, *head position - ordinate*).

We statistically analyzed relations between the selfie coding categories, psychological constructs and FBI using the *t*-test and Pearson's correlation. Generally, the analyses yielded statistically significant results, which are identified in bold text in **Table 2**.

There are no significant relations between coding cues and psychological constructs.

Entitlement is the only construct (from NPI) that had a significant correlation with the face-ism index ( $r = -0.27$ ).

Additionally, we analyzed the relation between all the concepts and the availability of selfie pictures to others. The results for participants whose selfie was available on social networks ( $M = 3.07$ ,  $SE = 0.079$ ) showed more emotional stability [ $t_{(124)} = -2.93$ ,  $p < 0.01$ ] than those whose selfie was available only to an intimate circle of people ( $M = 2.75$ ,  $SE = 0.070$ ), with an effect size of  $r = 0.27$ .

## GENERAL DISCUSSION

From the perspective of the average user/observer of social networks, the interpretation and consequent meaning of a selfie is related to limited capacity to process and understand the context of the selfie picture. Computer based algorithms have the advantage of efficiently processing large amounts of (meta)data in profiling individual users of social networks. However, the incidental user can creatively focus attention on particular attributes (cues) of the selfie and the context of the picture and over time gradually elaborate an impression of the actor in the selfie.

TABLE 2 | Descriptive statistics of selfie coding categories regarding psychological constructs and FBI.

Category	Sub category <sup>a</sup>	BFI					NPI					SDQ	BSRI		FBI		
		E	A	C	N	O	Au	Ex	Su	En	Exp		Ss	Va		M	F
Background brightness	Light (107)	3.64 (0.69)	3.71 (0.58)	3.77 (0.55)	2.85 (0.61)	3.80 (0.61)	3.02 (0.66)	2.23 (0.55)	2.90 (0.58)	3.12 (0.60)	2.86 (0.58)	3.18 (0.50)	2.39 (0.78)	3.44 (0.61)	3.39 (0.52)	4.00 (0.55)	2.90 (0.76)
	Dark (21)	3.42 (0.52)	3.35 (0.65)	3.53 (0.54)	3.02 (0.56)	3.76 (0.45)	2.95 (0.51)	2.28 (0.45)	2.54 (0.54)	3.24 (0.59)	2.96 (0.45)	3.03 (0.43)	2.09 (0.69)	3.02 (0.51)	3.39 (0.33)	3.86 (0.45)	3.01 (0.75)
Context	Inside (89)	3.60 (0.69)	3.61 (0.62)	3.71 (0.56)	2.91 (0.63)	3.76 (0.60)	3.00 (0.64)	2.24 (0.54)	2.86 (0.59)	3.18 (0.61)	2.92 (0.54)	3.15 (0.52)	2.30 (0.76)	3.34 (0.61)	3.38 (0.50)	3.97 (0.57)	3.01 (0.73)
	Outside (39)	3.59 (0.64)	3.75 (0.56)	3.79 (0.53)	2.80 (0.54)	3.85 (0.55)	3.02 (0.63)	2.23 (0.53)	2.80 (0.59)	3.05 (0.57)	2.78 (0.59)	3.16 (0.42)	2.44 (0.78)	3.43 (0.62)	3.42 (0.47)	4.01 (0.48)	2.78 (0.67)
Tilt of the body	LD (23)	3.90 (0.53)	3.73 (0.63)	3.82 (0.41)	2.78 (0.63)	3.99 (0.60)	3.17 (0.56)	2.19 (0.56)	2.89 (0.70)	3.06 (0.54)	2.93 (0.52)	3.13 (0.32)	2.46 (0.93)	3.63 (0.58)	3.55 (0.35)	4.13 (0.42)	2.84 (0.89)
	RD (29)	3.52 (0.76)	3.65 (0.68)	3.67 (0.47)	2.79 (0.62)	3.61 (0.65)	2.87 (0.71)	2.14 (0.41)	2.69 (0.53)	3.18 (0.61)	2.83 (0.65)	3.17 (0.62)	2.02 (0.67)	3.22 (0.59)	3.33 (0.56)	3.94 (0.57)	3.05 (0.50)
Tilt of the head	C (76)	3.54 (0.66)	3.63 (0.60)	3.73 (0.61)	2.94 (0.59)	3.8 (0.54)	3.01 (0.62)	2.29 (0.57)	2.88 (0.57)	3.15 (0.62)	2.88 (0.54)	3.16 (0.48)	2.43 (0.72)	3.35 (0.62)	3.36 (0.56)	3.95 (0.55)	2.89 (0.79)
	Centre (98)	3.58 (0.71)	3.67 (0.58)	3.72 (0.55)	2.88 (0.64)	3.87 (0.56)	3.06 (0.67)	2.23 (0.51)	2.81 (0.59)	3.16 (0.61)	2.87 (0.58)	3.19 (0.48)	2.32 (0.74)	3.37 (0.63)	3.41 (0.50)	3.97 (0.49)	2.88 (0.76)
Part of the face	Tilted (30)	3.69 (0.53)	3.61 (0.68)	3.77 (0.54)	2.86 (0.49)	3.54 (0.60)	2.82 (0.49)	2.26 (0.62)	2.93 (0.59)	3.08 (0.58)	2.89 (0.47)	3.05 (0.52)	2.41 (0.85)	3.37 (0.57)	3.34 (0.47)	4.01 (0.68)	3.02 (0.70)
	Left (30)	3.47 (0.71)	3.75 (0.49)	3.84 (0.55)	2.97 (0.55)	3.92 (0.65)	2.88 (0.64)	2.19 (0.62)	2.88 (0.70)	3.05 (0.59)	2.89 (0.61)	3.06 (0.49)	2.17 (0.75)	3.20 (0.55)	3.29 (0.44)	4.09 (0.52)	2.75 (0.73)
Eye contact	Right (39)	3.66 (0.63)	3.60 (0.67)	3.74 (0.54)	2.75 (0.62)	3.72 (0.50)	3.02 (0.64)	2.25 (0.48)	2.86 (0.52)	3.22 (0.68)	2.87 (0.53)	3.23 (0.48)	2.26 (0.70)	3.36 (0.58)	3.44 (0.43)	3.93 (0.54)	3.09 (0.71)
	Center (59)	3.63 (0.68)	3.64 (0.62)	3.68 (0.56)	2.92 (0.62)	3.77 (0.60)	3.06 (0.63)	2.25 (0.54)	2.80 (0.58)	3.13 (0.55)	2.87 (0.56)	3.15 (0.49)	2.49 (0.80)	3.46 (0.65)	3.41 (0.55)	3.96 (0.55)	2.94 (0.71)
Frame of the picture	Yes (83)	3.57 (0.64)	3.61 (0.61)	3.73 (0.52)	2.93 (0.59)	3.74 (0.57)	3.02 (0.61)	2.26 (0.56)	2.82 (0.59)	3.20 (0.58)	2.93 (0.54)	3.15 (0.49)	2.33 (0.73)	3.32 (0.62)	3.41 (0.46)	3.94 (0.57)	2.97 (0.72)
	No (23)	3.50 (0.81)	3.73 (0.62)	3.81 (0.53)	2.87 (0.65)	3.80 (0.72)	2.85 (0.76)	2.04 (0.31)	2.87 (0.5)	2.92 (0.48)	2.75 (0.62)	3.21 (0.48)	2.28 (0.74)	3.49 (0.62)	3.23 (0.61)	4.13 (0.41)	2.87 (0.81)
	Horizontal (31)	3.80 (0.53)	3.86 (0.50)	3.86 (0.56)	2.65 (0.55)	3.92 (0.62)	3.07 (0.66)	2.12 (0.45)	2.85 (0.48)	3.09 (0.60)	2.85 (0.57)	3.24 (0.48)	2.38 (0.72)	3.43 (0.54)	3.38 (0.47)	4.15 (0.48)	2.78 (0.75)
	Vertical (77)	3.56 (0.67)	3.57 (0.61)	3.7 (0.55)	2.92 (0.63)	3.78 (0.58)	3.04 (0.59)	2.28 (0.53)	2.81 (0.60)	3.22 (0.58)	2.97 (0.51)	3.16 (0.49)	2.32 (0.69)	3.36 (0.64)	3.44 (0.43)	3.88 (0.52)	2.88 (0.77)

(Continued)

TABLE 2 | Continued

Category	Sub category <sup>a</sup>	BFI				NPI				SDQ	BSRI		FBI					
		E	A	C	N	O	Au	Ex	Su		En	Exp		Ss	Va	M	F	
Head position	Square (20)	3.43 (0.84)	3.65 (0.68)	3.65 (0.53)	3.08 (0.51)	3.65 (0.53)	2.78 (0.75)	2.25 (0.66)	2.94 (0.69)	2.89 (0.62)	2.56 (0.61)	2.99 (0.47)	2.40 (1.09)	3.31 (0.64)	3.22 (0.70)	4.09 (0.65)	3.25 (0.62)	
	Ordinate	Down (5)	3.55 (0.85)	3.95 (0.51)	3.93 (0.70)	2.65 (0.56)	3.56 (0.49)	3.12 (0.71)	2.00 (0.34)	2.52 (0.64)	3.00 (0.78)	2.80 (0.20)	3.13 (0.44)	2.06 (0.76)	3.38 (0.84)	3.38 (0.52)	4.16 (0.28)	2.67 (0.64)
		Center (76)	3.55 (0.68)	3.68 (0.63)	3.75 (0.51)	2.83 (0.64)	3.80 (0.53)	3.02 (0.62)	2.26 (0.58)	2.88 (0.56)	3.08 (0.57)	2.88 (0.53)	3.19 (0.49)	2.36 (0.81)	3.42 (0.60)	3.39 (0.47)	3.94 (0.58)	2.87 (0.79)
		Up (47)	3.70 (0.64)	3.58 (0.58)	3.68 (0.59)	2.98 (0.55)	3.80 (0.68)	2.96 (0.67)	2.23 (0.48)	2.79 (0.62)	3.25 (0.61)	2.87 (0.64)	3.09 (0.50)	2.35 (0.71)	3.27 (0.61)	3.38 (0.52)	4.02 (0.49)	3.02 (0.69)
		Abscissa Left (20)	3.47 (0.91)	3.63 (0.68)	3.77 (0.57)	3.00 (0.63)	3.73 (0.68)	2.92 (0.74)	2.16 (0.42)	2.79 (0.53)	2.99 (0.59)	2.77 (0.70)	3.10 (0.55)	2.11 (0.81)	3.27 (0.71)	3.32 (0.54)	4.02 (0.51)	2.92 (0.54)
	Center (98)	3.63 (0.62)	3.65 (0.58)	3.71 (0.54)	2.87 (0.60)	3.82 (0.56)	2.99 (0.62)	2.25 (0.55)	2.85 (0.60)	3.19 (0.60)	2.91 (0.54)	3.15 (0.49)	2.35 (0.75)	3.37 (0.59)	3.39 (0.49)	3.98 (0.53)	2.94 (0.77)	
	Right (10)	3.57 (0.63)	3.71 (0.77)	3.85 (0.64)	2.71 (0.62)	3.69 (0.66)	3.33 (0.48)	2.28 (0.64)	2.80 (0.66)	2.98 (0.59)	2.78 (0.44)	3.3 (0.34)	2.76 (0.78)	3.51 (0.66)	3.53 (0.37)	3.95 (0.70)	2.7 (1.00)	
	Mood	Positive (95)	3.60 (0.68)	3.62 (0.61)	3.74 (0.53)	2.92 (0.58)	3.80 (0.57)	2.98 (0.65)	2.26 (0.55)	2.87 (0.58)	3.17 (0.59)	2.86 (0.54)	3.14 (0.50)	2.40 (0.80)	3.41 (0.60)	3.40 (0.51)	4.02 (0.55)	2.98 (0.70)
		Neutral (33)	3.6 (0.66)	3.77 (0.60)	3.70 (0.62)	2.75 (0.67)	3.78 (0.63)	3.07 (0.59)	2.15 (0.49)	2.73 (0.63)	3.06 (0.64)	2.92 (0.61)	3.19 (0.44)	2.19 (0.65)	3.25 (0.66)	3.36 (0.44)	3.85 (0.50)	2.81 (0.78)
	Social distance	Personal (107)	3.61 (0.69)	3.65 (0.61)	3.72 (0.54)	2.88 (0.63)	3.81 (0.58)	2.99 (0.63)	2.25 (0.55)	2.86 (0.61)	3.15 (0.59)	2.91 (0.55)	3.14 (0.48)	2.37 (0.80)	3.36 (0.62)	3.38 (0.50)	3.98 (0.55)	2.94 (0.75)
Social (21)		3.58 (0.60)	3.67 (0.58)	3.79 (0.62)	2.87 (0.45)	3.70 (0.60)	3.08 (0.67)	2.15 (0.48)	2.73 (0.48)	3.10 (0.66)	2.70 (0.57)	3.20 (0.52)	2.23 (0.55)	3.41 (0.61)	3.41 (0.47)	3.99 (0.52)	2.93 (0.59)	
Face-ism dev <b>b</b>		-0.20	0.03	0.13	0.14	0.03	-0.12	0.00	-0.01	-0.27*	-0.11	-0.10	-0.09	-0.07	-0.19	0.07	-0.08	

BFI factors: extraversion (E), agreeableness (A), conscientiousness (C), neuroticism (N) and openness (O). NPI dimensions: authority (Au), exhibitionism (Ex), superiority (Su), entitlement (En), exploitativeness (Exp), self-sufficiency (Ss) and vanity (Va). BSRI subscales: masculinity (M), femininity (F). Values are represented with mean and standard deviation in brackets. Bold numbers represent statistically significant results.

<sup>a</sup>Numerus in brackets for each subcategory.

<sup>b</sup>Pearson's correlation with psychological constructs (in the same order as noted); \*  $p < 0.05$ .

Qiu et al. (2015) emphasize the lens model as a useful framework in the process of assessment of personality characteristics on the basis of the selfie picture. According to the lens model, in the interpretation of a (selfie) picture we use distinctive attributes of or cues in the picture to reach a personality judgment about the author of the selfie.

In Study 1 we tried to extract the observable characteristics of selfie pictures that can be helpful for observers in understanding the message of the picture. Since a selfie is photograph, we conducted qualitative analysis of its content according to the elements of composition, which is a fundamental characteristic of every photo. In a selfie picture, composition it is not subordinated to the skill of artistic expression, because a selfie by nature is a casual snapshot, thus, the composition reflects its author's habits, adopted social norms of visual expression, skills of sensorimotor coordination and conscious and unconscious personality characteristics (Frosh, 2015). The results of the Study 1 provided insight into the overall structure of the composition of selfies.

In Study 2 observable cues or coding categories were related to selected psychological constructs. In this sense, the analysis of Study 2 refers to an important segment of the lens model, i.e., cue validity (Qiu et al., 2015), and therefore, to the validity of the cues or coding categories of the selfies.

Consequently, both studies merge to yield an interpretation of selfies as “structured pictures that potentially reflect”; the coding scheme of selfie pictures is thus central and crucial for any further analysis and interpretation.

From the analysis of measures of inter-rater reliability (Study 1), we can conclude that one group of coding categories in the selfie coding scheme is intuitive and user-friendly, such as *eye contact*, *context*, *social distance*, and *tilt of the head*. The other group of coding categories has potential significance for inferences in the personality, but additional computer based accessories, such as lines and diagonals in the picture, improved the use of these cues. In this group are the categories *tilt of the body*, *tilt of the head*, and *head position*. *Camera position* is the most problematic category for coding, and the lack of contextualized cues from the process of selfie making probably implies that it cannot be objectively and reliably coded from the perspective of an independent coder. One important implication from both studies in the research is that it is reasonable to include categories with only a few sub-categories in the process of selfie coding.

Based on the identified cues or categories from the coding, we latter identified some basic characteristics of male and female selfies, relations to the context of the selfie pictures and relations with psychological constructs.

Comparatively, male selfies were centered in the picture; generally, the head was positioned around the center of the picture with very few expressions or body/head positions. In that sense, female selfies were less homogeneous and generally more expressive in the matter of head position, exhibition of the face, tilting of the head and mood expression.

Döring et al. (2016) found that the biggest difference between male and female selfies involved feminine touch and imbalance, which refers to canting of the head or body. Head canting is

described as a gesture of submission (Key, 1975). We found that women tilted their heads more than males, but the results showed no relation to authority.

In female selfie pictures there was much diversity in the focus of the face compared to male pictures. On the other hand, the assumption about the focus being on the left side of the face in the majority of the selfie pictures (Bruno and Bertamini, 2013; Bruno et al., 2015) was not confirmed.

According to Kress and van Leeuwen (2006), the participant's gaze (direct eye contact) demands that the viewer enter into relationship with him. Other gestures or expressions determine what kind of relationship the participant wants to establish. When someone is smiling, he or she wishes to engage in a relation of social affinity. Female pictures emphasize smiling and eye contact (Tifferet and Vilnai-Yavetz, 2014). We found consistent results, with females who are more prone to smile in selfies than males.

Concerning the availability of selfies to others, participants whose selfies were available on social networks had higher results for emotional stability than participants whose selfies were available only to an intimate circle of people.

## CONCLUSIONS

The initial impression from the findings of our research analysis might be that there are no statistically important features of selfie pictures in relation to the personality characteristics of their owners. The implication might be that applying selfies in the context of personality assessment of the authors comes with reasonable reservations.

However, as emphasized in the introduction and design of the studies, the basic issue in our research was what can be said about the personality of the author on the basis of a single auto-portrait picture. In this regard, our sample, with its small number of participants and very narrow age range, is an obstacle to any firm generalization.

However, the perspective highlighted in our research was that, as important as the picture (selfie) is, it is also a selected selfie which is published, and the act of selection contributes to the final result. Therefore, the editorial process is a crucial part of selfie making. Our subjects have intentionally submitted (having reflected on and chosen) an image that they consider a prototype of the concept of “the selfie.” In this way, our research is distinct from studies which harvest images from the web, where researchers usually rely on the hash tags #selfie, #me or similar, and thus do not encounter similar drawbacks to potential generalization.

Another limitation of our research involves the analysis of effects in selfies and the context of selfie making (e.g., handedness of participants). Effects could potentially influence some aspects of coding (e.g., categories of background, frame of the picture or mood), but this could be of particular importance especially for the context of selfie analysis as impression formation, which was outside of the scope of the present research. Handedness, on the other hand, could especially influence the interpretation of camera position cues. However, camera position as a cue proved to be problematic, since assessment of this cue did not



reach acceptable values of interrater reliability, despite additional software support in coding. Therefore, we excluded this cue from further analysis.

In search of a possible answer it is reasonable to consider lessons learned from the use of projection techniques. In this context one single product of a subject (e.g., a picture) may represent a basis for initial interpretation, but in the final stage more accurate implications in forming a personality impression of the subject require inclusion of information from other sources. Other sources could include other images or the results of other modalities of observation of the subject and monitoring of individuals over time (Hammer, 1968). More accurate or valid interpretation therefore derives from the integration of diverse data sources, and thus the principle of convergence should be applied. In the case of selfies, other available information from social networks could be taken into consideration, thus representing the broader context of the selfie picture and implying additional personality-related information about its author.

In this respect, a coding scheme for selfies with relatively few and simple (possible dichotomized) coding categories can represent a valuable initial tool in personality assessment. The set of coding cues is not exhaustive, and there is additional room for possible refinements, especially with the inclusion of more subjective measures (e.g., effects, attraction of the selfie).

In this first step, the research presented in this paper considers testing some features of a selfie with regard to general personality characteristics. Although the research was inspired by projective

techniques, its aim was not to develop techniques for diagnosing personality disorders. Future work could explore this path and test selfies with regard to some established diagnostic model of personality disorders, like the hybrid dimensional-categorical model of DSM 5 (American Psychiatric Association, 2013).

Lessons learned from our research can also be seen as a step toward a broader understanding of the selfie concept, which could subsequently contribute to more objective debate on the phenomenon and shatter the widespread, everyday, intuitive idea of its ascribed pathological nature.

## AUTHOR CONTRIBUTIONS

BM was leader of the research team in both studies, coordinating the concept of studies, implementation and dissemination. In the manuscript participated in all parts of IMRAD structure, thus also for final version. AP participated in the all phases of research (conceptualization, implementation, dissemination). In manuscript contributed to the part of Methods, Results, and Discussion. TR participated in the all phases of research (conceptualization, implementation, dissemination). In manuscript contributed especially to Introduction, Methods and Discussion. LK participated in implementation and dissemination phases. She took especially active role in Study 1. NB participated in the all phases of research (conceptualization, implementation, dissemination). In manuscript contributed to all parts of IMRAD structure, but especially in conceptualization of Introduction and Discussion.

## REFERENCES

- Ackerman, R. A., Witt, E. A., Donnellan, M. B., Trzesniewski, K. H., Robins, R. W., and Kashy, D. A. (2011). What does the narcissistic personality inventory really measure? *Assessment* 18, 67–87. doi: 10.1177/1073191110382845
- American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders, 5th Edn.* Washington, DC: American Psychiatric Association.
- Amichai-Hamburger, Y., Wainapel, G., and Fox, S. (2002). “On the Internet no one knows I’m an introvert”: extroversion, neuroticism, and Internet interaction. *Cyberpsychol. Behav.* 5, 125–128. doi: 10.1089/109493102753770507
- Archer, D., Iritani, B., Kimes, D. D., and Barrios, M. (1983). Face-ism: five studies of sex differences in facial prominence. *J. Pers. Soc. Psychol.* 45, 725–735. doi: 10.1037/0022-3514.45.4.725
- Balmaceda, M. J., Schiaffino, S., and Godoy, D. (2014). How do personality traits affect communication among users in online social networks? *Online Inf. Rev.* 38, 136–153. doi: 10.1108/OIR-06-2012-0104
- Barry, C. T., Doucette, H., Loflin, D. C., Rivera-Hudson, N., and Herrington, L. L. (2017). “Let me take a selfie”: associations between self-photography, narcissism, and self-esteem. *Psychol. Pop. Media Cult.* 6, 48–60. doi: 10.1037/ppm0000089
- Batchen, G. (2008). Snapshots. *Photographies* 1, 121–142. doi: 10.1080/17540760802284398
- Bem, S. L. (1974). The measurement of psychological androgyny. *J. Consult. Clin. Psychol.* 42, 155–162. doi: 10.1037/h0036215
- Blachnio, A., Przepiórka, A., and Rudnicka, P. (2013). Psychological determinants of using Facebook: a research review. *Int. J. Hum. Comput. Interact.* 29, 775–787. doi: 10.1080/10447318.2013.780868
- Bornstein, R. F. (2007). Toward a process-based framework for classifying personality tests: comment on Meyer and Kurtz (2006). *J. Pers. Assess.* 89, 202–207. doi: 10.1080/00223890701518776
- Bruno, N., and Bertamini, M. (2013). Self-portraits: smartphones reveal a side bias in non-artists. *PLoS ONE* 8:e55141. doi: 10.1371/journal.pone.0055141
- Bruno, N., Bertamini, M., and Protti, F. (2015). Selfie and the city: a world-wide, large, and ecologically valid database reveals a two-pronged side bias in naïve self-portraits. *PLoS ONE* 10:e0124999. doi: 10.1371/journal.pone.0124999
- Corry, N., Merritt, R. D., Mrug, S., and Pamp, B. (2008). The factor structure of the narcissistic personality inventory. *J. Pers. Assess.* 90, 593–600. doi: 10.1080/00223890802388590
- Craddick, R. A. (1963). The self-image in the Draw-a-Person Test and self-portrait drawings. *J. Proj. Techn. Pers. Assess.* 27, 288–291. doi: 10.1080/0091651X.1963.10120049
- Döring, N., Reif, A., and Poeschl, S. (2016). How gender stereotypical are selfies? A content comparison with magazine adverts. *Comput. Hum. Behav.* 55, 955–962. doi: 10.1016/j.chb.2015.10.001
- Eager, T., and Dann, S. (2016). Classifying the narrated #selfie: Genre typing human-branding activity. *Eur. J. Market.* 50, 1–33. doi: 10.1108/ejm-07-2015-0509
- Eftekhari, A., Fullwood, C., and Morris, N. (2014). Capturing personality from Facebook photos and photo-related activities: how much exposure do you need? *Comput. Hum. Behav.* 37, 162–170. doi: 10.1016/j.chb.2014.04.048
- Ellison, N. B., Steinfield, C., and Lampe, C. (2007). The benefits of Facebook “friends”: social capital and college students’ use of online social network sites. *J. Comput. Mediated Commun.* 12, 1143–1168. doi: 10.1111/j.1083-6101.2007.00367.x
- Emmons, R. A. (1987). Narcissism: theory and measurement. *J. Pers. Soc. Psychol.* 52, 11–17. doi: 10.1037/0022-3514.52.1.11
- Fleiss, J. L., Levin, B., and Paik, M. C. (2003). *Statistical Methods for Rates and Proportions, 3rd Edn.* New York, NY: John Wiley and Sons.
- Fox, J., and Rooney, M. C. (2015). The Dark Triad and trait self-objectification as predictors of men’s use and self-presentation behaviors on social

- networking sites. *Pers. Individ. Dif.* 76, 161–165. doi: 10.1016/j.paid.2014.12.017
- Frosh, P. (2015). The gestural image: the selfie, photography theory, and kinesthetic sociability. *Int. J. Commun.* 9, 1607–1628.
- Giessner, S. R., Ryan, M. K., Schubert, T. W., and van Quaquebeke, N. (2011). The power of pictures: vertical picture angles in power pictures. *Media Psychol.* 14, 442–464. doi: 10.1080/15213269.2011.620541
- Glaser, B. G., and Strauss, A. L. (1967). *The Discovery of Grounded Theory*. Chicago, IL: Aldine.
- Goffman, E. (1959). *The Presentation of Self in Everyday Life*. New York, NY: Anchor Books.
- Gunther, A. (2014). *L'image Conversationnelle. Études Photographiques*, 31. Available online at: <http://etudesphotographiques.revues.org/3378>
- Hall, J. A., and Pennington, N. (2013). Self-monitoring, honesty, and cue use on Facebook: the relationship with user extraversion and conscientiousness. *Comput. Hum. Behav.* 29, 1556–1564. doi: 10.1016/j.chb.2013.01.001
- Hammer, E. F. (1968). "Projective drawings," in *Projective Techniques in Personality Assessment: A Modern Introduction*, ed A. I. Rabin (New York, NY: Springer), 366–393.
- John, O. P., and Srivastava, S. (1999). "The Big-Five trait taxonomy: history, measurement, and theoretical perspectives," in *Handbook of Personality: Theory and Research, 2nd Edn*, eds L. A. Pervin and O. P. John (New York, NY: Guilford Press), 102–138.
- Key, M. R. (1975). *Male / Female Language*. Metuchen, NJ: Scarecrow Press.
- Kress, G., and van Leeuwen, T. (2006). *Reading Images: The Grammar of Visual Design, 2nd Edn*. London: Routledge.
- Kubarych, T. S., Deary, I. J., and Austin, E. J. (2004). The Narcissistic Personality Inventory: factor structure in a non-clinical sample. *Pers. Individ. Dif.* 36, 857–872. doi: 10.1016/S0191-8869(03)00158-2
- Leary, M. R., and Hoyle, R. H. (Eds.). (2009). *Handbook of Individual Differences in Social Behavior*. New York, NY: The Guilford Press.
- Lister, M. (Ed.). (1995). *The Photographic Image in Digital Culture*. London: Routledge.
- Machover, K. (1951). Personality projection in the drawing of the human figure. *Am. J. Sociol.* 57, 205–206. doi: 10.1037/h0050665
- Marsh, H. W., and O'Neill, R. (1984). Self description questionnaire III: the construct validity of multidimensional self-concept ratings by late adolescents. *J. Educ. Meas.* 21, 153–174. doi: 10.1111/j.1745-3984.1984.tb00227.x
- McCrae, R. R., and John, O. P. (1992). An introduction to the five-factor model and its applications. *J. Pers.* 60, 175–215. doi: 10.1111/j.1467-6494.1992.tb00970.x
- Murray, H. A. (1938). *Explorations in Personality*. New York, NY: Oxford University Press.
- Orchard, L. J., Fullwood, C., Galbraith, N., and Morris, N. (2014). Individual differences as predictors of social networking. *J. Comput. Mediated Commun.* 19, 388–402. doi: 10.1111/jcc4.12068
- Oxford Dictionaries (2013). *Selfie is Named Oxford Dictionaries Word of the Year 2013*. Available online at: <http://blog.oxforddictionaries.com/press-releases/oxford-dictionaries-word-of-the-year-2013> (Accessed October 22, 2015).
- Park, G., Schwartz, H. A., Eichstaedt, J. C., Kern, M. L., Kosinski, M., Stillwell, D. J., et al. (2015). Automatic personality assessment through social media language. *J. Pers. Soc. Psychol.* 108, 934–952. doi: 10.1037/pspp0000020
- Piotrowski, C. (2015a). Clinical instruction on projective techniques in the USA: a review of academic training settings 1995–2014. *J. Proj. Psychol. Mental Health* 22, 83–92.
- Piotrowski, C. (2015b). Projective techniques usage worldwide: a review of applied settings 1995–2015. *J. Indian Acad. Appl. Psychol.* 41, 9–19.
- Qiu, L., Lu, J., Yang, S., Qu, W., and Zhu, T. (2015). What does your selfie say about you? *Comput. Hum. Behav.* 52, 443–449. doi: 10.1016/j.chb.2015.06.032
- Raskin, R., and Terry, H. (1988). A principal-components analysis of the Narcissistic Personality Inventory and further evidence of its construct validity. *J. Pers. Soc. Psychol.* 54, 890–902. doi: 10.1037/0022-3514.54.5.890
- Rosenberg, J., and Egbert, N. (2011). Online impression management: personality traits and concerns for secondary goals as predictors of self-presentation tactics on Facebook. *J. Comput. Mediated Commun.* 17, 1–18. doi: 10.1111/j.1083-6101.2011.01560.x
- Schindelin, J., Arganda-Carreras, I., Frise, E., Kaynig, V., Longair, M., Pietzsch, T., et al. (2012). Fiji: an open-source platform for biological-image analysis. *Nat. Methods* 9, 676–682. doi: 10.1038/nmeth.2019
- Senft, T. M., and Baym, N. K. (2015). What does the selfie say? Investigating a global phenomenon. *Int. J. Commun.* 9, 1588–1606.
- Shelton, A. K., and Skalski, P. (2014). Blinded by the light: illuminating the dark side of social network use through content analysis. *Comput. Hum. Behav.* 33, 339–348. doi: 10.1016/j.chb.2013.08.017
- Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Pisanski, K., Chmiel, A., and Sorokowski, P. (2016). Selfies and personality: who posts self-portrait photographs? *Pers. Individ. Dif.* 90, 119–123. doi: 10.1016/j.paid.2015.10.037
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviors are associated with narcissism among men. *Pers. Individ. Dif.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004
- Szillis, U., and Stahlberg, D. (2007). The face-ism effect in the internet differences in facial prominence of women and men. *Int. J. Internet Science*, 2, 3–11.
- Tifentale, A., and Manovich, L. (2015). "Selfiecity: exploring photography and self-fashioning in social media," in *Postdigital Aesthetics: Art, Computation and Design*, eds D. M. Berry and M. Dieter (London: Palgrave Macmillan), 109–122.
- Tifferet, S., and Vilnai-Yavetz, I. (2014). Gender differences in facebook self-presentation: an international randomized study. *Comput. Hum. Behav.* 35, 388–399. doi: 10.1016/j.chb.2014.03.016
- Wang, S. S. (2013). "I share, therefore I am": personality traits, life satisfaction, and Facebook check-ins. *Cyberpsychol. Behav. Soc. Netw.* 16, 870–877. doi: 10.1089/cyber.2012.0395
- Warfield, K. (2014). "Making selfies/making self: digital subjectivities in the selfie," in *On-site Presentation at the Fifth International Conference on the Image and the Image knowledge Community*. Freie Universität, Berlin.
- Weiser, E. B. (2015). #Me: narcissism and its facets as predictors of selfie-posting frequency. *Pers. Individ. Dif.* 86, 477–481. doi: 10.1016/j.paid.2015.07.007
- Youyou, W., Kosinski, M., and Stillwell, D. (2015). Computer-based personality judgments are more accurate than those made by humans. *Proc. Natl. Acad. Sci. U.S.A.* 112, 1036–1040. doi: 10.1073/pnas.1418680112

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# Corrigendum: What Is Seen Is Who You Are: Are Cues in Selfie Pictures Related to Personality Characteristics?

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**Keywords:** selfie, self-presentation, social media, selfie coding, personality assessment

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## What Is Seen Is Who You Are: Are Cues in Selfie Pictures Related to Personality Characteristics?

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In the original article, there was an error. The wrong reference was cited, Hall and Pennington (2013), was cited instead of Hall (1964). A correction has been made to the **Coding Section, Sub-Section Social Distance, first sentence of the fifth paragraph:**

According to Hall (1964; see also Kress and van Leeuwen, 2006), we coded six social distances.

The authors apologize for this error and state that this does not change the scientific conclusions of the article in any way.

## REFERENCES

Hall, E. T., (1964). Communication: theoretical and biological studies. Silent assumptions in social communication. *Res. Publ. Assoc. Res. Nerv. Ment. Dis.* 42, 41–55.

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# How HEXACO Personality Traits Predict Different Selfie-Posting Behaviors among Adolescents and Young Adults

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Selfies are self-portrait photos shared on Social Networks. Previous literature has investigated how personality traits, and specifically narcissism, are associated with selfie-posting behaviors. In this contribution we investigated how selfie-posting behaviors are predicted by the six HEXACO personality traits, controlling for age, gender and sexual orientation. The Kinsey scale, three questions about the frequency of own selfies, group selfies and selfies with partner, and 60-item HEXACO Personality Inventory-Revised were administered to 750 young people from 13 to 30 years. Females, adolescents and not-exclusively heterosexual people posted more own selfies, and adolescents posted also more group selfies and selfies with partner. Moreover, lower Honesty/Humility, lower Conscientiousness, higher Emotionality and higher Extraversion significantly predict own selfies and group selfies. Finally, only lower Honesty/Humility and higher Emotionality predict selfies with partner. Theoretical and practical implications are provided.

**Keywords:** selfies, HEXACO personality traits, adolescents, young adults, Honesty/Humility

## INTRODUCTION

A selfie is a self portrait photo typically taken with a Smartphone or a webcam and shared on social networks (Oxford Online Dictionaries, 2015). In the last years, selfies became very popular among young people all over the world. Recently, Sorokowski et al. (2015) suggested the distinction among three main kinds of selfies: selfies taken alone (or own selfies), selfies with a partner and group selfies, the latter also called groupies (Wang et al., in press). According to previous research, people usually take and post selfies for self-presentation, for seeking attention and feedback from peers (Kiprin, 2013; Katz and Crocker, 2015), for communicating, for archiving and for having entertainment (Sung et al., 2016).

Literature showed a relationship between online behaviors and different personality traits, founding that high extraversion, high openness to experience, high neuroticism and low conscientiousness predict more Social Network use (Ross et al., 2009; Ryan and Xenos, 2011; Eftekhari et al., 2014). Recently, studies started focusing also on the role of personality traits in selfie behaviors, employing the Five Factor Model as main personality theoretical framework, and found high extraversion and high neuroticism predicting more selfies (Qiu et al., 2015; Sorokowska et al., 2016).



In the last 10 years, the HEXACO model of personality structure enlightened interesting results that helped in understanding phenomena beyond the Five Factor Model (Lee and Ashton, 2004; Ashton and Lee, 2007; Ashton et al., 2014). In fact, HEXACO model is based on the same lexical and cross cultural studies from which originated the Five Factor model, but it is composed of six dimensions instead of five (Ashton et al., 2006): Honesty/Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to experience.

The most important change is related to the introduction of a sixth factor, named Honesty/Humility. People with high Honesty/Humility are inclined to be sincere, fair, and unassuming. Conversely, people with low scores have a strong sense of self-importance and are inclined to flatter others and break the rules in order to get what they want. A recent review by Ashton et al. (2014) shed light on how Honesty/Humility dimension better predicts different variables compared to the Five Factor Model. These findings are consistent using both self-report and observer report methods. Moreover, low Honesty/Humility appears to be a good predictor of antisocial, manipulative and unethical behaviors, and to be strongly related to the Dark Triad dimensions (Ashton et al., 2014). Other differences between the Five Factor Model and the HEXACO model are related to Agreeableness and Emotionality factors (Ashton et al., 2004). In the HEXACO model, Emotionality describes a tendency to vulnerability, sentimentality and fearfulness vs. a tendency to fearlessness, detachment and toughness. Emotionality is similar to Neuroticism in the Big Five Factor Model, except for being less pejorative and for not describing individuals high on this dimension through ill-temper related terms. Agreeableness factor assesses a tendency to be cooperative, patient and lenient vs. a tendency to be ill-tempered, irritable and resentful. Thus, the Agreeableness in the HEXACO model is somewhat different from Agreeableness in the Big Five Factor Model since the latter excludes ill-temper related terms. The remaining factors, Extraversion, Conscientiousness and Openness to experience, are similar in both models. Specifically, Extraversion assesses the tendency to be optimist, secure in group interactions and confident in own social ability, vs. the feeling to be unpopular, unable and indifferent to social activity. High Conscientiousness describes people who tend to be organized, dependable, perfectionist, and obsessive, while low Conscientiousness describes people more flexible and spontaneous, but also negligent and unreliable. Finally, high levels in Openness to experience are related to curiosity, creativity, risk-taking and preference for novelty, while low levels are evident in preference for adhering to convention and predictable patterns.

Thus, the purpose of this study is to investigate the relationships between the HEXACO personality traits and three different kinds of selfie (own selfies, selfies with partner and group selfies), controlling for age, gender and sexual orientation, that in literature were found to be related with selfies and online behaviors (DeHaan et al., 2013; Chong et al., 2015; Jang et al., 2015; Dhir et al., 2016; Sorokowski et al., 2016). The HEXACO Model (Lee and Ashton, 2004), and specifically the

Honesty/Humility dimension can help in deeply understanding these online behaviors. In fact, since high Honesty/Humility was found to be related to being fair and cooperative with others (Hilbig and Zettler, 2009; Chirumbolo and Leone, 2010), it is possible that people with low Honesty/Humility could post more selfies as a strategy to seek admiration and to take advantage from others to reach own social goals at the expense of communality on social networks.

Furthermore, previous research has shown that selfies-posting behaviors are predicted by high level of narcissism (Barry et al., 2015; Fox and Rooney, 2015; Sorokowski et al., 2015; Weiser, 2015; Halpern et al., 2016). In these studies narcissism is described as a multiform construct characterized by exhibitionism, vanity, grandiosity, exploitativeness, entitlement and desire of authority, aspects that could be motivated by the need for self-esteem regulation (Morf and Rhodewalt, 2001). Weiser (2015) underlined how both adaptive and maladaptive facets of narcissism can predict selfies posting. In fact, previous studies found that narcissism is strongly and negatively correlated with Honesty/Humility traits, and positively and strongly correlated with Extraversion traits (Lee and Ashton, 2005; Bresin and Gordon, 2011; Jonason and McCain, 2012). Thus these findings could support the link between honesty-humility and selfies, suggesting the utility of the HEXACO model in understanding selfies-posting behaviors. Moreover, Dark Triad traits (Paulhus and Williams, 2002), that include Narcissism, are well predicted by lower Honesty/Humility (Lee et al., 2013) and, thus it is plausible expecting that posting selfies could be more frequent among people with lower levels of Honesty/Humility.

Regarding demographics variables, studies on selfies found age and gender differences, showing that adolescents are more likely than young adults to post selfies on social network websites, and that girls usually share more selfies than boys (Jang et al., 2015; Dhir et al., 2016; Sorokowski et al., 2016). Conversely there is a lack in literature about sexual orientation differences in selfies. However, studies on online behaviors showed that sexual orientation seems to predict differences in the use of social networks: The Internet is commonly used by not heterosexual young people to find friends and romantic partners, in order to compensate the perceived difficulty of establishing offline contact with LGBT peers (DeHaan et al., 2013; Chong et al., 2015; Morelli et al., 2016).

In line with literature on online behaviors and personality traits (Ross et al., 2009; Ryan and Xenos, 2011; Eftekhari et al., 2014; Qiu et al., 2015; Sorokowska et al., 2016), and with studies on the relationship between selfies and narcissism (Barry et al., 2015; Fox and Rooney, 2015; Sorokowski et al., 2015; Weiser, 2015) that emerged being related to Honesty/Humility dimension of HEXACO model (Lee and Ashton, 2005), we hypothesized that low Honesty/Humility and high Extraversion could be related to all kinds of selfie-posting behaviors investigated. It is plausible that people with low Honesty/Humility could share more selfies in order to affirm their inflated beliefs about their positive self-view and extraverted people could share their selfies in order to improve their relationships and popularity.

Moreover, we expected that Conscientiousness would be negatively related to posting all kinds of selfies because people who are high in Conscientiousness are less involved in online behaviors and in the use of the Internet (Swickert et al., 2002; Butt and Phillips, 2008; Hughes et al., 2012), probably because they are engaged in offline activities and they considered Internet only a distraction from their tasks (Ross et al., 2009). Finally, we expected that high Emotionality could predict more selfie-posting behaviors because people high on this dimension may consider social networks as a safer place to express self-aspects compared to the off-line reality (Forest and Wood, 2012; Seidman, 2013), probably due to the association between Emotionality and social anxiety (Ashton et al., 2006).

## MATERIALS AND METHODS

### Participants

Participants were 750 adolescents and young adults (59.1% girls,  $n = 443$ ) from 13 to 30 years old ( $M_{age} = 20.96$ ;  $SD_{age} = 4.23$ ), 82.1% ( $n = 616$ ) reported to be exclusively heterosexual. Adolescents were recruited in secondary schools and an online survey was administered after obtaining written informed consents by parents and school authorities. Young adults were recruited via an online survey and they gave their informed consent by selecting “Yes, I accept to participate to this study” on the first page of the survey. This study was carried out in accordance with the recommendations of the Ethics Committee of the Department of Social and Developmental Psychology of Sapienza University of Rome, with written informed consent from all subjects. All subjects gave their informed consent in accordance with the Declaration of Helsinki. For minor participants, written informed consents were also obtained by parents and school authorities. The protocol was approved by the Ethics Committee of the Department of Developmental and Social Psychology of Sapienza University of Rome.

### Measures

#### Socio-Demographic Data

Participants were asked about socio-demographic information, such as gender, age.

#### Sexual Orientation

Participants assessed their sexual orientation via the Kinsey Scale (Kinsey, 1948) on a 5-point Likert scale from 1 (exclusively heterosexual) to 5 (exclusively homosexual).

#### Selfie-Posting Behaviors

Selfies have been defined as self-portrait photos that people shared online (via social networks, Instagram, etc.). Three questions evaluated the frequency of different kinds of selfies, specifically own selfies, group selfies, and selfies with partner, during the last month on a 6-point Likert scale (from 1 = Never to 6 = More than once a day). A sample question was: “How often have you publicly posted your own selfies on social network during the last month?” Only 454 participants (mean age = 21.95; standard deviation = 4.19; 63.7% girls,  $n = 289$ ), who reported to currently be in a dating relationship (81.9% reported

to be exclusively heterosexual,  $n = 372$ ), completed questions about sharing selfies with their partner.

### HEXACO Personality Traits

Personality traits were assessed with 60-item HEXACO Personality Inventory-Revised (Ashton and Lee, 2009). This inventory measured the six major dimensions of personality: Honesty/Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to experience. Participants rated each item on a 5-point Likert scale (from 1 = *Completely disagree* to 5 = *Completely agree*). Each scale showed a good reliability: Honesty/Humility (Cronbach alpha of .71), Emotionality (Cronbach alpha of .72), Extraversion (Cronbach alpha of .76), Agreeableness (Cronbach alpha of .74), Conscientiousness (Cronbach alpha of .71), and Openness to experience (Cronbach alpha of .70).

### Data Analysis

First of all, we calculated correlations among all variables. Then, three hierarchical regression analyses were used in order to investigate which personality traits could predict the three kinds of selfies (i.e., own selfies, group selfies and selfies with partner), controlling for age, gender and sexual orientation. In the first step of each regression, socio-demographic variables, such as gender, age and sexual orientation were included as covariates. In the second step, the criterion was regressed on the six HEXACO personality traits.

## RESULTS

First of all, we reported the zero-order correlations among the variables included in the study. Regarding correlations among different kinds of selfies and demographic variables, own selfies were negatively and weakly related to gender and age, and positively related to sexual orientation. Thus, own selfies were more frequently posted by females (66.1%) than males (55%), by adolescents (68.1%) than young adults (54.8%) and by not heterosexual (64.9%) than heterosexual participants (60.9%). Age was also negatively and modestly related to group selfies and selfies with partner: Group selfies were more reported by adolescents (81.5%) than young adults (66.8%) and also selfies with partner were more frequent among adolescents (75.8%) than young adults (57.1%). Regarding correlations between HEXACO personality traits and selfies, Honesty/Humility, Conscientiousness, and Openness to Experience were negatively and modestly related to all kind of selfies (i.e., own selfies, group selfies and selfies with partner). Moreover, own selfies were weakly and positively related to Emotionality and Extraversion, and negatively related to Agreeableness. Group selfies were weakly and positively related to Extraversion. Finally, correlations among HEXACO factors showed that Honesty/Humility was moderately and positively correlated with Emotionality, Agreeableness, Conscientiousness, and Openness to Experience. Emotionality was moderately and negatively correlated with Extraversion, that was found to be positively and moderately correlated with Conscientiousness and Openness to Experience. Finally, Conscientiousness was

found to be positively and robustly correlated with Openness to Experience. Correlations among all the variables and descriptive statistics are reported in **Table 1**.

## Hexaco Personality Traits and Own Selfies

A hierarchical regression analysis was conducted following the previously described procedure to determine which personality traits predict sharing own selfies, controlling for gender, age, and sexual orientation. Gender, age and sexual orientation were entered in the first step as covariates. Altogether, they accounted for 6.5% of the variance,  $R^2 = 0.065$ ,  $p = 0.000$ . Both gender,  $\beta = 0.12$ ,  $p = 0.001$ , age,  $\beta = -0.22$ ,  $p = 0.000$ , and sexual orientation,  $\beta = 0.11$ ,  $p = 0.002$ , emerged as significant predictors, with females (more than males), adolescents (more than young adults) and not-exclusively heterosexual people (more than exclusively heterosexual people) reporting to publicly share their own selfies on social networks. In the second step, in which HEXACO personality traits were added to the equation, 13.7% of the variance was accounted for,  $R^2 = 0.137$ , with a significant increment of 7.2% in the explained variance,  $\Delta F_{(6, 740)} = 10.26$ ,  $p = 0.000$ . Gender, age and sexual orientation were still significant predictors but, controlling for these variables, lower Honesty/Humility,  $\beta = -0.12$ ,  $p = 0.001$ , lower Conscientiousness,  $\beta = -0.14$ ,  $p = 0.000$ , higher Emotionality,  $\beta = 0.10$ ,  $p = 0.007$ , and higher Extraversion,  $\beta = 0.17$ ,  $p = 0.000$ , turned out to be significant predictors of sharing own selfies. See **Table 2** for regression coefficients.

## Hexaco Personality Traits and Group Selfies

A hierarchical regression analysis was conducted following the previously described procedure to determine which personality traits predict sharing group selfies, controlling for gender, age and sexual orientation. Gender, age and sexual orientation were entered in the first step as covariates. Altogether, they accounted for 4.9% of the variance,  $R^2 = 0.049$ ,  $p = 0.000$ . Only age,  $\beta = -0.22$ ,  $p = 0.000$ , emerged as a significant predictor, with adolescents (more than young adults) reporting to publicly share group selfies on social networks. In the second step, in which HEXACO personality traits were added to the equation, 11.8% of the variance was accounted for,  $R^2 = 0.118$ , with a significant increment of 6.9% in the explained variance,  $\Delta F_{(6, 740)} = 9.71$ ,  $p = 0.000$ . Age was still a significant predictor but, controlling for these variables, lower Honesty/Humility,  $\beta = -0.11$ ,  $p = 0.006$ , lower Conscientiousness,  $\beta = -0.12$ ,  $p = 0.002$ , higher Emotionality,  $\beta = 0.07$ ,  $p = 0.05$ , and higher Extraversion,  $\beta = 0.22$ ,  $p = 0.000$ , turned out to be significant predictors of sharing group selfies. See **Table 2** for regression coefficients.

## Hexaco Personality Traits and Selfies with Partner

A hierarchical regression analysis was conducted following the previously described procedure to determine which personality traits predict sharing selfies with partner, controlling for gender, age and sexual orientation. Gender, age and sexual orientation were entered in the first step as covariates. Altogether, they

accounted for 4.1% of the variance,  $R^2 = 0.041$ ,  $p = 0.000$ . Only age,  $\beta = -0.20$ ,  $p = 0.000$ , emerged as a significant predictor, with adolescents (more than young adults) reporting to share publicly on social networks selfies with partner. In the second step, in which HEXACO personality traits were added to the equation, 7.4% of the variance was accounted for,  $R^2 = 0.074$ , with a significant increment of 3.3% in the explained variance,  $\Delta F_{(6, 444)} = 2.65$ ,  $p = 0.015$ . Age and sexual orientation were still significant predictors but, controlling for these variables, lower Honesty/Humility,  $\beta = -0.11$ ,  $p = 0.026$ , and higher Emotionality,  $\beta = 0.10$ ,  $p = 0.046$ , turned out to be significant predictors of sharing selfies with partner. See **Table 2** for regression coefficients.

## DISCUSSION

This study aimed to investigate the role of personality traits in the display of different typologies of selfies (i.e., own selfies, group selfies, and selfies with partner), taking into account gender, age and sexual orientation differences. We found that lower Honesty/Humility and higher Emotionality traits were associated with more own, group and romantic selfie-posting behaviors, while higher Extraversion and lower Conscientiousness traits were associated only with posting own and group selfies.

The present investigation is one of the first studies examining the role of the HEXACO model of personality in predicting selfie-taking behaviors. To the best of our knowledge, we could find only one unpublished exploratory paper (Paris and Pietschnig, 2015) reporting, in a merely descriptive manner, significant associations between HEXACO traits and travel selfie-taking behaviors. With respect to Paris and Pietschnig (2015), our study offered a more comprehensive view of the phenomenon by investigating different type of selfie behaviors in a more extensive sample, taking at the same time into account the impact of socio-demographic variables. Moreover, it is also worth to note that sexual orientation differences in selfie-posting behaviors have never been investigated in literature.

We consider the meaning and the implications related to the results of the present study, first regarding the associations between personality traits on different selfie-posting behaviors, and then regarding the role of the covariates effects (i.e., gender, age, sexual orientation) in such behaviors. Finally, we consider study limitations and possible directions for future research.

## Selfie-Posting Behaviors in the Hexaco Model of Personality

Correlations between HEXACO personality traits and selfies-posting behaviors emerged in our study, although they were rather small. Nevertheless, large correlations were not expected, because selfie frequency at a given period could depend on many short-term situational factors, such as peer group norms, recency of having a phone, and current competing activities. Moreover, small correlations could be due to the fact that personality and selfies were assessed by self-report: Probably, higher correlations would be obtained from combination of self- and observer reports, as the aggregation across sources

**TABLE 1 | Correlations among variables.**

	1	2	3	4	5	6	7	8	9	10	11	12	M	SD
1. Gender	1												–	–
2. Age	–0.10**	1											20.96	4.23
3. Sexual Orientation	0.00	0.12**	1										–	–
4. H	–0.27**	0.13**	–0.02	1									3.48	0.68
5. E	–0.36**	0.01	0.01	0.16**	1								3.31	0.65
6. X	0.04	0.13**	–0.01	–0.01	–0.20**	1							3.25	0.67
7. A	0.01	0.03	0.01	0.26**	–0.01	–0.04	1						2.92	0.57
8. C	–0.13**	0.21**	–0.01	0.25**	0.08*	0.20**	0.08*	1					3.51	0.61
9. O	–0.10**	0.24**	0.20**	0.20**	0.07*	0.18**	0.04	0.31**	1				3.31	0.66
10. Own selfies <sup>a</sup>	–0.10**	–0.20**	0.08*	–0.15**	0.08*	0.08*	–0.10**	–0.17**	–0.10**	1			2.07	1.20
11. Group selfies <sup>a</sup>	0.01	–0.21**	0.01	–0.15**	0.01	0.15**	–0.05	–0.15**	–0.10**	0.61**	1		2.20	1.05
12. Selfies with partner <sup>b</sup>	–0.01	–0.20**	–0.01	–0.14**	0.06	0.01	–0.03	–0.11*	–0.14**	0.58**	0.53**	1	2.01	1.04

\*\* $p < 0.01$ ; \* $p < 0.05$ .

<sup>a</sup> $N = 750$ .

<sup>b</sup> $n = 454$ .

Gender was coded as 0 = Females and 1 = Males. H, Honesty/Humility; E, Emotionality; X, Extraversion; A, Agreeableness; C, Conscientiousness; O, Openness to Experience.

**TABLE 2 | Hierarchical regression analyses: own selfies, group selfies, and selfies with partner were, respectively, regressed on HEXACO personality traits, controlling for gender, age and sexual orientation.**

Predictor	Selfies					
	Own selfies		Group selfies		Selfies with partner	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	0.06***		0.05***		0.04***	
Gender		0.12***		0.01		0.01
Age		–0.22***		–0.22***		–0.20***
Sexual Orientation		0.11**		0.04		0.01
Step 2	0.07***		0.07***		0.03*	
Gender		0.15***		0.04		0.02
Age		–0.19***		–0.20***		–0.16**
Sexual Orientation		0.12**		0.05		0.03
Honesty/humility		–0.12**		–0.11**		–0.11*
Emotionality		0.10**		0.07*		0.10*
Extraversion		0.17***		0.22***		0.07
Agreeableness		–0.05		0.004		0.01
Conscientiousness		–0.14***		–0.12**		–0.05
Openness to experience		–0.06		–0.05		–0.09
Total $R^2$	0.13***		0.12***		0.07*	
N	750		750		454	

Gender was coded as 0 = Males and 1 = Females. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

would likely increase the validity of the personality measures. In any case, regression analyses showed that some specific personality traits, according to the HEXACO model, were significantly associated with the three different selfie-posting behaviors: The effects of Honesty/Humility and Emotionality traits were consistent in the three typologies of selfies, while Extraversion and Conscientiousness traits seem to discriminate own selfies and group selfies from selfies with a partner.

Honesty/Humility was associated with a general low level of selfie-posting behaviors. People low on this personality dimension show high levels of slyness/deceit, pretentiousness and greed (Ashton et al., 2006). Since social networks allow most full control over self-presentation, we speculate that people low on Honesty/Humility dimension may tend more to select appealing photos of themselves in order to affirm their inflated beliefs about their positive self-view, especially of their physical appearance, social popularity, and status. It is also worth



considering that Honesty/Humility has been found to strongly correlate with narcissistic aspects from other personality models (Lee and Ashton, 2005). Therefore, the negative association between Honesty/Humility and selfie-posting behaviors seems plausible and may indirectly support previous findings on the association of frequency of selfies with narcissism (Sorokowski et al., 2015; Sung et al., 2016). At the same time, we argue that the significant effect of the Honesty/Humility dimension moves beyond the well-known role of the narcissistic facets and gives a more nuanced understanding of the motivations that drive selfie-posting: Honesty/Humility is a trait level manifestation that is strictly related to social interactions, and translates into behaving fairly and cooperating with others in order to favor social equality (Chirumbolo and Leone, 2010). Thus, rather than for communication and interaction purposes, people low in Honesty/Humility may use selfies as self-regulatory strategies, such as admiration seeking and bragging and the selfie may indirectly represent a way to take advantage from others to reach own social goals at the expense of communality on social networks.

The positive association of Emotionality is also consistent with previous investigations on social media use (Seidman, 2013). People high in Emotionality tend to have large discrepancies between the actual and the ideal self and tend to present themselves differently from their self-perception. Since, as abovementioned, social networks allow people to control their self-presentations, selfies may represent an instrument to idealize selves online (Seidman, 2013). Since Emotionality is also associated to social anxiety (Ashton et al., 2006), other studies speculated that people high on this dimension may see the social networks as a safer place to express self-aspects compared to the off-line reality (Forest and Wood, 2012; Seidman, 2013). Thus, it is conceivable that people who show high Emotionality may tend more to use selfies as tools of expression and disclosure of hidden self-aspects not normally expressed in everyday life, because they probably have a greater need for emotional connection with others.

Consistent with our hypotheses, Extraversion was positively associated to own and group selfie-posting behaviors. This result is in line with findings that extraverted people more frequently engage in elaborate online self-presentations. High levels of extraversion are related to feeling positively about themselves and confident in groups, also in the online dimension. On the contrary, people with low levels of extraversion consider themselves unpopular and feel uncomfortable being at the center of attention, also in online contexts: Thus, they could post less frequently selfies. Specifically, according to previous studies (Marcus et al., 2006; Krämer and Winter, 2008; Sorokowska et al., 2016), extraverted people tend to present aspects of their own lives in a less restrained manner and to choose less conservative pictures of themselves compared to other people. Since, people who demonstrate high Extraversion are typically highly sociable (Ashton et al., 2006), posting selfies might also function as a display of willingness to seek out virtual social contact. If for people high in Emotionality is conceivable a “social compensation” hypothesis that proposes that social network may compensate for their weaker social skills, a “rich-get-richer”

hypothesis may be applicable to extraverts who tend to gain more from social network usage as their offline sociability is transferred online (Correa et al., 2010). Indeed, since extraverted people are more active users of social network sites, it is likely that they are also more active in selfie-posting (Gosling et al., 2011). Contrary to another study where a significant correlation between Extraversion and partner selfies was reported (Sorokowska et al., 2016), we found no association between these two dimensions. Probably, after controlling for other personality and socio-demographic variables, the effect of Extraversion in our regression model may result less relevant for this specific kind of selfie-posting behavior. A possible explanation for this non-significant association is that taking romantic partner selfies may not be congruent with the social goals of extraverted people, namely the preference to seek social interaction (Costa and McCrae, 1992). Indeed, it is plausible that posting own and group selfies may stimulate social interactions to a greater extent compared to posting partner selfies that, conversely, might be driven mostly by other motivations.

Finally, the negative associations between Conscientiousness, own and group selfies suggest that more conscientious individuals are more likely to avoid showing personal aspects and more concerned about their privacy. This finding confirmed our hypothesis, according to which more conscientious people are less likely to spend a lot of their time on Social Networks because they consider them as a distraction from their tasks (Butt and Phillips, 2008). Moreover, in other studies Conscientiousness is related to authentic online self-presentation (Hall and Pennington, 2013) implying that conscientious people present themselves online in ways consistent with their self-perceptions. Based on this finding, it is speculated that selfie-posting behaviors are more likely in people who tend to show online self-presentations detached from the reality. The lack of association between Conscientiousness and selfie with partner may be interpreted taking into account the differences in the content of romantic photographs compared to own and group selfies: Romantic partner selfies tend to represent less inappropriate contents and are more consistent with social norms.

## Selfie-Posting Behaviors: The Role of Gender, Age, and Sexual Orientation

Although not the focus of this paper, we observed some interesting results regarding the effect of the demographic covariates (gender, age and sexual orientation) on selfie-taking behaviors. Consistent with the literature (Jang et al., 2015; Dhir et al., 2016; Sorokowska et al., 2016), we found that girls participating in the study declared posting significantly more own selfies compared to boys. In order to explain these differences, prior findings suggested that women are more concerned compared to men with the creation of a positive picture of oneself online and the selection of pictures to show on social media (Haferkamp et al., 2012).

Moreover, it is conceivable that posting many pictures of oneself might be more socially acceptable among women compared to men and may reflect the nature of gender

stereotypes that associate vanity and physically attractive self-presentation to women (Manago et al., 2008). Conversely, gender differences were not found with respect to posting romantic partner selfies and group selfies. The latter result is inconsistent with previous findings (Sorokowski et al., 2015, 2016) reporting that women publish a greater number of group selfies compared to men. Probably, such gender differences are less likely to be identified using a general measure of frequency of selfie-posting, as it was done in the present study, while it may be more detectable when accounting for the actual number of posted selfies (Sorokowski et al., 2015, 2016). Moreover, these inconsistent result could also be related to cultural differences that should be further investigated in cross-cultural studies.

In line with previous findings acknowledging that adolescents use social network sites and online communities more often than adults (Qiu et al., 2015; Dhir et al., 2016), in our study age was also negatively associated with all three typologies of selfie-posting behaviors.

Another interesting finding of the present study was the significant association between sexual orientation and selfie-posting behaviors. Specifically, our results showed that lesbian, gay and bisexual participants reported to post own selfies to a greater extent than the heterosexual counterparts. A first reasonable explanation for this result is strictly related to the abovementioned cultural views of taking selfies as a feminine behavior. It seems plausible to speculate that gay, lesbian, and bisexual people may feel less concerned to the gender stereotypes associated to taking selfies. A second hypothesis is mostly related to the usage of social network by gay, lesbian, and bisexual people. Indeed, dating apps have become popular particularly among not heterosexual people for practical reasons (DeHaan et al., 2013; Chong et al., 2015). Most of these apps employ global positioning system technology to facilitate connections with other users based on their current location and enable the users to see pictures from nearby users and chat with them (Grosskopf et al., 2014). The large usage of date apps that enable people to present themselves to multiple audiences simultaneously through a single selfie may affect people's self-presentation strategies.

## Limitation and Future Directions

The present study had a number of limitations that should be addressed in future research. Our findings were based on data from a self-reported survey. Ideally, future research could collect observable data of selfie-posting behaviors. However, the task of identifying appropriate measures for studies on online behaviors remains still very challenging since it requires time and special permissions that are difficult to obtain. Moreover, the observation of individuals' posts of selfies on social media is not exempt from self-selection bias in terms of one's willingness to participate in a study about selfie-posting behaviors.

Another limitation is that the study relied on cross-sectional data. It would be important to extend the present study with longitudinal data in order to assess the stability of the influence of personality traits and socio-demographic variables on selfie-posting behaviors over time.

Although the present study was interested in studying selfie-posting behaviors among adolescents, extending the study to

older adults could be of considerable interest since according to the literature they may differ in their use of social networks (Pfeil et al., 2009). Finally, the categorization of the selfies (own, group and with romantic partner) may not be exhaustive: Future research should refine categories in a manner that potential significant information is not lose. For example, selfie can be further categorized based on their content: Some own selfies are focused on physical appearance, other are used to document special events and occasions. Mostly of the selfies might be coded based on contextual information accompanying them.

## CONCLUSION

In summary, although other studies have investigated specific correlates of personality in posting selfies (mostly, based on the evaluation of single trait effects), of note, the present study is the first to study the relationship between personality traits and different selfie-posting behaviors according to the HEXACO model. Additionally, the current study contributes to the existing literature on social media use by studying the relation between gender, age and sexual orientation, and posting selfies.

We found that, among personality traits, Honesty/Humility and Emotionality were the most consistent in predicting selfie-posting behaviors. Moreover, results showed that younger people, women and non-heterosexual people tend to take more own selfies compared to men and heterosexual people.

Despite the growing popularity and usage of posting selfies, yet the social, cognitive and psychological implications for posting selfie photographs to various online sites remain largely unknown. Our findings support the hypothesis that the motivations and the functions of this social phenomenon may be in part related to personality, gender, and sexual orientation based self-presentations. Moreover, this research may have important practical implications as selfie-posting behaviors represent a relevant aspect of many individuals' social interactions. Since selfie-posting behaviors are becoming more and more popular, the number and the type of selfies may provide additional important information on individual personality traits and self-representations. Specifically, this study suggests a key to understand online self-presentations in-depth. For example, as previously discussed, a selfie-posting behavior may express the need for affirming one's positive self-view, or for disclosing hidden self-aspects, or for seeking out virtual social contacts, that could be related to personality traits. Moreover, as social networking has become a widespread phenomenon in the lives of many people, examining personality traits may be helpful to differentiate normative vs. problematic behaviors in this domain. For instance, selfie-posting behaviors can have a potential negative impact on one's confidence and self-esteem for people with low Honesty/Humility, because selfies perpetuate the need for admiration and make them dependent on external feedback. Furthermore, people with high Emotionality may consider selfies an appealing venue for self-disclosure, thus selfie-posting behaviors could make them more vulnerable to undesirable

responses as being rejected or ignored and perpetuate negative emotions. Of course, these are speculations and hypotheses to be tested in further studies that may provide new insights into how taking and posting selfies allow people to express, manage and develop their self-presentations and their social interactions.

## REFERENCES

- Ashton, M. C., and Lee, K. (2007). Empirical, theoretical, and practical advantages of the HEXACO model of personality structure. *Pers. Soc. Psychol. Rev.* 11, 150–166. doi: 10.1177/1088868306294907
- Ashton, M. C., and Lee, K. (2009). The HEXACO-60: a short measure of the major dimensions of personality. *J. Pers. Assess.* 91, 340–345. doi: 10.1080/00223890902935878
- Ashton, M. C., Lee, K., and de Vries, R. E. (2014). The HEXACO Honesty–Humility, agreeableness, and emotionality factors: a review of research and theory. *Pers. Soc. Psychol. Rev.* 18, 139–152. doi: 10.1177/1088868314523838
- Ashton, M. C., Lee, K., de Vries, R. E., Perugini, M., Gnisci, A., and Sergi, I. (2006). The HEXACO model of personality structure and indigenous lexical personality dimensions in Italian, Dutch, and English. *J. Res. Pers.* 40, 851–875. doi: 10.1016/j.jrp.2005.06.003
- Ashton, M. C., Lee, K., Perugini, M., Szarota, P., De Vries, R. E., Di Blas, L., et al. (2004). A six-factor structure of personality-descriptive adjectives: solutions from psycholexical studies in seven languages. *J. Pers. Soc. Psychol.* 86, 356–366. doi: 10.1037/0022-3514.86.2.356
- Barry, C. T., Doucette, H., Loflin, D. C., Rivera-Hudson, N., and Herrington, L. L. (2015). “Let Me Take a Selfie”: associations between self-photography, narcissism, and self-esteem. *Psychol. Pop. Media Cult.* doi: 10.1037/ppm0000089. Available online at: <http://psycnet.apa.org/psycarticles/2015-28942-001>
- Bresin, K., and Gordon, K. H. (2011). Characterizing pathological narcissism in terms of the HEXACO model of personality. *J. Psychopathol. Behav. Assess.* 33, 228–235. doi: 10.1007/s10862-010-9210-9
- Butt, S., and Phillips, J. G. (2008). Personality and self reported mobile phone use. *Comput. Human Behav.* 24, 346–360. doi: 10.1016/j.chb.2007.01.019
- Chirumbolo, A., and Leone, L. (2010). Personality and politics: The role of the HEXACO model of personality in predicting ideology and voting. *Pers. Individ. Dif.* 49, 43–48. doi: 10.1016/j.paid.2010.03.004
- Chong, E. S., Zhang, Y., Mak, W. W., and Pang, I. H. (2015). Social media as social capital of LGB individuals in Hong Kong: its relations with group membership, stigma, and mental well-being. *Am. J. Community Psychol.* 55, 228–238. doi: 10.1007/s10464-014-9699-2
- Correa, T., Hinsley, A. W., and de Zúñiga, H. G. (2010). Who interacts on the Web?: the intersection of users’ personality and social media use. *Comput. Human Behav.* 26, 247–253. doi: 10.1016/j.chb.2009.09.003
- Costa, P. T., and McCrae, R. R. (1992). *Professional manual: revised NEO personality inventory (NEO-PI-R) and NEO five-factor inventory (NEO-FFI)*. Odessa, FL: Psychological Assessment Resources.
- DeHaan, S., Kuper, L. E., Magee, J. C., Bigelow, L., and Mustanski, B. S. (2013). The interplay between online and offline explorations of identity, relationships, and sex: a mixed-methods study with LGBT youth. *J. Sex Res.* 50, 421–434. doi: 10.1080/00224499.2012.661489
- Dhir, A., Pallesen, S., Torsheim, T., and Andreassen, C. S. (2016). Do age and gender differences exist in selfie-related behaviours? *Comput. Human Behav.* 63, 549–555. doi: 10.1016/j.chb.2016.05.053
- Eftekhari, A., Fullwood, C., and Morris, N. (2014). Capturing personality from Facebook photos and photo-related activities: how much exposure do you need? *Comput. Human Behav.* 37, 162–170. doi: 10.1016/j.chb.2014.04.048
- Forest, A. L., and Wood, J. V. (2012). When social networking is not working: individuals with low self-esteem recognize but do not reap the benefits of self-disclosure on Facebook. *Psychol. Sci.* 23, 295–302. doi: 10.1177/0956797611429709
- Fox, J., and Rooney, M. C. (2015). The Dark Triad and trait self-objectification as predictors of men’s use and self-presentation behaviors on social networking sites. *Pers. Individ. Dif.* 76, 161–165. doi: 10.1016/j.paid.2014.12.017
- Gosling, S. D., Augustine, A. A., Vazire, S., Holtzman, N., and Gaddis, S. (2011). Manifestations of personality in online social networks: self-reported Facebook-related behaviors and observable profile information. *Cyberpsychol. Behav. Soc. Netw.* 14, 483–488. doi: 10.1089/cyber.2010.0087
- Grosskopf, N. A., LeVasseur, M. T., and Glaser, D. B. (2014). Use of the internet and mobile-based “Apps” for sex-seeking among men who have sex with men in New York city. *Am. J. Mens Health* 8, 510–520. doi: 10.1177/1557988314527311
- Haferkamp, N., Eimler, S. C., Papadakis, A.-M., and Kruck, J. V. (2012). Men are from mars, women are from venus? examining gender differences in self-presentation on social networking sites. *Cyberpsychol. Behav. Soc. Netw.* 15, 91–98. doi: 10.1089/cyber.2011.0151
- Hall, J. A., and Pennington, N. (2013). Self-monitoring, honesty, and cue use on Facebook: the relationship with user extraversion and conscientiousness. *Comput. Human Behav.* 29, 1556–1564. doi: 10.1016/j.chb.2013.01.001
- Halpern, D., Valenzuela, S., and Katz, J. E. (2016). “Selfie-ists” or “Narci-selfiers”? a cross-lagged panel analysis of selfie taking and narcissism. *Pers. Individ. Dif.* 97, 98–101. doi: 10.1016/j.paid.2016.03.019
- Hilbig, B. E., and Zettler, I. (2009). Pillars of cooperation: honesty–humility, social value orientations, and economic behavior. *J. Res. Pers.* 43, 516–519. doi: 10.1016/j.jrp.2009.01.003
- Hughes, D. J., Rowe, M., Batey, M., and Lee, A. (2012). A tale of two sites: twitter vs. facebook and the personality predictors of social media usage. *Comput. Human Behav.* 28, 561–569. doi: 10.1016/j.chb.2011.11.001
- Jang, J. Y., Han, K., Shih, P. C., and Lee, D. (2015). “Generation like: comparative characteristics in Instagram,” in *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (State College, PA: University of Pennsylvania, ACM), 4039–4042.
- Jonason, P. K., and McCain, J. (2012). Using the HEXACO model to test the validity of the dirty dozen measure of the dark triad. *Pers. Individ. Dif.* 53, 935–938. doi: 10.1016/j.paid.2012.07.010
- Katz, J. E., and Crocker, E. T. (2015). Selfies and photo messaging as visual conversation: reports from the United States, United Kingdom, and China. *Int. J. Commun.* 9, 1861–1872. Available online at: <http://ijoc.org/index.php/ijoc/article/view/3180/1405>
- Kinsey, A. C. (1948). *Sexual Behavior in the Human Female*. Philadelphia PA: W. B. Saunders.
- Kiprin, B. (2013). *Go Selfie Yourself*. Available online at: <http://borislavkiprin.com/2013/12/13/go-selfie-yourself/>
- Krämer, N. C., and Winter, S. (2008). Impression Management 2.0: the relationship of self-esteem, extraversion, self-efficacy, and self-presentation within social networking sites. *J. Media Psychol.* 20, 106–116. doi: 10.1027/1864-1105.20.3.106
- Lee, K., and Ashton, M. C. (2004). Psychometric properties of the HEXACO personality inventory. *Multivariate Behav. Res.* 39, 329–358. doi: 10.1207/s15327906mbr3902\_8
- Lee, K., and Ashton, M. C. (2005). Psychopathy, machiavellianism, and narcissism in the five-factor model and the HEXACO model of personality structure. *Pers. Individ. Dif.* 38, 1571–1582. doi: 10.1016/j.paid.2004.09.016
- Lee, K., Ashton, M. C., Wiltshire, J., Bourdage, J. S., Visser, B. A., and Gallucci, A. (2013). Sex, power, and money: prediction from the Dark Triad and Honesty–Humility. *Eur. J. Pers.* 27, 169–184. doi: 10.1002/per.1860
- Manago, A. M., Graham, M. B., Greenfield, P. M., and Salimkhan, G. (2008). Self-presentation and gender on myspace. *J. Appl. Dev. Psychol.* 29, 446–458. doi: 10.1016/j.appdev.2008.07.001

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RB, MM, DB, AC, and MN originated the study. MM, DB, MN, and SI wrote the initial draft. MM and AC completed the analyses. RB and AC supervised the analyses. All the authors interpreted the findings and edited drafts of the article.

- Marcus, B., Machilek, F., and Schütz, A. (2006). Personality in cyberspace: personal web sites as media for personality expressions and impressions. *J. Pers. Soc. Psychol.* 90, 1014–1031. doi: 10.1037/0022-3514.90.6.1014
- Morelli, M., Bianchi, D., Baiooco, R., Pezzuti, L., and Chirumbolo, A. (2016). Sexting, psychological distress and dating violence among adolescents and young adults. *Psicothema* 28, 137–142. doi: 10.7334/psicothema2015.193
- Morf, C. C., and Rhodewalt, F. (2001). Unraveling the paradoxes of narcissism: a dynamic self-regulatory processing model. *Psychol. Inq.* 12, 177–196. doi: 10.1207/S15327965PLI1204\_1
- Oxford Online Dictionaries (2015). *Selfie*. Available online at: <http://www.oxforddictionaries.com/definition/english/selfie>
- Paris, C., and Pietschnig, J. (2015). “But first, let me take a selfie”: Personality traits as predictors of travel selfie taking and sharing behaviors,” in *Tourism Travel and Research Association: Advancing Tourism Research Globally* (Amherst, MA: University of Massachusetts).
- Paulhus, D. L., and Williams, K. M. (2002). The dark triad of personality: narcissism, machiavellianism, and psychopathy. *J. Res. Pers.* 36, 556–563. doi: 10.1016/S0092-6566(02)00505-6
- Pfeil, U., Arjan, R., and Zaphiris, P. (2009). Age differences in online social networking-A study of user profiles and the social capital divide among teenagers and older users in MySpace. *Comput. Human Behav.* 25, 643–654. doi: 10.1016/j.chb.2008.08.015
- Qiu, L., Lu, J., Yang, S., Qu, W., and Zhu, T. (2015). What does your selfie say about you?. *Comput. Human Behav.* 52, 443–449. doi: 10.1016/j.chb.2015.06.032
- Ross, C., Orr, E. S., Sisic, M., Arseneault, J. M., Simmering, M. G., and Orr, R. R. (2009). Personality and motivations associated with Facebook use. *Comput. Human Behav.* 25, 578–586. doi: 10.1016/j.chb.2008.12.024
- Ryan, T., and Xenos, S. (2011). Who uses Facebook? An investigation into the relationship between the Big Five, shyness, narcissism, loneliness, and Facebook usage. *Comput. Human Behav.* 27, 1658–1664. doi: 10.1016/j.chb.2011.02.004
- Seidman, G. (2013). Self-presentation and belonging on Facebook: How personality influences social media use and motivations. *Pers. Individ. Dif.* 54, 402–407. doi: 10.1016/j.paid.2012.10.009
- Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Pisanski, K., Chmiel, A., and Sorokowski, P. (2016). Selfies and personality: who posts self-portrait photographs? *Pers. Individ. Dif.* 90, 119–123. doi: 10.1016/j.paid.2015.10.037
- Sorokowski, P., Sorokowska, A., Frackowiak, T., Karwowski, M., Rusicka, I., and Oleszkiewicz, A. (2016). Sex differences in online selfie posting behaviors predict histrionic personality scores among men but not women. *Comput. Human Behav.* 59, 368–373. doi: 10.1016/j.chb.2016.02.033
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviors are associated with narcissism among men. *Pers. Individ. Dif.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004
- Sung, Y., Lee, J. A., Kim, E., and Choi, S. M. (2016). Why we post selfies: understanding motivations for posting pictures of oneself. *Pers. Individ. Dif.* 97, 260–265. doi: 10.1016/j.paid.2016.03.032
- Swickert, R. J., Hittner, J. B., Harris, J. L., and Herring, J. A. (2002). Relationships among Internet use, personality, and social support. *Comput. Human Behav.* 18, 437–451. doi: 10.1016/S0747-5632(01)00054-1
- Wang, R., Yang, F., and Haigh, M. M. (in press). Let me take a selfie: exploring the psychological effects of posting and viewing selfies and groupies on social media. *Telematics Informa.* doi: 10.1016/j.tele.2016.07.004
- Weiser, E. B. (2015). #Me: narcissism and its facets as predictors of selfie-posting frequency. *Pers. Individ. Dif.* 86, 477–481. doi: 10.1016/j.paid.2015.07.007

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# Not All Selfies Took Alike: Distinct Selfie Motivations Are Related to Different Personality Characteristics

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Selfies have become a frequent and commonplace occurrence, though the reasons which lead people to take selfies remain unclear. This research explores what motivates selfie taking, and suggests that this is not a uniform phenomenon and varying motivations may be found among selfie takers. In addition, the connection between these distinct selfie motivations and personality characteristics, including the big five, narcissism, and self-esteem, as well as types of selfie behaviors are examined. At the first stage of the research, 117 participants filled out a questionnaire dealing with their reasons for taking selfies. An explanatory factor analysis revealed three distinct selfie motivations: self-approval, belonging, and documentation. At the second stage, 191 different participants answered both the same questionnaire, and personality traits questionnaires. A confirmatory factor analysis verified that the three selfie motivations model has a good fit. Our results suggested that each selfie motivator is differently related to personality characteristics: self-approval was negatively related to: conscientiousness, emotional stability, openness to experiences, and self-esteem, and positively correlated to frequent checking for “likes.” Belonging was related to openness to experiences. Documentation was related to agreeableness and extroversion. Unlike previous studies, none of the selfie motivating factors was found to relate to narcissism. The reasons for these differences, as well as the need to refer to selfie taking as a multidimensional phenomenon, are discussed.

**Keywords:** selfie, motivation, selfie motivation, personality, big five, narcissism, self-esteem

## INTRODUCTION

A “selfie” is a self-photograph, usually taken by cellphone or webcam, mainly in order to upload it to social network sites (SNS) (Weiser, 2015). The phenomenon of selfies is so common, that in 2013, the Oxford dictionary declared it is the “word of the year” (Oxford dictionaries, 2013). In 2015, Instagram hosted 238 million photos with a selfie hashtag (Weiser, 2015), a number that has now risen to 267 million. This indicates that in the space of about a year, 29 million selfies were uploaded to Instagram. Katz and Crocker (2015) surveyed and interviewed people from the United States, United Kingdom, and China about their selfie habits. Their results showed that within the age of 18–24, with no cultural differences, between 96 and 100% of participants reported having taken selfies. Most of participants also reported frequently upload selfies to SNS, however, its notable to mention that due to self-appearance worries and ideas about privacy, most of the selfies were not uploaded to SNS (Katz and Crocker, 2015). All these statistics suggest that selfie taking is a popular, common, cross-cultural phenomenon.

Thus, it is no wonder that in the recent years, the increasing number of selfies has prompted a growing interest as to the reasons people take and post selfies. Much of this research has implied that narcissism plays a role in selfie behaviors: For example, narcissistic individuals tend to take more selfies than non-narcissistic ones (Halpern et al., 2016), and to like posting selfies to SNS more than less-narcissistic individuals (Lee and Sung, 2016). Another study found that narcissism in general, and grandiose exhibitionism facets specifically, are related to the frequency of selfie posting (Weiser, 2015). Other study showed that vulnerable narcissism, the kind of narcissism in which an individual bases his or her self-esteem on others' opinions, is found to be related to selfie posting (Barry et al., 2015). However, another study suggested that the relationship between selfie posting and narcissism is valid only for men (Sorokowski et al., 2015). An interesting piece of research asked participants directly, in an open question, whether selfie posting is encourage them to engage in narcissist behaviors, and more than 50% of the answers made a connection between taking a selfie and narcissistic behavior (Wickel, 2015).

In addition to narcissism, other explanations to selfie behaviors have been posited. One of them, suggested in a study in which participants were asked to fill a self-report survey regarding selfie taking and sharing during travels, is that a traveling selfie can be posted to SNS as a "real time" update, directed to others that are not sharing the same experience with you (Paris and Pietschnig, 2015). Similar ideas were also found in Warfield's (2014) interviews with young women, from which she concluded that taking selfies helped them to sense "authentic." All these findings were supported by Katz and Crocker (2015) survey and interviews, who demonstrated that people take selfies in order to control their self-presentation and identification, to prove they took part in an experience or event, and to receive feedback from their peers.

As Katz and Crocker (2015) concluded, "the selfie category encompasses a range of use and intention" (p. 1870). While most of the studies suggest there is one major reason to produce a selfie, Katz and Crocker advocate, there may in fact be a variety of motivations behind taking a selfie. This suggestion has not been given sufficient prominence, and with this in mind, our study aims to examine whether there might be several distinct motivations behind taking a selfie, since it might not be a unidimensional phenomenon as most studies suggest. Moreover, each of the studies mentioned above, described different, sometimes conflicting, motivations. For example, taking selfie for narcissist reasoning as suggested by Halpern et al. (2016), might perceived as the opposite of taking selfie to feel authentic, as suggested by Warfield (2014). These varied reasons may also be seen as a further indication that selfie taking is, as we suggest, a multidimensional phenomenon, and that several reasons to take a selfie may exist simultaneously. Thus, the current study will investigate how many selfie motivations exist, and what are these motivations actually are.

As mentioned earlier, selfies are directly connected to SNS, since some of them are being posted on SNS, and since they are a social phenomenon that begin and advance their power

at SNS (Katz and Crocker, 2015). There is much evidence to show that behaviors displayed on SNS often relate to personality traits. For example, the compulsive use of SNS is positively related to extroversion, agreeableness, and neuroticism (Hsiao et al., 2017). Other research showed that Facebook users are perceived as being more extraverted and narcissistic as compared to non-users (Ryan and Xenos, 2011). Several studies found that higher Facebook use, number of Facebook friends, and amount of public information sharing are also positively related to extroversion (Ross et al., 2009; Amichai-Hamburger and Vinitzky, 2010; Seidman, 2013; Jain et al., 2016). In addition, neuroticism is negatively related to overall SNS use (Jain et al., 2016), but positively correlated to public sharing of personal information (Amichai-Hamburger and Vinitzky, 2010), and to sharing information about one's ideal self on SNS (Seidman, 2013). Other personality characteristics were also related to SNS usage, for example, agreeableness was positively related to the amount of photo uploading, and negatively related to the amount of status updating (Amichai-Hamburger and Vinitzky, 2010; Jain et al., 2016), openness to experience was related to using a large number of Facebook tools, and conscientiousness was positively related to a greater amount of Facebook friends (Amichai-Hamburger and Vinitzky, 2010). The amount of updating of profiles were also related to higher self-esteem (Gonzales and Hancock, 2011). And it is not just the online behavior, even the topics that people chose to share on SNS were found to be related to their personalities: openness to change was positively related to sharing intellectual issues, extroversion was positively related to sharing information about social activities, higher self-esteem was related to less sharing about ones' romantic experiences, and narcissism was related to sharing information about the self body image (Marshall et al., 2015).

The link between SNS and personality occurs on other sites as well: amount of YouTube usage was found to be related to extroversion and neuroticism, and amount of Instagram usage was related to all the big five personality traits (Hamid et al., 2015). Moreover, different Instagram behaviors, such as amount of time spent on Instagram and changing profile photos, as well as motivation to use Instagram, were related to narcissism (Moon et al., 2016; Sheldon and Bryant, 2016). With all this in mind, the next stage of our research was to examine the relationship between the selfie taking motivations and personality traits: in the case of divergent types of motives to selfie taking, it would seem logical to assume that they are related to different personality type.

There is evidence that selfie behaviors are related to personality traits. As mentioned earlier, most studies have focused on the selfie, as it relates to narcissism. However, Paris and Pietschnig (2015) found that positive attitudes toward selfies are positively related to emotionality and extroversion, while positive attitudes toward "travel selfies," that are taken during a trip in order to share experiences, are positively related to agreeableness.

To explore the relationships between different selfie motivations and different personality traits, personality measures that were previously found to distinguish between SNS uses

were used. For this study, the relationship between the particular selfie motivation that was found among subjects and the personality traits of narcissism, self-esteem, and the big five traits: Extraversion, agreeableness, conscientiousness, emotional stability, and openness to experiences was examined. We predicted that there are several motivations behind the act of taking a selfie, and each of these relates differently to personality characteristics.

Lastly, it is important to note that the term “selfie behaviors,” is used to denote both selfie taking and selfie posting to SNS. It seems that in the literature relating to selfies, the distinction between these two acts is not clear enough. For example, some studies discussed selfie taking, (for example, Warfield, 2014; Halpern et al., 2016), some talked about selfie posting (for example, Barry et al., 2015; Sorokowski et al., 2015; Weiser, 2015), and some dealt with both of these activities, (Katz and Crocker, 2015; Paris and Pietschnig, 2015). Overall, these terms were generally perceived as being similar to one another and sometimes used interchangeably. However, since only less than half of the selfies taken are in fact uploaded to SNS (Katz and Crocker, 2015), a distinction between taking and posting selfies is important. Selfie taking is a private act, while selfie posting is public, thus it arouses questions and concerns as to how others perceived the photo and what kind of feedback it will receive (Katz and Crocker, 2015). We believe that the time has come for a clear distinction to be made between these terms. This specific article will discuss only the motives of selfie taking, and their relationship to personality traits. Since selfie posting also involves the act of sharing the selfie with others, a different investigation should explore the motives behind selfie posting, and its connections to personality traits.

## The Current Study

Our research aimed to discover whether there are one or several motivations behind the taking of a selfie, and, in the case of several motivations, whether these are related to personality traits. In order to do this, we used a methodology that is similar to the one used by Paris and Pietschnig (2015). In Paris and Pietschnig's (2015) study about taking and posting travel selfies, a pre-test in which participants freely write statements regarding their attitudes about travel selfies was conducted as a first stage. Based on this list, they produced an exploratory factor analysis (EFA), and based on that factor analysis, they examined which factor was related to each of the personality traits that they measured.

Similarly, we were first used a pre-test using the same free-writing assignment, in which participants freely indicated their motives behind selfie taking. We used their answers to produce an EFA to reveal the different selfie taking motives. At the second stage of the current research, an analysis was performed as to examine whether the factor structure that was found in the EFA can be replicated in a new sample. The factor structure was tested using confirmatory factor analysis (CFA). If the factor's pattern had, in fact, been replicated, the connections between the different factors and personality traits would be investigated.

## MATERIALS AND METHODS

### Participants

In order to build and confirm different selfie motivations in two separate analyses, two stages of data were collected: At the first stage, 117 communications undergraduate volunteered to take part in the study. First stage sample included 82 women and 35 men,  $M_{age} = 23.07$ ,  $SD_{age} = 1.81$ . For the second stage, 191 psychology undergraduates took part of the study in return to course credit. Of them, 128 were women and 63 were men. Unfortunately, due to technical problem, their age has not been recorded. However, as both stages were collected from undergraduates at the same college, we assume that second stage participants were about the same age as first stage participants.

### Measures

#### Selfie Motivations

A pre-test was conducted on 11, volunteer, psychology undergraduates, all of whom were similar in age and gender distribution to the studies' samples. Similarly to Paris and Pietschnig's (2015) pre-test, participants were asked to write down as many motivations as they could think of to take a selfie.

They freely generated about 60 items. To avoid repetitiveness, items that were similar in meaning united into one item. As we wanted the motivation to represent the students' state of mind accurately, we did not add any other item. We also did not delete any suggested item. That means that even items that appeared once during the pre-test were part of the selfie motivation questionnaire. Based on this pre-test, the selfie motivation questionnaire included 35 different types of motives to take a selfie. For example: “I'm taking selfie because it makes me feel less lonely,” or “I'm taking selfie because it helps me to meet new people,” or “I'm taking selfie because I want a souvenir from places that I visited.”

Participants were asked to indicate to which degree they agreed or disagreed with each sentence, on a 5-point Likert scale, ranged from 1-highly disagree, to 5-highly agree. To avoid repetitiveness, followed the instructions and before the list of different motives, it was written “*I'm taking a selfie because...*” Then, each sentence appeared without this beginning.

#### Selfie Behaviors

Participants were asked in which frequency they are uploading selfies to SNS, on a 4-point scale, ranged from 1 = “once a day and more” to 4 = “less than once a week.” Participants were also asked in which frequency they are checking the amount of likes their photo receives, on a 5-point scale ranging from 1 = “every minute” to 5 = “once a day or less.”

#### Self-esteem

Self-esteem was measured by the Rosenberg's (1965) self-esteem scale, contains 10 items on a 4-point scale, ranged from “strongly agree” to “strongly disagree.” For example: “I take a positive attitude toward myself.” As in the original scale, answers were

summed up, allowing a scale ranged from 10 to 40. The scale's reliability was good at the current study ( $\alpha = 0.88$  at the second sample, in which we examined the relationship between self-esteem and selfie motivations).

### Big Five

To examine the big five traits: Extraversion, agreeableness, conscientiousness, emotional stability, and openness to experiences, we used the Ten-Item Personality Inventory (TIPI) (Gosling et al., 2003). This questionnaire assembled from 10 pairs of descriptions (for example, "Disorganized, careless"), and participants asked to rate the extent to which this pair of descriptions suitable to them, upon 7-point Likert scale, range from 1-strongly disagree to 7-strongly agree. Each of the big five traits is calculated based on the average of answers to two questions, one is a reversed version of the other (for example, agreeableness was calculated as the average of the score for "Sympathetic, warm," and the reversed score for "Critical, quarrelsome").

### Narcissism

Narcissism was measured by the NPI-16 (Ames et al., 2006), a 16 items narcissism scale. Each item contains two sentences that are the opposite of each other, with a 5-points scale between them. Participants needed to choose the answer which they find as most identified of themselves. Choosing the middle item suggest a neutral opinion, while being more close to a sentence mean a larger agreement with it. For example, one of the items is "I am more capable than others," against "There is a lot that I can learn from others." Higher score among the scale referred to higher amount of narcissism. The scale's reliability in the current study was good ( $\alpha = 0.83$  at the second sample, in which we will examine the relationship between self-esteem and selfie motivations).

### Procedure

In both samples, after agreeing to participate, participants were directed to a web questionnaire, and asked to sign a consent form. First they received general instructions about the survey and were informed that their anonymity would be preserved. Next, they answered the selfie behavior questions. Then, on a separate page, they filled the selfie motivation questions. Then, they answered the Rosenberg self-esteem questionnaire, the TIPI and the NPI-16. In the first sample, participants were then asked about their gender and age, while at the second sample, participants were asked about their gender at the beginning of the questionnaire. At the final screen, participants thanked for their participation. Both studies and the pre-test were conducted and run in Hebrew, and all the participants were native Hebrew speakers. It is also notable to mention that these studies were carried out in accordance with the recommendation of the APA ethical principles, Interdisciplinary Center Herzliya (IDC) ethics committee, with written informed consent from all subjects, in accordance with the Declaration of Helsinki. These studies protocols were approved by the IDC ethics committee.

## RESULTS

### Stage One: Exploratory Factor Analysis (EFA)

The first step was to examine the number of factors, or motivations, to produce a selfie. Both Cattell's scree plot and parallel analysis (based on Humphreys and Montanelli's 1975 method, and on O'Connor's 2000 program) revealed a three factors model (see **Figure 1**). Based on this, a three factors model was examined, using a varimax rotation solution. A cut-off of 0.3 was used as a reference to indicate salient item loadings. The model accounted for 58.36% of the variance in selfie motivations scores. It should be noted that other two competing models, of one-factor and two-factor solutions, were also examined using a varimax rotation solution and a cut-off of 0.3. These models arouse a weaker amount of explained variance (one-factor solution: 39.45%, two-factors solution: 51.77%), supporting the scree plot and parallel analysis three factors solution.

Thus, we remain with the three-factors solution. Items that were load over more than one-factor removed from the final model. Leaving the final solution with 17 items, loaded upon three-factors. The EFA three-factors solution can be seen in **Table 1**.

The first factor, relates to the motivation to take selfie to confirm inner feelings, needs, and believes, was labeled "self-approval." The second factor, discusses the motivation to take selfie to feel part of a group and to obey social norms, was labeled "belonging." The third factor, talks about the motivation to keep memories from one's own point of view, was labeled "documentation."

### Stage Two: Confirmatory Factor Analysis (CFA)

Using the second dataset, CFA was conducted in AMOS software, to examine the model fit. The model suggested mediocre fitting ( $X^2/df = 3.03$ , CFI = 0.91, GFI = 0.81, TLI = 0.89, SRMR = 0.11, RMSEA = 0.10). In the light of this mediocre model fit, we examine the standardized residual co-variances, and three items, that their standardized residual co-variances were higher than 2, excluded from the model. These items were: "I must do it to feel good with myself" (item number 5), "I want to perpetuate the moment from my own point of view" (item number 15), and "I want others to see what I've experienced" (item number 17). Removing these items from the model emerge a good model fit, confirming that the hypothesized factors fit well ( $X^2/df = 2.02$ , CFI = 0.96, GFI = 0.90, TLI = 0.95, SRMR = 0.05, RMSEA = 0.07). The path diagram of standardized estimates was illustrated in **Figure 2**.

### Comparison with Two-Factor Model

Following a reviewer's suggestion, we combined "self-approve" and "belonging" factors, which were highly correlated, and examined a two-factor model. Here as well, there were three items with standardized residual co-variances that were higher than 2, we excluded from the model. The items were: "It allows me to remember places and experiences that I've experienced" (item



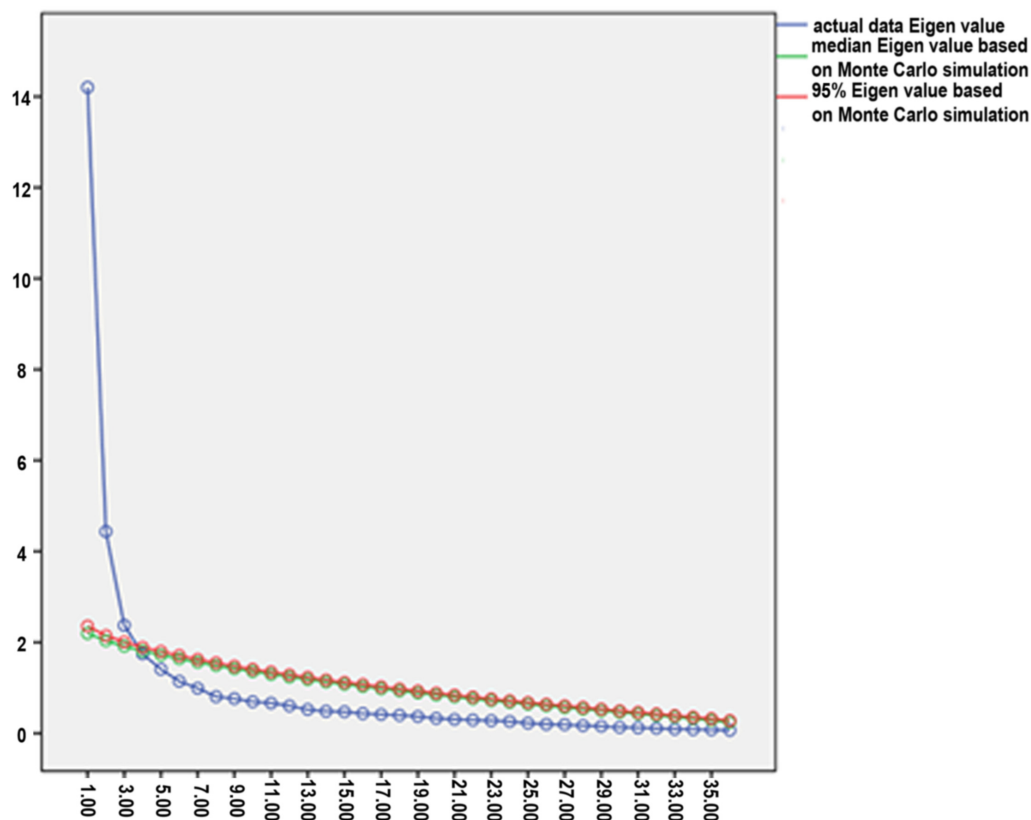


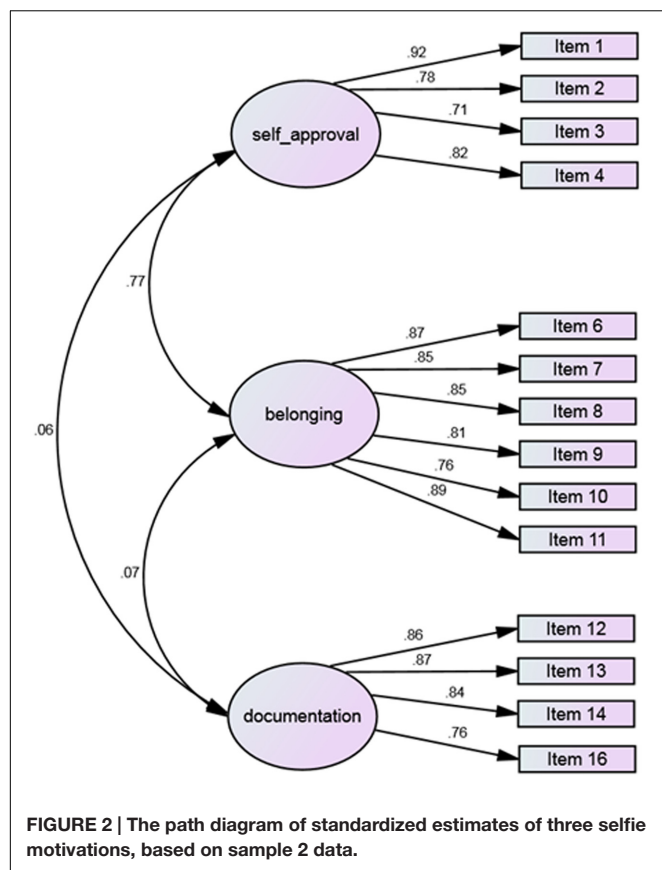
FIGURE 1 | Scree plot with parallel analysis results of 50% and 95% Eigen values, based on Monte Carlo Simulation.

TABLE 1 | Rotated exploratory factor loadings of selfie motivations, using sample 1 data.

I'm taking selfies because...	Item #	Factor 1: self-approve	Factor 2: belonging	Factor 3: documentation
It builds my self-confidence	1	0.778		
It makes me look at myself in a positive way	2	0.768		
It might make me perceived as attractive to the opposite sex	3	0.717		
It is a way for me to receive love	4	0.691		
I must do it to feel good with myself	5	0.653		
My friends upload selfies, so I'm uploading too	6		0.817	
It makes me feel part of the society	7		0.808	
It makes me feel a strong feeling of belonging	8		0.777	
I don't want to be the only one who not takes selfies	9		0.753	
This is the current trend, and everyone are doing it	10		0.752	
I want to be like everyone	11		0.751	
It supplies documentation for my experiences	12			0.853
It is a good and easy way to preserve memories	13			0.795
It allows me to remember places and experiences that I've experienced	14			0.783
I want to perpetuate the moment from my own point of view	15			0.769
I want a souvenir from places that I visited	16			0.764
I want others to see what I've experienced	17			0.550

number 14), "I want to perpetuate the moment from my own point of view" (item number 15), and "I want others to see what I've experienced" (item number 17). The model fit was lower than the three-factor model above any fitting index ( $X^2/df = 4.49$ ,

CFI = 0.87, GFI = 0.768, TLI = 0.84, SRMR = 0.06, RMSEA = 0.13). Relative measurements to model comparisons (Penny, 2012), AIC and BIC, were also both lower in the three-factor model (AIC = 211.511, BIC = 318.662) compared with the



two-factor model (AIC = 399.32, BIC = 493.49), giving a more direct indication that the three-factor model has a better fit as compared with the two-factor model.

### Reliabilities

The cronbach's  $\alpha$  coefficient for the self-approving scale was 0.88, for the belonging scale was 0.93, and for the documentation scale 0.90, indicating a good reliability for all three scales.

### Analyses of Excluded Items

The first item list included 35 items, while in the final selfie motivation questionnaire, only 14 questions remained. To examine whether the excluded items contained any further information that was missing from the final questionnaire, we created an additional EFA, similar to the first one, based on the items that were collected in Study 1, which contains all the initial collected items. We used similar methods to those used in Study 1, with a varimax rotation solution and a cut-off of 0.3 as a reference to indicate salient item loading. Cattell's scree plot was offered as a three-factors solution. The items that remain after cleaning items that were load over more than one-factor are presented in **Table 2**. These three-factors shared a similar meaning with the three-factors that are part of the selfie questionnaire, indicating that by excluding these items from the final questionnaire, we did not miss any further information.

### Different Selfie Motivation as Connected to Personality Dimensions

Based on the data from sample 2, we also examine whether the three distinct selfie motivations are correlated with different personality characteristics. **Table 3** presents the correlations between the motivations and the personality traits.

### Selfie Behaviors

Not surprisingly, all three motives were related to frequency of selfie taking, suggesting that higher selfie motivations are related to greater frequency of selfie posting (self-approve:  $r = -0.22$ ,  $p < 0.01$ , belonging:  $r = -0.15$ ,  $p < 0.05$ , documentation:  $r = -0.15$ ,  $p < 0.05$ ). However, only self-approval motivation was related to frequency of likes checking ( $r = -0.292$ ,  $p < 0.001$ ), indicating that self-approval motivation arise liking checking.

### Narcissism

Unlike other studies, our results did not support the idea that selfie motivations are related to narcissism. None of the three selfie motivations were related to narcissism (self-approve:  $r = -0.013$ ,  $p = 0.87$ ; belonging:  $r = -0.028$ ,  $p = 0.72$ ; documentation:  $r = 0.07$ ,  $p = 0.41$ ). Since evidence suggests that selfies are related to narcissism in men but

**TABLE 2 | Rotated exploratory factor loadings of excluded selfie motivations, using sample 1 data.**

<i>I'm taking selfies because...</i>	Factor 1	Factor 2	Factor 3
This is how you meet new and interesting people	0.837		
It helps me widen my social circle	0.796		
I believe it's one of the best ways to meet new people	0.781		
It opens opportunities for me to meet new people	0.757		
It helps me build relationships with others	0.686		
I must do it to feel good with myself	0.676		
It allows me to be seen at my best and to be perceived as popular in other people's eyes		0.792	
I want others to see what I've experienced			0.822
Because it's fun to share others in my daily experience			0.700
Because I want to publish whatever I'm doing			0.648
I want to perpetuate the moment from my own point of view			0.631

TABLE 3 | Means, standard deviations, and correlation matrix for all variables, based on sample 2 data.

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
(1) Self-approve motivation	1.696	1.08	1												
(2) Belonging motivation	1.69	0.935	0.715**	1											
(3). Documentation motivation	3.39	1.20	0.047	0.072	1										
(4) Uploading selfies frequency	3.79	0.549	-0.216**	-0.154*	-0.148*	1									
(5) Checking "likes" frequency	3.67	1.15	-0.291**	-0.081	-0.050	0.244**	1								
(6) Narcissism	3.18	0.593	-0.013	-0.028	0.066	0.011	-0.130	1							
(7) Self-esteem	32.49	5.41	-0.153*	-0.125	0.129	-0.004	-0.017	0.337**	1						
(8) Extraversion	4.56	1.16	-0.142	-0.109	0.227**	-0.103	-0.086	0.207*	0.273**	1					
(9) Agreeableness	4.83	1.08	-0.051	0.010	0.161*	-0.077	0.092	-0.139	0.196*	0.067	1				
(10) Conscientiousness	5.25	1.38	-0.201*	-0.117	0.046	0.110	0.041	0.135	0.165*	0.200*	0.082	1			
(11) Emotional Stability	4.13	1.41	-0.200*	-0.022	0.068	0.092	0.061	0.155	0.370**	0.180*	0.232**	0.128	1		
(12) Openness to experiences	4.78	1.32	-0.183*	-0.235**	0.030	-0.103	0.238**	0.196*	0.144	-0.006	-0.025	-0.127	0.127	1	
(13) Gender	1.67	0.471	0.031	-0.033	0.274**	-0.101	-0.149*	-0.202*	-0.031	0.110	0.137	0.071	-0.103	-0.183*	1

M, Mean; SD, Standard Deviation, \* $p < 0.05$  level, \*\* $p < 0.01$  level.

not in women (Sorokowski et al., 2015), we examine the relationship between the three selfie motivations and narcissism separately to each gender, however, could not find any significant effect (for men, all  $p$ 's  $> 0.33$ ; for women, all  $p$ 's  $> 0.15$ ). Moreover, we conducted three regression analyses in steps, to examine whether gender has a moderating role in the connection between narcissism and each of the three selfie motivations. In the first step of each regression, gender and narcissism were entered. In the second step, the multiplication of gender and narcissism was entered. As a dependent variable, we used one selfie motivation at each regression analysis. None of these regressions were found a significant interaction between gender and narcissism in their ability to predict selfie motivation (self-approve:  $\beta = 0.027$ ,  $p = 0.96$ , belonging:  $\beta = 0.58$ ,  $p = 0.30$ , documentation:  $\beta = -0.001$ ,  $p = 0.99$ )

### Self-esteem

Self-esteem was negatively correlated to self-approval motivation ( $r = -0.15$ ,  $p < 0.05$ ), and was not correlated to either belonging or documentation motivations.

### Big Five

Big five traits were able to differentiate between the selfie motivations: documentation motivation, but not the other selfie motivations, was positively related to extroversion ( $r = 0.23$ ,  $p < 0.005$ ) and agreeableness ( $r = 0.16$ ,  $p < 0.05$ ). Self-approval motivation, but not the other motives, was negatively related to conscientiousness ( $r = -0.20$ ,  $p < 0.05$ ) and to emotional stability ( $r = -0.20$ ,  $p < 0.05$ ). Self-approval and belonging motivations were negatively related to openness to experiences ( $r = -0.18$ ,  $p < 0.05$ ;  $r = -0.24$ ,  $p < 0.01$ , respectively).

## DISCUSSION

The major aim of the study was to reveal the number and type of motivations behind the taking of selfies. As predicted, the EFA and the good fit of the CFA indicated that more than one motivation might instigate selfie taking. The factor analyses displayed three distinct selfie motivations: self-approval, belonging and documentation. Self-approval is the need to validate one's confidence or significance by taking selfies. Belonging is the tendency to take and upload selfies and obeying the social norms, in order to feel part of one's environment. Documentation is the intention to preserve one's memory and experience by taking a selfie.

Moreover, we suggested that if several selfie motivations were revealed, each motivation would be differently connected to different personality traits. Results indicate that mostly, this was the case. But, it should be taken into account that some of these relationships were weak, indicating a limited effect sizes. However, although these connections might be smaller than expected, all of them are perceived as reasonable in the light of pervious research, which showed similar trends.

Self-approval motivation was negatively related to conscientiousness. Conscientiousness is one of the

big five personality traits and relates to persistence, self-oriented motivations, and a decreased need to conform (John and Srivastava, 1999; Roccas et al., 2002). Our finding, suggests that it also relates to a higher need to seek your self-confirmation from an external source as selfies, seems to continue the same line of findings. Self-approval motivation was negatively related to emotional stability, implying that gaining your own confidence from others' opinions is not indicative of a stable emotional state. A similar interpretation can be given to the negative relationship between the motives of self-esteem and self-approval: if one seeks confidence and approval from others, then one's self-esteem is dependent upon their opinion. This reinforces an earlier finding that people perceive their self-esteem as higher in areas that relate to characteristics that others believe they possess (MacDonald et al., 2003). Moreover, having conscientiousness, emotional stability and self-esteem negatively relate to self-approval may also explain the positive correlation between this motive and the frequent need to check for "likes" after posting a selfie on SNS. When someone's self-worth is not determined by their own inner compass, it is no wonder that s/he is searching for external reinforcements, in this case, in the shape of a "like."

Both motivators of self-approval and belonging were negatively related to openness to experiences. A high score in openness to experiences is related to higher risk taking (Nicholson et al., 2005), higher creativity (George and Zhou, 2001), and higher self-directed values (Roccas et al., 2002). These motives both have roots that relate to trying to be normative and conventional, in the self-approval motive, for your own confirmation, and in the belonging motive, in order to fit to the social norms. As openness to experience is somewhat the opposite of being normative (McCrae, 1987, 1993), these two motives are negatively correlated with it.

Aside from openness to experiences, belonging was not related to any other characteristic. It is surprising, as belonging is one of the basic needs (Maslow, 1971), that would predicted to be connected to some personality variables. We suggest that as belonging, in this research, is the motive to be socially normative, none of our personality measures may be relevant to this motive: none of them is a measurement of conformity or importance of social norms. Future studies should examine the role of belonging as a motivator in other personality traits, such as conformity and locus of control. Ever since Asch's famous study, it is clear that people who are higher on the need to belong will also conform to the group, even at the cost of lying, but this will not be the case for those who have a lower need to belong (Asch, 1956, see also: Turner, 1987; Adler et al., 1992; Harris, 1995). Similarly, we predict that a higher need for belonging will be related to a greater external locus of control, as external locus of control means gaining control from others, and not from the inner self (Biondo and MacDonald, 1971; Lefcourt, 1976), which in today's world may come to fruition through the taking of selfies because everyone else is doing so.

Documentation was positively related to both extraversion and agreeableness. Agreeableness might be explained as a reason behind the type of selfie taking. As Paris and Pietschnig (2015) demonstrated, travel selfies are related to agreeableness, which

might imply that this personality trait influences the type of activity one is doing, and this activity type leads to different type of selfie motives. This may well be the case for extraversion, since extraverts are higher on hedonism and stimulation (Roccas et al., 2002), when they take an excursion they are likely to take travel selfies for the purpose of documenting their experiences. Further study should examine the type of selfies that are common for each motive, and examine whether the selfie-type is mediated between personality traits and selfie motives.

Unlike other studies, none of the selfie motives were found to be related to narcissism. Even when, following the earlier study (Sorokowski et al., 2015), we examined this relationship as divided by gender, or when we used gender as a moderator. A possible explanation to this gap might be found in previous studies about the relationship between selfies and narcissism, since some of these did not find a straightforward connection between narcissism and selfie behaviors (for example: Barry et al., 2015; Sorokowski et al., 2015). However, there is evidence that several specific dimensions of narcissism and not narcissism in general, are related to selfie behaviors. Specifically, it was found that grandiose exhibitionism facets and vulnerable narcissism are related to selfie posting (Barry et al., 2015; Weiser, 2015). Future studies should examine whether specific narcissism dimensions are also related to the three different selfie motives that were found in this study. It is reasonable to assume, for example, that the self-approval motive is related to vulnerable narcissism, as they both relate to maintaining self-confirmation using external cues.

Another explanation for the gap between the literature and our study might be that studies about narcissism-selfie connections mostly focus on posting selfies to SNS, whereas in our study, we asked our participants to refer to selfie taking. As mentioned, most of the selfies are in fact not uploaded to SNS (Katz and Crocker, 2015), therefore there should be a distinction made between taking and posting selfies. Narcissists, who tend to be attention seekers and exhibitionists (Vazire et al., 2008), might give additional weight to posting selfies to SNS, which is a public act, and less importance to selfie taking in general, as it is a private behavior. In such case, it is reasonable that our research, focusing on selfie taking, did not find a connection between the taking of selfies and narcissism, that was present in other studies which focused on selfie posting. We suggest that future studies on the role of narcissism in selfies should study the differences between the private action of taking selfies, and the public practice of posting selfies to SNS.

This research suffers from several limitations: first, participants in both research stages were undergraduate students. As social network behaviors change with age (Carrier et al., 2009; Turner, 2015), and specifically as selfie behaviors change with age (Dhir et al., 2016), these results represent only a certain population. Secondly, this study is based on self-reported data. The relationships between personality traits and SNS behaviors have been shown to be different when measured by self-reporting or by more objective criteria (Amichai-Hamburger and Vinitzky, 2010). Thus, the results of the current study should be interpreted only as part of greater picture, that also includes selfie behaviors and their motivational meanings.



## CONCLUSION

This research served as initial foray into the search for different selfie motivations. It indicates three main motives behind the taking of selfies, and their ability to distinct between different personality traits. Since selfie taking is such a huge phenomenon, we perceive this research as a primary exploration that should be extended to ensure a deeper understanding of the different selfie motives

and their implications for on individuals, as well as for society.

## AUTHOR CONTRIBUTIONS

YA-H developed the study concept; SE and YA-H collected the data; SE analyzed and interpreted the data; and SE and YA-H wrote and revised the manuscript.

## REFERENCES

- Adler, P. A., Kless, S. J., and Adler, P. (1992). Socialization to gender roles: popularity among elementary school boys and girls. *Sociol. Educ.* 65, 169–187. doi: 10.2307/2112807
- Ames, D. R., Rose, P., and Anderson, C. P. (2006). The NPI-16 as a short measure of narcissism. *J. Res. Pers.* 40, 440–450. doi: 10.1037/a0033192
- Amichai-Hamburger, Y., and Vinitzky, G. (2010). Social network use and personality. *Comput. Hum. Behav.* 26, 1289–1295. doi: 10.1016/j.chb.2010.03.018
- Asch, S. E. (1956). Studies of independence and conformity: I. A minority of one against a unanimous majority. *Psychol. Monogr. Gen. Appl.* 70, 1–70. doi: 10.1037/h0093718
- Barry, C. T., Doucette, H., Loflin, D. C., Rivera-Hudson, N., and Herrington, L. L. (2015). “Let me take a selfie”: associations between self-photography, narcissism, and self-esteem. *Psychol. Pop. Media Cult.* 6, 48–60. doi: 10.1037/ppm0000089
- Biondo, J., and MacDonald, A. P. Jr. (1971). Internal-external locus of control and response to influence attempts. *J. Pers.* 39, 407–419. doi: 10.1111/j.1467-6494.1971.tb00051.x
- Carrier, L. M., Cheever, N. A., Rosen, L. D., Benitez, S., and Chang, J. (2009). Multitasking across generations: multitasking choices and difficulty ratings in three generations of Americans. *Comput. Hum. Behav.* 25, 483–489. doi: 10.1016/j.chb.2008.10.012
- Dhir, A., Pallesen, S., Torsheim, T., and Andreassen, C. S. (2016). Do age and gender differences exist in selfie-related behaviours? *Comput. Hum. Behav.* 63, 549–555. doi: 10.1016/j.chb.2016.05.053
- George, J. M., and Zhou, J. (2001). When openness to experience and conscientiousness are related to creative behavior: an interactional approach. *J. Appl. Psychol.* 86, 513–524. doi: 10.1037/0021-9010.86.3.513
- Gonzales, A. L., and Hancock, J. T. (2011). Mirror, mirror on my facebook wall: effects of exposure to facebook on self-esteem. *Cyberpsychol. Behav. Soc. Network.* 14, 79–83. doi: 10.1089/cyber.2009.0411
- Gosling, S. D., Rentfrow, P. J., and Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *J. Res. Pers.* 37, 504–528. doi: 10.1016/S0092-6566(03)00046-1
- Halpern, D., Valenzuela, S., and Katz, J. E. (2016). “Selfie-ists” or “Narci-selfiers”? a cross-lagged panel analysis of selfie taking and narcissism. *Pers. Ind. Dif.* 97, 98–101. doi: 10.1016/j.paid.2016.03.019
- Hamid, N. A., Ishak, M. S., and Yazam, S. S. N. M. (2015). Facebook, youtube and instagram: exploring their effects on undergraduate students’ personality traits. *J. Soc. Med. Soc.* 4, 138–165.
- Harris, J. R. (1995). Where is the child’s environment? A group socialization theory of development. *Psychol. Rev.* 102, 458–489. doi: 10.1037/0033-295X.102.3.458
- Hsiao, K. L., Shu, Y., and Huang, T. C. (2017). Exploring the effect of compulsive social app usage on technostress and academic performance: perspectives from personality traits. *Telemat. Inform.* 34, 679–690. doi: 10.1016/j.tele.2016.11.001
- Humphreys, L. G., and Montanelli, R. G. Jr. (1975). An investigation of the parallel analysis criterion for determining the number of common factors. *Multiv. Behav. Res.* 10, 193–205. doi: 10.1207/s15327906mbr1002\_5
- Jain, A., Gera, N., and Ilavarasan, P. V. (2016). Whether social media use differs across different personality types? Insights for managing human resources. *Int. J. Work Organ. Emot.* 7, 241–256. doi: 10.1504/IJWOE.2016.081465
- John, O. P., and Srivastava, S. (1999). The big five trait taxonomy: history, measurement, and theoretical perspectives. *Handb. Pers. Theory Res.* 2, 102–138.
- Katz, J. E., and Crocker, E. T. (2015). Selfies and photo messaging as visual conversation: reports from the United States, United Kingdom and China. *Int. J. Commun.* 9, 1861–1872.
- Lee, J. A., and Sung, Y. (2016). Hide-and-seek: narcissism and “Selfie”-related behavior. *Cyberpsychol. Behav. Soc. Network.* 19, 347–351. doi: 10.1089/cyber.2015.0486
- Lefcourt, H. M. (1976). *Locus of Control*. New York, NY: Lawrence Erlbaum Associates.
- MacDonald, G., Saltzman, J. L., and Leary, M. R. (2003). Social approval and trait self-esteem. *J. Res. Pers.* 37, 23–40. doi: 10.1016/S0092-6566(02)00531-7
- Marshall, T. C., Lefringhausen, K., and Ferenczi, N. (2015). The Big Five, self-esteem, and narcissism as predictors of the topics people write about in Facebook status updates. *Pers. Individ. Dif.* 85, 35–40. doi: 10.1016/j.paid.2015.04.039
- Maslow, A. H. (1971). *Farther Reaches of Human Nature*. New York, NY: Viking Press.
- McCrae, R. (1987). Creativity, divergent thinking, and openness to experience. *J. Pers. Soc. Psychol.* 52, 1258–1265. doi: 10.1037/0022-3514.52.6.1258
- McCrae, R. R. (1993). Openness to experience as a basic dimension of personality. *Imagin. Cogn. Pers.* 13, 39–55. doi: 10.2190/H8H6-QYKR-KEU8-GAQ0
- Moon, J. H., Lee, E., Lee, J. A., Choi, T. R., and Sung, Y. (2016). The role of narcissism in self-promotion on instagram. *Pers. Individ. Dif.* 101, 22–25. doi: 10.1016/j.paid.2016.05.042
- Nicholson, N., Soane, E., Fenton-O’Creedy, M., and Willman, P. (2005). Personality and domain-specific risk taking. *J. Risk Res.* 8, 157–176. doi: 10.1080/1366987032000123856
- O’Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer’s MAP test. *Behav. Res. Methods Instrum. Comput.* 32, 396–402. doi: 10.3758/BF03200807
- Oxford dictionaries (2013). *The Oxford Dictionaries Word of the Year 2013*. Available at: <http://blog.oxforddictionaries.com/press-releases/oxford-dictionaries-word-of-the-year-2013/>
- Paris, C. M., and Pietschnig, J. (2015). ‘But First, Let Me Take a Selfie’: Personality Traits as Predictors of Travel Selfie Taking and Sharing Behaviors. Available at: [http://scholarworks.umass.edu/ttra/ttra2015/Academic\\_Papers\\_Oral/1](http://scholarworks.umass.edu/ttra/ttra2015/Academic_Papers_Oral/1)
- Penny, W. D. (2012). Comparing dynamic causal models using AIC, BIC and free energy. *Neuroimage* 59, 319–330. doi: 10.1016/j.neuroimage.2011.07.039
- Roccas, S., Sagiv, L., Schwartz, S. H., and Knafo, A. (2002). The big five personality factors and personal values. *Pers. Soc. Psychol. Bull.* 28, 789–801. doi: 10.1177/0146167202289008
- Rosenberg, M. (1965). Rosenberg Self-Esteem Scale (RSE). *Acceptance and Commitment Therapy. Measures package*.
- Ross, C., Orr, E. S., Sisic, M., Arseneault, J. M., Simmering, M. G., and Orr, R. R. (2009). Personality and motivations associated with Facebook use. *Comput. Hum. Behav.* 25, 578–586. doi: 10.1016/j.chb.2008.12.024
- Ryan, T., and Xenos, S. (2011). Who uses Facebook? An investigation into the relationship between the Big Five, shyness, narcissism, loneliness, and Facebook usage. *Comput. Hum. Behav.* 27, 1658–1664. doi: 10.1016/j.chb.2011.02.004
- Seidman, G. (2013). Self-presentation and belonging on Facebook: how personality influences social media use and motivations. *Pers. Individ. Dif.* 54, 402–407. doi: 10.1016/j.paid.2012.10.009

- Sheldon, P., and Bryant, K. (2016). Instagram: motives for its use and relationship to narcissism and contextual age. *Comput. Hum. Behav.* 58, 89–97. doi: 10.1016/j.chb.2015.12.059
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviors are associated with narcissism among men. *Pers. Individ. Dif.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004
- Turner, A. (2015). Generation Z: technology and social interest. *J. Individ. Psychol.* 71, 103–113. doi: 10.1353/jip.2015.0021
- Turner, J. C. (1987). *Rediscovering the Social Group: A Self-Categorization Theory*. Oxford: Basil Blackwell.
- Vazire, S., Naumann, L. P., Rentfrow, P. J., and Gosling, S. D. (2008). Portrait of a narcissist: manifestations of narcissism in physical appearance. *J. Res. Pers.* 42, 1439–1447. doi: 10.1016/j.jrp.2008.06.007
- Warfield, K. (2014). *Making Selfies/Making Self: Digital Subjectivities in the Selfie*. Available at: <http://kora.kpu.ca/facultypub/8>
- Weiser, E. B. (2015). #Me: narcissism and its facets as predictors of selfie-posting frequency. *Pers. Individ. Dif.* 86, 477–481. doi: 10.1016/j.paid.2015.07.007
- Wickel, T. M. (2015). Narcissism and social networking sites: the act of taking selfies. *Elon J. Undergrad. Res. Commun.* 6, 5–12.

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# Selfies and the (Creative) Self: A Diary Study

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In this diary investigation, over 2 weeks we monitored the intensity of selfie posting among 292 Facebook users (60% females), aged between 18 and 50, to estimate the extent of selfying's day-to-day variability and its predictors. The obtained effect was large; 64% of the variability in selfying was located within rather than between individuals. Day-to-day changes in creative activity explained a significant proportion of selfying, similarly as previous creative achievement did. At the same time, intelligence was negatively linked to the intensity of selfie posting and moderated the relationship between creative achievements and selfying. We discuss hypothetical links between selfie posting and the situational and individual differences characteristics related to creativity and cognitive abilities.

**Keywords:** selfie, creativity, creative activity, diary study, multilevel modeling

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## INTRODUCTION

Consider for a moment some seminal achievements in the history of art: the portrait of a man in red chalk, attributed to Leonardo da Vinci; a collection of Pablo Picasso's self-portraits showing evolution of his artistic style; or a dozen of Vincent van Gogh's self-portraits, with their famous mirror-like character. Now, let us switch to XXI century with its new technologies, smartphones, Facebook posts, and Twitter tweets. And here's the point: would Leonardo, Picasso, or van Gogh be selfying instead of self-portraying today? Do selfies hold any creative value or should they be perceived exclusively as a proof of narcissism and vanity (Sorokowski et al., 2016)? These provocative questions inspire our endeavors presented in this article.

This paper explores the selfie phenomenon, but does not focus on Leonardo's or Picasso's selfies. Even if some links and regularities between artists' self-portraits and naïve people's selfies were indeed established (Bruno and Bertamini, 2013, but see also Suitner and Maass, 2007), our intention is – by no means – to equate selfies with self-portraits. We focus on a complex, yet understudied relationship between selfie posting and creative behaviors in their mundane forms. Instead of asking about van Gogh's selfies, we explore the direction and strength of the link between creative activity and achievement on the one hand and the intensity of selfie posting on the other. What are the theoretical connections – if any – between creativity and selfying that make any empirical links plausible at all? Should we consider taking and posting selfies as even a potentially creative behavior, or quite the opposite, as a proof of algorithmic, repetitive, and unoriginal activity characterized by a low level of social value? We explore these questions further in this introduction. First, however, we briefly review the state of the art in selfies research, specifically highlighting the findings that informed our inquiry. Next, we present the benefits of analyzing selfies as a situated phenomenon and the need of ecological momentary assessment (EMA) in selfies research.

## WHO IS SELFING AND WHY: KNOWN AND UNKNOWN

To paraphrase Hermann Ebbinghaus' famous saying, selfing has a long past, but only a short history. The first selfie was likely taken in 1840 and is attributed to Robert Cornelius: an American amateur photographer and Charles Wheatstone: an English inventor. However, only recently selfies have gathered popularity thanks to the growing availability of smartphones with the reversed camera option (Dhir et al., 2016). Consequently, also scholarly works on selfies flourished only in the last decade searching for predictors of selfie posting (Sorokowski et al., 2015) or demographic differences between people posting more or fewer selfies (Dhir et al., 2016).

Although selfies are becoming more and more popular among social media users, it does not mean they are common. Quite the opposite: a recent summary of the *selficity project*<sup>1</sup> (Tifentale and Manovich, 2016) estimated the number of selfies in all social media sites at only 4% of all photos posted. A look at scholarly works on selfies confirms these estimations; indeed, selfies' distribution is usually very skewed, with a huge majority of users declaring taking none or only a few selfies, and a clear minority selfing intensively. Such distribution forms an analytical challenge, as typical regression or correlation-based techniques are not robust enough to deal with non-normal distribution. Poisson models or log-transformations are required to handle such a pattern effectively.

Previous studies bring a list of well-corroborated findings regarding selfies. Not surprisingly, selfies were found to be more typical for younger than older social media users (Dhir et al., 2016). Females post more selfies than males (Dhir et al., 2016), although this effect seems to be moderated by selfie type: while selfies that present only a single person are indeed more common among women (Sorokowska et al., 2016), in the case of selfies with a partner or friends, differences are less profound.

What are the personality predictors of selfie posting? Previous studies established a number of selfies' correlates, but usually these links are, at best, mediocre. Among big five personality factors (McCrae and Costa, 1997) only extraversion seems to be related to selfing, but the effect size of this link is weak (Sorokowska et al., 2016). Indeed, previous studies had found extraversion to be related to general Facebook activity, which, in turn predicts posting photos (Correa et al., 2010; Gosling et al., 2011). The remaining Big Five traits, i.e., agreeableness, neuroticism, conscientiousness, and openness to experience seem to be unrelated to selfing, although future studies would benefit from a more facet-or-aspect-level analysis of personality in this respect (DeYoung et al., 2007).

Previous studies have also examined a range of other personality-related characteristics as selfing's predictors. For instance, it was hypothesized that self-esteem may influence the intensity of selfie-posting, yet previous studies bring equivocal findings – while some researchers (Nadkarni and Hofmann, 2012) posit that higher self-esteem should translate into more intensive presentation in social media, others demonstrate that

lowered self-esteem leads to a more intensive social media practices (Mehdizadeh, 2010). A recent large investigation (Sorokowska et al., 2016) found self-esteem to be unrelated to selfie posting – the one and only positive relationship ( $r = 0.19$ ) was observed among males whose self-esteem was correlated with own selfie posting – a relationship between posting group selfies or selfies with a partner was unrelated to self-esteem in either males or females.

Likely, the most promising line of research in the selfie literature focuses on the dark personality characteristics as its predictors. These studies include exhibitionism (Sorokowska et al., 2016), histrionic personality (Sorokowski et al., 2016), or narcissism (Sorokowski et al., 2015). Consistently with the predictions, in several studies people who posted selfies were found to be higher in narcissism, exhibitionism, and histrionic personality. Two things, however, are important to note. First, the effect size of the links observed was usually tiny. A large sample size made these correlations or regression coefficients statistically significant, however, with coefficients in their 20s there is a lot of room for exceptions. Second, the positive links between narcissism-related traits and selfing were much more consistent among men than women. Hence, paradoxically, although females are more intensive selfie takers and posters, we know less about the causes of their selfing.

Finally, almost all recent studies on selfies have utilized cross-sectional designs (see Guazzini et al., 2016, for an exception). Participants are usually asked how many selfies they posted on social media or how intensively they are *usually* selfing. We believe, however, that the most promising research strategy is to analyze selfies as a *situated phenomenon*. Are people selfing because they are narcissistic or because they are in a place and a moment that they would like to share with their friends? Or perhaps both? Aren't situational factors – moment-to-moment or day-to-day activity – at least equally as important in explaining the phenomenon of selfie posting? In the study, we present below, we decided to explore this opportunity and focus on selfies as a changeable phenomenon that differs from day to day. Among potential daily predictors of selfing, we see the role played by creative activity. Yet, why and how can creativity be related to selfies? We discuss this issue below.

## (UN)CREATIVE SELFIES?

Creativity is understood as a human capacity that allows people to produce ideas and artifacts that are both novel and appropriate. Although creativity scholars often omit the explicit definition of their main construct of interest (Plucker et al., 2004; Silvia, 2014), two aforementioned elements: novelty (originality) and value (usefulness, quality) are perceived as critical definitional criteria for creativity: ingredients of the so-called standard definition of creativity (Runco and Jaeger, 2012). Several additional criteria of creativity were proposed, including surprisingness (Simonton, 2012), esthetics and authenticity (Kharkhurin, 2014); potential (Corazza, 2016); or – long before – transformational power and condensation of meaning (Jackson and Messick, 1965). The last six decades of research within cognitive and personality

<sup>1</sup>selficity.net



psychology have also established several traits predictive of creative thinking and problem solving. It was demonstrated that intelligence forms an important, perhaps even necessary, yet not sufficient condition of creativity (Silvia, 2015; Karwowski et al., 2016). Similarly, the role of certain personality traits, mainly openness (Feist, 1998), but also psychoticism (Eysenck, 1995; Acar and Runco, 2012) has been replicated by different labs. Regarding motivational characteristics, there is a widely held consensus that intrinsic motivation is fruitful for creativity (Amabile, 1996), although rewards and extrinsic influences may be conducive to creative thinking as well (Eisenberger et al., 1998; Byron and Khazanchi, 2012). The role of creative self-efficacy – or more generally – creative self-beliefs, has been demonstrated as well, showing how creative self-efficacy, creative personal identity (Jaussi et al., 2007), creative metacognition (Kaufman and Beghetto, 2013), and creative mindsets (Karwowski, 2014; Karwowski and Brzeski, 2017) explain a significant portion of variability in creative efforts, activities, and achievements. *Last but not least*, two distinctions are relevant for understanding creativity. The first distinguishes between creative potential and creative activity or achievement. Creative potential is a complex and multifaceted category of cognitive processes and personality, including divergent thinking (Baer, 2014), creative imagination (Dziedziewicz and Karwowski, 2015), openness to experience (Silvia et al., 2014), or curiosity (Karwowski, 2012). Creative activity denotes time and effort put into different domains: be it science, art or everyday creativity. Finally, creative achievement denotes observable and socially recognized accomplishments – published poems, received patents or awards – all the way to the Pulitzer or Noble Prize. Another relevant distinction differentiates levels of creativity: a personal insight typical for *mini-c* creativity, via *little-c* creative solutions important for everyday problem solving, to *Pro-c* – creative activity in professional activity, and all the way to *Big-C* creativity: eminent form of creative achievements (Kaufman and Beghetto, 2009).

How could creativity and selfying be related? One line of reasoning would put narcissism as a bridge between them. As we already highlighted, narcissism predicts selfying, at least among men. But although the links between creativity and narcissism have been hypothesized for decades (Raskin, 1980), empirical evidence is, at best, equivocal. While some studies demonstrated consistent and robust links between narcissism and self-reported creativity (Furnham et al., 2013; Jonason et al., 2015; McKay et al., 2016), the relationship between narcissism and divergent thinking, creative problem solving (Goncalo et al., 2010), or creative achievement (Jonason et al., 2015) is weaker and less consistent. Therefore, although the relationships “creativity-narcissism” and “narcissism-selfying” may lead to expecting associations between creativity and selfying as well, this rationale is not void of problems.

Covariance of creativity and selfying is also easily inferred from a long tradition of studies that utilize the autophotographic methodology. Autophotography, described in the writings of Ziller and Lewis (1981), Ziller and Rorer (1985) and Ziller (1990/2000), asks participants to take a set of photos that describe their identity and respond to the question “who are you”? Crucially for our argument here, in dozens of investigations

Dollinger et al. (1996) and Dollinger and Dollinger (2003) demonstrated fruitfulness of autophotography for studying creativity. They convincingly profiled less creative individuals as those who portray themselves in one-dimensional ways, while observing that more creative people’s photo-essays are not only different, but also much more integrated (Dollinger et al., 1996; Dollinger and Dollinger, 2003). Dollinger described these more metaphorical and esthetically sensitive photo-essays as *individualistic*, and found consistent correlations between individuality and creativity. It is important to note, however, that for Dollinger a selfie is an antonym rather than synonym of highly individualistic photo-essays. As Dollinger (2017, p. 347) put it: “If selfies are included in photo essays—selfies as they are usually portrayed in the media—they would likely result in a low score on individuality/richness.” Although indeed, typical selfies seem to be more imitative and algorithmic than metaphorical and esthetically appealing, this claim is yet to be empirically examined. This is not exactly our aim here, however: as we have mentioned above, it is not our goal to analyze selfies’ content. Instead, we explore the dynamic links between day-to-day creative behaviors and selfying.

## THE PRESENT STUDY

To estimate the level and factors that stand behind intra-individual variability in selfying, we decided to conduct a diary study instead of running the most common cross-sectional studies. Such microlongitudinal approach allows for including within-person predictors such as day-to-day activity as well as several between-person variables, i.e., cognitive abilities, creative achievement or demographic controls. We are primarily interested in the scope of day-to-day variability in selfying, but also in the role played by day-to-day creative activity in different domains and previous creative achievement (measured as a between-person variable) for selfying. We hypothesize that creative activity in art-related domains, and – especially – an activity typical for everyday behavior in spheres related to social media – like blogging or taking photos, will predict the intensity of selfie posting.

## MATERIALS AND METHODS

### Participants

A total of 292 Polish adults (174 women), aged between 18 and 50:  $M_{\text{age}} = 32.77$ ;  $SD_{\text{age}} = 8.72$ ) participated in this 2-weeks diary study. All participants were recruited from a larger cross-sectional study ( $N = 803$ ) in which between-level variables: intelligence and creative achievement were measured (about 2 months before the diary study). In the current investigation, we only use data from those of our participants who kept the diary active for no less than a week out of 14 days ( $M = 11.68$  days,  $SD = 1.43$ , range 7–14 days) and were active Facebook users, i.e., declared using Facebook on these days with at least minimal activity every day. The participants were members of an online research panel led by the Millward Brown Poland research

company (including close to 100,000 Poles – a representative nationwide sample of Internet users) whose members take part in various research programs once or twice per year. Participants received remuneration for their participation in the form of a voucher valued at 100 PLN (~25 euro).

## Measures

### Between-Person Measures

#### Intelligence

To measure intelligence, we selected 30 items developed within the International Cognitive Ability Resource Project (IPAR; Condon and Revelle, 2014). There were ten matrix reasoning items, 10 mental rotations items, seven letter series items, and three overall reasoning items. Reliability of the overall score was good ( $\alpha = 0.87$ ).

#### Creative achievement

To quantify the level of participants' previous creative achievement we used Creative Achievement Questionnaire (CAQ; Carson et al., 2005). CAQ measures creative activity in 10 domains: (a) visual arts; (b) music; (c) dance; (d) architecture; (e) writing; (f) humor; (g) inventions; (h) science; (i) theater and film; and (j) kitchen. The total score was skewed ( $M = 6.28$ ,  $SD = 7.35$ , skewness = 2.26, kurtosis = 5.69), which is typical for CAQ distribution (Carson et al., 2005; Silvia et al., 2012). Therefore, we log-transformed it (skewness = 0.16, kurtosis = -0.38) for multivariate analyses.

#### Between-person controls

We controlled for participants' age and gender.

### Within-Person Measures

#### Creative activity

Each day, participants rated the intensity of their engagement in 15 different activities, using a 7-point Likert scale (1 = *not at all*, 7 = *very intensively*).

#### Selfying

Participants rated the intensity of selfie posting during the day, using a 7-point Likert scale (1 = *not at all*, 7 = *very intensively*).

#### Within-person controls

We controlled for weekday (versus weekend) and day-to-day variability in Facebook usage.

## Procedure

After responding to the invitation to participate in a study, participants completed the informed consent form. For 2 weeks, they completed an online daily diary accessible between 6:00 p.m. and 11:00 p.m.

## RESULTS

We proceeded with data analysis in three steps. After an initial overview of descriptive statistics and correlations between variables, we reduced the number of within-person variables using confirmatory factor analysis (CFA). Then, we estimated

the level of within-person (day-to-day) and between-person variability in selfying as well as its situational and individual predictors.

Descriptive statistics and intercorrelations between Level-2 (between-person) variables are presented in **Table 1**, while **Table 2** shows descriptive statistics for Level-1 (within-person) variables.

Posting selfies (aggregated across all days of the diary study) was positively linked to the intensity of Facebook usage, Pearson's  $r = 0.30$ , Spearman's  $\rho = 0.34$ , previous creative achievement (in the case of raw CAQ score  $r = 0.30$ ,  $\rho = 0.13$ ; in the case of log-transformed CAQ  $r = 0.24$ ;  $\rho = 0.13$ ) and negatively to the level of intelligence,  $r = -0.18$ ;  $\rho = -0.25$  (all  $ps < 0.05$ ). Although these initial findings are in line with our expectations, they tell us little about intra-individual-day-to-day variability. Therefore, in the next step we focused on within-level analyses.

## Data Reduction

To reduce the number of within-person variables, we factor-analyzed creative activity variables while controlling for the clustered data at hand (days nested within participants) using Mplus 7.11 and maximum likelihood estimator with robust standard errors. A three-factor CFA model with creative activity in art, science, and everyday creativity fit the data well according to usually applied criteria (Hu and Bentler, 1999), such as confirmatory fit index ( $CFI = 0.945$ ; Tucker Lewis Index ( $TLI = 0.932$ , and root mean square error of approximation ( $RMSEA = 0.019$ ; and 90% CI: 0.015, 0.022 (see last three columns of **Table 2** for factor loadings).

Strikingly, selfie is a rare phenomenon even among Facebook users – only 13% of participants declared posting some selfies during the last 14 days, having an average estimated intensity only slightly higher than 1 (1.25) on a 7-point intensity scale. As expected, selfie posting distribution was skew (**Figure 1**, Left), following a Poisson distribution, similarly as in previous studies (Sorokowski et al., 2016). Creative activity had a similar pattern – among fifteen different activities analyzed, only cooking achieved a mean higher than 2 on a 7-point scale, and some activities – e.g., designing clothing items, creating choreographies, composing music pieces – were almost completely missing (means only slightly higher than 1, with a mode category being 1 = *not at all*). Such distribution, however, resembles a pattern that is typical for creative activity (Jauk et al., 2014).

Poisson distribution of the main variables of interests, especially the dependent variable of the intensity of posting selfies informed our decision to proceed with multilevel Poisson regressions. In the first step, however, we estimated an empty multilevel model to obtain the overall level of day-to-day variability in selfying. The intra-class correlation coefficient (ICC) was estimated at 0.36. In other words, 36% of the obtained variability came from between-person differences, while the remaining 64% (1-ICC) was located within person or between days (**Figure 1**, Right). Such a substantial level of intra-individual variability not only justifies our decision to use the multilevel modeling, but is also interesting on its own rights; it demonstrates that selfie posting is to a large extent situation-dependent and

**TABLE 1 | Descriptive statistics and correlations among between-person variables.**

		Min	Max	<i>M</i>	<i>SD</i>	Skew	Kurt	1	2	3	4	5	6	7
1	Selfie	1.00	4.45	1.25	0.52	3.44	13.89	1	0.30**	−0.18**	0.30**	0.24**	−0.04	−0.02
2	Facebook	1.54	6.80	3.04	1.07	0.90	0.63	0.34**	1	−0.12*	−0.01	−0.02	−0.05	−0.20**
3	Intelligence	0.04	1.00	0.49	0.20	0.13	−0.55	−0.25**	−0.12*	1	0.13*	0.20**	−0.11	−0.13*
4	CAQ	0.00	42.00	6.28	7.35	2.26	5.69	0.13*	0.02	0.20**	1	0.88**	−0.07	−0.13*
5	CAQ-log	0.00	3.76	1.59	0.88	0.16	−0.38	0.13*	0.01	0.20**	0.99**	1	−0.06	−0.11
6	Gender	1 (M)	2 (F)	60%F	–	–	–	0.01	−0.04	−0.10	−0.06	−0.06	1	0.06
7	Age	18	50	32.77	8.72	0.35	−0.95	0.01	−0.21**	−0.13*	−0.11	−0.11	0.08	1

*N* = 292; Selfie = the aggregated (daily average) number of selfies from diary module aggregated across all days of the diary study; Facebook = the aggregated (averaged) intensity of Facebook usage from diary module; CAQ, Creative Achievement Questionnaire (raw score); CAQlog, log transformed score in Creative Achievement Questionnaire; Gender was coded 1 = male, 2 = female; Skew, Skewness; Kurt, Kurtosis. Pearson's *r*s are presented above the diagonal; Spearman's *ρ*s below diagonal. \**p* < 0.05; \*\**p* < 0.01.

**TABLE 2 | Descriptive statistics and factor analyses results for within-person variables.**

	<i>M</i>	<i>SD</i>	Art factor	Science factor	Everyday factor
Selfie	1.25	0.78			
Selfie2	13%	–			
Facebook	3.04	1.52			
Designing clothing items	1.09	0.49	0.76		
Creating choreographies/dancing	1.10	0.55	0.69		
Writing, e.g., poetry, short stories, novels, theatrical plays	1.15	0.67	0.61		
Writing press articles (including e.g., columns)	1.13	0.65	0.56		
Designing buildings/interiors	1.17	0.7	0.56		
Composing musical pieces/playing music	1.12	0.59	0.55		
Painting/drawing/sculpting	1.20	0.78	0.54		
Preparing for public speeches/giving public speeches	1.21	0.78	0.49		
Creating websites	1.15	0.69		0.67	
Programing/creating computer programs	1.17	0.74		0.61	
Writing scholarly papers	1.16	0.73		0.51	
Solving technical/scientific problems	1.66	1.35		0.39	
Creating online blog(s) entries	1.23	0.79			0.67
Taking photos/making videos, e.g., with a phone	1.53	1.09			0.44
Cooking based on one's own recipes	2.10	1.64			0.27

*N* = 3356 occasions (occasion = Number of Days × Number of Participant). Seven point Likert scale (1 = not at all, 7 = very intensively) was used for all variables except for Selfie2, which was binary coded. Selfie = raw variable describing selfying's intensity across occasions (7-point Likert scale); Selfie2 = dichotomized (0 = no, 1 = yes) variable describing selfying.

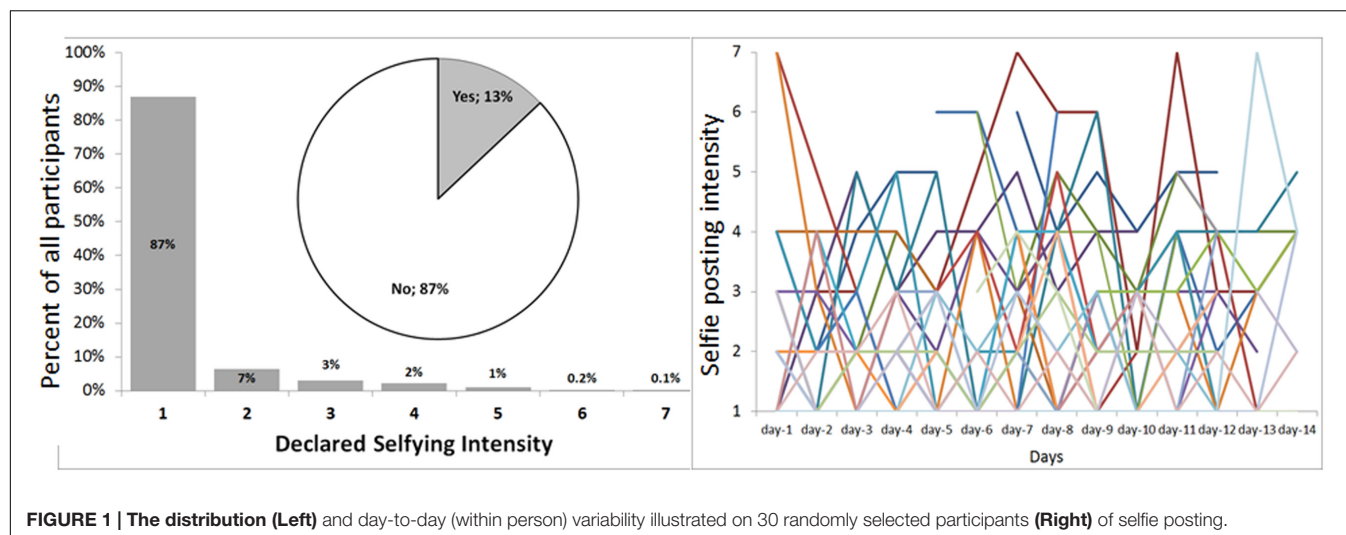
looking for those aspects of a situation that may cause or predict selfie posting is especially relevant.

The initial multilevel model (Table 3, Model A) included five within-person and four between-person predictors. More specifically, we regressed the intensity of selfying on the following within-person variables: the intensity of Facebook usage that day, week-versus-weekend (binary coded), as well as three factors describing creative activity obtained in the CFA: the creative activity in artistic, scholarly, and everyday domains. All these variables (except the dichotomously coded weekend) were group-mean centered around each person's mean to model changes around each person's typical behavior across all days. Between-person predictors included two controls: sex and age as well as intelligence and creative achievement. These variables (except the binary coded sex) were grand-mean centered.

Day-to-day variability in selfie posting has been positively linked to the overall intensity of Facebook usage. Selfies were

also more often posted on weekends than weekdays. Importantly, though, and consistently with our hypotheses, selfying was positively predicted by the engagement in creative activity in arts and everyday creative behavior such as blogging or taking photos. In the case of everyday creative activity, the effect size of these differences was substantial (standardized estimate = 0.65). Sex or age did not differentiate the intensity of selfie posting, but intelligence and previous creative achievement did. Strikingly, their effects were opposite; while we have observed a clear and strong positive effect of previous creative achievement on selfying, the effect of intelligence was negative.

For exploratory purposes, we examined several cross-level interactions, but the effect of art-related and everyday creativity on selfie posting was robust: it held among males and females, older and younger participants, people with higher and lower intelligence, and participants with or without previous creative achievements. We have also tested the between-person



**TABLE 3 | Multilevel models explaining the intensity of selfing.**

Predictors	Model A		Model B	
	<i>B</i> (SE)	Stand Est	<i>B</i> (SE)	Stand Est
Within-person predictors				
Facebook	0.03 (0.009)	0.29***	0.03 (0.009)	0.29***
Weekend (0 = no, 1 = yes)	0.06 (0.022)	0.21**	0.06 (0.022)	0.21**
Artistic creative activity	0.19 (0.039)	0.36***	0.19 (0.04)	0.36***
Everyday creative activity	0.14 (0.023)	0.65***	0.14 (0.023)	0.66***
Scientific creative activity	0.04 (0.026)	0.13	0.045 (0.027)	0.14
Between-level predictors				
Sex (1 = M, 2 = F)	−0.05 (0.05)	−0.17	−0.05 (0.05)	−0.17
Age	−0.001 (0.003)	−0.07	−0.002 (0.003)	−0.10
Intelligence (IQ)	−0.51 (0.12)	−0.76***	0.08 (0.17)	0.11
Creative Achievement (CAQ)	0.13 (0.03)	0.81***	0.29 (0.07)	1.76***
<i>IQ</i> × <i>CAQ</i>	—	—	−0.36 (0.10)	−1.50***

*Bs* are unstandardized Poisson regression coefficients with robust standard errors (SE) from multilevel modeling that reflect the estimated average within-person relationship for the sample.

interaction of *Creative Achievement* × *Intelligence* (Table 3, Model B). This interaction was indeed statistically significant.

Using the Hayes (2013) process, we explored this interaction further<sup>2</sup>. More specifically, although the direction of the interaction term suggested that the positive effect of creative achievement on selfie posting may be more profound among less intelligent participants, the Johnson-Neyman technique (Hayes, 2013) has demonstrated that the positive link between previous creative achievement and selfie posting was observed among those 77% of participants whose intelligence was almost one standard deviation above mean or lower (an equivalent of 112 points on the IQ scale; see Figure 2, Left). Indeed, the observed effect of creative achievement on selfies was significant among

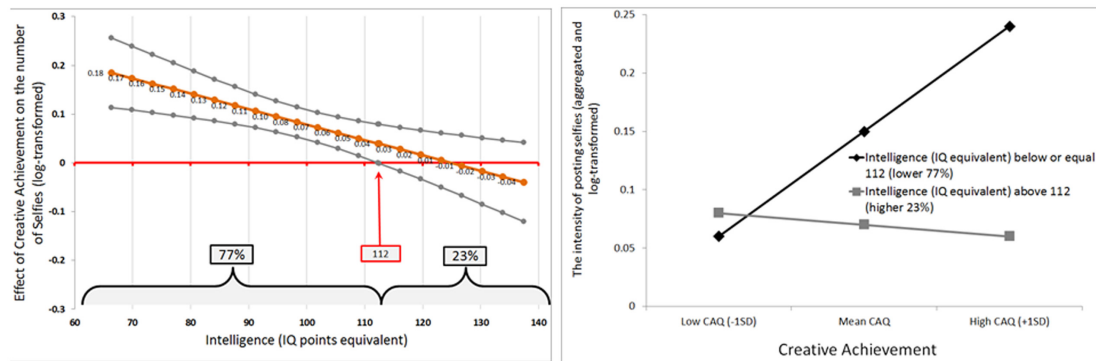
individuals with intelligence up-to-almost-one-standard-deviation above the mean, while it disappeared among those whose intelligence level was within the upper 23% (Figure 2, Right).

## DISCUSSION

Is selfing really so common as media seem to suggest? Is it driven primarily by selfiers' psychological characteristics or is it rather situation-dependent? Is selfie posting related to creativity, and if yes, then how? This diary study explored these questions with the aim of looking at the selfies phenomenon from a slightly different angle than previous research did. More specifically, we were interested in selfies' dynamic and intra-individual rather than between-individual predictors. Although the findings of this study generally replicate those of previous research, at least some of our results may form an extension of this line of inquiry.

<sup>2</sup>As this cross-product effect was observed between Level-2 (between-person) variables, we decided to aggregate the number of selfies within individuals (sum them up) and conduct these analyses on Level-2 (person) data.





**FIGURE 2 | The relationship between creative achievement and selfing as moderated by intelligence: estimated zone of significant moderation (Left) and slopes for people differing in intelligence (Right).**

Similarly as in previous research<sup>3</sup> (see Tifentale and Manovich, 2016; also Sorokowski et al., 2016), our study confirms that selfing, especially intensive selfing, is a rare phenomenon. Despite its growing popularity and media attention, a vast majority of social media users do not post selfies at all. Across the 2 weeks of our investigation, only 13% of all participants declared posting selfies, with a clearly skew distribution: even those who selfied, did it once or twice in 2 weeks. That pattern has both methodological and substantial implications. Methodologically, controlling for this severe skewness is necessary to obtain unbiased estimates. Substantially, an extremely small group of intensive selfie-takers forms a challenge for understanding this niche better. Future studies, then, should apply comparative designs focused specifically on intensive selfie takers.

Consistently with our expectations, the day-to-day variability of selfie posting was visibly (in this investigation: two times) higher than its between-person variance. In other words, to understand selfing, we should focus on the dynamic, situational factors rather than (or at least equally to) on stable, psychological characteristics. This finding seems logical; after all, people are often selfing to share their special moments with others or show places they visit. Indeed, we were able to demonstrate that selfing was more profound on weekends than on weekdays and when people spent more time on Facebook. Interestingly, though, daily creative activity within the domain of widely understood art-related activities and especially during everyday creative activities was positively linked to the intensity of selfing. Those who painted, blogged, or composed music posted more selfies the day they engaged in creative activity. Creative activity in science-related spheres was unrelated to selfing. The creativity-selfing association was also visible on a person level – those social media users who had higher creative achievement selfied more than those with little or no achievement. At the same time, however, intelligence negatively linked to selfing and qualified the relationship between creative achievement and selfing – only among people with an IQ-equivalent of up to about one-standard-deviation-above-the-mean was this link significant.

The links we observed obviously require replication and a sound theoretical explanation. Here, we discuss some plausible, even if a bit speculative explanations of obtained associations with the hope to inspire future investigations. More specifically, we see four potential mechanisms that may stand behind the relationships obtained and that should be more thoroughly examined in future studies.

The first argument for the links between creative activity and selfing may stem from previously discussed correlations between narcissism and creativity (Goncalo et al., 2010) and narcissism and selfing (Sorokowski et al., 2015). Although previous studies provided mixed findings regarding the narcissism-creativity association, we believe that this possibility should not be ignored. Creativity requires an authentic rather than hubristic pride (Damian and Robins, 2013), but more narcissistic, hubristic pride may also associate with creativity under certain conditions. For instance, Damian and Robins (2013) showed that in the condition of anger, creativity and hubristic pride were positively related. Therefore, future studies would benefit not only from controlling for participants' narcissism in creativity-selfing studies, but also from measuring narcissism in a more detailed way, including its facets, to uncover more subtle relationships.

The second potential mechanism and line of future inquiry is related to emotions as factors responsible for – or at least qualifying – the relationship between creativity and selfing. Previous studies, including those based on EMA (Silvia et al., 2014; Conner and Silvia, 2015), demonstrated that everyday creative behavior is linked to positive, active emotions. Such associations were also hypothesized in the theory of everyday creativity (Richards et al., 1988) and are generally widely accepted in the psychology of creativity (Silvia et al., 2014, but see also Baas et al., 2008, 2011). Therefore, one may expect positive emotions to stand behind both creative activity and selfie posting. It should be noted, however, that although the relationship between creativity and positive emotions is likely reciprocal, creativity theories perceive emotions as a cause of creativity rather than vice versa. It is striking, because in the case of selfie posting the opposite direction seems more plausible. Therefore, it is positive

<sup>3</sup>selfiecity.net

emotions that lead to selfie-posting rather than selfie-posting building positive emotions even if such a hypothesis cannot be fully refuted so easily. So future studies, ideally longitudinal or microlongitudinal, may want to examine the extent to which positive emotions mediate the relationship between creativity and selfie posting or whether it is creative activities that mediate the relationship between positive emotions and selfying. Eventually, it is obviously possible as well that positive emotions and creativity predict selfie posting independently from each other.

The third possibility may consider selfying as a natural consequence or even epiphenomenon of the higher level of activity caused by openness and extraversion and consequently plasticity: the personality meta-factor they form together (DeYoung, 2006). Previous studies consistently confirmed that openness is critical for creative functioning (Feist, 1998; Puryear et al., 2016), while the role of extraversion is much more prominent in the case of self-reported creativity-relevant characteristics, such as creative self-efficacy (Karwowski and Lebeda, 2016). Therefore, it could be argued that selfying is a sub-product of higher activity and a search for different activities and hobbies (Wolfradt and Pretz, 2001). This expectation, however, is weakened by inconsistent and usually weak correlations between selfying and personality. Although indeed, extraversion does predict selfie posting, openness is usually unrelated to selfying. Again, future researchers may want to include an even wider measurement of openness – not only including its aspects (DeYoung et al., 2007), but also specific types of openness (Kaufman, 2013; Kaufman et al., 2015) that predicted creativity in previous studies. As these types of openness differently predicted creative behavior across domains, we are approaching the final point: the issue of domain-specificity versus domain-generalizability of creativity.

Thus, the fourth point may highlight the domain-specific relationship between creative functioning and selfying. Indeed, in our study we found a robust relationship between selfying and everyday creativity, significant and weaker links between selfying and art-related creative activity, and virtually no relationship between selfie posting and scientific creativity. At the between-person level, although selfying was positively related to the total score of the CAQ, its relationship with intelligence was negative. It suggests that while some forms and domains of creativity – mainly art-based and everyday – may be positively related to selfie posting, other – science-related – are either unrelated or even negatively related to selfying<sup>4</sup>. Scientists and artists differ in terms of their personality (Feist, 1998); different personality traits predict creative achievement in art and science (Kaufman et al., 2015). Even if selfies themselves are rarely artistically creative, artistic activity was positively related with selfying. Again, this opens an intriguing opportunity for future studies. What makes art-related creativity related to selfie posting? Is it a matter of

personality characteristics of people who engage into artistic activity or perhaps selfies are still sometimes creative? This question becomes even more important if we keep in mind the role of such everyday activities as blogging, taking photos, or designing new clothing items for selfie posting. There are good reasons to believe that selfying, together with these activities, may form a specific syndrome of behavior, a more typical one for young people and not void of creative elements.

## Strengths and Limitations

The findings we have presented should be interpreted in light of advantages and limitations of the current investigation. Among its strengths, we see applications of the EMA methodology, i.e., the use of a diary study with several within- and between-person predictors. It allowed us to demonstrate that selfying is situation-dependent and within-person variables should be included in studies' designs to better understand why, when, and what are people selfying for.

The main weakness of this study may be seen in a relatively straightforward measurement of the main dependent variable, meaning selfie posting. Future studies should include more detailed sets of questions regarding the different types of selfies. Most importantly, however, future investigations should allow for analyzing selfies' content. Following an interesting take of the selfiecity project<sup>5</sup> (Tifentale and Manovich, 2016), it would be interesting to see not only whether creative behavior predicts selfie posting, but also to assess the creativity of selfies. Using big data available in social media may make such a research project possible.

## ETHICS STATEMENT

This study was carried out in accordance with the recommendations of The Maria Grzegorzewska University with written informed consent from all subjects. All subjects gave informed consent in accordance with the Declaration of Helsinki. The protocol was approved by The Maria Grzegorzewska University Institutional Review Board (decision number 128-2016/2017).

## AUTHOR CONTRIBUTIONS

MK planned the whole study, performed statistical analyses, and drafted the manuscript. AB co-analyzed the results and provided a critical overview of the manuscript. Both authors read and approved the final version of the manuscript.

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<sup>4</sup>As the total score of the CAQ is aggregated across different domains, we tested our reasoning in a separate regression on aggregated, between-person level data. We regressed selfying on 10 CAQ domains. The model explained 20% of selfies variability and, as hypothesized, significant predictors were those that related to art rather than science. More specifically, selfying was predicted by creative achievements in music ( $\beta = 0.21$ ;  $p < 0.001$ ), dance ( $\beta = 0.15$ ;  $p = 0.007$ ), architecture ( $\beta = 0.19$ ;  $p = 0.003$ ), and theatre ( $\beta = 0.18$ ;  $p = 0.006$ ).

<sup>5</sup>selfiecity.net

## REFERENCES

- Acar, S., and Runco, M. A. (2012). Psychoticism and creativity: a meta-analytic review. *Psychol. Aesthet. Creat. Arts* 6, 341–350. doi: 10.1037/a0027497
- Amabile, T. M. (1996). *Creativity in Context*. Boulder, CO: Westview Press.
- Baas, M., De Dreu, C. K., and Nijstad, B. A. (2008). A meta-analysis of 25 years of mood-creativity research: hedonic tone, activation, or regulatory focus? *Psychol. Bull.* 134, 779–806. doi: 10.1037/a0012815
- Baas, M., De Dreu, C. K., and Nijstad, B. A. (2011). When prevention promotes creativity: the role of mood, regulatory focus, and regulatory closure. *J. Pers. Soc. Psychol.* 100, 794–809. doi: 10.1037/a0022981
- Baer, J. (2014). *Creativity and Divergent Thinking: A Task-Specific Approach*. New York, NY: Psychology Press.
- Bruno, N., and Bertamini, M. (2013). Self-portraits: smartphones reveal a side bias in non-artists. *PLoS ONE* 8:e55141. doi: 10.1371/journal.pone.0055141
- Byron, K., and Khazanchi, S. (2012). Rewards and creative performance: a meta-analytic test of theoretically derived hypotheses. *Psychol. Bull.* 138, 809–830. doi: 10.1037/a0027652
- Carson, S. H., Peterson, J. B., and Higgins, D. M. (2005). Reliability, validity, and factor structure of the creative achievement questionnaire. *Creat. Res. J.* 17, 37–50. doi: 10.1207/s15326934crj1701\_4
- Condon, D. M., and Revelle, W. (2014). The international cognitive ability resource: development and initial validation of a public-domain measure. *Intelligence* 43, 52–64. doi: 10.1016/j.intell.2014.01.004
- Conner, T. S., and Silvia, P. J. (2015). Creative days: a daily diary study of emotion, personality, and everyday creativity. *Psychol. Aesthet. Creat. Arts* 9, 463–470. doi: 10.1037/aca0000022
- Corazza, G. E. (2016). Potential originality and effectiveness: the dynamic definition of creativity. *Creat. Res. J.* 28, 258–267. doi: 10.1080/10400419.2016.1195627
- Correa, T., Hinsley, A. W., and de Zúñiga, H. G. (2010). Who interacts on the Web?: the intersection of users' personality and social media use. *Comput. Hum. Behav.* 26, 247–253. doi: 10.1016/j.chb.2009.09.003
- Damian, R. I., and Robins, R. W. (2013). Aristotle's virtue or Dante's deadliest sin? The influence of authentic and hubristic pride on creative achievement. *Learn. Individ. Differ.* 26, 156–160.
- DeYoung, C. G. (2006). Higher-order factors of the Big Five in a multi-informant sample. *J. Pers. Soc. Psychol.* 91, 1138–1151. doi: 10.1037/0022-3514.91.6.1138
- DeYoung, C. G., Quilty, L. C., and Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *J. Pers. Soc. Psychol.* 93, 880–896. doi: 10.1037/0022-3514.93.5.880
- Dhir, A., Pallesen, S., Torsheim, T., and Andreassen, C. S. (2016). Do age and gender differences exist in selfie-related behaviours? *Comput. Hum. Behav.* 63, 549–555. doi: 10.1016/j.chb.2016.05.053
- Dollinger, S. J. (2017). "Much more than selfies: autophotography, individuality, and creativity," in *The Cambridge Handbook of Creativity and Personality Research*, eds G. J. Feist, R. Reiter-Palmon, and J. C. Kaufman (New York, NY: Cambridge University Press), 323–354.
- Dollinger, S. J., and Dollinger, S. M. C. (2003). Individuality in young and middle adulthood: an autophotographic study. *J. Adult Dev.* 10, 227–236. doi: 10.1023/A:1026003426064
- Dollinger, S. J., Preston, L. A., O'Brien, S. P., and DiLalla, D. L. (1996). Individuality and relatedness of the self: an autophotographic study. *J. Pers. Soc. Psychol.* 71, 1268–1278. doi: 10.1037/0022-3514.71.6.1268
- Dziedziejewicz, D., and Karwowski, M. (2015). Development of children's creative visual imagination: a theoretical model and enhancement programmes. *Education* 3–13 43, 382–392.
- Eisenberger, R., Armeli, S., and Pretz, J. (1998). Can the promise of reward increase creativity? *J. Pers. Soc. Psychol.* 74, 704–714. doi: 10.1037/0022-3514.74.3.704
- Eysenck, H. J. (1995). *Genius: The Natural History of Creativity*. New York, NY: Cambridge University Press.
- Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Pers. Soc. Psychol. Rev.* 2, 290–309. doi: 10.1207/s15327957pspr0204\_5
- Furnham, A., Hughes, D. J., and Marshall, E. (2013). Creativity, OCD, narcissism and the Big Five. *Think. Skills Creat.* 10, 91–98. doi: 10.1016/j.tsc.2013.05.003
- Goncalo, J. A., Flynn, F. J., and Kim, S. H. (2010). Are two narcissists better than one? The link between narcissism, perceived creativity, and creative performance. *Pers. Soc. Psychol. Bull.* 36, 1484–1495. doi: 10.1177/0146167210385109
- Gosling, S. D., Augustine, A. A., Vazire, S., Holtzman, N., and Gaddis, S. (2011). Manifestations of personality in online social networks: self-reported Facebook-related behaviors and observable profile information. *Cyberpsychol. Behav. Soc. Netw.* 14, 483–488. doi: 10.1089/cyber.2010.0087
- Guazzini, A., Cecchini, C., Guidi, E., Milani, M., and Meringolo, P. (2016). Excessive self-presentation on Facebook. *Frontiers* 5, 16–27.
- Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. New York, NY: Guilford Press.
- Hu, L., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model.* 6, 1–55. doi: 10.1080/10705519909540118
- Jackson, P. W., and Messick, S. (1965). The person, the product, and the response: conceptual problems in the assessment of creativity. *J. Pers.* 33, 309–329. doi: 10.1111/j.1467-6494.1965.tb01389.x
- Jauk, E., Benedek, M., and Neubauer, A. C. (2014). The road to creative achievement: a latent variable model of ability and personality predictors. *Eur. J. Pers.* 28, 95–105. doi: 10.1002/per.1941
- Jaussi, K. S., Randel, A. E., and Dionne, S. D. (2007). I am, I think I can, and I do: the role of personal identity, self-efficacy, and cross-application of experiences in creativity at work. *Creat. Res. J.* 19, 247–258. doi: 10.1080/10400410701397339
- Jonason, P. K., Richardson, E. N., and Potter, L. (2015). Self-reported creative ability and the Dark Triad traits: an exploratory study. *Psychol. Aesthet. Creat. Arts* 9, 488–494. doi: 10.1037/aca0000037
- Karwowski, M. (2012). Did curiosity kill the cat? Relationship between trait curiosity, creative self-efficacy and creative personal identity. *Eur. J. Psychol.* 8, 547–558.
- Karwowski, M. (2014). Creative mindsets: measurement, correlates, consequences. *Psychol. Aesthet. Creat. Arts* 8, 62–70. doi: 10.1037/a0034898
- Karwowski, M., and Brzeski, A. (2017). "Creative mindsets: prospects and challenges," in *The Creative Self*, eds M. Karwowski and J. C. Kaufman (San Diego, CA: Academic Press), 367–383.
- Karwowski, M., Dul, J., Gralewski, J., Jauk, E., Jankowska, D. M., Gajda, A., et al. (2016). Is creativity without intelligence possible? A necessary condition analysis. *Intelligence* 57, 105–117. doi: 10.1016/j.intell.2016.04.006
- Karwowski, M., and Lebuda, I. (2016). The big five, the huge two, and creative self-beliefs: a meta-analysis. *Psychol. Aesthet. Creat. Arts* 10, 214–232. doi: 10.1037/aca0000035
- Kaufman, J. C., and Beghetto, R. A. (2009). Beyond big and little: the four c model of creativity. *Rev. Gen. Psychol.* 13, 1–12. doi: 10.1037/a0013688
- Kaufman, J. C., and Beghetto, R. A. (2013). In praise of Clark Kent: creative metacognition and the importance of teaching kids when (not) to be creative. *Roeper Rev.* 35, 155–165. doi: 10.1080/02783193.2013.799413
- Kaufman, S. B. (2013). Opening up openness to experience: a four-factor model and relations to creative achievement in the arts and sciences. *J. Creat. Behav.* 47, 233–255. doi: 10.1002/jocb.33
- Kaufman, S. B., Quilty, L. C., Grazioplene, R. G., Hirsh, J. B., Gray, J. R., Peterson, J. B., et al. (2015). Openness to experience and intellect differentially predict creative achievement in the arts and sciences. *J. Pers.* 82, 248–258. doi: 10.1111/jopy.12156
- Kharkhurin, A. V. (2014). Creativity.4in1: four-criterion construct of creativity. *Creat. Res. J.* 26, 338–352. doi: 10.1080/10400419.2014.929424
- McCrae, R. R., and Costa, P. T. Jr. (1997). Personality trait structure as a human universal. *Am. Psychol.* 52, 509–516. doi: 10.1037/0003-066X.52.5.509
- McKay, A. S., Karwowski, M., and Kaufman, J. C. (2016). Measuring the muses: validating the Kaufman domains of creativity scale (K-DOCS). *Psychol. Aesthet. Creat. Arts*. doi: 10.1037/aca0000074
- Mehdizadeh, S. (2010). Self-Presentation 2.0: narcissism and self-esteem on Facebook. *Cyberpsychol. Behav. Soc. Netw.* 13, 357–364. doi: 10.1089/cyber.2009.0257
- Nadkarni, A., and Hofmann, S. G. (2012). Why do people use Facebook? *Pers. Individ. Dif.* 52, 243–249. doi: 10.1016/j.paid.2011.11.007
- Plucker, J. A., Beghetto, R. A., and Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? Potentials, pitfalls, and future directions in creativity research. *Educ. Psychol.* 39, 83–96. doi: 10.1207/s15326985ep3902\_1

- Puryear, J. S., Kettler, T., and Rinn, A. N. (2016). Relationships of personality to differential conceptions of creativity: a systematic review. *Psychol. Aesthet. Creat. Arts*. doi: 10.1037/aca0000079
- Raskin, R. N. (1980). Narcissism and creativity: Are they related? *Psychol. Rep.* 46, 55–60. doi: 10.2466/pr0.1980.46.1.55
- Richards, R., Kinney, D. K., Benet, M., and Merzel, A. P. (1988). Assessing everyday creativity: characteristics of the lifetime creativity scales and validation with three large samples. *J. Pers. Soc. Psychol.* 54, 476–485. doi: 10.1037/0022-3514.54.3.476
- Runco, M. A., and Jaeger, G. J. (2012). The standard definition of creativity. *Creat. Res. J.* 24, 92–96. doi: 10.1080/10400419.2012.650092
- Silvia, P. J. (2014). Why big theories are fruitless, fragmentation is ideal, defining creativity is overrated and method-driven research is urgent: some thoughts on the flourishing state of creativity science. *Creativity* 1, 233–240. doi: 10.15290/ctra.2014.01.02.10
- Silvia, P. J. (2015). Intelligence and creativity are pretty similar after all. *Educ. Psychol. Rev.* 27, 599–606. doi: 10.1007/s10648-015-9299-1
- Silvia, P. J., Beaty, R. E., Nusbaum, E. C., Eddington, K. M., Levin-Aspenson, H., and Kwapil, T. R. (2014). Everyday creativity in daily life: an experience-sampling study of “little c” creativity. *Psychol. Aesthet. Creat. Arts* 8, 183–188. doi: 10.1037/a0035722
- Silvia, P. J., Wigert, B., Reiter-Palmon, R., and Kaufman, J. C. (2012). Assessing creativity with self-report scales: a review and empirical evaluation. *Psychol. Aesthet. Creat. Arts* 6, 19–34. doi: 10.1037/a0024071
- Simonton, D. K. (2012). Taking the U.S. patent office criteria seriously: a quantitative three-criterion creativity definition and its implications. *Creat. Res. J.* 24, 97–106. doi: 10.1080/10400419.2012.676974
- Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Pisanski, K., Chmiel, A., and Sorokowski, P. (2016). Selfies and personality: Who posts self-portrait photographs? *Pers. Individ. Dif.* 90, 119–123. doi: 10.1016/j.paid.2015.10.037
- Sorokowski, P., Sorokowska, A., Frackowiak, T., Karwowski, M., Rusicka, I., and Oleszkiewicz, A. (2016). Sex differences in online selfie posting behaviors predict histrionic personality scores among men but not women. *Comput. Hum. Behav.* 59, 368–373. doi: 10.1016/j.chb.2016.02.033
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviors are associated with narcissism among men. *Pers. Individ. Dif.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004
- Suitner, C., and Maass, A. (2007). Positioning bias in portraits and self-portraits: Do female artists make different choices? *Empir. Stud. Arts* 25, 71–95. doi: 10.2190/X458-8V17-5M35-5549
- Tifentale, A., and Manovich, L. (2016). *Selficity: Exploring Photography and Self-Fashioning in Social Media*. Available at: <http://selficity.net> [accessed November 11, 2016]
- Wolfradt, U., and Pretz, J. E. (2001). Individual differences in creativity: personality, story writing, and hobbies. *Eur. J. Pers.* 15, 297–310. doi: 10.1002/per.409.abs
- Ziller, R. C. (1990/2000). *Photographing the Self*. Newbury Park, CA: Sage.
- Ziller, R. C., and Lewis, D. (1981). Orientations: self, social, and environmental percepts through auto-photography. *Pers. Soc. Psychol. Bull.* 7, 338–343. doi: 10.1177/014616728172025
- Ziller, R. C., and Rorer, B. A. (1985). Shyness-environment interaction: a view from the shy side through auto-photography. *J. Pers.* 53, 626–639. doi: 10.1111/j.1467-6494.1985.tb00387.x

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# Taking the Perfect Selfie: Investigating the Impact of Perspective on the Perception of Higher Cognitive Variables

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Taking selfies is now becoming a standard human habit. However, as a social phenomenon, research is still in the fledgling stage and the scientific framework is sparse. Selfies allow us to share social information with others in a compact format. Furthermore, we are able to control important photographic and compositional aspects, such as perspective, which have a strong impact on the assessment of a face (e.g., demonstrated by the height-weight illusion, effects of gaze direction, faceism-index). In Study 1, we focused on the impact of perspective (left/right hemiface, above/below vs. frontal presentation) on higher cognitive variables and let 172 participants rate the perceived attractiveness, helpfulness, sympathy, dominance, distinctiveness, and intelligence, plus important information on health issues (e.g., body weight), on the basis of 14 3D faces. We could show that lateral snapshots yielded higher ratings for attractiveness compared to the classical frontal view. However, this effect was more pronounced for left hemifaces and especially female faces. Compared to the frontal condition, 30° right hemifaces were rated as more helpful, but only for female faces while faces viewed from above were perceived as significant *less* helpful. Direct comparison between *left* vs. *right* hemifaces revealed no effect. Relating to sympathy, we only found a significant effect for 30° right *male* hemifaces, but only in comparison to the frontal condition. Furthermore, female 30° *right hemifaces* were perceived as more intelligent. Relating to body weight, we replicated the so-called “height-weight illusion.” Other variables remained unaffected. In Study 2, we investigated the impact of a typical selfie-style condition by presenting the respective faces from a lateral (left/right) and tilted (lower/higher) vantage point. Most importantly, depending on what persons wish to express with a selfie, a systematic change of perspective can strongly optimize their message; e.g., increasing their attractiveness by shooting from above left, and in contrast, decreasing their expressed helpfulness by shooting from below. We could further extend past findings relating to the height-weight illusion and showed that an *additional* rotation of the camera positively affected the perception of body weight (lower body weight). We discuss potential explanations for perspective-related effects, especially gender-related ones.

**Keywords:** selfie, viewing perspective, personality assessment, optimization, height-weight illusion, perspective, perception bias, face processing

## INTRODUCTION

Taking selfies is a well-known but still poorly investigated social phenomenon. In contrast to a classical portrait, it refers to a self-portrait picture taken by ourselves using e.g., the frontal camera of a smartphone and allows us to control important photographic and compositional aspects such as perspective, which has a strong impact on perceptual factors (e.g., variation of the assessed weight, the so-called “height-weight illusion”, see Schneider et al., 2012). It is assumed that taking selfies has now become an important social phenomenon for expressing individual values and personality traits, showing off and sharing the current mood (see e.g., Sorokowska et al., 2016). Despite the high degree of relevance, there is only sparse research that has investigated whether selfies and related self-portraits serve as a valid predictor for personal traits (see e.g., Qiu et al., 2015; Teijeiro-Mosquera et al., 2015). More precisely, the “*nature of selfies*” is not well-investigated: It is suggested that viewing perspective/head rotation and picture details make a selfie different to a classical portrait (see e.g., Bruno and Bertamini, 2013; Bruno et al., 2014; Yeh and Lin, 2014). Other research relating to selfies has revealed that they can serve as valid cues for a respective person’s personality traits (Qiu et al., 2015). More precisely, Guntuku et al. (2015) analyzed several visual cues (so-called “mid-level cues”) relating to the selfie-taker’s personality (such as facial expression, photo location, Photoshop editing, amount of body visible etc.) and found that *Agreeableness*—in the sense of the *Big-Five* personality factors which are described as personality traits manifesting themselves in individual behavioral characteristics that are perceived as *kind*, *sympathetic*, *cooperative*, *warm*, and *considerate*—(see Thompson, 2008) was negatively correlated with camera height (agreeable individuals are more likely to take selfies from below). They further found that *Conscientiousness*—in the sense of the *Big-Five* which are described as personality traits manifesting themselves in individual behavioral characteristics such as being *neat* and *systematic*; also including such elements as *carefulness*, *thoroughness*, and *deliberation*—(see Thompson, 2008) was negatively correlated with private locations. Guntuku et al. (2015) argue that conscientious people do not like to expose their private space in the background. The authors further revealed that Neuroticism is negatively correlated with a duckface expression. However, a clear conclusion based on this resulting data pattern remains unclear. Evidence from research investigating whether faces provide valid predictions about personality related variables suggests that people seem to have high interrater consensus (in case of frontal facial presentations), but only when context information (e.g., expression, clothing, background, or speech) is visible. For example, Nestler et al. (2012) used standardized photographs and demonstrated that *extraversion*—in the sense of the *Big-Five* personality factors which are described as personality traits manifesting themselves in individual behavioral characteristics that are perceived as *outgoing*, *talkative*, and *energetic behaviors*—(see Thompson, 2008) is associated with facial *attractiveness*, while *openness*—what could be described by six dimensions or facets (of the *Big-Five* personality factors) including *active imagination (fantasy)*,

*aesthetic sensitivity*, *attentiveness to inner feelings*, *preference for variety*, and *intellectual curiosity* (see Costa and McCrae, 1992)—is associated with the volume of the lips, and *conscientiousness* is associated with facial *femininity*. In another study using full-body images Naumann et al. (2009) demonstrated that also for spontaneous poses and facial expression (in contrast to standardized photographs), observers made quite accurate predictions of the target’s personality. Furthermore, also dynamic cues, such as clothing, provided valuable information for the predicted personality (see e.g., Penton-Voak et al., 2001; Qiu et al., 2015 for further investigations).

For optimizing selfies in terms of what the depictions show in regard of higher cognitive variables, we might use specific perspectives—a method established for a very long time in the field of classical portrait photography. It was shown within a wide spectrum of research approaches that such higher cognitive variables can change the attitude and behavior toward the depicted person. For instance, facial *attractiveness* was revealed to positively affect gaze behavior (e.g., longer gaze duration, larger cone of gaze etc.) in human beings (see e.g., Maner et al., 2003, 2007; Leder et al., 2010, 2016; van Straaten et al., 2010; Baranowski et al., 2016). Research in the field of social psychology revealed that attractive individuals are perceived as more socially capable, popular, and competent (Dion et al., 1972; Eagly et al., 1991). They further earn more wages (Mobius and Rosenblat, 2006; Toledano, 2012), are even more likely to win political elections (Banducci et al., 2008; King and Leigh, 2009; Berggren et al., 2010), are sentenced more lenient by courts (Stewart, 1980), and are associated with a higher level of bodily health (Jones et al., 2001; Rhodes et al., 2001; Fink et al., 2006; Nedelec and Beaver, 2014).

However, past research identified perceived facial *attractiveness*, *masculinity*, and *dominance* as important cues to sexual fitness bodily health in male individuals, even if the manner how they interact remains inconsistent (see Penton-Voak et al., 2001 for a review). Masculine facial features (e.g., large jaws and prominent brows) in males are suggested to be testosterone dependent and therefore associated with greater immunocompetence, phenotypic and genetic quality, respectively (see e.g., Folstad and Karter, 1992; Thornhill and Grammer, 1999). On the one hand, Cunningham et al. (1990) as well as Grammer and Thornhill (1994) demonstrated that masculine facial features are preferred by female observers, while facial masculinity is highly related to the perceived *dominance* in male faces across female and male observers (see e.g., McArthur and Apatow, 1984; McArthur and Berry, 1987; Berry and Brownlow, 1989; Perrett et al., 1998). On the other hand, perceived *dominance* is highly correlated with associated muscle mass (Frederick and Haselton, 2007), as well as a higher level of testosterone (Swaddle and Reiersen, 2002) in male individuals. However, scientific reports about direct effects of *dominance* on the perceived *attractiveness* are rather inconsistent, for example, positive effects are reported by e.g., Keating (1985), but see Perrett et al. (1998) for reported negative effects. With respect to viewing perspective and the perception of the associated *dominance* on the basis of faces, there is evidence that raising the head improves the perception of perceived dominance (e.g.,

Otta et al., 1994; Mignault and Chaudhuri, 2003; Chiao et al., 2008; Rule et al., 2012). Furthermore, Burke and Sulikowski (2010) revealed a strong relationship between upward postures and perceived *masculinity*. Results from studies investigating effects of facial lateralization (*left hemiface* which is from the owner's perspective the left side of the face vs. *right hemiface* which is from the owner's perspective the right side of the face) with chimaeric faces (combining one side of a face and mirroring it to the other side) revealed that the *right hemiface* is associated with higher ratings of *attractiveness* (see e.g., Zaidel et al., 1995; Burt and Perrett, 1997; but see Zaidel and Cohen, 2005 who only found effects for female faces). Following these results, we strongly expect that the showing the right cheek (*right hemiface*) positively affects the perceived *attractiveness* of a face. Furthermore, a face that is viewed from a lower vantage point should be perceived as more *dominant*.

Relating to female individuals, Jones (1995) revealed that faces that appear to be younger than the actual age (neotenus faces e.g., small lower jaw and nose, and large lips) are rated as more attractive by male raters across five populations. In a further experiment, Jones demonstrated that manipulation of facial features toward increased neoteny resulted in higher ratings of attractiveness. From an evolutionary perspective, preferring female youthful facial features by male individual was more adaptive since neoteny is highly associated with greater fertility, fecundity, phenotypic and genetic quality (see e.g., Thornhill and Gangestad, 1993; Perrett et al., 1998). Beside the fact that (primarily for female faces) the *right hemiface* is associated with higher perceived attractiveness, there is also evidence for lateralization effects on the perceived age. For example, Burt and Perrett (1997) revealed a *right hemiface* bias, hence the perceived age of the face is biased toward the *right hemiface*. Similarly, Hole and George (2011) suggested that holistic face processing (in the sense that facial parts are bound into a single "Gestalt," see Tanaka and Farah, 1993) plays an important role in age perception. Using the so-called "composite face effect" (assembling the top half of one face with the bottom half of a different face produces the impression of a "new" face) they asked participants to estimate the associated age of a composite face and found that participants' estimates were significantly biased toward the age of the bottom half of the face. Regarding direct changes of viewing perspective (or head posture), downward pitched heads appear to be younger and upward pitched heads appear to be older (Bruce et al., 1989). According to past research, we hypothesize a positive effect for the *right hemiface* on the perceived *attractiveness* also for female faces. Furthermore, with respect to the aforementioned relationship between perceived younger age and higher ratings of attractiveness in female faces, we cautiously assume that a downward pitched female face is associated with higher ratings of attractiveness.

There is also research on more "objective" variables relating to the actual *health* such as the body height and weight of the "selfied" person. It is scientifically recognized that body shape and mass is highly related to the associated health (e.g., Swami and Tovee, 2005, 2008; Furnham et al., 2006; Tovee et al., 2006) and faces also provide valid cues to body weight and health. For example, Coetzee et al. (2009), Coetzee et al.

(2010), as well as Tinlin et al. (2013) demonstrated that facial adiposity could be taken as a predictor of various health related variables, such as the associated immunological competence, cardiovascular function, frequency of respiratory infections, and ultimate mortality. Furthermore, facial adiposity is also highly correlated with the perceived attractiveness (Re and Rule, 2016). Viewing perspective, which is often used as a composition property in selfies, strongly affects the perception of these variables (Schneider et al., 2012, 2013). However, with respect to lateralization effects on the perceived health on the basis of faces, there is scientific disagreement (right side of the face see e.g., Reis and Zaidel, 2001; Kramer and Ward, 2011; Jones et al., 2012; but see Sitton et al., 2006 for the left side of the face).

In fact, many people use perspective as a powerful technique to enhance or optimize some further (non- health- and mating-related) properties. Whether this is done implicitly or explicitly, it is clear that perspective is very differently employed in selfies and classical portraits (Bruno and Bertamini, 2013; Bruno et al., 2014). It is assumed that turning the face to the right (showing the left cheek: *left hemiface*) affects the perception of some emotions. More precisely, the left side of the face was rated as more emotionally expressive and emotions were perceived more intense (see e.g., Sackeim et al., 1978; Zaidel et al., 1995; Nicholls et al., 2002; Jones et al., 2012; Lindell, 2013a,b; Low and Lindell, 2016). This is widely in accordance with findings that the left cheek is overrepresented in classical portraits, see e.g., Bruno and Bertamini (2013) and McManus and Humphrey (1973); but also see contrasting research by Lindell (2016) who worked on specific cases of art history (i.e., Vincent Van Gogh's work). However, there are still some contradictions about the lateralization of perceptual aspects (e.g., the perception of higher-cognitive variables), for example, see Burt and Perrett (1997) or Jones et al. (2012). More precisely, there is some evidence for the asymmetrical facial organization of these variables. For example, as aforementioned, the right side of the face (*right hemiface*) affects the perception of attractiveness, sex and age, participants gaze at the right side of the face longer, whereas, the left side is perceived as more emotional and more expressive (see e.g., Sackeim et al., 1978; Burt and Perrett, 1997; Nicholls et al., 2002; Butler et al., 2005; Lindell, 2013a,b). Due to the importance of lateral effects and the non-consistent findings reported in the literature, we have made an overview of lateralization effects on a variety of face-relevant variables in **Table 1**. That there are contradictory findings between face research and empirical findings from the domain of selfies might underline the hypothesis by Bruno et al. (2014) that selfies show a general and systematic deviation from known principles of photographic compositions.

The aim of the present study was to provide fundamental information what impact a change of *perspective* has on a variety of higher-order variables that are relevant for expressing personality and for mating. To the authors' knowledge, there is no systematic investigation of how *viewing perspective* affects the perception of higher cognitive variables (such as personality variables) on basis of faces, especially for more selfie-style conditions. Accordingly, we decided to use systematically varied full 3D models which have a clear advantage over typical analysis

**TABLE 1 |** List of research which investigated the effect of *hemiface* (left vs. right) on the perception of *attractiveness*, *emotional expression* (posed and spontaneous), *personality related variables*, and *health*, showing that the results are quite far from consistent (emotional expression shows highly consistent results).

Investigated variable	Study	N	Lateralization effect <sup>#</sup>
Attractiveness	Burt and Perrett, 1997	132 (73 female)	<b>Right</b>
	Dunstan and Lindell, 2012	192 (129 female)	<b>Right</b> ( $\varphi^*/\sigma^{n.s.}$ )
	Sitton et al., 2006	40	<b>Left</b>
	Zaidel and Cohen, 2005	27 (15 female)/21 (14 female)	No effect for attractive faces
	Zaidel et al., 1995	26 (16 female)	<b>Right</b> ( $\varphi^*/\sigma^{n.s.}$ )
Emotional expression—posed	Borod et al., 1988	16 (0 female)	<b>Left:</b> happiness, surprise, sexual arousal, disgust, fear, anger, confusion, neutral
	Ekman et al., 1981	36	<b>Left:</b> smiling
	Indersmitten and Gur, 2003	38 (19 female)	<b>Left:</b> happiness, sadness, fear
	Kowner, 1995	72 (36 female)	<b>Left:</b> smiling
	Low and Lindell, 2016	90 (70 female)	<b>Left:</b> happiness
	Moreno et al., 1990	90	<b>Left:</b> smiling
	Nicholls et al., 2002	348 (274 female)	<b>Left:</b> general more emotional expressive
	Sackeim et al., 1978	86 (29 female)	<b>Left:</b> neutral, sad, anger, fear, surprise, disgust, happy
Emotional expression—spontaneous	Zaidel et al., 1995	18 (9 female)	<b>Left</b> ( $\varphi^*/\sigma^*$ ): smiling
	Cacioppo and Petty, 1981	50	<b>Left:</b> sadness
	Dopson et al., 1984	34 (31 female)	<b>Left:</b> happy, sad
	Indersmitten and Gur, 2003	38 (19 female)	<b>Right:</b> anger
Personality-related variables	Jones et al., 2012	44 (25 female)	<b>Right:</b> general higher accuracy
	Kramer and Ward, 2011	32 (25 female)	<b>Right:</b> general higher accuracy
	Okubo et al., 2013	100 (50 female)	<b>Left:</b> trustworthiness (smiling faces)
Health	Reis and Zaidel (2001)	24 (12 female)	<b>Left</b>
	Sitton et al. (2006)	40	<b>Right</b>

<sup>#</sup>Left, significant higher ratings for the left side of the face from owner's perspective (left hemiface).

Right, significant higher ratings for the right side of the face from the owner's perspective (right hemiface).

\*Controlled for gender, effect was significant.

of selfie-photographs. The factor of is not confounded with other variables such as emotional expression, style, context etc. and therefore, this fundamental information can be easily transferred to statements about selfies. We investigated the impact of systematically manipulated *viewing perspectives* (see method section) on seven social- as well as health- and mating-relevant (so called higher cognitive) variables. First of all, we investigated *attractiveness*, *dominance*, *intelligence*, and *body weight* as important predictors to bodily health and fitness.

Secondly, past research in the field of social psychology has identified *helpfulness* or helping behavior as an important social variable. Helping behavior (or helpfulness) as a subcategory of prosocial behavior is intentional and it benefits another living being or group (Hogg and Vaughan, 2013). According to the question of the philosopher Turner (2005), whether altruistic and helpful behavior is an anomaly in human beings, there is a great debate across social psychologists (e.g., Campbell, 1975), sociobiologists (e.g., Wilson, 2000), and evolutionary social psychologists (e.g., Neuberg et al., 2010). The core question seems to be: is altruistic and helpful behavior a trait that has evolutionary survival value? From a raw biological view,

altruistic and helpful behavior is associated with non-profitable enhancement of the reproductive fitness of another organism at one's own charge. Turner (2005, p. 317) further asked: "...how could natural selection ever smile upon organisms that sacrifice their own reproductive fitness for another's benefit?" However, this behavior is also empirically observable in animals which underlines the evolutionary importance of it: for example, some types of fishes enter the mouths of their hosts to remove parasites even at mortal danger (Stevens et al., 2005). From a more social psychological view, the apparent benefit of helpful behavior in social groups is well-documented in research (for example, the *bystander intervention*, whereby a person breaks out of the role of a bystander and helps another person in an emergency). Another finding is provided by Baumeister et al. (1988) who revealed a relationship between leadership and helping behavior. Leaders seem to have a generalized responsibility providing a buffer against the diffusion of responsibility.

Thirdly, *sympathy* as another important construct in social psychology. Empathy and *sympathy* are often used interchangeably. However, these terms have distinct meanings (Lishner et al., 2011). One definition of empathy is provided by



Hogg and Vaughan (2013) who suggest that it is the ability to experiencing another person's emotions, thoughts and mindset. In contrast, *sympathy* is defined as a feeling of caring about someone else's trouble, sorrow or misfortune, but not necessarily the feeling of sharing the same feelings of another person. It could further be understood as a state of sharing the same interests, attitudes, goals etc. with another person. With respect to mating-related behavior (such as mating choice), research revealed *sympathy* as an important variable. In accordance with the so-called "homogamy hypothesis", people tend to seek for partners with similar hobbies, habits, interests, attitudes (e.g., religiosity) and mindsets (e.g., Hahn and Blass, 1997; Watson et al., 2004; Luo and Klohnen, 2005; Perry, 2015).

**Distinctiveness.** Carbon et al. (2010) pointed out that this term is somewhat ambiguously defined in research. Following the definition of Wickham and Morris (2003), *distinctiveness* can "traditionally" mean "standing out from a crowd" or, alternatively, "deviating from the average face" (so-called "deviation"). In the present paper, we used the traditional definition from face research with *distinctiveness* as an assessment of the salience of a face standing out of a crowd (of other faces). With respect to research in the field of perceived attractiveness and mating behavior, there is some evidence that *symmetry*, but also *averageness* could be taken as a predictor to bodily health (see e.g., Thornhill and Gangestad, 1993; Grammer and Thornhill, 1994; Shackelford and Larsen, 1997; Jones et al., 2001; Penton-Voak et al., 2001; Rhodes et al., 2001; Zaidel and Cohen, 2005; Fink et al., 2006). According to Valentine's (1991) so-called *Multidimensional Face Space Model*, typical faces (e.g., high level of averageness) are densely located near the centroid of this face space, hence these faces are highly similar; whereas distinctive faces are less densely clustered (Valentine, 1991; Newell et al., 1999). Thus, potential effects of rarely changes in viewing perspective on the perceived *distinctiveness* could be applied to selfie-related techniques.

The finding of evidence that viewing perspective has a great impact could lead to a better understanding of *how* a selfie should be taken and *how* we perceive a given face.

## STUDY 1

### Methods

Study 1 was conducted as an initial study where we wanted to find out which conditions were interesting in particular. Accordingly, we targeted to reveal even small effects. We further stressed the detection of effects against testing null-effects (focusing on  $\alpha$  and not  $\beta$ ). For the initial study, we had no knowledge of how strong our target variables (e.g., attractiveness and sympathy) correlated. Accordingly, we set all the pre-defined correlations to relatively weak intercorrelations. With an  $\alpha$ -level of 0.05, a power of 0.80 and an effect size to be able to detect  $f = 0.10$  we obtained a minimum total sample size of 161.

### Participants

One Hundred and seventy two observers participated in the online based study (134 female;  $M = 25.2$  years,  $SD = 8.3$ , range 18–61 years) on voluntary basis. Data were collected using the online survey tool "SoSci Survey" (Leiner, 2014). Most of

the recruited participants were students of the University of Bamberg and gained course credit to fulfill course requirements. All other participants were recruited by online announcements (e.g., Facebook groups). All participants were naïve to the aim of the study and were not familiar with the presented faces.

### Materials

In order to ascertain the precise orientation of a face with respect to the vantage point of the camera, we selected 3D face scans (Di3D-technology) of 14 human models (7 female, aged  $M = 25.0$  years,  $SD = 3.3$ , range 20–31 years). We aligned these models with respect to a virtual camera and created 2D images of the faces corresponding to a camera position aligned with the inter-ocular point and perpendicular to the vertical axis of the face. We then rendered the image from seven camera perspectives (see **Table 2**) using Autodesk 3ds<sup>TM</sup> Max 2017 (note: the perspectives were all defined in terms of the face owner's view): *above*<sub>30°</sub> ("from above," which is equivalent to a camera raised and tilted by 30°), *below*<sub>30°</sub> ("from below," which is equivalent to a camera lowered and tilted by 30°), *15° left* (rotated, which is equivalent to a camera located 15° to the left side of the face: we refer to this manipulation as *left hemiface*<sub>15°</sub>), *30° left* (rotated, which is equivalent to a camera located 30° to the left side of the face: we refer to this manipulation as *left hemiface*<sub>30°</sub>), *15° right* (rotated, which is equivalent to a camera located 15° to the right side of the face: we refer to this manipulation as *right hemiface*<sub>15°</sub>), *30° right* (rotated, which is equivalent to a camera located 30° to the right side of the face: we refer to this manipulation as *right hemiface*<sub>30°</sub>), and *0°* (frontal view, which is equivalent to a frontal snapshot). The use of these seven perspectives was inspired by a study of Schneider et al. (2012) who only used gradations of 30° which we extended by using more finely graduated levels of 15° levels (0°, 15°, 30°). We refer to this manipulation as *viewing perspective* in the following. Please see example stimulus with the respective manipulation in **Table 2**.

### Procedure

The study had two factors: *model gender* (gender of the shown face) and *viewing perspective*, with the dependent variable (rating of personality variables: *attractiveness*, *helpfulness*, *sympathy*, *dominance*, *distinctiveness*, *intelligence*, and the associated *body weight*) as the subordinate orders. Factor levels were blocked and their sequences were counterbalanced across participants. This resulted in  $2$  [gender of model]  $\times$   $7$  [viewing perspective]  $\times$   $7$  [personality dimensions] = 98 trials. Each picture was presented in color on a black background and was standardized to a size of  $600 \times 450$  pixels. Due to the fact that the study ran online, the actual size on the display could not be fully controlled. However, we asked the participants to avoid the use of a mobile device (such as mobile phones and tablets). Furthermore, we kindly asked the participants to use the full screen mode of their browser to reduce destructing visual cues.

For each stimulus, participants provided a rating (on a 7-point Likert scale) or body weight judgment (in kilograms) based on their individual, subjective and spontaneous impression, respectively (by presenting an initial sentence like e.g., "I perceive the shown face as..."). The scale ranged from "less" to "very"

**TABLE 2 |** Study 1: Mean facial judgments and effect sizes (Cohen's *d*) across different viewing perspectives with a focus on differences between the frontal condition and the other viewing perspectives split by model gender (negative values of effect sizes indicate lower judgments compared to the frontal condition).

Dependent variable	Gender	Below30°	Left hemisphere30°	Left hemisphere15°	Frontal	Right hemisphere15°	Right hemisphere30°	Above30°
Attractiveness	♀	2.95	3.54** (1.33)	3.65*** (1.58)**	2.84	3.21* (0.58)	3.54** (1.12)	2.68
	♂	3.04	3.59* (0.74)	3.70** (0.95)	3.06	3.38* (0.43)	3.52* (0.55)	2.81
	Total	3.00	3.57** (1.01)	3.68*** (1.25)	2.95	3.29* (0.52)	3.53** (0.81)	2.75
Helpfulness	♀	4.04	4.09	3.97	4.01	4.15	4.21* (0.31)	3.08*** (−1.47)
	♂	3.99	3.92	4.00	4.06	4.10	4.21	3.06*** (−1.96)
	Total	4.02	4.00	3.99	4.03	4.13	4.21* (0.31)	3.07*** (−1.75)
Sympathy	♀	3.85	4.01	4.07	3.84	3.94	4.11	3.49
	♂	3.97	3.98	4.06	3.85	4.10	4.19* (0.49)	3.56
	Total	3.91	4.00	4.07	3.84	4.02	4.15* (0.34)	3.53
Dominance	♀	4.06	3.68	3.68	3.97	3.77	3.97	4.30
	♂	4.14	3.81	3.69	3.81	3.97	3.93	4.04
	Total	4.10	3.75	3.69	3.89	3.87	3.95	4.17
Distinctiveness	♀	3.47	3.73	3.99	3.95	4.03	3.81	4.17
	♂	3.82	3.92	4.20	4.03	4.05	4.02	4.11
	Total	3.64	3.82	4.09	3.99	4.04	3.91	4.14
Intelligence	♀	4.22	4.13	4.27	4.06	4.09	4.46* (0.66)	4.09
	♂	4.20	4.18	4.13	3.99	4.22	4.27	3.85
	Total	4.21	4.16	4.20	4.03	4.16	4.37* (0.59)	3.97
Body weight	♀	75.90** (1.13)	70.36	69.93	71.91	70.73	70.81	65.26** (−1.89)
	♂	80.00*** (1.75)	71.95	72.54	73.62	71.99	71.11** (−0.75)	68.23** (−1.72)
	Total	77.95*** (1.36)	71.16* (−0.48)	71.24	72.76	71.36* (−0.46)	70.96** (−0.56)	66.75*** (−1.75)

Significances were marked as bold values (\* $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p \leq 0.001$ ). Additionally, direct comparisons between left and right hemifaces were calculated and significant effects were marked with gray boxes corresponding to their effect sizes [see Cohen (1988)]: medium gray indicates medium large effects (Cohen's  $d = [0.5-0.8]$ ) and dark gray indicates large effects size (Cohen's  $d > 0.8$ ). Light gray column in the middle highlights the frontal condition. Example stimuli in the first row: Please note that we obtained consent to publish the individual's face in the present study.

(e.g., “attractive”). For the variable *distinctiveness*, we additionally referred to the aforementioned definition: “a distinct face/person is remarkable standing out from a crowd of other faces/persons.” With respect to the perceived body weight, the initial sentence was “Please judge the perceived body weight of the shown person in kilograms (in whole numbers).” Each trial started with a fixation cross followed by a blank screen and the target face until a response on the keyboard was made. The whole procedure lasted ~15 min.

## Results

One of the main goals of this study was to understand the nature of selfies in contrast to conventional frontal portraits, such as current passport photos in the European Union. Accordingly, analyses focused on potential differences between the *frontal* condition and the other *viewing perspectives*. Data were analyzed with a two-factorial repeated-measures analysis of variance (rmANOVA) with the within-subject factor *viewing perspective* and the between-subject factor *model gender*. An univariate approach with Huynh-Feldt correction (Huynh and Feldt, 1976) for the degrees of freedom (*df*) was used (correction factor  $\epsilon$ ), which should be applied if  $\epsilon$  is  $>0.75$  (Girden, 1992). Furthermore, it shows good control of the Type I error rate (Oberfeld and Franke, 2013). The original value of the *df* is reported. Partial  $\eta^2$  ( $\eta_p^2$ ) is reported as a measure of association strength. An  $\alpha$ -level of 0.05 was used for all analyses reported in this paper and all reported *p*-values are two-tailed. Pairwise comparisons and respective Cohen's *d* were additionally calculated (see Table 2). Further analyses were conducted with a focus on the simple main effects. All assumptions of a repeated measurement ANOVA were sufficiently fulfilled: independence of observations, normality of distribution of residuals as well as the homoscedasticity across and within all groups. All analyses were conducted by using RStudio (ver. 0.99.903) for Mac.

Regarding the *attractiveness* ratings, we found a significant main effect of *viewing perspective*,  $F_{(6, 72)} = 19.80$ ,  $p < 0.0001$ ,  $\eta_p^2 = 0.62$ ,  $\epsilon = 0.91$ . In comparison to *frontal* snapshots ( $M_{\text{frontal}} = 2.95$ ,  $SD_{\text{frontal}} = 0.73$ ), further analyses revealed that sided snapshots were rated as significantly more attractive. However, this effect was more pronounced for snapshots of the *left hemiface* compared to the *right hemiface*, but only for the  $15^\circ$  *left* condition (direct comparison:  $M_{15^\circ \text{left}} = 3.68$ ,  $SD_{15^\circ \text{left}} = 0.38$  vs.  $M_{15^\circ \text{right}} = 3.29$ ,  $SD_{15^\circ \text{right}} = 0.60$ ;  $d = 0.77$ ). Although the *left hemiface* affected both genders, the effect was more pronounced for *female* faces (direct comparison:  $M_{15^\circ \text{leftfemalefaces}} = 3.65$ ,  $SD_{15^\circ \text{leftfemalefaces}} = 0.35$  vs.  $M_{15^\circ \text{rightfemalefaces}} = 3.21$ ,  $SD_{15^\circ \text{rightfemalefaces}} = 0.62$ ;  $d = 0.89$  and  $M_{15^\circ \text{leftmalefaces}} = 3.70$ ,  $SD_{15^\circ \text{leftmalefaces}} = 0.43$  vs.  $M_{15^\circ \text{rightmalefaces}} = 3.38$ ,  $SD_{15^\circ \text{rightmalefaces}} = 0.62$ ;  $d = 0.60$ ). So, on average, showing the left cheek seems to be slightly more appealing, see Table 2.

Analyses for *helpfulness* revealed a significant main effect of *viewing perspective*,  $F_{(6, 72)} = 29.53$ ,  $p < 0.0001$ ,  $\eta_p^2 = 0.711$ ,  $\epsilon = 1.00$ . Interestingly, in comparison to *frontal* snapshots ( $M_{\text{frontal}} = 4.03$ ,  $SD_{\text{frontal}} = 0.64$ ), pairwise comparison revealed that faces photographed from a higher viewing perspective (*above* $_{30^\circ}$ ) were

rated as significantly less helpful, ( $M_{\text{above}30^\circ} = 3.07$ ,  $SD_{\text{above}30^\circ} = 0.44$ ,  $d = -1.75$ ) across female and male faces, suggesting a body height dependent effect on the perception of *helpfulness* (see Table 2). For snapshots of the *right hemiface* $_{30^\circ}$  we additionally found a small effect for only female faces ( $M_{30^\circ \text{right}} = 4.21$ ,  $SD_{30^\circ \text{right}} = 0.60$ ,  $d = 0.31$ ), see Table 2. However, direct comparisons of *left* vs. *right hemifaces* revealed no effect. Further analyses for the variable *sympathy* revealed a main effect of *viewing perspective*,  $F_{(6, 72)} = 5.70$ ,  $p < 0.0001$ ,  $\eta_p^2 = 0.322$ ,  $\epsilon = 0.87$ . More specifically, we found a small effect for snapshots of the *right hemiface* $_{30^\circ}$  ( $M_{30^\circ \text{right}} = 4.15$ ,  $SD_{30^\circ \text{right}} = 0.77$ ,  $d = 0.40$ ), see Table 2. This effect was slightly more pronounced in male faces ( $M_{30^\circ \text{right}} = 4.19$ ,  $SD_{30^\circ \text{right}} = 0.63$ ,  $d = 0.49$ ). Again, direct comparisons of *left* vs. *right hemifaces* revealed no effect. Analyses for the variable *intelligence* revealed a small but significant main effect of *viewing perspective*,  $F_{(6, 72)} = 2.39$ ,  $p = 0.041$ ,  $\eta_p^2 = 0.166$ ,  $\epsilon = 0.94$ . In comparison to *frontal* snapshots ( $M_{\text{frontal}} = 4.03$ ,  $SD_{\text{frontal}} = 0.72$ ), analyses revealed that the *right hemiface* $_{30^\circ}$  ( $M_{30^\circ \text{right}} = 4.37$ ,  $SD_{30^\circ \text{right}} = 0.40$ ,  $d = 0.59$ ) was rated as slightly more intelligent. Direct comparisons of *left* vs. *right hemifaces* revealed no effect.

Regarding the body weight judgments, we found a strong effect of *viewing perspective*,  $F_{(6, 72)} = 31.10$ ,  $p < 0.0001$ ,  $\eta_p^2 = 0.722$ ,  $\epsilon = 0.95$ , replicating the results reported by Schneider et al. (2012). In comparison to the *frontal* condition ( $M_{\text{frontal}} = 71.91$ ,  $SD_{\text{frontal}} = 3.41$ ), the associated body weight for faces photographed from a lower perspective ( $M_{\text{below}30^\circ} = 77.95$ ,  $SD_{\text{below}30^\circ} = 4.10$ ,  $d = 1.36$ ) was rated as significantly higher than for faces photographed from a higher perspective ( $M_{\text{above}30^\circ} = 66.75$ ,  $SD_{\text{above}30^\circ} = 3.37$ ,  $d = -1.75$ ), see Table 2. We further found that snapshots of the *right hemiface* produced slightly lower body weight judgments ( $M_{15^\circ \text{right}} = 71.36$ ,  $SD_{15^\circ \text{right}} = 2.60$ ,  $d = -0.46$  and  $M_{30^\circ \text{right}} = 70.96$ ,  $SD_{30^\circ \text{right}} = 2.89$ ,  $d = -0.56$ ). Furthermore, left cheek views (showing the *left hemiface*) also produced significantly lower associated body weight assessments ( $M_{30^\circ \text{left}} = 71.16$ ,  $SD_{30^\circ \text{left}} = 3.11$ ,  $d = -0.48$ ). Other *viewing perspectives* had no effect on the associated body weight. We did not find any effects for the variables *dominance* or *distinctiveness*.

## Discussion

The main goal of Study 1 was to investigate the potential effects of different *perspectives* on the perception of a given face, compared to classical frontal portrait photos. In Study 1, we let our participants rate person-related variables across different viewing perspectives on the basis of faces. We were able to show that in the case of *attractiveness* ratings, the perspective of the camera had a significant effect. This effect was especially positive for presentations of the *left hemiface* and more distinct for female faces (in contrast to male faces) what is in line with findings by Sitton et al. (2006), although others, e.g., Dunstan and Lindell (2012) did only found this effect for male faces. This optimization possibility is seemingly often used in the field when people take a selfie: Here, people tend to show a side bias (mostly showing the left cheek)—interestingly, the *left hemiface* has a significant effect on the perception of (positive) emotion (see McManus and Humphrey, 1973; Bruno and Bertamini, 2013; Lindell, 2013a,b;

Low and Lindell, 2016). However, our results are also in some contrast to our initial hypothesis and also to other research: e.g., Burt and Perrett (1997) used chimeric faces and revealed that the *right hemiface* impacts attractiveness more than the left side. Other research e.g., Zaidel et al. (1995) as well as Dunstan and Lindell (2012) also revealed this right side effect but only for female faces. Furthermore, in our dataset the *right hemiface* also positively affected the perception of attractiveness although this effect was less pronounced. However, in these studies only frontal (partly chimeric) faces were used and stimuli were not rendered from 3D models. Dunstan and Lindell (2012), in contrast, used photographs of human models but with a visible torso and direct gaze toward the camera. In the present study, we decided to use fully rotated faces which were based on photogrammetry which allows the extracting of variable perspectives from one single face model, so that all instances show the very same face at one fixed moment in time. Similarly, Burke et al. (2007) and Schneider et al. (2012) suggested that depth information (which was highly available in our stimuli set) in particular contributes to differences in the perception of a face. In contrast to our hypothesis, we did not find any effects of elevating or lowering the camera, neither for male (lowering the camera) nor for female faces (elevating the camera). However, this is in line with recent research by Baranowski and Hecht (in press) who did not find such an effect in faces of (unknown) actors.

Regarding the variable *helpfulness*, we found a small but significant effect for right sided faces and a clear negative effect for faces shown from a higher vantage point, suggesting a height-dependent effect of viewing perspective on perceived helpfulness. Regarding the *above<sub>30°</sub>* condition, which is equivalent to a taller person looking down on a smaller person, recent research revealed that taller persons are associated with greater leadership skills (Re et al., 2012, 2013). From this point of view, you may expect that smaller persons indeed rely on the helpfulness of the respective leader instead of being more helpful themselves. Accordingly, persons seen from above, such as typically smaller persons, might be assessed as less helpful—or even more precisely, as being potentially less helpful. Interestingly, we found such a perspective-relevant effect on helpfulness only with faces that are observed from above, but we failed to document an effect of higher helpfulness with faces observed from below. Furthermore, showing the *right cheek* (compared to the *frontal* condition) positively affects the perception of *helpfulness* especially for female faces. Beside the fact that this effect was rather small and *not* significantly larger for the *left cheek* condition, we could only speculate: similarly, we also found a significant and positive effect for the *right hemiface* on the perceived *intelligence*. Following the results of a recent study by Furnham and Cheng (2015), *intelligence* could be taken as a predictor for *helpful behavior* (as a facet of agreeableness). Accordingly, this may explain the similar pattern of *helpfulness* and *intelligence*. However, the effect of gender as well as the effect of rotation could not be sufficiently explained. A possible explanation for the right-side bias in the perception of *intelligence* is provided by findings that the *right hemiface* is associated with scientific, rational, academic and unemotional concepts (e.g., Nicholls et al., 1999; ten Cate, 2002; Lindell and Savill,

2010; Churches et al., 2012): e.g., in a study ten Cate (2002) presented pictures of professors of the eighteenth century and let participants rate how “scientific” they perceived the respective professor. Accordingly, participants rated the right cheek pictures as more scientific. This finding was further extended by Churches et al. (2012) who found that people intuitively show either the left or the right cheek, depending on what they want to express (scientists of core-sciences such as mathematics, engineering as well as chemistry show their right cheek, whereas scientists of human sciences such as psychology tended to show the left cheek).

With respect to the perceived *sympathy*, we found a significant and positive effect for right sided snapshots (showing the right cheek) especially for *male* faces (compared to the *frontal* condition). However, direct comparison of *left* vs. *right* hemifaces revealed no significant difference. Accordingly, our results might contrast past findings according to which the *left* hemiface is perceived as more emotional (see e.g., Sackeim et al., 1978; Zaidel et al., 1995; Nicholls et al., 2002; Jones et al., 2012; Lindell, 2013a,b; Low and Lindell, 2016). However, to the author’s knowledge, there is no investigation on the perception of *sympathy* with respect to viewing perspective. Moreover, we assume that *sympathy* is only a single facet of the entire and complex construct of emotion. Thus, the pattern of our data leads to the speculation that it does *not* contradict past findings, since the perception of emotions is not homogeneously unilaterally affected.

With respect to the perception of the associated *dominance*, past research revealed that raising the head improves the perception of it (e.g., Otta et al., 1994; Mignault and Chaudhuri, 2003; Chiao et al., 2008; Rule et al., 2012). Similarly, Burke and Sulikowski (2010) demonstrated a clear association between upward postures and perceived masculinity. Thus, we expected higher ratings for upward-pitched faces and lower ratings for downward-pitched faces, compared to the *frontal* condition. However, we did not find this effect in our sample. Moreover, there was not even any significant difference between upward vs. downward pitched faces. Calling our results into question, we suggest that *cervical* cues (e.g., the visibility of a neck) are essential for the perception of dominance (keep in mind that in the aforementioned studies, the neck was visible). Additionally, the human *trapezius muscle* (a large muscle that extends longitudinally from the occipital bone to the lower thoracic vertebrae and laterally to the spine of the shoulder blade) is more visible and especially the *longus colli muscle* (the long muscle of the neck) is in more tension in the case of raised heads. Most notably with male bodies, Frederick and Haselton (2007) demonstrated that perceived *dominance* is strongly dependent on the perceived muscle mass. Our set of stimuli was limited to neckless faces only. Accordingly, important cues to muscle mass and *dominance* were not accessible.

Considering past research, the effects that were mainly investigated were of *viewpoint* on recognition processes, relating to *distinctiveness*. It is suggested that distinctive faces are recognized better than ones that are more typical in their appearance (in the sense of Valentine, 1991 so-called *Multidimensional Face Space Model*): Typical faces are densely



located near the centroid of this face space, hence there is a high potential for confusion; whereas distinctive faces are less densely clustered (e.g., Valentine, 1991; Newell et al., 1999). Regarding to our study, research revealed that in cases of *unfamiliar* face processing, changes due to (planar) rotation (i.e., a rotation called “roll”) makes face recognition harder. In fact such a kind of rotation disrupts featural (e.g., Carbon and Leder, 2006; Stephan and Caine, 2007; Akselrod-Ballin and Ullman, 2008) as well as “configural processing” (e.g., Carbon and Leder, 2006; Favelle et al., 2011) and “holistic processing” (Tanaka and Farah, 1993; Leder and Carbon, 2005; Goffaux et al., 2009; but see Richler et al., 2011). In the present study we addressed the much-less-investigated case of faces rotated in terms of “yaw” and “pitch.” Furthermore, relating to face recognition, research revealed an interaction between *distinctiveness* and *viewing perspective*. More specifically, it is suggested that the visibility of distinctive parts of a face varies across different *viewing perspectives*, hence recognition performance is dependent on the availability of these parts: distinctive facial features could be invisible in faces which are presented in profile (e.g., Valentin et al., 1999, 2001). However, direct potential effects of *viewing perspective* on *distinctiveness* have not yet been investigated. In our study, we could not find any effects of *perspective* on *distinctiveness*; probably the extent of utilized deviations from the *frontal* perspective was just not large enough to find any effects. This would be in accordance with previous research wherein robust face processing of configural aspects was documented up to a (planar) rotation of about 60° from the frontal-upright orientation (Carbon et al., 2007).

In Study 1, we were able to replicate the so called “*height-weight illusion*” (first mentioned by Schneider et al., 2012) whereby faces seen from a higher viewing perspective are associated with a significantly lower body weight compared to faces seen from a lower viewing perspective. This advantage was slightly more pronounced in faces showing their right cheek (*right hemiface*). This finding is in accordance with research that revealed a preference for sided faces (e.g., Bruno and Bertamini, 2013; Yeh and Lin, 2014). Furthermore, it underlines the correlation between the perception of facial mass (and respective body weight), and perceived attractiveness (e.g., Tovee et al., 1998, 1999, 2006; Swami et al., 2006, 2010; Coetzee et al., 2009, 2010).

## STUDY 2

Study 1 revealed that *perspective* has an impact on facial judgments, especially for body weight judgments (previews findings are reported by e.g., Schneider et al., 2012, 2013); other postulated effects were less pronounced or absent. However, the used viewing perspectives of Study 1 are sometimes found with selfies but some additional ones are even more typical of the selfie style (see e.g., Bruno et al., 2014). Just imagine that you are going to take a selfie on your next trip. It is unlikely that you will only rotate your mobile phone rigidly around one axis, but typically you will use a combination of such rotations. Accordingly, the

aim of Study 2 was to examine the impact of typical *perspectives* of selfies on facial judgments.

For study 2, we focused on medium size effects as the study was framed in a more applied context expecting rather more noise and less signal. Accordingly, we adjusted our pre-sets in terms of effect size ( $f = 0.25$ ) and power ( $1 - \beta = 0.95$ ), yielding a needed total sample size of 45.

## Method

### Participants

Sixty-seven observers participated in the online-based study (52 female;  $M = 24.3$  years,  $SD = 3.6$ , range 19–38 years) on a voluntary basis. Data were collected using the online study tool “SoSci Survey” (Leiner, 2014). Method of recruiting participants was the same as in Study 1. All participants were naïve to the aim of the study; none of them participated in Study 1; they were not familiar to the presented faces.

### Materials

The stimulus material of Study 2 was the same as in Study 1, with the difference that we changed the used *viewing perspectives* toward an even more selfie-esque style by combining tilted and rotated camera conditions (see Carbon, 2017). As a result, we got the following seven *viewing perspectives* (see Table 3):

- *above<sub>30°</sub>*, *below<sub>30°</sub>* (both, *above<sub>30°</sub>* and *below<sub>30°</sub>* as in Study 1),
- *above<sub>30° left</sub>* (combination: elevated/rotated, which is equivalent to a raised and tilted camera *plus* a camera located 30° to the left side of the face) *below<sub>30° left</sub>* (combination: lowered/rotated, which is equivalent to a lowered and tilted camera *plus* a camera located 30° to the left side of the face), *above<sub>30° right</sub>* (combination: elevated/rotated, which is equivalent to a raised and tilted camera *plus* a camera located 30° to the right side of the face), *below<sub>30° right</sub>* (combination: lowered/rotated, which is equivalent to a lowered and tilted camera *plus* a camera located 30° to the right side of the face), and 0° (frontal view, which is equivalent to a frontal snapshot).

### Procedure

The procedure was the same as in Study 1.

## Results

In Study 2 we focused again on the impact of different perspectives on several person-related variables, always with the *frontal* perspective as the base condition. To be able to optimally compare the results between both studies, we followed the same strategy of analyses (see details above).

Regarding the *attractiveness* ratings, we found a significant main effect of *viewing perspective*,  $F_{(6, 72)} = 11.75$ ,  $p < 0.0001$ ,  $\eta_p^2 = 0.495$ ,  $\varepsilon = 1.00$ . In comparison to *frontal* snapshots ( $M_{frontal} = 3.22$ ,  $SD_{frontal} = 0.90$ ), analyses revealed that elevating and rotating the camera had a large positive effect on *attractiveness* ( $M_{above30° left} = 4.23$ ,  $SD_{above30° left} = 0.78$ ,  $d = 1.20$  and  $M_{above30° right} = 4.11$ ,  $SD_{above30° right} = 0.83$ ,  $d = 1.02$ ). In both cases (snapshots of the *left* and *right hemiface*), the effect was more pronounced for male faces ( $M_{above30° left} = 4.16$ ,  $SD_{above30° left} = 0.96$ ,  $d = 1.77$  and  $M_{above30° right} =$

**TABLE 3 |** Study 2: Mean facial judgments and effect sizes (Cohen's *d*) across different viewing perspectives with a focus on differences between the frontal condition and the other viewing perspectives split by model gender (negative values of effect sizes indicate lower judgments compared to the frontal condition).

Dependent variable	Gender	Below30°	Below30°left	Above30°left	Frontal	Above30°right	Below30°right	Above30°
Attractiveness	♀	3.90	3.30	4.29	3.65	4.12	2.25** (−1.44)	3.32
	♂	2.93	2.17	4.16** (1.77)	2.79	4.10* (1.67)	2.25	2.64
	Total	3.42	2.73	4.23** (1.20)	3.22	4.11* (1.02)	2.25** (−1.11)	2.98
Helpfulness	♀	4.02	4.07	4.15	4.30	3.98	3.64	2.66*** (−2.26)
	♂	3.70	2.96	3.91* (1.23)	3.04	4.41*** (1.62)	3.30	2.39
	Total	3.89	3.52	4.03	3.67	4.20* (0.53)	3.47	2.52** (−1.41)
Sympathy	♀	4.05	4.01	4.15	3.96	4.35	3.49	4.48
	♂	3.56	3.11	3.65	3.06	4.31	3.50	3.61
	Total	3.81	3.56	3.90	3.51	4.33	3.49	4.04
Dominance	♀	4.42	3.66	3.40	3.75	3.68	3.71	3.07
	♂	4.30	4.18	4.05	4.03	4.53	4.72	4.00
	Total	4.36	3.92	3.73	3.89	4.10	4.21	3.54
Distinctiveness	♀	4.76	4.09	3.84	3.92	4.30	4.92	4.44
	♂	4.38	3.90	3.94	4.08	4.10	4.55	3.53
	Total	4.57	3.99	3.91	4.00	4.20	4.74	3.98
Intelligence	♀	4.55	4.68	4.07	4.27	4.39	4.23	4.32
	♂	3.63	3.84	3.67	4.02	4.54	4.14	3.83
	Total	4.09	4.26	3.87	4.14	4.47	4.19	4.08
Body weight	♀	66.94** (3.20)	63.28** (2.86)	50.99** (−3.65)	57.96	51.14*** (−3.51)	61.72** (2.19)	51.77** (−2.68)
	♂	83.48*** (2.00)	79.58*** (2.12)	65.61*** (−2.11)	73.55	63.12*** (−3.47)	79.76*** (2.10)	64.94*** (−2.82)
	Total	75.21*** (1.03)	71.43*** (0.66)	58.30*** (−0.89)	65.75	57.13*** (−1.13)	70.74*** (0.55)	58.35*** (−0.93)

Significances were marked as bold values ( $p \leq 0.05$ , \*\* $p \leq 0.01$ , \*\*\* $p \leq 0.001$ ). Additionally, direct comparisons between the left and right hemiface plus above and below conditions were calculated, but we did not find any significant effect. Example stimuli in the first row: Please note that we obtained consent to publish the individual's face in the present study. Light gray column in the middle highlights the frontal condition.

4.10,  $SD_{above30^\circ right} = 0.97$ ,  $d = 1.67$ ). In contrast, lowering and rotating the camera had a negative effect on *attractiveness* ( $M_{below30^\circ right} = 2.25$ ,  $SD_{below30^\circ right} = 0.86$ ,  $d = -1.11$ ). This effect was more pronounced for female faces ( $M_{below30^\circ right} = 2.25$ ,  $SD_{below30^\circ right} = 0.95$ ,  $d = -1.44$ ), see **Table 3**.

Analyses for the variable *helpfulness* revealed a significant main effect of *viewing perspective*,  $F_{(6, 72)} = 7.95$ ,  $p < .0001$ ,  $\eta_p^2 = 0.398$ ,  $\varepsilon = 1.00$ . Similarly to Study 1, in comparison to *frontal* snapshots ( $M_{frontal} = 3.67$ ,  $SD_{frontal} = 1.08$ ), faces photographed from a higher viewing perspective (*above30°*) were rated as significantly less helpful ( $M_{above30^\circ} = 2.52$ ,  $SD_{above30^\circ} = 0.40$ ,  $d = -1.41$ ). This effect was particularly large for *female* faces ( $M_{above30^\circ} = 2.66$ ,  $SD_{above30^\circ} = 0.45$ ,  $d = -2.26$ ), see **Table 3**. Elevating the camera, however, did *not* have an effect. Specifically, for male faces, a *combination* of elevation and rotation of the camera (*above30°left* and *above30°right*) led to significantly higher *helpfulness* ratings ( $M_{above30^\circ left} = 3.91$ ,  $SD_{above30^\circ left} = 0.55$ ,  $d = 1.23$  and  $M_{above30^\circ right} = 4.41$ ,  $SD_{above30^\circ right} = 0.85$ ,  $d = 1.62$ ), suggesting an interaction of gender and viewing perspective. Regarding the variable *sympathy*, we found higher ratings for male faces which were photographed from a higher viewing perspective and rotated by  $30^\circ_{right}$ . However, this effect was not significant; see **Table 3**.

Regarding *body weight* judgments, we replicated the height-weight illusion (Schneider et al., 2012) which was also found in Study 1, see **Table 3**. Furthermore, compared to the *frontal* condition ( $M_{frontal} = 65.75$ ,  $SD_{frontal} = 8.65$ ), lowering *plus* rotating the camera produced significantly higher body weight judgments ( $M_{below30^\circ left} = 71.43$ ,  $SD_{below30^\circ left} = 8.53$ ,  $d = 0.66$  and  $M_{below30^\circ right} = 70.74$ ,  $SD_{below30^\circ right} = 9.44$ ,  $d = 0.55$ ). Interestingly these conditions (*below30°left* and *below30°right*), were still slightly lower than the pure *above30°* condition without a horizontal rotation ( $M_{below30^\circ} = 75.21$ ,  $SD_{below30^\circ} = 9.71$ ,  $d_{below30^\circ left} = -0.41$  and  $d_{below30^\circ right} = -0.47$ ). We could also detect that elevating and rotating the camera indeed produced significantly lower body weight judgments ( $M_{above30^\circ left} = 58.30$ ,  $SD_{above30^\circ left} = 8.04$ ,  $d = -0.89$  and  $M_{above30^\circ right} = 57.13$ ,  $SD_{above30^\circ right} = 6.41$ ,  $d = -1.13$ ). Nevertheless, additional horizontal rotation of the camera did not significantly enhance the effect of height-weight illusion. In line with Study 1, we did not find any effects for the variables *sympathy*, *dominance*, *distinctiveness*, or *intelligence*.

## Discussion

The aim of Study 2 was to examine whether more selfie-specific *viewing perspectives* have an even more pronounced effect on facial judgments. Accordingly, in Study 2, we let participants rate personality variables across different viewing perspectives on the basis of faces. In accordance with the findings of Study 1, we could show that in case of *attractiveness* judgments were positively affected by horizontally rotating and elevating the camera. Similarly to Study 1, this effect was slightly (but not significantly) more pronounced for the left side of the face compared to the right side. We also reported larger effects for male faces compared to female faces. This suggests a clear preference for lateral and elevated snapshots. This conclusion is supported by findings that elevating the camera *plus* rotating the

camera is generally preferred for taking selfies (Yeh and Lin, 2014; Kalayeh et al., 2015). An elevation within pure frontal depictions had *no* effect on attractiveness ratings at all what is in line with Study 1 and findings by Baranowski and Hecht (in press). However, there was a slight (but non-significant) decrease in perceived attractiveness. In the case of the *below<sub>right</sub>* condition (which is equivalent to a view from the right bottom) we found a *decrease* in perceived attractiveness, and this effect was even more pronounced for female faces. Burt and Perrett (1997) as well as Zaidel et al. (1995) argued that the right side of the owner's face positively affects the perception of facial attractiveness. However, this effect had not yet been investigated in combination with a classical selfie-style camera upward tilt. Similarly, it could be shown that facial cues can be taken as a valid predictor of body weight and this highly correlates with the perceived health and attractiveness (Coetzee et al., 2009, 2010).

Regarding the assessment of *helpfulness* in Study 2, we showed that elevating and rotating the camera had a significant and positive effect. Similarly to Study 1, this effect was again slightly more pronounced in faces showing their right cheek (*above30°right*). In contrast, we replicated the negative effect of Study 1 (a *frontally* elevated camera: the *above30°* condition is equivalent to a taller person looking downwards on a smaller person). At first sight this contradicts the finding of Study 1, where we argued the typical view of a taller person caused people to assess the viewed person as more helpful. The additional horizontal rotation eliminated this effect. We can only speculate at this point, but in the specific combination of tilting and rotating a camera might have induced a higher rating for helpfulness in Study 2 as this perspective reveals many details of the face and also looks quite realistic—the participants probably perceived a face from this perspective as much more of a real face than would have been the case with a flat picture of a face. The variable *helpfulness* might benefit from such a more holistic capture of a face to a greater extent than other variables.

Regarding the *body weight* judgments, we replicated the height-weight illusion that we also documented for Study 1. From this point of view (Schneider et al., 2012), we expected and found generally higher body weight judgments for lower camera positions and generally lower body weight judgments for elevated camera positions. Surprisingly, in cases of lower camera positions (*below30°left* and *below30°right*), we were able to show that a further camera rotation slightly reduced the effect of higher body weight judgments and this was significant compared to the *below30°* control condition. This suggests a strong positive rotation effect on perceived body weight, which is in accordance with the findings of Study 1. Similarly, we also found a slight but non-significant advantage in the combination of elevating and rotating the camera. Taken together, elevating the camera produces significantly lower body weight judgments across all conditions. An additional rotation does not sufficiently improve this effect. Lowering the camera produces significantly higher body weight judgments across all conditions. However, an additional rotation has a significant effect on perceived body weight (lower body weight judgments).

## GENERAL DISCUSSION

The main goal of this study was to reveal the impact of perspective on persons depicted via selfies. In two studies, we revealed clear effects of *perspective* on higher cognitive processes (namely the perception of person-related variables on the basis of facial depictions). Research on selfies has revealed that persons who shoot selfies want to express their mood, their personality and even their lifestyle via selfies, so they try to optimize this information by intuitively adapting the camera position (see e.g., Sorokowska et al., 2016). Previous work documented that in cases of classical portraits there were a lot of compositional suggestions and artificial rules which were applied to gain pictures of high appeal, e.g., the “Golden Ratio Rule” or the “Rule of Thirds” or general placement principles of facial features (see e.g., Tyler, 1998a,b; Westphalen, 2016). However, scientific research is quite far from achieving consistent results about the meaningfulness and effects of these rules in general (e.g., Green, 1995; Höge, 1997; McManus and Weatherby, 1997; McManus and Thomas, 2007; Bertamini et al., 2011). In contrast, regarding the social phenomenon of taking *selfies*, one may find only a small number of suggestions, often in a relative unsystematic way, for taking the “best” selfie (scientifically investigated by e.g., Yeh and Lin, 2014; Kalayeh et al., 2015) and some photographic rules like the “high-angle shot” (e.g., Mamer, 2013). However, there is little knowledge about *whether* and *how exactly* these aspects may have an impact on the perception of a given face. Moreover, there are some hints toward a general deviation from known photographic principles in selfies (Bruno et al., 2014) and the impact of a typical selfie-style *perspective* has yet to be investigated.

Accordingly, our results suggest that *perspective* has a significant impact on the perception of the beholder, especially for attractiveness, helpfulness, sympathy, intelligence, and associated body weight: Study 1 investigated the impact of *viewing perspective* in cases of more classical portraits and revealed that showing the *right cheek* (showing the *right hemiface*) positively affects the perception of attractiveness, helpfulness, sympathy, intelligence and body weight. This finding is in accordance with the finding that the *right side* of the owner's face (*right hemiface*) affects the perception of attractiveness, age and gender (Zaidel et al., 1995; Burt and Perrett, 1997; Dunstan and Lindell, 2012) more than the left side (*left hemiface*) but is in some contrast to findings that emotional aspects can be derived better and more accurately from the *left side* of the owner's face (e.g., Zaidel et al., 1995; Kramer and Ward, 2011; Lindell, 2013a,b; Low and Lindell, 2016). However, with respect to the perceived *attractiveness*, we found comparative larger effects for the *left hemiface*, contrasting past research by others (for instance, Zaidel et al., 1995; Burt and Perrett, 1997; Dunstan and Lindell, 2012; but also see Sitton et al., 2006). It is important to mention that past research (but see Kramer and Ward, 2011) did not use 2D stimuli generated from real 3D face models for that kind of research question. Schneider et al. (2012) suggested that differences in perceptual aspects (e.g., perceived body weight on the basis of faces) are strongly dependent on depth information, hence *viewing perspective* affects respective ratings.

In Study 2, we investigated the effect of more selfie-style *viewing perspectives* (typical combination of camera rotation and camera pitch) and only found effects for attractiveness, helpfulness and body weight. Importantly, elevating and rotating had a positive effect on these variables and was slightly more pronounced for the *right side* of the face on average. Lowering the camera only had negative effects on perceived attractiveness and body weight. Regarding the perceived body weight, an additional rotation of the camera reduced the effect of a lowered/raised camera, supporting previous findings relating to the *height-weight* illusion (Schneider et al., 2012). The rest of the personality-related variables remained unaffected from a statistical point of view, although they showed slightly higher ratings for right-sided and elevated snapshots on a purely numerical basis.

How can the complex data pattern be interpreted? First of all: *Perspective* has a significant impact on the perception of higher-cognitive variables (such as person-related variables) on the basis of faces. Secondly: Effects of *perspective* were in contrast to some past findings (for example, higher effects for the right side of the face on average in Study 2 and larger effects for attractiveness for the *left* side of the face in Study 1 and 2) suggesting that selfies constitute an own class of pictorial presentations of a person. This is supported by the findings of Bruno et al. (2014) showing a systematic deviation from known photographic rules in selfies. Furthermore, our results highlight the importance of the visibility of certain features in facial stimuli, *per se* (e.g., regarding the perception of *dominance*, our results underline the visibility of the neck as an important cue to masculinity and dominance). Thirdly: Interestingly, for most of the variables effects were significant for the 30° head turn (left and right hemiface) images, but not the 15° head turn images. We have at least two reasons for this discrepancy in mind: On the one hand, the 15° rotation is just too similar to the frontal condition, at least to detect any differences from the frontal view by means of the given experimental setting with limited sample sizes which were only capable of revealing effect sizes of small to medium effect sizes but not, for example, very small effects. On the other hand, referring to research papers which systematically varied other kinds of rotation, e.g., planar rotations, we also observed a certain range of rotations for which essential variables did not change [e.g., Carbon et al., 2007 did not detect any significant change of the target variable grotesqueness as well as the reaction time (RT) associated with this assessment]. Fourthly: In contrast to the common standpoint that we are able to make meaningful suggestions about “how to take the perfect selfie,” our results indicate that we are a long way from having any clear references.

We would also like to mention some limitations of this study: Past research revealed that direct vs. averted gazes have a direct impact on the perception of a given face (e.g., Kampe et al., 2001; Ewing et al., 2010). More precisely, these studies revealed that an averted gaze has a negative effect on the perception of attractiveness. However, the effect of the combination of averted head *plus* direct gaze vs. frontal face *plus* averted gaze across different viewing perspectives on the perception



of higher cognitive variables (like those we used) has not yet been investigated. In this study, we did not investigate such a combination, which would incidentally be very much in accord with some Renaissance portraits like La Gioconda by Leonardo da Vinci (see details on the perspective of the Mona Lisa in Carbon and Hesslinger, 2013). Future research should address such further settings to enrich the existing knowledge base on selfies. Another weakness of the present study is that we neither could control the actual size of the presented face on the monitor nor the actual viewing distance. Moreover, we must expect that display color, contrast and brightness were not at the same level across all participants. This might affect the perception of a face dramatically. However, the fact that we could replicate the height-weight illusion (Schneider et al., 2012) makes it conjecturable that other effects were relative stable. Similarly, other studies (e.g., ten Cate, 2002; Churches et al., 2012) used relatively unstandardized images that could not be controlled along those variables, and though revealed consistent results.

Despite all the back draws you always face with standardized and systematically varied material, such experimental material can test already small effects which might be tested with more ecologically valid material in the field later on. We hope that our study contributes to the understanding on how perspective can change the assessment of higher cognitive variables. This will help to sensitize selfie-ists how powerful

the use of perspective might be in conveying their inner states.

## ETHICS STATEMENT

The study was reviewed and approved by the Ethics Committee of the University of Bamberg, Germany. Its protocol was approved.

## AUTHOR CONTRIBUTIONS

TS was responsible for collecting and analyzing/interpreting data as well as for writing this manuscript. CC was responsible for supervision (initial idea and experimental design improvements), result interpretation and critical manuscript reviewing. Both authors agree to be accountable for the content of the work.

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## REFERENCES

- Akselrod-Ballin, A., and Ullman, S. (2008). Distinctive and compact features. *Image Vis. Comput.* 26, 1269–1276. doi: 10.1016/j.imavis.2008.03.005
- Banducci, S. A., Karp, J. A., Thrasher, M., and Rallings, C. (2008). Ballot photographs as cues in low-information elections. *Polit. Psychol.* 29, 903–917. doi: 10.1111/j.1467-9221.2008.00672.x
- Baranowski, A., and Hecht, H. (in press). Effect of camera angle on perception of trust and attractiveness. *Empirical Studies of the Arts*.
- Baranowski, A., Leder, H., Schneider, T. M., Hemmerich, W., and Hecht, H. (2016). “Facial attractiveness and the cone of gaze,” in *Abstracts of the 58th Conference of Experimental Psychology*, eds J. Funke, J. Rummel, and A. Voss (Heidelberg: Lengerich: Pabst Science Publishers), 19–20.
- Baumeister, R. F., Chesner, S. P., Senders, P. S., and Tice, D. M. (1988). Who's in charge here? *Pers. Soc. Psychol. Bull.* 14, 17–22. doi: 10.1177/0146167288141002
- Berggren, N., Jordahl, H., and Poutvaara, P. (2010). The looks of a winner: beauty and electoral success. *J. Public Econ.* 94, 8–15. doi: 10.1016/j.jpubeco.2009.11.002
- Berry, D. S., and Brownlow, S. (1989). Were the physiognomists right? Personality-correlates of facial babyishness. *Pers. Soc. Psychol. Bull.* 15, 266–279. doi: 10.1177/0146167289152013
- Bertamini, M., Bennett, K. M., and Bode, C. (2011). The anterior bias in visual art: the case of images of animals. *Laterality* 16, 673–689. doi: 10.1080/1357650X.2010.508219
- Borod, J. C., Kent, J., Koff, E., Martin, C., and Alpert, M. (1988). Facial asymmetry while posing positive and negative emotions support for the right-hemisphere hypothesis. *Neuropsychologia* 26, 759–764. doi: 10.1016/0028-3932(88)90013-9
- Bruce, V., Burton, M., Doyle, T., and Dench, N. (1989). Further experiments on the perception of growth in three dimensions. *Percept. Psychophys.* 46, 528–536.
- Bruno, N., and Bertamini, M. (2013). Self-Portraits: smartphones reveal a side bias in non-artists. *PLoS ONE* 8:e55141. doi: 10.1371/journal.pone.0055141
- Bruno, N., Gabriele, V., Tasso, T., and Bertamini, M. (2014). Selfies reveal systematic deviations from known principles of photographic composition. *Art Percept.* 2, 45–58. doi: 10.1163/22134913-00002027
- Burke, D., and Sulikowski, D. (2010). A new viewpoint on the evolution of sexually dimorphic human faces. *Evol. Psychol.* 8, 573–585. doi: 10.1177/147470491000800404
- Burke, D., Taubert, J., and Higman, T. (2007). Are face representations viewpoint dependent? A stereo advantage for generalising across different views of faces. *Vis. Res.* 47, 2164–2169. doi: 10.1016/j.visres.2007.04.018
- Burt, D. M., and Perrett, D. I. (1997). Perceptual asymmetries in judgements of facial attractiveness, age, gender, speech and expression. *Neuropsychologia* 35, 685–693. doi: 10.1016/S0028-3932(96)00111-X
- Butler, S., Gilchrist, I. D., Burt, D. M., Perrett, D. I., Jones, E., and Harvey, M. (2005). Are the perceptual biases found in chimeric face processing reflected in eye-movement patterns? *Neuropsychologia* 43, 52–59. doi: 10.1016/j.neuropsychologia.2004.06.005
- Cacioppo, J. T., and Petty, R. E. (1981). Lateral asymmetry in the expression of cognition and emotion. *J. Exp. Psychol. Hum. Percept. Perform.* 7, 333–341. doi: 10.1037/0096-1523.7.2.333
- Campbell, D. T. (1975). On the conflicts between biological and social evolution and between psychology and moral tradition. *Am. Psychol.* 30, 1103–1126. doi: 10.1037/0003-066X.30.12.1103
- Carbon, C. C. (2017). Universal principles of depicting oneself across the centuries: from Renaissance self-portraits to selfie-photographs. *Front. Psychol.* 8:245. doi: 10.3389/fpsyg.2017.00245
- Carbon, C. C., and Hesslinger, V. M. (2013). Da Vinci's Mona Lisa entering the next dimension. *Perception* 42, 887–893. doi: 10.1068/p7524
- Carbon, C. C., and Leder, H. (2006). When faces are heads: view-dependent recognition of faces altered relationally or componentially. *Swiss J. Psychol.* 65, 245–252. doi: 10.1024/1421-0185.65.4.245
- Carbon, C. C., Grüter, T., Grüter, M., Weber, J. E., and Lueschow, A. (2010). Dissociation of facial attractiveness and distinctiveness processing in congenital prosopagnosia. *Vis. Cogn.* 18, 641–654. doi: 10.1080/13506280903462471
- Carbon, C. C., Gruter, T., Weber, J. E., and Lueschow, A. (2007). Faces as objects of non-expertise: processing of thatcherised faces in congenital prosopagnosia. *Perception* 36, 1635–1645. doi: 10.1068/p7547

- Chiao, J. Y., Adams, R. B., Tse, P. U., Lowenthal, W. T., Richeson, J. A., and Ambady, N. (2008). Knowing who's boss: fMRI and ERP investigations of social dominance perception. *Group Process. Intergroup Relat.* 11, 201–214. doi: 10.1177/1368430207088038
- Churches, O., Callahan, R., Michalski, D., Brewer, N., Turner, E., Keage, H. A. D., et al. (2012). How academics face the world: a study of 5829 homepage pictures. *PLoS ONE* 7:e38940. doi: 10.1371/journal.pone.0038940
- Coetsee, V., Chen, J. Y., Perrett, D. I., and Stephen, I. D. (2010). Deciphering faces: quantifiable visual cues to weight. *Perception* 39, 51–61. doi: 10.1068/p6560
- Coetsee, V., Perrett, D. I., and Stephen, I. D. (2009). Facial adiposity: a cue to health? *Perception* 38, 1700–1711. doi: 10.1068/p6423
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*, 2nd Edn. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Costa, P. T., and McCrae, R. R. (1992). *NEO Personality Inventory Professional Manual*. Odessa, FL: Psychological Assessment Resources.
- Cunningham, M. R., Barbee, A. P., and Pike, C. L. (1990). What do women want: facialmetric assessment of multiple motives in the perception of male facial physical attractiveness. *J. Pers. Soc. Psychol.* 59, 61–72. doi: 10.1037/0022-3514.59.1.61
- Dion, K., Berscheid, E., and Walster, E. (1972). What is beautiful is good. *J. Pers. Soc. Psychol.* 24, 285–290. doi: 10.1037/h0033731
- Dopson, W. G., Beckwith, B. E., Tucker, D. M., and Bullard-Bates, P. C. (1984). Asymmetry of facial expression in spontaneous emotion. *Cortex* 20, 243–251. doi: 10.1016/S0010-9452(84)80041-6
- Dunstan, C. J., and Lindell, A. K. (2012). Hemifacial preferences for the perception of emotion and attractiveness differ with the gender of the one beheld. *Cogn. Emot.* 26, 907–915. doi: 10.1080/02699931.2011.621931
- Eagly, A. H., Makhijani, M. G., Ashmore, R. D., and Longo, L. C. (1991). What is beautiful is good, but: a meta-analytic review of research on the physical attractiveness stereotype. *Psychol. Bull.* 110, 109–128. doi: 10.1037/0033-2909.110.1.109
- Ekman, P., Hager, J. C., and Friesen, W. V. (1981). The symmetry of emotional and deliberate facial actions. *Psychophysiology* 18, 101–106. doi: 10.1111/j.1469-8986.1981.tb02919.x
- Ewing, L., Rhodes, G., and Pellicano, E. (2010). Have you got the look? Gaze direction affects judgements of facial attractiveness. *Vis. Cogn.* 18, 321–330. doi: 10.1080/13506280902965599
- Favelle, S. K., Palmisano, S., and Avery, G. (2011). Face viewpoint effects about three axes: the role of configural and featural processing. *Perception* 40, 761–784. doi: 10.1068/p6878
- Fink, B., Neave, N., Manning, J. T., and Grammer, K. (2006). Facial symmetry and judgements of attractiveness, health and personality. *Pers. Individ. Dif.* 41, 491–499. doi: 10.1016/j.Paid.2006.01.017
- Folstad, I., and Karter, A. J. (1992). Parasites, bright males, and the immunocompetence handicap. *Am. Nat.* 139, 603–622. doi: 10.1086/285346
- Frederick, D. A., and Haselton, M. G. (2007). Why is muscularity sexy? Tests of the fitness indicator hypothesis. *Pers. Soc. Psychol. Bull.* 33, 1167–1183. doi: 10.1177/0146167207303022
- Furnham, A., and Cheng, H. (2015). Early indicators of adult trait Agreeableness. *Pers. Individ. Dif.* 73, 67–71. doi: 10.1016/j.paid.2014.09.025
- Furnham, A., Swami, V., and Shah, K. (2006). Body weight, waist-to-hip ratio and breast size correlates of ratings of attractiveness and health. *Pers. Individ. Dif.* 41, 443–454. doi: 10.1016/j.paid.2006.02.007
- Girden, E. R. (1992). *ANOVA: Repeated Measures*. New York, NY: SAGE Publications.
- Goffaux, V., Rossion, B., Sorger, B., Schiltz, C., and Goebel, R. (2009). Face inversion disrupts the perception of vertical relations between features in the right human occipito-temporal cortex. *J. Neuropsychol.* 3, 45–67. doi: 10.1348/174866408x292670
- Grammer, K., and Thornhill, R. (1994). Human (Homo-Sapiens) facial attractiveness and sexual selection: the role of symmetry and averageness. *J. Comp. Psychol.* 108, 233–242. doi: 10.1037/0735-7036.108.3.233
- Green, C. D. (1995). All that glitters: a review of psychological research on the aesthetics of the golden section. *Perception* 24, 937–968. doi: 10.1068/p240937
- Guntuku, S. C., Qiu, L., Roy, S., Lin, W., and Jakhetiya, V. (2015). “Do others perceive you as you want them to?: Modeling personality based on selfies,” in *Paper Presented at the Proceedings of the 1st International Workshop on Affect; Sentiment in Multimedia* (Brisbane, QLD).
- Hahn, J., and Blass, T. (1997). Dating partner preferences: a function of similarity of love styles. *J. Soc. Behav. Pers.* 12, 595–610.
- Höge, H. (1997). The golden section hypothesis its last funeral. *Empir. Stud. Arts* 15, 233–255. doi: 10.2190/2pnh-8tt0-emc5-ftw5
- Hogg, M. A., and Vaughan, G. M. (2013). *Social Psychology*, 7 Edn. Essex: Pearson Education Limited.
- Hole, G., and George, P. (2011). Evidence for holistic processing of facial age. *Vis. Cogn.* 19, 585–615. doi: 10.1080/13506285.2011.562076
- Huynh, H., and Feldt, L. S. (1976). Estimation of the Box correction for degrees of freedom from sample data in randomized block and split-plot designs. *J. Educ. Behav. Stat.* 1, 69–82. doi: 10.3102/10769986001001069
- Indersmitten, T., and Gur, R. C. (2003). Emotion processing in chimeric faces: hemispheric asymmetries in expression and recognition of emotions. *J. Neurosci.* 23, 3820–3825.
- Jones, A. L., Kramer, R. S. S., and Ward, R. (2012). Signals of personality and health: the contributions of facial shape, skin texture, and viewing angle. *J. Exp. Psychol. Hum. Percept. Perform.* 38, 1353–1361. doi: 10.1037/A0027078
- Jones, B. C., Little, A. C., Penton-Voak, I. S., Tiddeman, B. P., Burt, D. M., and Perrett, D. I. (2001). Facial symmetry and judgements of apparent health support for a good genes explanation of the attractiveness-symmetry relationship. *Evol. Hum. Behav.* 22, 417–429. doi: 10.1016/S1090-5138(01)00083-6
- Jones, D. (1995). Sexual selection, physical attractiveness, and facial neoteny—cross-cultural evidence and implications. *Curr. Anthropol.* 36, 723–748. doi: 10.1086/204427
- Kalayeh, M. M., Seifu, M., LaLanne, W., and Shah, M. (2015). “How to take a good selfie?,” in *Paper Presented at the Proceedings of the 23rd ACM International Conference on Multimedia* (Brisbane, QLD).
- Kampe, K. K. W., Frith, C. D., Dolan, R. J., and Frith, U. (2001). Reward value of attractiveness and gaze making eye contact enhances the appeal of a pleasing face, irrespective of gender. *Nature* 413, 589–589. doi: 10.1038/35098149
- Keating, C. F. (1985). Gender and the physiognomy of dominance and attractiveness. *Soc. Psychol. Q.* 48, 61–70. doi: 10.2307/3033782
- King, A., and Leigh, A. (2009). Beautiful politicians. *Kyklos* 62, 579–593. doi: 10.1111/j.1467-6435.2009.00452.x
- Kowner, R. (1995). Laterality in facial expressions and its effect on attributions of emotion and personality: a reconsideration. *Neuropsychologia* 33, 539–559. doi: 10.1016/0028-3932(94)00137-E
- Kramer, R. S. S., and Ward, R. (2011). Different signals of personality and health from the two sides of the face. *Perception* 40, 549–562. doi: 10.1068/p6856
- Leder, H., and Carbon, C. C. (2005). When context hinders! Learn-test compatibility in face recognition. *Q. J. Exp. Psychol. A* 58, 235–250. doi: 10.1080/02724980343000936
- Leder, H., Mitrovic, A., and Goller, J. (2016). How beauty determines gaze! facial attractiveness and gaze duration in images of real world scenes. *Iperception* 7, 1–12. doi: 10.1177/2041669516664355
- Leder, H., Tinio, P. P., Fuchs, I. M., and Bohrn, I. (2010). When attractiveness demands longer looks: the effects of situation and gender. *Q. J. Exp. Psychol.* 63, 1858–1871. doi: 10.1080/17470211003605142
- Leiner, D. (2014). *SoSci Survey*. Available online at: <http://www.sosicisurvey.de/>
- Lindell, A. K. (2013a). Capturing their best side? Did the advent of the camera influence the orientation artists chose to paint and draw in their self-portraits? *Laterality* 18, 319–328. doi: 10.1080/1357650x.2012.673622
- Lindell, A. K. (2013b). The silent social/emotional signals in left and right cheek poses: a literature review. *Laterality* 18, 612–624. doi: 10.1080/1357650x.2012.737330
- Lindell, A. K. (2016). No cheek bias: posing orientation in van Gogh's portraits and self-portraits. *Empir. Stud. Arts*, 1–13. doi: 10.1177/0276237416661988
- Lindell, A. K., and Savill, N. J. (2010). Time to turn the other cheek? The influence of left and right poses on perceptions of academic specialisation. *Laterality* 15, 639–650. doi: 10.1080/13576500903201784
- Lishner, D. A., Batson, C. D., and Huss, E. (2011). Tenderness and sympathy: distinct empathic emotions elicited by different forms of need. *Pers. Soc. Psychol. Bull.* 37, 614–625. doi: 10.1177/0146167211403157
- Low, J. Y., and Lindell, A. K. (2016). Featural information is sufficient to produce a left cheek bias for happiness perception. *Brain Cogn.* 107, 10–15. doi: 10.1016/j.bandc.2016.06.001

- Luo, S. H., and Klothner, E. C. (2005). Assortative mating and marital quality in newlyweds: a couple-centered approach. *J. Pers. Soc. Psychol.* 88, 304–326. doi: 10.1037/0022-3514.88.2.304
- Mamer, B. (2013). *Film Production Technique: Creating the Accomplished Image*. Stamford, CT: Cengage Learning.
- Maner, J. K., Gailliot, M. T., Rouby, D. A., and Miller, S. L. (2007). Can't take my eyes off you: attentional adhesion to mates and rivals. *J. Pers. Soc. Psychol.* 93, 389–401. doi: 10.1037/0022-3514.93.3.389
- Maner, J. K., Kenrick, D. T., Becker, D. V., Delton, A. W., Hofer, B., Wilbur, C. J., et al. (2003). Sexually selective cognition: beauty captures the mind of the beholder. *J. Pers. Soc. Psychol.* 85, 1107–1120. doi: 10.1037/0022-3514.85.6.107
- McArthur, L. Z., and Apatow, K. (1984). Impressions of baby-faced adults. *Soc. Cogn.* 2, 315–342. doi: 10.1521/soco.1984.2.4.315
- McArthur, L. Z., and Berry, D. S. (1987). Cross-cultural agreement in perceptions of babyfaced adults. *J. Cross Cult. Psychol.* 18, 165–192. doi: 10.1177/0022002187018002003
- McManus, I. C., and Humphrey, N. K. (1973). Turning the left cheek. *Nature* 243, 271–272. doi: 10.1038/243271a0
- McManus, I. C., and Thomas, P. (2007). Eye centring in portraits: a theoretical and empirical evaluation. *Perception* 36, 167–182. doi: 10.1068/p5578
- McManus, I. C., and Weatherby, P. (1997). The golden section and the aesthetics of form and composition: a cognitive model. *Empir. Stud. Arts* 15, 209–232. doi: 10.2190/wwcr-vwhv-2y2w-91ee
- Mignault, A., and Chaudhuri, A. (2003). The many faces of a neutral face: head tilt and perception of dominance and emotion. *J. Nonverbal Behav.* 27, 111–132. doi: 10.1023/A:1023914509763
- Mobius, M. M., and Rosenblat, T. S. (2006). Why beauty matters. *Am. Econ. Rev.* 96, 222–235. doi: 10.1257/000282806776157515
- Moreno, C. R., Borod, J. C., Welkowitz, J., and Alpert, M. (1990). Lateralization for the expression and perception of facial emotion as a function of age. *Neuropsychologia* 28, 199–209. doi: 10.1016/0028-3932(90)90101-S
- Naumann, L. P., Vazire, S., Rentfrow, P. J., and Gosling, S. D. (2009). Personality judgments based on physical appearance. *Pers. Soc. Psychol. Bull.* 35, 1661–1671. doi: 10.1177/0146167209346309
- Nedelec, J. L., and Beaver, K. M. (2014). Physical attractiveness as a phenotypic marker of health: an assessment using a nationally representative sample of American adults. *Evol. Hum. Behav.* 35, 456–463. doi: 10.1016/j.evolhumbehav.2014.06.004
- Nestler, S., Egloff, B., Küfner, A. C. P., and Back, M. D. (2012). An integrative lens model approach to bias and accuracy in human inferences: hindsight effects and knowledge updating in personality judgments. *J. Pers. Soc. Psychol.* 103, 689–717. doi: 10.1037/a0029461
- Neuberg, S. L., Kenrick, D. T., and Schaller, M. (2010). “Evolutionary social psychology,” in *Handbook of Social Psychology, Vol. 2, Edn 5*, eds S. T. Fiske, D. T. Gilbert, and G. Lindzey (Hoboken, NJ: John Wiley & Sons), 761–796.
- Newell, F. N., Chiroro, P., and Valentine, T. (1999). Recognizing unfamiliar faces: the effects of distinctiveness and view. *Q. J. Exp. Psychol. A* 52, 509–534. doi: 10.1080/027249899391179
- Nicholls, M. E. R., Clode, D., Wood, S. J., and Wood, A. G. (1999). Laterality of expression in portraiture: putting your best cheek forward. *Proc. R. Soc. B Biol. Sci.* 266, 1517–1522. doi: 10.1098/rspb.1999.0809
- Nicholls, M. E. R., Wolfgang, B. J., Clode, D., and Lindell, A. K. (2002). The effect of left and right poses on the expression of facial emotion. *Neuropsychologia* 40, 1662–1665. doi: 10.1016/S0028-3932(02)00024-6
- Oberfeld, D., and Franke, T. (2013). Evaluating the robustness of repeated measures analyses: the case of small sample sizes and nonnormal data. *Behav. Res. Methods* 45, 792–812. doi: 10.3758/s13428-012-0281-2
- Okubo, M., Ishikawa, K., and Kobayashi, A. (2013). No trust on the left side: hemifacial asymmetries for trustworthiness and emotional expressions. *Brain Cogn.* 82, 181–186. doi: 10.1016/j.bandc.2013.04.004
- Otta, E., Lira, B. B., Delevati, N. M., Cesar, O. P., and Pires, C. S. G. (1994). The effect of smiling and of head tilting on person perception. *J. Psychol.* 128, 323–331. doi: 10.1080/00223980.1994.9712736
- Penton-Voak, I. S., Jones, B. C., Little, A. C., Baker, S., Tiddeman, B., Burt, D. M., et al. (2001). Symmetry, sexual dimorphism in facial proportions and male facial attractiveness. *Proc. R. Soc. Lond. B Biol. Sci.* 268, 1617–1623. doi: 10.1098/rspb.2001.1703
- Perrett, D. I., Lee, K. J., Penton-Voak, I., Rowland, D., Yoshikawa, S., Burt, D. M., et al. (1998). Effects of sexual dimorphism on facial attractiveness. *Nature* 394, 884–887. doi: 10.1038/29772
- Perry, S. L. (2015). A match made in heaven? Religion-based marriage decisions, marital quality, and the moderating effects of spouse's religious commitment. *Soc. Indic. Res.* 123, 203–225. doi: 10.1007/s11205-014-0730-7
- Qiu, L., Lu, J. H., Yang, S. S., Qu, W. N., and Zhu, T. S. (2015). What does your selfie say about you? *Comput. Hum. Behav.* 52, 443–449. doi: 10.1016/j.chb.2015.06.032
- Re, D. E., and Rule, N. O. (2016). Heavy matters: the relationship between just noticeable differences in perceptions of facial adiposity and facial attractiveness. *Soc. Psychol. Pers. Sci.* 7, 69–76. doi: 10.1177/1948550615599829
- Re, D. E., Dzhelyova, M., Holzleitner, I. J., Tigue, C. C., Feinberg, D. R., and Perrett, D. I. (2012). Apparent height and body mass index influence perceived leadership ability in three-dimensional faces. *Perception* 41, 1477–1485. doi: 10.1068/P7342
- Re, D. E., Hunter, D. W., Coetzee, V., Tiddeman, B. P., Xiao, D., DeBruine, L. M., et al. (2013). Looking like a leader-facial shape predicts perceived height and leadership ability. *PLoS ONE* 8:e80957. doi: 10.1371/journal.pone.0080957
- Reis, V. A., and Zaidel, D. W. (2001). Functional asymmetry in the human face: perception of health in the left and right sides of the face. *Laterality* 6, 225–231. doi: 10.1080/713754415
- Rhodes, G., Zebrowitz, L. A., Clark, A., Kalick, S. M., Hightower, A., and McKay, R. (2001). Do facial averageness and symmetry signal health? *Evol. Hum. Behav.* 22, 31–46. doi: 10.1016/S1090-5138(00)00060-X
- Richler, J. J., Mack, M. L., Palmeri, T. J., and Gauthier, I. (2011). Inverted faces are (eventually) processed holistically. *Vis. Res.* 51, 333–342. doi: 10.1016/j.visres.2010.11.014
- Rule, N. O., Adams, R. B., Ambady, N., and Freeman, J. B. (2012). Perceptions of dominance following glimpses of faces and bodies. *Perception* 41, 687–706. doi: 10.1068/p7023
- Sackeim, H. A., Gur, R. C., and Saucy, M. C. (1978). Emotions are expressed more intensely on the left side of the face. *Science* 202, 434–436. doi: 10.1126/science.705335
- Schneider, T. M., Hecht, H., and Carbon, C. C. (2012). Judging body weight from faces: the height-weight illusion. *Perception* 41, 121–124. doi: 10.1068/p7140
- Schneider, T. M., Hecht, H., Stevanov, J., and Carbon, C. C. (2013). Cross-ethnic assessment of body weight and height on the basis of faces. *Pers. Individ. Dif.* 55, 356–360. doi: 10.1016/j.paid.2013.03.022
- Shackelford, T. K., and Larsen, R. J. (1997). Facial asymmetry as an indicator of psychological, emotional, and physiological distress. *J. Pers. Soc. Psychol.* 72, 456–466.
- Sitton, S. C., Waite, L., and Rivers, S. C. (2006). Perception of traits from normal, mirror and chimeric images of faces. *Am. J. Psychol. Res.* 2, 14–20.
- Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Pisanski, K., Chmiel, A., and Sorokowska, P. (2016). Selfies and personality: who posts self-portrait photographs? *Pers. Individ. Dif.* 90, 119–123. doi: 10.1016/j.paid.2015.10.037
- Stephan, B. C. M., and Caine, D. (2007). What is in a view? The role of featural information in the recognition of unfamiliar faces across viewpoint transformation. *Perception* 36, 189–198. doi: 10.1068/p5627
- Stevens, J. R., Cushman, F. A., and Hauser, M. D. (2005). Evolving the psychological mechanisms for cooperation. *Annu. Rev. Ecol. Syst.* 36, 499–518. doi: 10.1146/annurev.ecolsys.36.113004.083814
- Stewart, J. E. (1980). Defendant's attractiveness as a factor in the outcome of criminal trials: an observational study. *J. Appl. Soc. Psychol.* 10, 348–361. doi: 10.1111/j.1559-1816.1980.tb00715.x
- Swaddle, J. P., and Reiersen, G. W. (2002). Testosterone increases perceived dominance but not attractiveness in human males. *Proc. Biol. Sci.* 269, 2285–2289. doi: 10.1098/rspb.2002.2165
- Swami, V., and Tovee, M. J. (2005). Male physical attractiveness in Britain and Malaysia: a cross-cultural study. *Body Image* 2, 383–393. doi: 10.1016/j.bodyim.2005.08.001
- Swami, V., and Tovee, M. J. (2008). Female physical attractiveness in Britain and Malaysia: a cross-cultural study. *Body Image* 2, 115–128. doi: 10.1016/j.bodyim.2005.02.002
- Swami, V., Caprario, C., Tovee, M. J., and Furnham, A. (2006). Female physical attractiveness in Britain and Japan: a cross-cultural study. *Eur. J. Pers.* 20, 69–81. doi: 10.1002/Per.568

- Swami, V., Frederick, D. A., Aavik, T., Alcalay, L., Allik, J., Anderson, D., et al. (2010). The attractive female body weight and female body dissatisfaction in 26 countries across 10 world regions: results of the International body project I. *Pers. Soc. Psychol. Bull.* 36, 309–325. doi: 10.1177/0146167209359702
- Tanaka, J. W., and Farah, M. J. (1993). Parts and wholes in face recognition. *Q. J. Exp. Psychol.* A 46, 225–245.
- Tejreiro-Mosquera, L., Biel, J. I., Alba-Castro, J. L., and Gatica-Perez, D. (2015). What your face vlogs about: expressions of emotion and Big-Five traits impressions in YouTube. *IEEE Trans. Affect. Comput.* 6, 193–205. doi: 10.1109/Taffc.2014.2370044
- ten Cate, C. (2002). Posing as professor: laterality in posing orientation for portraits of scientists. *J. Nonverbal Behav.* 26, 175–192. doi: 10.1023/A:1020713416442
- Thompson, E. R. (2008). Development and validation of an international English Big-Five mini-markers. *Pers. Individ. Dif.* 45, 542–548. doi: 10.1016/j.paid.2008.06.013
- Thornhill, R., and Gangestad, S. W. (1993). Human facial beauty - averageness, symmetry, and parasite resistance. *Hum. Nat.* 4, 237–269. doi: 10.1007/Bf02692201
- Thornhill, R., and Grammer, K. (1999). The body and face of woman: one ornament that signals quality? *Evol. Hum. Behav.* 20, 105–120. doi: 10.1016/S1090-5138(98)00044-0
- Tinlin, R. M., Watkins, C. D., Welling, L. L., DeBruine, L. M., Al-Dujaili, E. A., and Jones, B. C. (2013). Perceived facial adiposity conveys information about women's health. *Br. J. Psychol.* 104, 235–248. doi: 10.1111/j.2044-8295.2012.02117.x
- Toledano, E. (2012). The looking-glass ceiling: appearance-based discrimination in the workplace. *Cardozo J. Law Gend.* 19, 683–714.
- Tovee, M. J., Maisey, D. S., Emery, J. L., and Cornelissen, P. L. (1999). Visual cues to female physical attractiveness. *Proc. R. Soc. Lond. B Biol. Sci.* 266, 211–218. doi: 10.1098/rspb.1999.0624
- Tovee, M. J., Reinhardt, S., Emery, J. L., and Cornelissen, P. L. (1998). Optimum body-mass index and maximum sexual attractiveness. *Lancet* 352, 548–548. doi: 10.1016/S0140-6736(05)79257-6
- Tovee, M. J., Swami, V., Furnham, A., and Mangalparsad, R. (2006). Changing perceptions of attractiveness as observers are exposed to a different culture. *Evol. Hum. Behav.* 27, 443–456. doi: 10.1016/j.evolhumbehav.2006.05.004
- Turner, D. D. (2005). Altruism – is it still an anomaly? *Trends Cogn. Sci.* 9, 317–318. doi: 10.1016/j.tics.2005.05.007
- Tyler, C. W. (1998a). Eye placement principles in portraits and figure studies over the past two millennia. *Hum. Vis. Electron. Imaging III* 3299, 431–438. doi: 10.1117/12.320133
- Tyler, C. W. (1998b). Painters centre one eye in portraits. *Nature* 392, 877–878. doi: 10.1038/31833
- Valentin, D., Abdi, H., and Edelman, B. (1999). From rotation to disfiguration: testing a dual-strategy model for recognition of faces across view angles. *Perception* 28, 817–824. doi: 10.1068/p2932
- Valentin, D., Abdi, H., Edelman, B., and Posamentier, M. (2001). “2D or not 2D? That is the question: what can we learn from computational models operating on two-dimensional representations of faces?,” in *Computational, Geometric, and Process Perspectives on Facial Cognition: Contexts and Challenges*, Scientific Psychology Series, ed M. J. Wenger (Mahwah, NJ: Erlbaum), 429–465.
- Valentine, T. (1991). A unified account of the effects of distinctiveness, inversion, and race in face recognition. *Q. J. Exp. Psychol.* A 43, 161–204. doi: 10.1080/14640749108400966
- van Straaten, I., Holland, R. W., Finkenauer, C., Hollenstein, T., and Engels, R. C. (2010). Gazing behavior during mixed-sex interactions: sex and attractiveness effects. *Arch. Sex. Behav.* 39, 1055–1062. doi: 10.1007/s10508-009-9482-x
- Watson, D., Klohnen, E. C., Casillas, A., Simms, E. N., Haig, J., and Berry, D. S. (2004). Match makers and deal breakers: analyses of assortative mating in newlywed couples. *J. Pers.* 72, 1029–1068. doi: 10.1111/j.0022-3506.2004.00289.x
- Westphalen, C. (2016). *Die Große Fotoschule: Das Handbuch zur Digitalen Fotografie [The great photo bible: Handbook of digital photography]*, 3rd Edn. Bonn: Rheinwerk-Verlag.
- Wickham, L. H. V., and Morris, P. E. (2003). Attractiveness, distinctiveness, and recognition of faces: attractive faces can be typical or distinctive but are not better recognized. *Am. J. Psychol.* 116, 455–468. doi: 10.2307/1423503
- Wilson, E. O. (2000). *Sociobiology: The New Synthesis*. Cambridge, MA: Harvard University Press.
- Yeh, M.-C., and Lin, H.-W. (2014). “Virtual Portraitist: aesthetic evaluation of selfies based on angle,” in *Paper Presented at the Proceedings of the 22nd ACM International Conference on Multimedia*, (Orlando, FL).
- Zaidel, D. W., and Cohen, J. A. (2005). The face, beauty, and symmetry: perceiving asymmetry in beautiful faces. *Int. J. Neurosci.* 115, 1165–1173. doi: 10.1080/00207450590914464
- Zaidel, D. W., Chen, A. C., and German, C. (1995). She is not a beauty even when she smiles: possible evolutionary basis for a relationship between facial attractiveness and hemispheric specialization. *Neuropsychologia* 33, 649–655. doi: 10.1016/0028-3932(94)00135-C

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# Selfie-Takers Prefer Left Cheeks: Converging Evidence from the (Extended) *selfiecity* Database

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According to previous reports, selfie takers in widely different cultural contexts prefer poses showing the left cheek more than the right cheek. This posing bias may be interpreted as evidence for a right-hemispheric specialization for the expression of facial emotions. However, earlier studies analyzed selfie poses as categorized by human raters, which raises methodological issues in relation to the distinction between frontal and three-quarter poses. Here, we provide converging evidence by analyzing the (extended) *selfiecity* database which includes automatic assessments of head rotation and of emotional expression. We confirm a culture- and sex-independent left-cheek bias and report stronger expression of negative emotions in selfies showing the left cheek. These results are generally consistent with a psychobiological account of a left cheek bias in self-portraits but reveal possible unexpected facts concerning the relation between side bias and lateralization of emotional expression.

**Keywords:** *selfiecity*, selfies, self-portraits, left side bias, lateralization

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## INTRODUCTION

Self-portraiture is a well-established genre in the visual arts and it invites scientific scrutiny in many ways. Here, we make a contribution to the study of factors affecting how portraitist arrange their subject in their created image, that is, the problem of composition. Our contribution is different from previous studies of composition for at least two reasons. First, and in contrast with more traditional approaches (see Arnheim, 1954, 1982), we focus on a very specific compositional feature, the choice to display more of the left or right cheek of the subject. Second, and in contrast with traditional studies of portraits and self-portraits (Crozier and Greenhalgh, 1988; Woodall, 1997; Ferrari, 2002; Brilliant, 2004; Calabrese, 2010; Hall, 2014), we study compositional choices using a database of selfies rather than corpora of paintings. Our unusual interests originate from an intriguing bias that has been found to affect posing choices in painted self-portraits as well as in selfies. This bias has potential implications for our understanding of the lateralization of functions in the human brain. Before describing what these implications may be (fourth paragraph of this introduction), we will briefly summarize relevant findings in portraiture and self-portraiture.

Based on studies of art books and catalogs, there is evidence suggesting that artists prefer poses showing left cheeks when composing a portrait, but showing right cheeks when composing their own self-portraits (LaBar, 1973; McManus and Humphrey, 1973; Latta, 1996; Nicholls et al., 1999; Suitner and Maas, 2007; Powell and Schirillo, 2009; Tosun and Vaid, 2014). It has been suggested that both biases may in fact originate from a preference for showing one's left cheek, as self-portraits are most typically painted while watching oneself in a mirror. The mirror reversal therefore causes the artist to paint

an image presenting the right side of the face, but this is in fact the anatomical left side. Supporting this speculation, there is evidence that a right bias in self-portraiture emerged when cheap large mirrors became available (Bruno and Bertamini, 2013) and disappeared when photography became widely available (Lindell, 2012; Bruno and Bertamini, 2013). In addition, evidence supporting a common account for the two biases has recently accrued from studies of selfies. ‘Selfie’ is a generic term referring to photographic self-portraits taken by non-professionals for the purpose of posting on web-based social media. Such casual photographic self-portraits have enjoyed tremendous popularity in the recent years. In addition, because they are taken by everyone and not just by professional artists, selfies are potentially a very rich source of data about compositional choices by individuals with no specific academic training. If such choices are governed by spontaneous preferences rather than academic training or studio conventions, one would expect to see similar biases in selfies and in self-portraits by trained painters. Recent studies have largely confirmed this prediction (Bruno and Bertamini, 2013; Bruno et al., 2014, 2015; Lindell, 2015).

Among these studies, key evidence has been provided by an analysis of the (original) *selfiecity* database containing 3200 selfies posted in *Instagram* from five major world cities (see Tifentale and Manovich, 2014<sup>1</sup>). This database contains two types of selfies: *standard* selfies, which are taken holding a smartphone at arm’s length, and *mirror* selfies, which are taken by photographing a mirror image of oneself, and one’s smartphone, while standing in front of an actual mirror. Interestingly, the analysis revealed a left cheek bias in standard selfies, but a right cheek bias in mirror selfies, independently of city-of-origin or taker sex (Bruno et al., 2015). Given that right cheeks in the photographed mirror images corresponded to the taker’s actual left cheek, this ubiquitous interaction effect is exactly what one would expect if there were a spontaneous, natural preference for displaying the left cheek over the right.

Although quite striking, the results reported by Bruno and collaborators on the *selfiecity* database raise issues. For instance, one obvious question regards the assessments of head rotation. To facilitate comparisons to previous studies, Bruno and collaborators categorized selfies by asking raters to assign each selfie to one of five categories: unambiguously showing more of the left cheek, unambiguously showing more of the right cheek, slightly rotated to the left, slightly rotated to the right, and frontal. The unambiguous categories were determined by looking at the image. If simple observations left some room for doubt, a ruler was used to measure distances from the center of the nose to the visible limit of the cheek and the selfie was categorized as slightly left or right based on which distance was larger. If the difference was smaller than 1 mm, the selfie was categorized as frontal. This method may be criticized in that it leaves some ambiguity on the definition of what is an unambiguous rotation, and in that it collapses moderate with very strong rotations into a single category. A second

important question concerns generality: does the bias hold for selfies from other cities (and, therefore, presumably other cultural environments) besides the analyzed five cities (New York City, São Paulo, Berlin, Moscow, and Bangkok). Finally, a third and most important question is what may be the cause of the bias. It has been suggested (Nicholls, 2000; Powell and Schirillo, 2011; Lindell, 2013) that a common cause might be identified in the right-hemispheric specialization for the expression of emotions, which tends to make most of us more expressive on the left side (the right-hemisphere hypothesis; Sackeim et al., 1978; but see also Torro Alves et al., 2008; Prete et al., 2015). If correct, the right hemisphere hypothesis would imply that side biases in self-portraiture have intriguing implications for our understanding of the lateralization of brain functions. It cannot be ruled out, however, that side biases might arise from cultural factors, such as those relating the right and left cheeks to distance in status or gender (Humphrey and McManus, 1973; McManus and Humphrey, 1973; Schirillo, 2000; ten Cate, 2002).

In the current paper we exploited the (extended) *selfiecity* database, now including a sixth city (London, for details see <http://selfiecity.net/london/>) to address these issues. In particular, we aim at doing two things. First, we want to validate previous conclusions about the existence of a left-side bias in the *selfiecity* database by re-analyzing posing behavior from automatic assessments of head rotation in an extended database now including six rather than five cities. Second, we want to exploit automatic assessments of emotional expression to derive estimates of overall intensity for positive and negative emotions, and to test whether these differ systematically between selfies showing more of the left or the right cheek. This is, to the best of our knowledge, the first attempt to directly relate posing biases in selfies to lateralized emotional expression.

## MATERIALS AND METHODS

### The (Extended) *selfiecity* Database

To study posing preferences in self-portraits by non-artists, we used the collection of selfies in the (extended) *selfiecity* database. This database consists of 3840 photographic self-portraits spontaneously uploaded on the online photo-sharing social network *Instagram* in six world cities, from December 4 to 12, 2013 (São Paulo, New York City, Berlin, Moscow, or Bangkok) or September 21 to 27, 2015 (London). In addition to the actual images, the database includes a wealth of information about potentially interesting image features, determined by automatic face recognition algorithms (Rekognition by Orbeus, Inc.) and by ratings provided by human observers (Amazon’s Mechanical Turk service). Among these, of interest here are assessments of head rotation around the vertical axis, which measures whether more of the left or right cheek is visible in the self-portrait, estimates of the selfie-taker sex, and estimates of the intensity in expressing a given “mood” (see Emotional Expression Scores), which consists in dimensions that are presumably related to basic emotions.

<sup>1</sup><http://selfiecity.net>

## Data Validation

Due to imperfections of the automatic face recognition algorithms, the *selfiecity* database contains a few images that are not selfies (see also Bruno et al., 2015). For instance, some of the images in the database contain portraits of more than one individual (“wefies,” see Bruno et al., 2014), or portray an individual who is clearly not holding the camera (which may be consistent with a self-portrait but is not technically a selfie), or contain face-like patterns such as a smiley. Individual inspection of the database led us to identify 269 such images (7% of the total) which were excluded from further analysis.

## Identification of Mirror and Standard Selfies

Although the database includes information about several variables of interest, it did not originally distinguish between standard and mirror selfies. This distinction is critical to test side biases as these two types of selfies make opposite predictions regarding which cheek will be preferred more often depending on whether the preference refers to the actual cheek of the taker or to the position relative to the picture. Selfie type was determined by individually inspecting all images. Selfies were classified as belonging to the mirror type if the camera was visible in the image and it was held by the subject, such that the image was clearly that of the selfie taker photographing his or her own image in the mirror. Otherwise, the image was classified as belonging to the standard type unless there was reason to exclude it as a non-selfie (see Data Validation).

## Identification of Unambiguous Three-Quarter Poses

A certain percentage of selfies consist of frontal poses, which provide no information about biases for one side of the face over the other. Although the percentage of frontal poses is typically not big in selfies, we found that it can vary depending on the nature of the database. It is therefore important to identify frontal poses before comparing percentages of left or right sides. In our previous study (Bruno et al., 2015), we distinguished frontal poses from three-quarter poses by asking raters to classify all images into five categories (unambiguously left, slightly left, frontal, slightly right, unambiguously right) according to the criteria specified in Bruno and Bertamini (2013). Conservatively, we performed all analyses only on the unambiguous poses (about 2400 selfies out of 3200). To identify unambiguous three-quarter poses in the extended *selfiecity* database using continuous head rotation data, we perused several dozens of images and estimated that a reasonable threshold for an unambiguous three-quarter pose can be estimated at  $\pm 2.5^\circ$ . Consistent with the estimate, the percentage of selfies from the updated database entered in the analysis using this threshold proved to be equal to 74%, which is close to the percentage of unambiguous poses from the earlier study (about 78%, see Table 1 in Bruno et al., 2015). We also evaluated the possibility that random error or biases in the automatic recognition algorithm results might impact on how we categorized posing choices. Note that random error would not have such impact as it would merely make the estimates more

noisy. Biases would represent a more serious concern but we see no reason that systematic errors, if any, would bias head rotation estimates to the left of right. Moreover, we can exclude that such biases are a serious concern as the automatic estimates turn out to be nicely consistent with our previous estimates based on human ratings (see sections below).

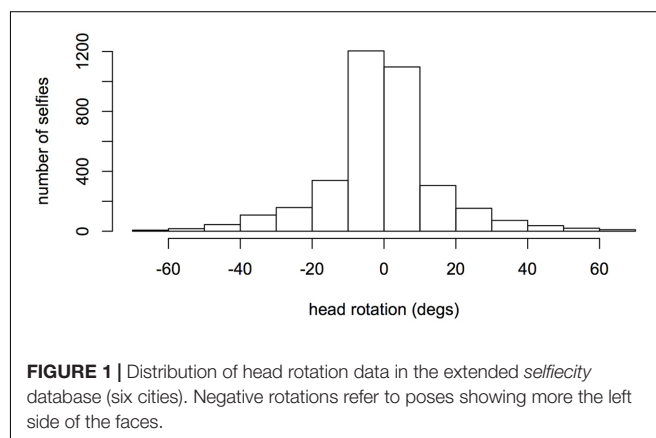
## Emotional Expression Scores

Estimates of the intensity of emotional expression were derived separately for positive and negative emotions according to the following procedure. Based on feature positions estimates from an automatic face recognition software, the *selfiecity* database includes information about “moods,” that is, 0–1 continuous scorings of the intensity of the following face attributes: “surprised,” “happy,” “confused,” “angry,” “sad,” “disgusted,” “calm.” At least one and most often more than one of these scorings are available for each selfie. Given the semantics of these attributes, and after qualitative inspection of corresponding images, we decided to use the score of the “happy” mood as a proxy of the intensity of the expression of a positive emotion, and the average of the “angry,” “sad,” and “disgusted” mood scores as a proxy of the intensity of the expression of a negative emotion. Out of the 3571 selfies that were left in the database after validation, 3202 were assigned a positive emotion score by this procedure and 2707 a negative emotion score. Thus, many selfies, but not all, had some score on both dimensions. These scores were used in further analyses of the association between cheek shown and emotional expression.

## RESULTS AND DISCUSSION

### Distribution of the Head Rotation Data

Figure 1 presents the distribution of the head rotation data, as computed by automatic face recognition software (ReKognition by Orbeus, Inc.). The median rotation was  $-0.45^\circ$  and the first and third quartiles of the distribution were  $-6.645$  and  $5.435$ . The minimum and maximum values of the distribution were  $-69.34$  and  $68.37$ . The mean head rotation was  $-0.64$ , which is statistically different from zero,  $t(3570) = -2.35$ ,  $p < 0.019$ . These statistics indicate a slight asymmetry of the distribution



**FIGURE 1 |** Distribution of head rotation data in the extended *selfiecity* database (six cities). Negative rotations refer to poses showing more the left side of the faces.

due to overrepresentation of negative values, which indeed correspond to head rotations showing more of the left cheek. However, they are of limited interest as the overall distribution conflates standard and mirror selfies. If a bias for showing one's left cheek exists, we would expect to see an excess of left cheeks in standard selfies, but an excess of right (mirror reflected left) cheeks in mirror selfies. To test this prediction, cheek frequencies need to be compared between selfie types, as we do next.

## Overall Bias for the Left Cheek

**Table 1A** presents the frequency of left- and right-cheek poses (threshold rotation for unambiguous three-quarter view =  $2.5^\circ$ ) as a function of selfie type. Given that the right cheek actually corresponds to the reflected left cheek of the taker, the total count of selfies showing the taker's left cheek is given by the sum of the frequencies of left cheeks in standard selfies and right cheeks in mirror selfies. This adds up to 1417 selfies or 53.8% of the database. This overall bias for showing the left cheek is similar in size to what previously reported for comparable databases (Bruno and Bertamini, 2013; Bruno et al., 2015; Lindell, 2015) and is statistically significant,  $\chi^2(1) = 15.2$ ,  $p < 0.0001$ , when tested against the null hypothesis that  $p(\text{right cheek}) = p(\text{left cheek}) = 0.5$ .

## Association between Cheek Shown and Selfie Type

The contingency table in **Table 1A** indeed confirms an excess of right cheeks in mirror selfies, and an excess of left cheeks in standard selfies. A statistical test reveals a small, Cramer's  $\phi = 0.056$ , but statistically significant association,  $\chi^2(1) = 8.45$ ,  $p = 0.0037$ . This is similar to the association ( $\phi = 0.13$ ,  $p < 0.00001$ ) reported by Bruno et al. (2015) who used human raters to detect three-quarter poses and classify cheek preferences in the (original) *selfiecity* database (five cities only).

To make sure that the significant association displayed by **Table 1A** is not just a consequence of choosing a particular threshold value for head rotation, we also studied how association statistics vary with different threshold values, from  $0^\circ$  (equivalent to including all selfies, even if actually consisting of frontal poses) to  $45^\circ$  (including only extreme rotations – almost profile views). **Figure 2** displays the results of this analysis. As one would expect, when the head rotation threshold increases the sample size drops rapidly (top left) as does the value of the chi-square statistic (top right), as less and less images are included in the analysis.

**TABLE 1A |** Frequencies of selfies showing more of the left or right cheek as a function of selfie type.

	Left cheek	Right cheek
Mirror selfies	164	198
Standard selfies	1219	1053

*Classification of cheek shown based on head rotation as estimated by facial recognition software (see text for details). A selfie was classified as displaying a three-quarter view when computed head rotation exceeded  $2.5^\circ$  in one of the two directions.*

However, statistical tests remain significant up to thresholds of about  $12^\circ$ , where the sample size is reduced to only about 1000 images. This pattern suggests that the left cheek bias is robust and does not depend on the choice of a particular value for head rotation as symptomatic of a three-quarter pose.

These results provide two important pieces of information. First, the predicted inversion of the side bias in mirror in comparison to standard selfies is observed even when pose is estimated by automatic recognition software. This suggests that the output of the software provides comparable data to that obtained from human raters (as done in our previous paper, Bruno et al., 2015) and validates the use of the automatic rotation data to predict emotional expression in the selfies, which is the major novel contribution of this paper (see later sections). Second, the predicted inversion remains detectable when the database is expanded to include the sixth city, which adds to the generality of the conclusions.

## Side Bias in Six World Cities

**Figure 3** presents the frequencies of right or left cheek poses in standard and mirror selfies in each of the six cities. The predicted inversion of the cheek bias is remarkably consistent in different cultural contexts. Indeed, in all six cities we observe an overabundance of left cheeks in standard selfies. In mirror selfies, a corresponding overabundance of right cheeks is observed in five cities. The only exception are the Berlin mirror selfies where we observed 25 left cheeks and 17 right cheeks. Binomial tests based the null hypothesis that in each city  $0.4 < p < 0.6$  of randomly observing the expected inversion yields  $p$ -values in the range 0.02–0.004, suggesting that this pattern is highly unlikely to be due to chance.

## Side Bias in Females and Males

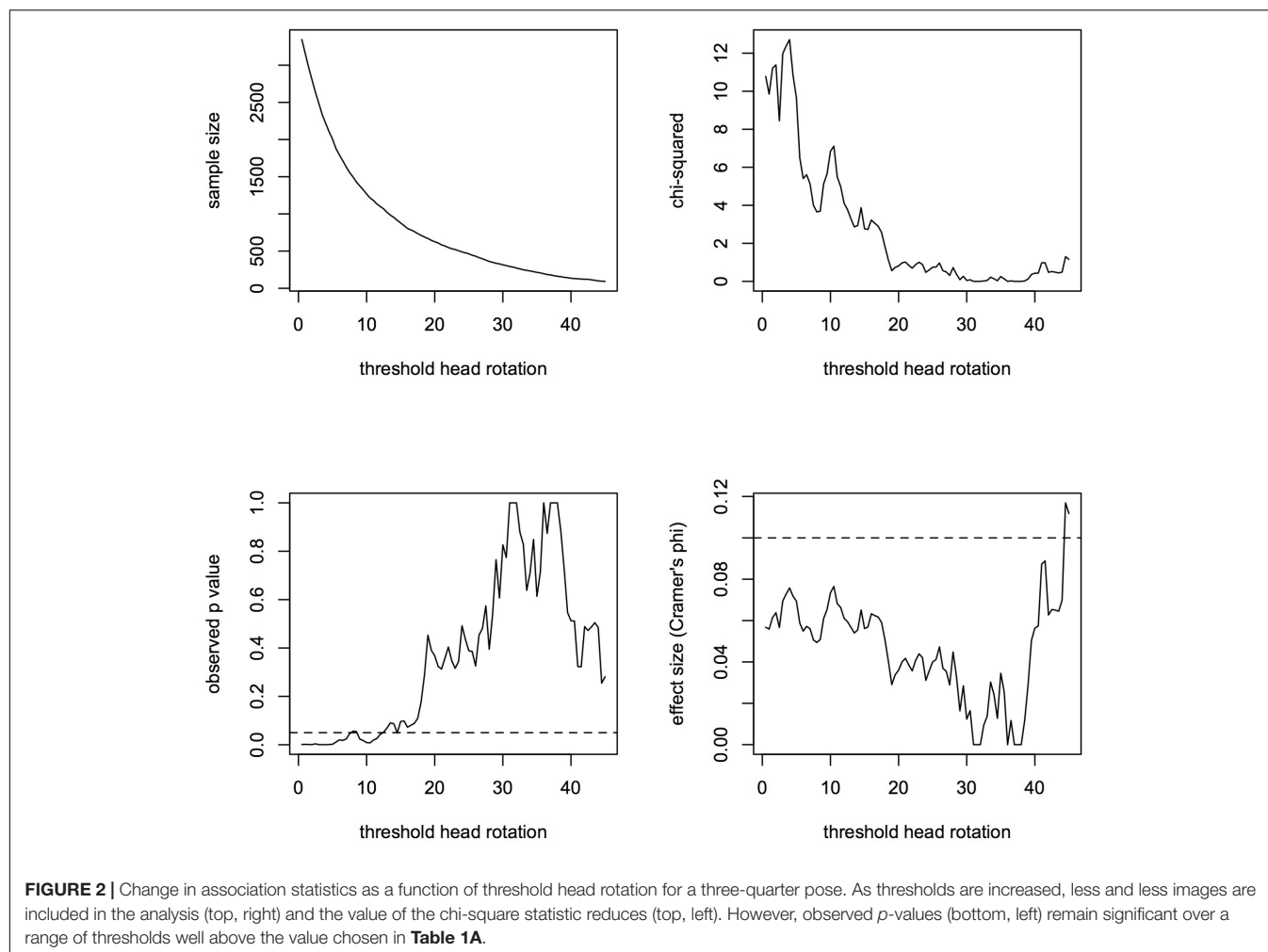
**Figure 4** present the frequencies of right or left cheek poses, in standard and mirror selfies, separately for females and males. The two subsamples are not completely comparable as women are much more likely to appear in the database than males. Nonetheless, the qualitative pattern of the association between selfie type and cheek remains visible in both sex categories. Separate tests yielded a statistically significant association in the female,  $\chi^2(1) = 7.4$ ,  $p < 0.007$ , but not in the male subset,  $\chi^2(1) = 1.1$ ,  $p = 0.3$ . These tests may be taken as indication that the side bias inversion is not present, or is not as general, in male as compared to female selfies. This conclusion, however will need further verification from other databases of images as in previous work (not including mirror selfies, Bruno and Bertamini, 2013) we found similar biases in males and females. We suggest that more data are needed here, especially given that both male and mirror selfies are underrepresented on Instagram relative to females and standard selfies.

## Analysis of Emotional Expression Scores

**Figure 5** presents the average intensities of negative and positive emotion scores in selfies showing a left- or right-cheek bias.

**Figure 6** presents the same data as a function of all the variables considered here, namely, the cheek bias, the selfie-taker gender (male or female), the type of selfie (mirror or standard), and





the city of origin. We performed two separate ANOVAs for the positive and negative emotion data. The dependent variable was the intensity of the expressed emotion, and the independent variables were the cheek shown (left or right), the selfie-taker gender (male or female), the type of selfie (mirror or standard), and the city of origin. These two ANOVAs were performed separately as the positive and negative scores had diametrically opposed distributions (right-tailed for negative, skewness = 2.16; but left-tailed for positive, skewness = -0.33). The results of these two ANOVAs are described in detail in the next sections.

### Effect of Valence

Overall, positive emotions were expressed more strongly than negative emotions. We take this as self evident after visual inspection of **Figure 6**, as every single bar in the bottom row is higher than the corresponding bar in the top row.

### Effect of Cheek Shown

Negative emotions were expressed more strongly in selfies showing the left cheek; positive emotions, conversely, were expressed more strongly in selfies showing the right cheek

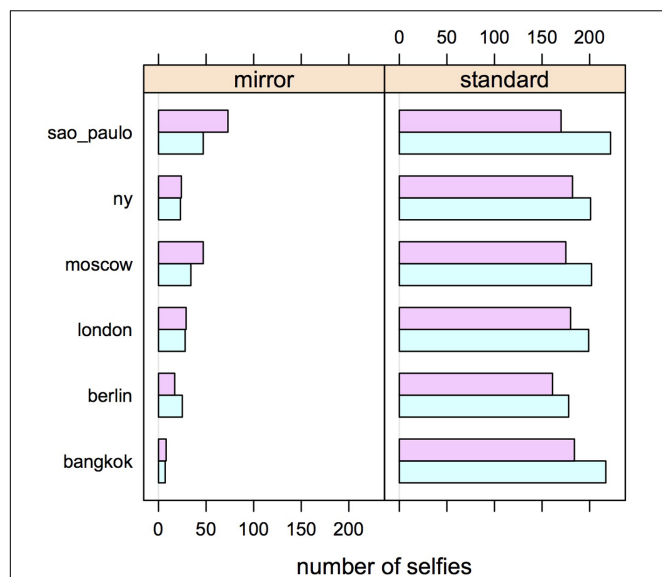
(**Figure 5**, see also **Table 1B**). In the negative emotions scores, the difference was statistically significant,  $F(1,1979) = 5.26$ ,  $p = 0.022$ . In the positive emotions scores, however, the difference failed to reach statistical significance,  $F(1,2325) = 2.85$ ,  $p = 0.092$ .

### Effect of Type of Selfie

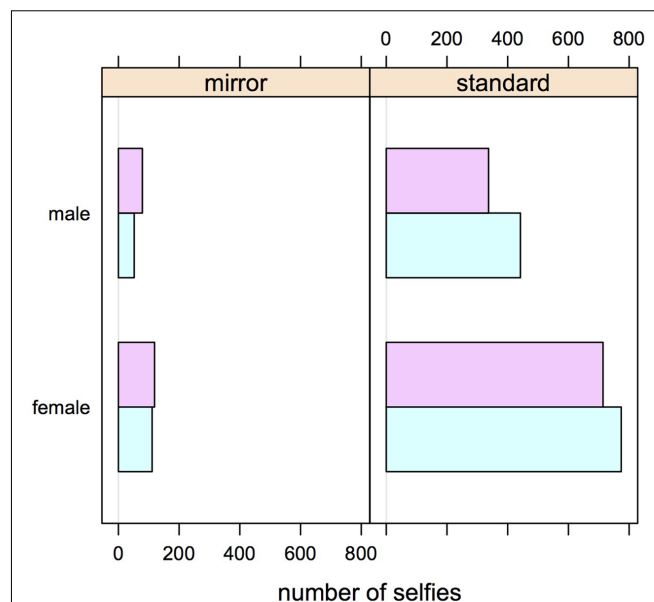
Negative emotions were expressed more strongly in mirror selfies; positive emotions, conversely, were expressed more strongly in standard selfies (see **Table 2**). In the negative emotions scores, the difference was statistically significant,  $F(1,1979) = 109$ ,  $p < 0.0000001$ . In the positive emotions scores, however, the difference failed to reach statistical significance,  $F(1,2325) = 3.8$ ,  $p = 0.051$ .

### Effect of Taker Gender

Both positive and negative emotions were expressed more strongly by females (see **Table 3**). In the positive emotions scores, the difference was statistically significant,  $F(1,2325) = 38.2$ ,  $p < 0.0000001$ . In the negative emotions scores, conversely, the difference failed to reach statistical significance,  $F(1,1979) = 2.24$ ,  $p = 0.135$ .



**FIGURE 3 |** Pose preferences (violet: showing more of the right cheek; pale blue: showing more of the left cheek) in selfies posted on Instagram from six different world cities, as a function of selfie type (mirror or standard).

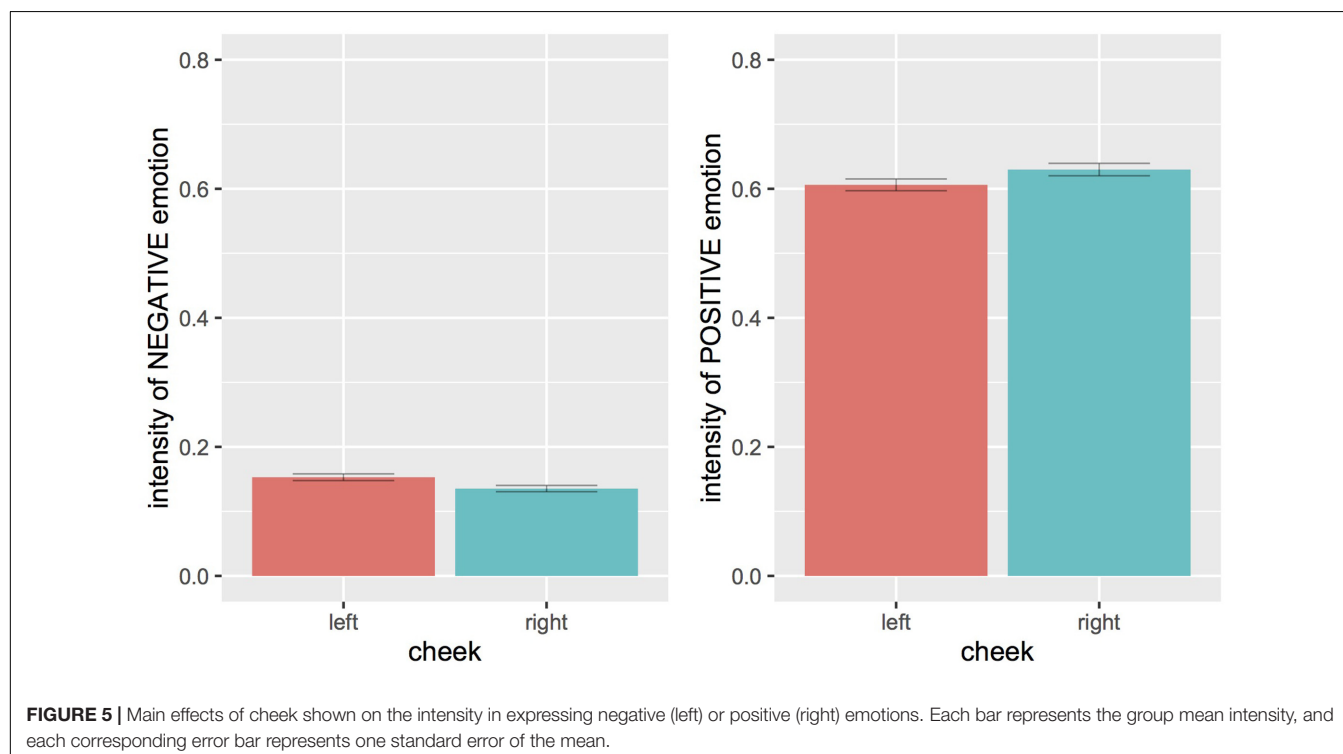


**FIGURE 4 |** Pose preferences (conventions as in Figure 3) in selfies as a function of selfie taker sex.

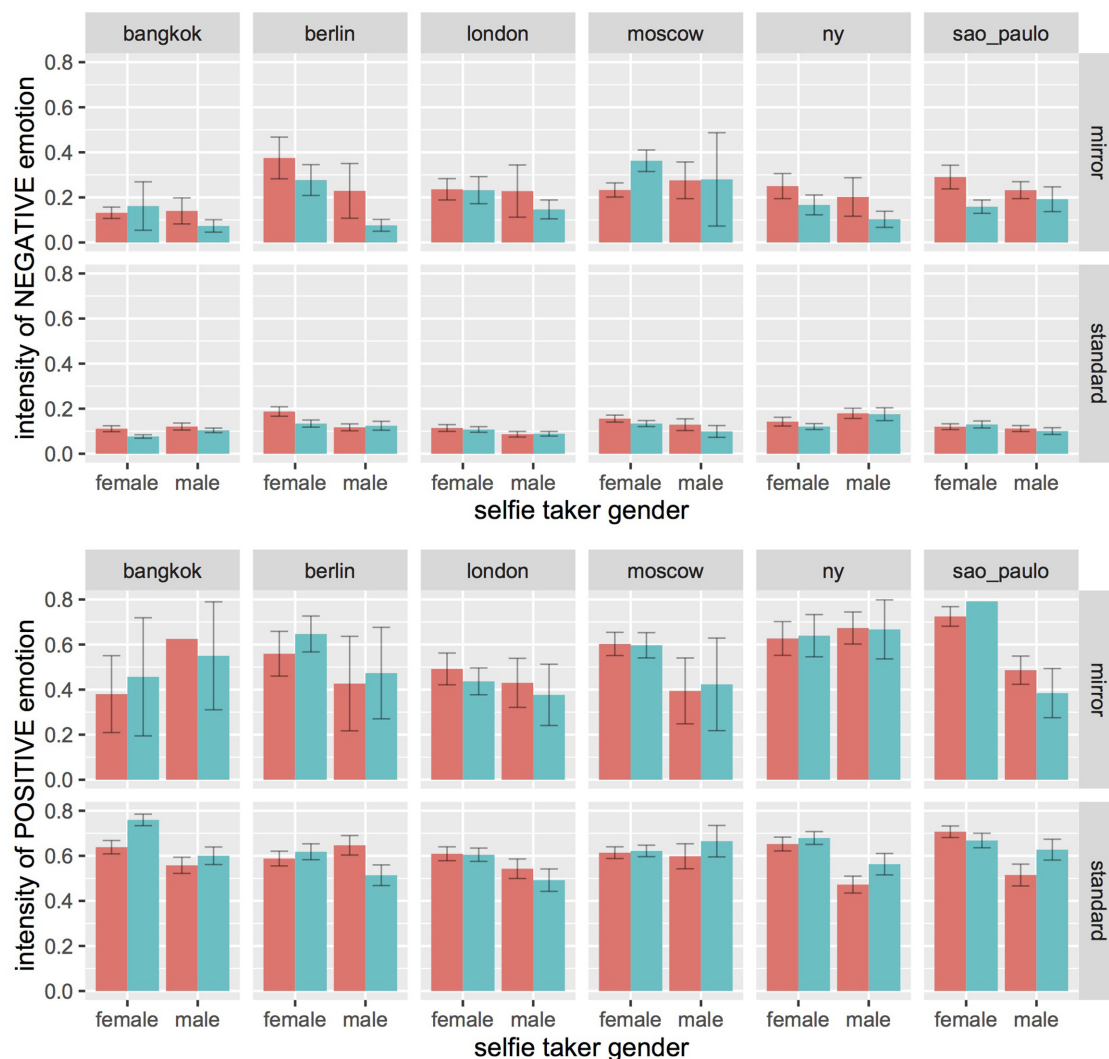
## City of Origin

The intensity of both negative and positive emotions changed as a function of the city of origin for the selfies (see Table 4),  $F(5,1979) = 5.26$ ,  $p < 0.0001$  and  $F(15,2325) = 4.3$ ,  $p = 0.0007$ . In the negative emotion scores, Tukey HSD *post hoc* pairwise comparisons identified significant differences between Bangkok

and Berlin,  $p = 0.002$ , Moscow,  $p = 0.004$ , and New York,  $p = 0.032$ ; as well as between London and Berlin,  $p = 0.024$ , and London and Moscow,  $p = 0.043$ . In the positive emotion scores, they identified significant differences between London and Bangkok,  $p = 0.012$ , and London and São Paulo,  $p = 0.002$ .



**FIGURE 5 |** Main effects of cheek shown on the intensity in expressing negative (left) or positive (right) emotions. Each bar represents the group mean intensity, and each corresponding error bar represents one standard error of the mean.



**FIGURE 6 |** Selfie-taker gender, selfie type, city of origin, and cheek shown (red = left; pale blue = right, as in **Figure 5**) as predictors of the intensity in the expression of negative (top) or positive (bottom) emotions. Each bar represents the group mean intensity, and each corresponding error bar represents one standard error of the mean.

### Two-Way Interactions: Cheek Shown by Selfie Type, Gender, or City

Overall differences in intensity of emotional expression between left and right cheek selfies were similar in standard or mirror selfies, male or female takers, and in each of the different cities (see **Figure 2**). Accordingly, the relevant two-way interactions yielded  $F$  values  $< 1$  in both the positive and the negative emotion scores.

### Three-Way Interactions: Cheek Shown by Gender and City

There was no evidence of a three-way interaction between cheek shown, gender and city of origin. Statistical tests yielded  $F < 1$  and  $F(1,2325) = 1.525$ ,  $p = 0.18$  and in the negative and positive emotion scores, respectively.

### Three-Way Interactions: Cheek Shown by Selfie Type and Gender

There was no evidence of a three-way interaction between cheek shown, selfie type and gender. Statistical tests yielded  $F(1,1979) = 2.8$ ,  $p = 0.095$  and  $F < 1$  in the negative and positive emotion scores, respectively.

### Three-Way Interactions: Cheek Shown by Selfie Type and City

In the negative emotion scores, the analysis provided evidence of a three-way interaction between cheek shown, selfie type and city,  $F(5,1979) = 3.21$ ,  $p = 0.007$ . Inspecting the interaction means indicated that this effect was due to a different pattern of the Moscow selfies in comparison to the other five cities. In all the other five cities, the pattern of the three-way interaction

**TABLE 1B |** Mean intensity (SEM) of estimated positive and negative emotional expression for selfies showing more of the taker's left or right cheek (frontal poses not included).

	Negative	Positive
Left cheek	0.154 (0.005)	0.606 (0.009)
Right cheek	0.136 (0.005)	0.629 (0.01)

**TABLE 2 |** Mean intensity (SEM) of estimated positive and negative emotional expression for two kinds of selfie (standard or mirror).

	Negative	Positive
Mirror	0.239 (0.013)	0.584 (0.018)
Standard	0.127 (0.003)	0.622 (0.007)

**TABLE 3 |** Mean intensity (SEM) of estimated positive and negative emotional expression in selfies by takers classified as men or women.

	Negative	Positive
Female	0.149 (0.005)	0.645 (0.008)
Male	0.137 (0.006)	0.551 (0.012)

**TABLE 4 |** Mean intensity (SEM) of estimated positive and negative emotional expression in selfies posted from six world cities.

	Negative	Positive
Bangkok	0.102 (0.006)	0.649 (0.016)
Berlin	0.168 (0.011)	0.595 (0.018)
London	0.123 (0.008)	0.563 (0.017)
Moscow	0.170 (0.009)	0.611 (0.015)
New York	0.153 (0.009)	0.618 (0.016)
São Paulo	0.147 (0.008)	0.654 (0.015)

was consistent with the main effect of cheek shown in both standard and mirror selfies. Said otherwise, all the means were consistent with higher emotional expression on the left cheek. In the Moscow selfies, however, this difference was visible in the standard selfies, but not in the mirror selfies that revealed a large difference in favor of the right, not left cheek. In the positive emotion scores, conversely, there was no evidence of a three-way interaction,  $F < 1$ .

## Four-Way Interactions: Cheek Shown by Gender, Selfie Type, and City

There was no evidence of a four-way interaction between the four independent variables. In the negative emotion scores, the statistical test yielded  $F(5,1979) = 1.2$ ,  $p = 0.3$ ; in the positive emotion scores, it yielded  $F < 1$ .

## Summary of Main Findings

We have performed a novel analysis of side biases in selfies using the (extended) *selfiecity* database that contains 1000s of photos from six global cities. We used continuous measures of head rotation, and estimates of the intensity of emotional expression provided by computer vision analysis of the photos.

Our results confirm the finding of previous studies: selfie-takers have a bias toward showing more often the left instead

than the right cheek. This bias is present regardless of the city where the photos were taken and of the gender of the takers. The only qualitative exception to the predicted pattern was found in the Berlin mirror selfies, which failed to show the expected bias for right cheeks (which, in the mirror reflection, corresponded to left cheeks of takers). However, given the relatively small number of mirror selfies in comparison to standard selfies, after dividing the sample in smaller subsets random fluctuations are to be expected and cannot be taken as evidence of systematic differences. Overall, our findings are therefore quite consistent with earlier reports, including our own which used a different method for assessing the side preference, in supporting a left-side bias independent of sociocultural factors. Especially, interesting in this respect is that cultural differences did emerge from our analysis. For instance, mirror selfies seem to be more prevalent in certain cities than in others. Despite these differences, however, a side bias remained apparent.

Concerning the role of emotional expression on the face as a potential factor in determining the side bias, our analysis revealed several interesting effects. In particular, our findings support the conclusions that negative, but not positive emotions are expressed more strongly in mirror than in standard selfies; that females express positive, but not negative, emotions more strongly than males; that there are cultural differences in emotional expression as shown by differences between some cities and others. These effects were in part already described by Tifentale and Manovich (2014) and may be regarded as at least partly consistent with common opinions about selfies. For instance, it has often been noted that selfie taking and posting is much more a female than a male behavior, and this may reflect in better skills at positive self presentation by females. A quick perusal of the *selfiecity* online database demonstrates that aggressive or provocative posing is often present in mirror selfies by both males and females. Although the reason for this phenomenon is unclear, it may underlie the bias in favor of negative emotions. Finally, styles of social interaction in South America and especially Asia generally predict that during self-presentation individuals might tend to prefer friendly expressions and especially to inhibit unfriendly expressions, in comparisons to North America or Northern Europe. Interestingly London, in comparison to the other five cities, yielded the lowest average intensity of positive emotional expression but also a very low average intensity of negative emotional expression (almost as low as Bangkok, which however has the highest intensity of positive expression), a finding that is surprisingly consistent with the a commonly held stereotype that social interactions in Great Britain favor restraint on emotional expression of all kinds.

Although the present study was not aimed at investigating sociocultural determinants of emotional expressions in selfies, we believe these observations are interesting and generally in support of the conclusion that the *selfiecity* database is representative of selfie taking behaviors across different cultural contexts. Importantly, these main effects seem to be essentially independent of potential sociocultural moderators, as shown by the absence of any two-way or higher-order interaction.



The only exception was the cheek by city and selfie type three-way interaction, which however seems to be driven only by some peculiarity of self presentations in a mirror by Moscow selfie takers. However, given that mirror selfies were much less frequent than standard selfies, it is difficult to decide whether this effect truly reflects a cultural modulation of cheek preferences or merely statistical variation.

Critically for the aims of the current paper, our results provide evidence for a difference in emotional expression between the left and the right cheek, but only for negative emotions. Indeed we observe that, at least for negative emotional expressions, selfies showing the left cheek tend to express the emotion more strongly than selfies showing the right cheek. A similar, but in the opposite direction, difference was observed for positive emotions, which tended to be expressed more strongly on the right side. This difference however failed to reach significance.

Our aim in assessing the intensity of emotional expression was to explore whether differences in emotion intensity can be observed depending on the posing bias for the left or right side of the face. Overall our results provide mixed evidence in support of this hypothesis. Although we did find that emotions were expressed more strongly in selfies showing the left side of the face, this observation was limited to negative emotions. In contrast, our results with positive emotions did not allow us to draw a clear-cut conclusion. On one hand, positive emotions yielded a trend in the opposite direction in comparison with negative ones. If this were indeed the case, the results could be interpreted as supporting the so-called *valence* hypothesis on the expression of facial emotions (Davidson et al., 1987; Bourne, 2010). According to this hypothesis, the right hemisphere specializes more for the expression of negative emotions, whereas the left hemisphere specializes more for the expression of positive emotions. On the other hand, this trend failed to reach significance. We cannot exclude, therefore, that there was in fact no difference in positive emotional expression between the right and the left cheek.

Either way, these findings may be interpreted as evidence that if the lateralization of emotional expression plays a role in the left side bias, this has to do more with the expression of negative than positive emotions. This possibility is unexpected and, to the best of our knowledge, has never been advanced before. In the context of the current study, however, we suggest it should remain a speculation in need of further support. The main reason for this note of caution is the nature of our emotional expression scores, which were not derived from psychometrically validated assessments of the intensity of expressed emotions but from machine-based estimates of “moods” within a commercial facial recognition algorithm. We cannot therefore be 100% certain that our scores were pure valid measures of emotional expression, although they are likely to reflect it at least to some degree. Because the *selfiecity* mood data were originally obtained from

a commercial site, we have been unable to obtain information on the proprietary algorithm that was used to derive the original mood scores. A natural solution to this problem will be to run the image database through a scoring procedure by human raters using psychometrically validated scales.

## CONCLUSION

The present results provide converging evidence for a natural, culture-independent preference to display the left cheek. It has been suggested (Nicholls et al., 1999; Powell and Schirillo, 2011; Lindell, 2013) that the basis for this preference might be identified in the right-hemispheric specialization for the expression of emotions, which tends to make most of us more expressive on the left side (Sackeim et al., 1978; Harris and Lindell, 2011; Blackburn and Schirillo, 2012; but see also Torro Alves et al., 2008; Prete et al., 2015). Evidence that a robust left cheek preference can be observed in casual self-portraits created by individuals that are unlikely to have had much exposure to academic training in the arts is certainly consistent with this proposal. Further study will be needed to determine whether the bias can be linked specifically to hemispheric asymmetries in emotional expression. As a first step in this direction, here we have shown that, at least for negative emotions, selfies showing the left cheek of the taker tend to have higher intensities of emotional expression. Further research is needed to determine if this conclusion is general and can form part of an explanation for the left side posing bias.

## ETHICS STATEMENT

The data were derived from publicly available photographic self-portraits. These were posted by individuals that, in so doing, implicitly gave permission to anyone to view and use the photographs as stated in the Instagram privacy policy (<https://www.instagram.com/about/legal/privacy/>). Thus Ethics approval was not needed as also stipulated in our earlier paper (Bruno et al., 2015; see <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0124999>). In addition, and to avoid any copyright issues, we did not reproduce any of the photograph in the paper or elsewhere, and were never aware of the identity of the individuals who posted the selfies.

## AUTHOR CONTRIBUTIONS

LM: data collection and analysis, critical revision of the article; VF: data collection and analysis; NB: conception or design of the work, data analysis, drafting the article.

## REFERENCES

- Arnheim, R. (1954). *Art and Visual Perception: A Psychology of the Creative Eye*. Berkeley, CA: University of California Press.
- Arnheim, R. (1982). *The Power of the Center: A Study of Composition in the Visual Arts*. Berkeley, CA: University of California Press.
- Blackburn, K., and Schirillo, J. (2012). Emotive hemispheric differences measured in real-life portraits using pupil diameter and subjective aesthetic preferences. *Exp. Brain Res.* 219, 447–455. doi: 10.1007/s00221-012-3091-y
- Bourne, V. J. (2010). How are emotions lateralised in the brain? Contrasting existing hypotheses using the Chimeric Faces Test. *Cogn. Emot.* 24, 903–911. doi: 10.1080/02699930903007714
- Brilliant, R. (2004). *Portraiture*. London: Reaktion Books.
- Bruno, N., and Bertamini, M. (2013). Self-portraits: smartphones reveal a side bias in non-artists. *PLoS ONE* 8:e55141. doi: 10.1371/journal.pone.0055141
- Bruno, N., Bertamini, M., and Protti, F. (2015). Selfie and the city: a world-wide, large, and ecologically valid database reveals a two-progded side bias in naive self-portraits. *PLoS ONE* 10:e0124999. doi: 10.1371/journal.pone.0124999
- Bruno, N., Gabriele, V., Tasso, T., and Bertamini, M. (2014). ‘Selfies’ reveal systematic deviations from known principles of photographic composition. *Art Percept.* 2, 45–58. doi: 10.1163/22134913-00002027
- Calabrese, O. (2010). *Larte Dell’Autoritratto: Storia e Teoria di un Genere Pittorico*. Charlottesville, VA: The Usher House.
- Crozier, W. R., and Greenhalgh, P. (1988). Self-portraits as presentations of self. *Leonardo* 212, 29–33. doi: 10.2307/1578412
- Davidson, R. J., Mednick, D., Moss, E., Saron, C., and Schaffer, C. E. (1987). Ratings of emotion in faces are influenced by the visual field to which stimuli are presented. *Brain Cogn.* 6, 403–411. doi: 10.1016/0278-2626(87)90136-9
- Ferrari, S. (2002). *Lo Specchio Dell’io: Autoritratto e Psicologia*. Rome: Editori Laterza.
- Hall, J. (2014). *The Self-Portrait: A Cultural History*. London: Thames & Hudson.
- Harris, C. D., and Lindell, A. K. (2011). The influence of autism-like traits on cheek biases for the expression and perception of happiness. *Brain Cogn.* 77, 11–16. doi: 10.1016/j.bandc.2011.07.005
- Humphrey, N. K., and McManus, C. (1973). Status and the left cheek. *New Sci.* 59, 437–439.
- LaBar, M. (1973). Turning the left cheek examined using modern photography. *Nature* 245, 338. doi: 10.1038/245338a0
- Latto, R. (1996). Turning the other cheek: profile direction in self-portraiture. *Empir. Stud. Arts* 14, 89–96. doi: 10.2190/198M-911X-PR9G-U18E
- Lindell, A. K. (2012). Capturing their best side? Did the advent of the camera influence the orientation artists chose to paint and draw in their self-portraits? *Laterality* 18, 319–328. doi: 10.1080/1357650X.2012.673622
- Lindell, A. K. (2013). The silent social/emotional signals in left and right cheek poses: a literature review. *Laterality* 18, 612–624. doi: 10.1080/1357650X.2012.737330
- Lindell, A. K. (2015). Motor biases do not influence posing orientation in selfies. *Laterality* 22, 49–59. doi: 10.1080/1357650X.2015.1109649
- McManus, I. C., and Humphrey, N. K. (1973). Turning the left cheek. *Nature* 243, 271–272. doi: 10.1038/243271a0
- Nicholls, M. E., Clode, D., Wood, S. J., and Wood, A. G. (1999). Laterality of expression in portraiture: putting your best cheek forward. *Proc. R. Soc. Lond. B* 266, 1517–1522. doi: 10.1098/rspb.1999.0809
- Nicholls, M. E. R. (2000). “Asymmetries in portraits: insight from neuropsychology,” in *Side-Bias: A Neuropsychological Perspective*, eds M. K. Mandal, M. B. Bulman-Fleming, and G. Tiwari (Amsterdam: Kluwer Academic Publishers), 313–329.
- Powell, W. R., and Schirillo, J. A. (2009). Asymmetrical facial expressions in portraits and hemispheric laterality: a literature review. *Laterality* 14, 545–572. doi: 10.1080/13576500802680336
- Powell, W. R., and Schirillo, J. A. (2011). Hemispheric laterality measured in Rembrandt’s portraits using pupil diameter and aesthetic verbal judgements. *Cogn. Emot.* 25, 868–885. doi: 10.1080/02699931.2010.515709
- Prete, G., Laeng, B., Fabri, M., Foschi, N., and Tommasi, L. (2015). Right hemisphere or valence hypothesis, or both? The processing of hybrid faces in the intact and callosotomized brain. *Neuropsychologia* 68, 94–106. doi: 10.1016/j.neuropsychologia.2015.01.002
- Sackeim, H. A., Gur, R. C., and Saucy, M. C. (1978). Emotions are expressed more intensely on the left side of the face. *Science* 202, 434–436. doi: 10.1126/science.705335
- Schirillo, J. A. (2000). Hemispheric asymmetries and gender influence Rembrandt’s portrait orientations. *Neuropsychologia* 38, 1593–1606. doi: 10.1016/S0028-3932(00)00063-4
- Suitner, C., and Maas, A. (2007). Positioning bias in portraits and self-portraits: Do female artists make different choices? *Empir. Stud. Arts* 25, 71–95. doi: 10.2190/X458-8V17-5M35-5549
- ten Cate, C. (2002). Posing as professor: laterality in posing orientation for portraits of scientists. *J. Nonverbal Behav.* 26, 175–192. doi: 10.1023/A:1020713416442
- Tifentale, A., and Manovich, L. (2014). *Selfiecity: Exploring Photography and Self-Fashioning in Social Media*. Available at: [http://manovich.net/content/04-projects/086-selfiecity-exploring/selfiecity\\_chapter.pdf](http://manovich.net/content/04-projects/086-selfiecity-exploring/selfiecity_chapter.pdf)
- Torro Alves, N., Fukushima, S. S., and Aznar-Casanova, J. A. (2008). Models of brain asymmetry in emotional processing. *Psychol. Neurosci.* 1, 63–66.
- Tosun, S., and Vaid, J. (2014). What affects facing direction in human facial profile drawing? A meta-analytic inquiry. *Perception* 43, 1377–1392. doi: 10.1068/p7805
- Woodall, J. (1997). *Portraiture: Facing the Subject*. Manchester: Manchester University Press.

**Conflict of Interest Statement:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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# Consistently Showing Your Best Side? Intra-individual Consistency in #Selfie Pose Orientation

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Intra-individual Consistency in #Selfie  
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Painted and photographic portraits of others show an asymmetric bias: people favor their left cheek. Both experimental and database studies confirm that the left cheek bias extends to selfies. To date all such selfie studies have been cross-sectional; whether individual selfie-takers tend to consistently favor the same pose orientation, or switch between multiple poses, remains to be determined. The present study thus examined intra-individual consistency in selfie pose orientations. Two hundred selfie-taking participants (100 male and 100 female) were identified by searching #selfie on Instagram. The most recent 10 single-subject selfies for the each of the participants were selected and coded for type of selfie (normal; mirror) and pose orientation (left, midline, right), resulting in a sample of 2000 selfies. Results indicated that selfie-takers do tend to consistently adopt a preferred pose orientation ( $\alpha = 0.72$ ), with more participants showing an overall left cheek bias (41%) than would be expected by chance (overall right cheek bias = 31.5%; overall midline bias = 19.5%; no overall bias = 8%). Logistic regression modelling, controlling for the repeated measure of participant identity, indicated that sex did not affect pose orientation. However, selfie type proved a significant predictor when comparing left and right cheek poses, with a stronger left cheek bias for mirror than normal selfies. Overall, these novel findings indicate that selfie-takers show intra-individual consistency in pose orientation, and in addition, replicate the previously reported left cheek bias for selfies and other types of portrait, confirming that the left cheek bias also presents within individuals' selfie corpora.

**Keywords:** left, right, emotion, photo, selfie, self-portrait

## INTRODUCTION

Selfies (digital self-portrait photographs taken with a smartphone or webcam) are now ubiquitous. Whilst self-portraiture in art has a long history, its prevalence as a vernacular photographic genre is novel (Walker, 2014; Marwick, 2015), and growing: use of the word "selfie" increased over 17,000% between 2012 and 2013 (Oxford Dictionaries, 2013). Though selfies are undoubtedly about the self, "... they long for – require even – sharing to be considered "true" selfies" (Hess, 2015, p. 1631), thus selfies are uploaded to social media like Facebook and Instagram. This public sharing of selfies is very much the norm, with 17- to 47-year-old Polish participants posting up to 650 selfies per month on social media sites (average 14.01 posted per month for females; 7.62 posted per month for males; Sorokowska et al., 2016).

The selfie phenomenon was catalyzed by the advent of the digital smartphone. Because the smartphone's front-facing camera provides a means for beholding oneself as the image is recorded (Walker, 2014; Frosh, 2015), people can exert a much higher degree of control over the way they self-represent than previously available. The fact that digital cameras provide photographs immediately, with no costs for film, means that selfies can be taken repeatedly, with the best carefully chosen, edited, and then uploaded to social media. The pose depicted is thus far from accidental (Lindell, 2017); every selfie available for public view on social media was first consciously selected and approved by the selfie-taker (Saltz, 2014). Although there is currently no academic research quantifying selfie-taking behavior, a recent market research survey conducted by OnePoll ( $N = 2000$ ) found that females aged 16–25 spend over 5 h a week (48 min per day) taking selfies, with an average of seven selfies being taken for each 'perfect selfie' uploaded to social media sites (Strick, 2015). Not surprisingly then, selfie-takers perceive themselves as more attractive and likable in their selfies than in photographs taken by other people (Re et al., 2016).

As creating and sharing a selfie can be conceived as "an act of self-representation," (Walker, 2014, p. 12), posing orientation in selfies has been examined to determine how selfie-takers self-represent. Such investigation is motivated by previous research that has established posing asymmetries in painted and photographic portraits: people are more likely to adopt a left than right cheek pose (LaBar, 1973; McManus and Humphrey, 1973). A number of different theories have been put forward to account for the left cheek bias. For example, accounts based on the effect of reading and writing direction suggest that readers of left-to-right languages show a left cheek bias, whereas readers of right-to-left languages instead show a right cheek bias (e.g., Pérez-González, 2012). The Spatial Agency Bias offers an alternate theory, suggesting that figures' roles in artworks, whether as agents or receivers of action, guide their pose orientation. According to this account, passive portrait poses favor left cheek poses because they emphasize the absence of agency (Suitner and McManus, 2011). Recent analysis of moving images appears consistent with this proposal, finding that the lead male actors in action films do not show a left cheek bias (Bode et al., 2016). This finding is also consistent with the emotion-based account of the left cheek bias favored by the present study. Because the left side of the face is predominantly controlled by the emotion-dominant right hemisphere (Patten, 1996; Demaree et al., 2005), the left cheek is more emotionally expressive (Nicholls et al., 2004). Consequently, people intuitively offer the left cheek when asked to pose for a photo expressing emotion, and the right cheek when posing for a photo that conceals emotion (Nicholls et al., 1999). Consistently, viewers perceive models in left cheek poses as more emotionally expressive and open than identical models in right cheek poses (Nicholls et al., 2002; see Lindell, 2013b, for review).

Research confirms that the left cheek bias extends to selfies. Bruno and Bertamini (2013) first investigated selfie posing biases experimentally, finding that over 45% of participants

(predominantly university student sample) adopted a left cheek pose when asked to take a selfie using an iPhone's front-facing camera (33% right cheek pose; 23% midline frontal pose), with proportions consistent across genders. Subsequent selfie-taking investigations in schoolchildren (aged 9–16 years), and a community sample of adults, similarly confirmed the left cheek bias for both male and female single-subject selfies (Bruno et al., 2014, in press). Though Lindell (2017) reported a midline (49.8%), rather than left cheek (26.5%), posing bias across genders in a general population adult sample, the discrepancy from previous investigations is argued to reflect the conservative criterion for coding midline poses adopted [Lindell's midline pose category encompasses three of Bruno and Bertamini's (2013) pose categories: "slightly left," "frontal," "slightly right"; see Lindell (2017), for discussion]. Overall, the research suggests that like other types of portrait, selfie-takers favor left cheek poses.

Critically, the left cheek bias for selfies does not simply reflect a mechanical artifact: neither participant handedness nor the hand used to capture the image influences selfie pose orientation (Lindell, 2017). Instead, the left cheek bias observed for selfies appears consistent with that observed for painted (McManus and Humphrey, 1973) and photographic (LaBar, 1973) portraits of others, and is argued to reflect the sitters' unconscious preference for displaying the more emotive left cheek (see Lindell, 2013b; Bruno et al., 2015, for discussion).

In keeping with experimental investigations of selfie-taking, examination of cheek biases in 3200 selfies uploaded to SelfieCity (an online selfie database, with images drawn from Instagram) also found a left cheek bias for standard selfies (selfies in which the selfie-taker points the camera toward themselves; Bruno et al., 2015). For mirror selfies, in which the selfie-taker poses in front of a mirror and takes a photo of their reflection, the posing bias reverses to a right cheek bias. As the mirror reverses left and right, a right cheek bias for mirror selfies indicates that the subjects adopted left cheek poses in front of the mirror, akin to the right cheek bias typically found in painted self-portraits (see Lindell, 2013a). Thus across selfie types, Bruno et al.'s (2015) SelfieCity study indicates that both male and female selfie-takers tend to pose offering their left cheek.

Previous investigations of posing orientation in selfies have all sampled a single selfie from multiple different participants (Bruno and Bertamini, 2013; Bruno et al., 2014, 2015, in press; Lindell, 2017). Whether the individual selfie-taker similarly shows a left cheek bias within his or her own corpus of selfies remains to be determined. Intra-individual investigation of selfie posing biases appears worthy of consideration because it illuminates the degree of consistency in posing orientation, determining whether selfie-takers repeatedly favor a preferred pose, or switch between the three pose types: left cheek, midline, and right cheek. Moreover, such investigation sheds light on the generalizability of the left cheek bias previously reported for selfies, based on samples comprised of multiple single selfies. The present study was thus designed to expand the selfie posing bias data by assessing intra-individual consistency in posing biases. An overall left cheek bias within an individual selfie-taker's corpus would be in keeping with the left cheek bias previously observed



across multiple subjects; an overall right cheek or midline bias, or a pattern in which the selfie-taker alternates evenly between the three posing options in their selfie corpus, would indicate that intra-individual patterns show a marked departure from those previously observed across individuals. Given that previous selfie investigations have found no difference in selfie posing biases between males and females (e.g., Bruno et al., 2015; Lindell, 2017), no gender effect was anticipated in the present investigation.

Selfies were sourced from Instagram: a free mobile application compatible with both iOS and Android operating systems. Instagram allows users to upload photographs (particularly selfies), manipulate them using filters, and share them with other people who may then comment on, and/or “like” the images (Marwick, 2015). There are over 500 million active Instagram users, uploading more than 95 million images per day<sup>1</sup>. Users can set their accounts to ‘public’ or ‘private’; only public accounts were included in the present investigation. At the time of writing over 275 million selfies had been uploaded to Instagram for public viewing using the hashtag “#selfie,” allowing the identification of images that users explicitly identified as selfies. Only single-subject selfies were sampled.

## MATERIALS AND METHODS

### Selfie Sourcing

Selfies were sourced by searching Instagram using the #selfie. Single-subject selfies were identified, with the first 100 male and 100 female single-subject selfie uploaders selected as participants; the #selfie feed was refreshed to load more #selfie images until the full sample of male and female participants was collected. The most recent 10 single-subject selfies for the each of the 200 participants were then identified in each participant’s Instagram feed, resulting in a total sample of 2000 selfies. The duration of time over which participants uploaded 10 single-subject selfies to Instagram ranged from <1 day (two participants uploaded 10 single-subject selfies to Instagram in fewer than 24 h) to 590 days ( $M = 92.20$  days;  $SD = 117.13$  days).

### Selfie Coding

Each selfie was coded for the participant’s identity, selfie type (normal; mirror), selfie-taker’s sex (male, female), and pose orientation (left cheek, right cheek, midline). The coding criterion used to determine posing orientation was conservative: selfies that unambiguously presented one side of the selfie-taker’s face to the camera were classified “left” or “right.” In keeping with the method previously described by Bruno and Bertamini (2013) and Lindell (2017), selfies that depicted the subject in a pose that could not be immediately classified by eye were first enlarged to approximately 16.5 cm × 21 cm. The distances from the center tip of the subject’s nose to each side of his/her face were then measured to determine posing orientation: (left > right = left cheek pose; left < right = right cheek pose). Any difference of <2 mm was recorded as a midline pose (see Lindell, 2017).

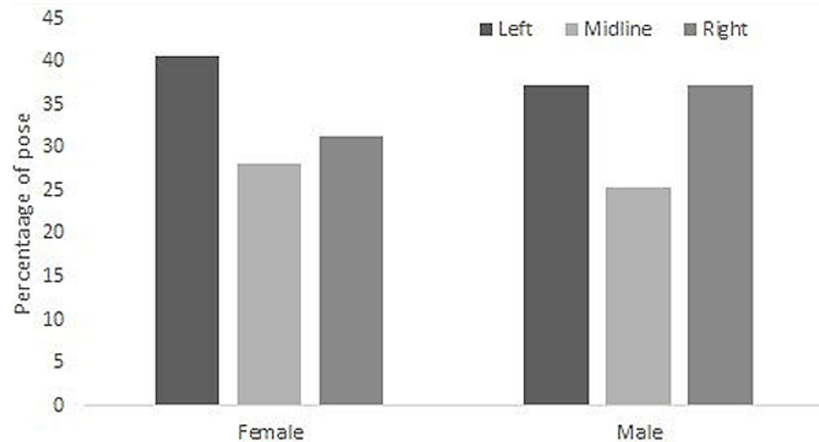
## RESULTS

Reliability analyses indicate that selfie-takers show a reasonable degree of internal consistency in their selfie pose selections: Cronbach’s  $\alpha = 0.720$  (female participants: Cronbach’s  $\alpha = 0.712$ ; male participants: Cronbach’s  $\alpha = 0.725$ ). Overall, there were more left ( $N = 779$ ) and fewer midline ( $N = 535$ ) selfies than would be expected by chance (expected  $N = 666.7$ ; right cheek pose  $N = 686$ ; please note that “left” and “right” always refer to the selfie-takers’ anatomical cheek offered to the camera or mirror). Comparing only left and right cheek poses indicates that selfie takers show a left cheek bias: 53.17% left cheek selfies; 46.83% right cheek selfies. **Figure 1** illustrates the percentages of left, right, and midline selfies for male and female selfie-takers.

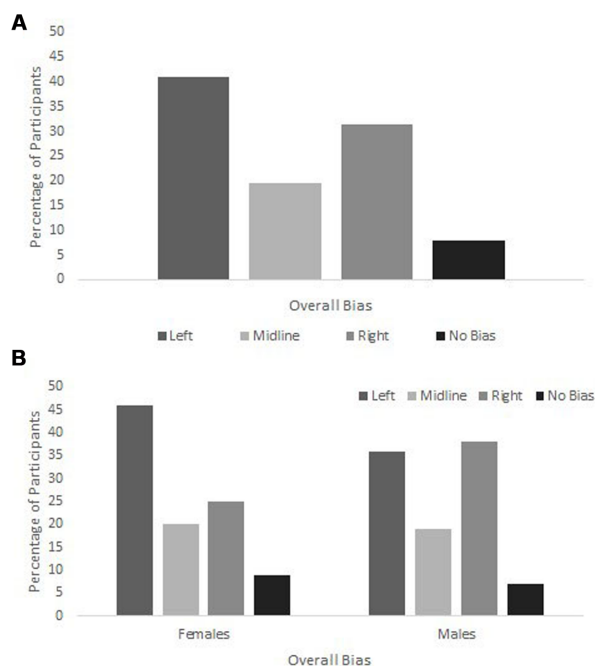
The number of left, right, and midline selfie poses for each participant were calculated to examine intra-individual consistency in pose orientation across 10 selfies. Given the three posing options (left cheek, midline, and right cheek pose), five or more selfies in one pose orientation was classed as an overall bias toward that pose orientation, being higher than the frequency expected by chance (3.33/10). Participants whose selfie poses were evenly distributed, with no more than four selfies in any of the three pose categories, were classified as having no overall bias. Similarly, three participants who had five selfies in each of two pose categories, and no selfies in the third category, were included in the no overall bias group. Only 16 participants showed no overall bias. The vast majority of participants ( $N = 184$ ) showed an overall bias across their 10 single-subject selfies favoring one of the three pose orientations: left cheek bias mean 6.61 left cheek poses/10 ( $SD = 1.37$ ); midline bias mean 6.54 midline poses/10 ( $SD = 1.59$ ); right cheek bias mean 6.70 right cheek poses/10 ( $SD = 1.50$ ). Of the participants who showed a very strong bias, with 8 or more out of their 10 selfies in one pose orientation, 20 had a left cheek bias (mean 8.50 left cheek poses/10,  $SD = 0.61$ ), 9 had a midline bias (mean 8.89 midline poses/10,  $SD = 0.93$ ), and 14 had a right cheek bias (mean 8.86 right cheek poses/10,  $SD = 0.77$ ).

The observed frequencies of overall left, midline, and right cheek biases were tested against a null model that assumes that the three posing categories (left, midline, right) are equally probable. The model thus assumes the frequencies expected by chance: 0.333 for each of the three pose categories (as 16/200 participants showed no overall bias, the null model’s chance  $N = 184/3 = 61.33$ ). Results revealed that the number of participants exhibiting an overall left cheek bias was higher ( $N = 82$ ), and an overall midline bias was lower ( $N = 39$ ), than would be expected by chance [ $\chi^2(2) = 15.141$ ,  $p = 0.001$ ; please refer to **Figure 2**]; the frequency of an overall right cheek bias was consistent with that anticipated by chance ( $N = 63$ ). Comparison of overall biases for females and males indicates that frequencies for both groups differed from those anticipated by chance [females:  $\chi^2(2) = 12.549$ ,  $p = 0.002$ ; males:  $\chi^2(2) = 7.032$ ,  $p = 0.030$ ; please refer to **Figure 2**]. However, it could be argued that a null model with equiprobable frequencies for overall left, midline, and right cheek biases does not necessarily reflect the probabilities of selfie poses, the range of rotation angles included

<sup>1</sup><http://www.instagram.com/press>



**FIGURE 1 | Percentages of left, right, and midline selfie poses as a function of the selfie-takers' sex (female, male).** Please note that 'cheek' refers to the anatomical cheek offered to the camera or mirror.



**FIGURE 2 | Percentages of overall left cheek, midline, right cheek, and no bias across 10 selfies for (A) all participants, and (B) as a function of selfie-taker's sex (female, male).** Please note that 'cheek' refers to the anatomical cheek offered to the camera or mirror.

in the 'midline' category being more restricted than those of the 'left' and 'right' categories.

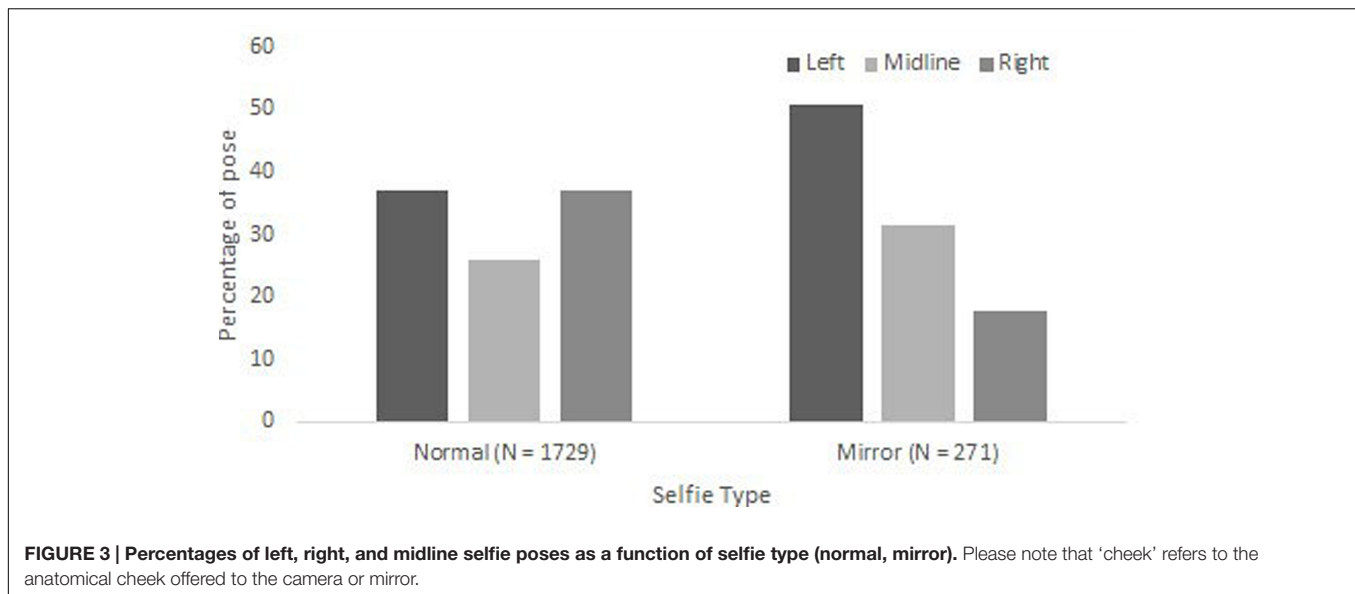
A pair of repeated measures logistic regressions were thus conducted. In the first analysis, midline poses were compared to left and right poses to assess the factors that determine whether people favor midline over asymmetric selfie poses. Repeated measures logistic regression modeled the relationship between

portrait orientation (midline, left/right) and the predictor variables sex (female, male) and selfie type (normal mirror), controlling for the repeated measure of selfie-taker identity. Results indicated that neither sex [ $\chi^2(1) = 0.820, p = 0.820$ ] nor selfie type [ $\chi^2(1) = 1.876, p = 0.171$ ] influenced selfie pose orientation. The interaction between sex and selfie type was similarly non-significant [ $\chi^2(1) = 0.297, p = 0.586$ ].

A second repeated measures logistic regression was then performed to examine the factors that influence preferences for asymmetric selfie poses only; midline poses were removed from the analysis. The model assessed the relationship between portrait orientation (left, right) and the predictor variables sex (female, male) and selfie type (normal mirror), controlling for the repeated measure of selfie-taker identity. Results indicated that whilst sex [ $\chi^2(1) = 1.368, p = 0.242$ ] did not predict pose orientation, selfie type proved a highly significant predictor [ $\chi^2(1) = 14.061, p = 0.000$ ]. For normal selfies, left ( $N = 641$ ) and right ( $N = 638$ ) cheek poses were similarly frequent, whereas for mirror selfies, left cheek ( $N = 138$ ) poses were more frequent than right cheek poses ( $N = 48$ ; please refer to **Figure 3**). The interaction between sex and selfie type was not significant [ $\chi^2(1) = 0.088, p = 0.767$ ].

## DISCUSSION

Research has established that the left cheek bias for painted (e.g., McManus and Humphrey, 1973) and photographic (e.g., LaBar, 1973) portraits of others is similarly evident in selfies (e.g., Bruno and Bertamini, 2013). As previous investigations of selfie posing biases have sampled a single selfie from multiple different participants, whether individual selfie-takers consistently favor their 'best side' when taking selfies, and whether a left cheek bias is evident intra-individually, was not known. The present study reveals that the vast majority of selfie-takers show an overall bias, repeatedly favoring one pose orientation (left cheek, midline, or right cheek). Critically, more participants showed a



left cheek bias within their own catalog of selfies than would be expected by chance; the left cheek bias previously observed across individuals is present intra-individually. Analysis comparing left and right cheek selfies and controlling the repeated measure of selfie-takers' identity indicated that while sex did not predict selfie pose orientation, the left cheek bias was stronger for mirror, than normal, selfies. Overall, these results are in line with previous reports in confirming a left cheek bias for selfies. Moreover, they indicate that selfie-takers tend to consistently adopt one pose orientation, presumably favoring their best side.

Examination of the 10 most recent selfies participants uploaded to Instagram confirms that individual selfie-takers consistently prefer one pose orientation. Ninety-two percent of the sample showed an overall posing bias, with 41% favoring their left cheek, 31.5% preferring their right cheek, and 19.5% repeatedly posting midline selfies. Given that only 8% of selfie-takers showed no overall bias, the tendency to repeatedly adopt a preferred pose appears to be the norm for selfie takers. Importantly, the number of participants showing an overall left cheek bias was significantly higher than expected by chance, indicating an intra-individual left cheek bias for selfies that complements the previously reported left cheek bias across individuals (Bruno and Bertamini, 2013; Bruno et al., 2014, 2015, in press). The greater frequency of an overall left cheek bias was similarly consistent at the upper end of the bias spectrum. Of the 43 participants who showed a very strong bias toward one pose in their selfie corpora (8 or more out of 10 selfies in one pose orientation), 46.5% had 8 or more left cheek selfies, 32.6% had 8 or more right cheek selfies, and 20.9% had 8 or more midline selfies. Given that selfies show the world one's subjective self-image (Souza et al., 2015), the greater than expected proportion of participants showing an overall left cheek bias suggests that selfie-takers intuitively favor the more emotionally expressive self-representation communicated in left

cheek and midline, rather than right cheek, poses (e.g., Nicholls et al., 2002).

The intra-individual consistency in pose choice ( $\alpha = 0.72$ ), and consistency in the magnitude of the intra-individual bias (overall left cheek bias: mean 6.61 left cheek selfies/10 selfies; overall midline bias: 6.54 midline selfies/10 selfies; overall right cheek bias: 6.70 right cheek selfies/10 right cheek selfies), suggests that whilst selfie-takers repeatedly favor a preferred pose, they occasionally switch pose orientations. Whether this is done consciously, to avoid monotony, or unconsciously, potentially reflecting state-based differences in selfie-takers' mood, is presently unknown. Moreover, whether selfie posing biases influence the number of 'likes' the selfies garner ('likes' being currency in social media, with selfies generally capturing 1.1–3.2 times more likes and comments than other types of images posted on Instagram, Souza et al., 2015) remains an open question.

Across the total sample of 2000 selfies, midline selfies were less frequent (26.75%) than either left cheek (38.95%) or right cheek (34.30%) selfies. This tendency to favor lateral, rather than head-on, selfie poses has been repeatedly reported in previous lab-based (Bruno and Bertamini, 2013; Bruno et al., in press) and real world (Bruno et al., 2015) investigations. Whilst research indicates that midline portrait poses are perceived as being just as emotionally expressive as left cheek poses (Nicholls et al., 2002), Lindell (2017) suggested that midline poses are less frequently adopted for a simple reason: they appear less flattering (e.g., driver's license, passport photo). Tips for posing for the "perfect portrait" and the "perfect selfie" regularly include avoiding facing the camera head on in a midline pose, unless one is aiming to look bigger; instead, adopting a 3/4 or 2/3 turn toward the camera is encouraged because it introduces more angles, highlights the cheekbones, and makes the subject of the photo appear slimmer (e.g., Manning, 2011; Olsen, 2012). As the subjects of selfies simultaneously serve as their own photographers, they are in the

position to take multiple images and try out multiple poses to find the best (and potentially the most flattering to one's self-concept, Döring et al., 2016), before uploading the chosen selfie to social media. This may explain the smaller proportion of midline selfies observed in the present investigation, however, research examining the relationship between selfie pose orientation and perceived emotionality, attractiveness, masculinity, or femininity, is clearly needed to assess this speculation.

Controlling for the repeated measure of selfie-taker identity, analysis comparing left and right cheek poses indicated that selfie type (normal, mirror) predicted pose orientation, revealing a stronger left cheek bias for mirror than normal selfies. Bruno et al. (2015) found a similar pattern in their examination of the SelfieCity database (selfies drawn from Instagram), arguing that this reflects differences in the mechanics of selfie taking. Most selfie-takers capture their selfies by holding the smartphone in their dominant hand (Lindell, 2017). In mirror selfies the smartphone is typically held centrally, near the body (Bruno et al., 2015), and when held with the right hand, may be placed slightly right of midline. Thus presuming that the majority of the sample is right-handed (a reasonable presumption, given the near-universal preference for the right hand, Corballis, 2014), this makes left cheek poses easier to adopt in mirror than normal/standard selfies (Bruno et al., 2015), potentially resulting in the higher proportion of left cheek poses observed. This argument is necessarily speculative because although motor biases (including handedness and hand used to capture the selfie) do not influence posing biases for normal selfies (Lindell, 2017), research has yet to investigate the influence of motor biases on mirror selfie pose orientation.

The absent effect of participant sex on pose orientation is also consistent with previous selfie investigations (Bruno et al., 2015; Lindell, 2017). Though inspection of the present data suggests a stronger left cheek bias for females than males (see **Figure 2**), sex was not a significant predictor of pose in either of the logistic regression analyses. Both Bruno et al. (2015) and Lindell (2017) similarly found that selfie pose orientations were not affected by participants' sex (sex was not examined as a factor in Bruno and Bertamini, 2013; Bruno et al., 2014, in press), suggesting that posing biases in selfies deviate from those observed for portraits of others. The stronger left cheek bias for females typically reported for portraits of others (e.g., McManus and Humphrey, 1973) is compatible with an emotion lateralization account of the left cheek bias (see Lindell, 2013b, for review). As females are more emotionally expressive (e.g., Kring et al., 1994), they are more likely to intuitively pose offering the more emotionally expressive left cheek.

The fact that sex did influence selfie pose orientation in the present study or previous investigations (e.g., Bruno et al., 2015; Lindell, 2017) could reflect an effect of the genre: males may feel more comfortable expressing emotion when capturing their own image in a selfie than when posing for another, especially when encouraged to pose "as you really are" [as

instructed in Lindell's (2017) investigation]. Equally, the lack of a sex effect for selfies could reflect changes in contemporary gender expectations and the characteristics of the population who upload selfies to Instagram for public consumption (both the present study and Bruno et al., 2015, used Instagram-based selfie samples). Sorokowska et al. (2016) found that higher levels of exhibitionism and extraversion characterize people who post selfies more frequently, irrespective of sex. One may speculate that the (typically young) males uploading selfies to Instagram are less constrained by social mores, and thus are more willing to express emotion, than males posing for professional portraits in previous generations (e.g., McManus and Humphrey, 1973). In keeping with this argument, recent research assessing emotional expressivity in college students found no difference between males' and females' levels of emotional expressivity (e.g., Lü and Wang, 2012), thus the lack of a sex difference in posing biases in the present study remains consistent with the emotion lateralization-based account of the left cheek bias. Further research examining whether males' and females' personality and emotional expressivity predict selfie pose orientations is needed to confirm this speculation.

The selfies sampled in the present study were explicitly identified as selfies (#selfie) and uploaded to Instagram by the selfie-takers for public viewing. Thus, like Bruno et al.'s (2015) selfie investigation, the present study has excellent ecological validity. It is therefore encouraging that the results observed in laboratory-based investigations of selfie-taking (e.g., Bruno et al., 2014, in press) match those found using these real-world samples. This consistency in findings is a clear indicator of the robustness of the left cheek bias for portraits, being evident across painted (e.g., McManus and Humphrey, 1973) and photographic (e.g., LaBar, 1973) portraits of others, and in both lab-based (e.g., Bruno et al., in press) and real-world (e.g., Bruno et al., 2015) samples of selfies. The present study confirms that the left cheek bias also manifests within an individual's selfie corpus, with more people consistently adopting a left cheek pose than either of the other posing options. Given the effort exerted in taking and retaking selfies to find the perfect angle (Hess, 2015), with young women discarding six selfies for each selfie uploaded (Strick, 2015), such findings imply that there is something very special about the left cheek. Previous research indicates that left cheek poses are perceived as more emotionally open and expressive than right cheek poses (Nicholls et al., 2002), and we know that selfie-takers perceive themselves as more attractive and likable in their selfies than in other photographs (Re et al., 2016). Whether left cheek selfies induce a more positive impression of the selfie-taker in other perceivers remains to be determined.

## AUTHOR CONTRIBUTIONS

AL designed the study, analyzed and interpreted the data, and wrote the paper.



## REFERENCES

- Bode, C., Bertamini, M., and Helmy, M. S. (2016). Left-right position in moving images: an analysis of face orientation, face position, and movement direction in eight action films. *Art Percept.* 4, 241–263. doi: 10.1163/22134913-00002053
- Bruno, N., and Bertamini, M. (2013). Self-portraits: smartphones reveal a side bias in non-artists. *PLoS ONE* 8:e55141. doi: 10.1371/journal.pone.0055141
- Bruno, N., Bertamini, M., and Protti, F. (2015). Selfie and the city: a world-wide, large, and ecologically valid database reveals a two-pronged side bias in naïve self-portraits. *PLoS ONE* 10:e0124999. doi: 10.1371/journal.pone.0124999
- Bruno, N., Bode, C., and Bertamini, M. (in press). Composition in portraits: selfies and selfies reveal similar biases in untrained modern youths and ancient masters. *Laterality*. doi: 10.1080/1357650X.2016.1185108 [Epub ahead of print].
- Bruno, N., Gabriele, V., Tasso, T., and Bertamini, M. (2014). ‘Selfies’ reveal systematic deviations from known principles of photographic composition. *Art Percept.* 2, 45–58. doi: 10.1163/22134913-00002027
- Corballis, M. C. (2014). Left brain, right brain: facts and fantasies. *PLoS Biol.* 12:e1001767. doi: 10.1371/journal.pbio.1001767
- Demaree, H. A., Everhart, E., Youngstrom, E. A., and Harrison, D. W. (2005). Brain lateralization of emotional processing: historical roots and a future incorporating “dominance”. *Behav. Cogn. Neurosci. Rev.* 4, 3–20. doi: 10.1177/1534582305276837
- Döring, N., Reif, A., and Poeschl, S. (2016). How gender-stereotypical are selfies? A content analysis and comparison with magazine adverts. *Comput. Hum. Behav.* 55, 955–962. doi: 10.1016/j.chb.2015.10.001
- Frosh, P. (2015). The gestural image: the selfie, photography theory, and kinaesthetic sociability. *Int. J. Commun.* 9, 1607–1628.
- Hess, A. (2015). The selfie assemblage. *Int. J. Commun.* 9, 1629–1646.
- Kring, A., Smith, D., and Neale, J. (1994). Individual differences in dispositional expressiveness: development and validation of the emotional expressivity scale. *J. Pers. Soc. Psychol.* 66, 934–949. doi: 10.1037/0022-3514.66.5.934
- LaBar, M. (1973). Turning the left cheek examined using modern photography. *Nature* 245, 338. doi: 10.1038/245338a0
- Lindell, A. K. (2013a). Capturing their best side? Did the advent of the camera influence the orientation artists chose to paint and draw in their self portraits? *Laterality* 18, 319–328. doi: 10.1080/1357650X.2012.673622
- Lindell, A. K. (2013b). The silent social/emotional signals in left and right cheek poses: a literature review. *Laterality* 18, 612–624. doi: 10.1080/1357650X.2012.737330
- Lindell, A. K. (2017). Motor biases do not influence posing orientation in selfies. *Laterality* 22, 49–59. doi: 10.1080/1357650X.2015.1109649
- Lü, W., and Wang, Z. (2012). Emotional expressivity, emotion regulations, and mood in college students: a cross-ethnic study. *Soc. Behav. Pers.* 40, 319–330. doi: 10.2224/sbp.2012.40.2.319
- Manning, E. (2011). *Portrait and Candid Photography*. Hoboken, NJ: Wiley Publishing, Inc.
- Marwick, A. E. (2015). Instafame: luxury selfies in the attention economy. *Public Cult.* 27, 137–160. doi: 10.1215/08992363-2798379
- McManus, I. C., and Humphrey, N. K. (1973). Turning the left cheek. *Nature* 243, 271–272. doi: 10.1038/243271a0
- Nicholls, M. E. R., Clode, D., Wood, S. J., and Wood, A. G. (1999). Laterality of expression in portraiture: putting your best cheek forward. *Proc. R. Soc. Lond. B* 266, 1517–1522. doi: 10.1098/rspb.1999.0809
- Nicholls, M. E. R., Ellis, B. E., Clement, J., and Yoshino, M. (2004). Detecting hemifacial asymmetries in emotional expression with 3D computerised image analysis. *Proc. R. Soc.* 271, 663–668. doi: 10.1098/rspb.2003.2660
- Nicholls, M. E. R., Wolfgang, B. J., Clode, D., and Lindell, A. K. (2002). The effect of left and right poses on the expression of facial emotion. *Neuropsychologia* 40, 1662–1665. doi: 10.1016/S0028-3932(02)00024-6
- Olsen, D. (2012). *Seven Killer Portrait Posing Tips*. Available at: <http://improvephotography.com/3654/portrait-posing-tips-by-dustin-olsen/> [accessed October 31, 2016].
- Oxford Dictionaries (2013). *The Oxford Dictionaries Word of the Year 2013*. Available at: <http://blog.oxforddictionaries.com/press-releases/oxford-dictionaries-word-of-the-year-2013/>
- Patten, J. (1996). *Neurological Differential Diagnosis*, 2nd Edn. New York, NY: Springer-Verlag. doi: 10.1007/978-1-4471-3583-8
- Pérez-González, C. (2012). Lateral organisation in nineteenth-century studio photographs is influenced by the direction of writing: a comparison of Iranian and Spanish photographs. *Laterality* 17, 515–532. doi: 10.1080/1357650X.2011.586701
- Re, D. E., Wang, S. A., He, J. C., and Rule, N. O. (2016). Selfie indulgence: self-favoring biases in perceptions of selfies. *Soc. Psychol. Pers. Sci.* 7, 588–596. doi: 10.1177/1948550616644299
- Saltz, J. (2014). *Art at Arm's Length: A History of the Selfie*. Available at: <http://www.vulture.com/2014/01/history-of-the-selfie.html>
- Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Pisanski, K., Chmiel, A., and Sorokowski, P. (2016). Selfies and personality: who posts self-portrait photographs? *Pers. Individ. Dif.* 90, 119–123. doi: 10.1016/j.paid.2015.10.037
- Souza, F., de Las Casas, D., Flores, V., Youn, S., Cha, M., et al. (2015). “Dawn of the selfie era: the whos, wheres, and hows of selfies on instagram,” in *Proceedings of the ACM Conference on Online Social Networks 2015* (Stanford, CA: Stanford University).
- Strick, K. (2015). *Women Spend FIVE HOURS A Week Taking Selfies. and One in Five Upload them to Social Media Make An Ex-Partner Jealous*. Available at: <http://www.dailymail.co.uk/femail/article-3053822/Women-spend-FIVE-HOURS-week-taking-selfies-one-five-upload-social-media-make-ex-partner-jealous.html> [accessed August 30, 2016].
- Suitner, C., and McManus, I. C. (2011). “Aesthetic asymmetries, spatial agency, and art history: a social psychological perspective,” in *Spatial Dimensions of Social Thought*, eds T. W. Thomas and A. Maass (Berlin: De Gruyter Mouton), 277–302.
- Walker, J. R. (2014). *Seeing Ourselves Through Technology: How We Use Selfies, Blogs, and Wearable Devices to See and Shape Ourselves*. New York, NY: Palgrave MacMillan.

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# Presenting Your Best Self(ie): The Influence of Gender on Vertical Orientation of Selfies on Tinder

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When taking a self-portrait or “selfie” to display in an online dating profile, individuals may intuitively manipulate the vertical camera angle to embody how they want to be perceived by the opposite sex. Concepts from evolutionary psychology and grounded cognition suggest that this manipulation can provide cues of physical height and impressions of power to the viewer which are qualities found to influence mate-selection. We predicted that men would orient selfies more often from below to appear taller (i.e., more powerful) than the viewer, and women, from an above perspective to appear shorter (i.e., less powerful). A content analysis was conducted which coded the vertical orientation of 557 selfies from profile pictures on the popular mobile dating application, Tinder. In general, selfies were commonly used by both men (54%) and women (90%). Consistent with our predictions, a gender difference emerged; men’s selfies were angled significantly more often from below, whereas women’s were angled more often from above. Our findings suggest that selfies presented in a mate-attraction context are intuitively or perhaps consciously selected to adhere to ideal mate qualities. Further discussion proposes that biological or individual differences may also facilitate vertical compositions of selfies.

**Keywords:** selfies, posing, height preference, sexual dimorphism, power, grounded cognition, attraction, online dating

## INTRODUCTION

When creating an online dating account, choosing a profile photo becomes a thoughtful process (Ellison et al., 2006), as it can predict the success of initiated contact (Hitsch et al., 2006). This is particularly true for the most currently used mobile dating application, Tinder (SurveyMonkey Intelligence, 2016), due to its emphasis on the profile photo; that is, its format promotes users to make rapid judgements based on physical attractiveness, a primary determinant in the early stages of mate selection (Li et al., 2013; Fletcher et al., 2014).

Curiously, mobile camera self-portraits or “selfies” are often used for the profile’s main image; 57% of men and 90% of women from our sample of Tinder users chose this method of representation. By considering evolutionary theories of attraction and grounded cognition, how the selfie-taker vertically orients the camera may be from an angle which perceptually manipulates qualities that are attractive to the opposite sex (e.g., height, perceptions of power). Specifically, the current study explores how heterosexual men and women vertically portray themselves relative to the viewer—from above, or from below—for selfies displayed on Tinder.

Attraction to vertical cues of physical height are largely suggested to emerge from humans' sexual size dimorphism. Males, on average, tend to exceed females in height (Gray and Wolfe, 1980; Ruff, 2002), thereby masculinity is strongly associated with the expression of tallness (Jackson and Ervin, 1992). However, a sizeable stature may also serve as a physical cue for females to other evolutionary advantages such as dominance, social status, and the ability to attain resources (Buss, 1989, 1994; Fiske, 2004). Women from Western cultures consistently demonstrate this attraction to tall men as reported from surveys of ideal mate characteristics (Pierce, 1996; Courtiol et al., 2010; Yancey and Emerson, 2014). Furthermore, the male-taller norm is evident from investigations of actual height differences between couples (Gillis and Avis, 1980). Women's robust height preference illuminates why taller males tend to report more sexual partners (Frederick and Jenkins, 2015) and reproductive success (Pawlowski et al., 2000; Nettle, 2002a) than their shorter-statured counterparts.

The literature on height preferences of men seeking women demonstrate a less stringent ideal, as men report a significantly weaker preference for respectively shorter women (Pawlowski, 2003; Fink et al., 2007). Research examining real-life data of online dating behavior revealed that men made first-contact emails to women of *average* height 43% more than women taller than 6'3, whereas women initiated contact with men of *above-average* height 65% more than shorter men (Hitsch et al., 2006). The preference for average height similarly corresponds to the stature of women with the most reproductive success (Nettle, 2002b), though this success is comparatively lower than that of taller men (Nettle, 2002a). The decreased importance of women's height is perhaps surprising given that men value external qualities for potential mates more so than women (Regan et al., 2000; Olivola et al., 2009). However, height is an attribute unrelated to female fertility (Nettle, 2002b), effectively decreasing this cue to represent any evolutionary advantage.

Although physical height is a significant feature of mate selection, this cue is absent from Tinder's profile layout unless explicitly stated by the user in their profile's tagline. Alternatively, the profile photo may be spatially manipulated to emulate the appearance of height either by orienting the camera from above or below the vertical axis, thereby exploiting the perception of the viewer to appear taller or shorter than the photographic subject. Research examining the effect of facial head-tilt on judgments of gender have found that pictures of faces with an upwards head-tilt, thus being perceived from below, are perceived to be more masculine, and faces tilted-downwards, so from an above perspective for the viewer, as more feminine (Main et al., 2010). These directionalities of head-tilt are parallel to ratings of facial attractiveness (Burke and Sulikowski, 2010; Sulikowski et al., 2015). Habitually learned perceptions of faces arising from height differences are proposed to guide these perceptions (DeBruine et al., 2006), though a complementary theory is proposed from the area of embodied cognition.

Grounded theories of cognition pioneered by Lakoff and Johnson (1980, 1999) posit that abstract concepts, such as power, are mentally associated with vertical spatial orientations (i.e., up is perceived as powerful and down, powerless; Barsalou,

1999). This association is exhibited by the English language, whereby common idioms of power and submission are vertically positioned: one has control *over* someone or be *under* their control, *rise* or *fall* from power, or be of *high* ranking or the *low* man on the totem pole (Lakoff and Johnson, 1980, p. 16). Considering this knowledge, Meier and Dionne (2009) predicted that the attractiveness of men's and women's portraits would depend on their spatial congruency with power; specifically, males are a proxy for "up" due to masculine trait preferences related to power (i.e., dominance, high social status) and for females, a lack of power (i.e., faithfulness) corresponding with "down." As predicted, men rated women's portraits as more attractive when *identical* photos were presented at the bottom of a computer screen (vs. top), whereas women were more attracted to images of men at the top of the screen (vs. bottom).

The directionality of the power metaphor with gender suggests a clear parallel with the literature from evolutionary psychology; "up" or tallness is signified with masculinity, and "down" or being shorter indicates femininity. However, as previously stated, height is not always an available cue in an online dating environment. Therefore, we propose that when choosing the focal point of the profile—the first profile picture—individuals may intuitively know to select an image where the vertical angle of the camera is consistent with how they want to be presented to the opposite sex: for men, from below to appear larger and dominant (i.e., powerful), and for women, from above to look smaller and submissive (i.e., less powerful). Due to the control from the self-display of the smartphone's frontal camera, an individual can easily manipulate this angle by taking a selfie, thus *appearing* taller or shorter relative to the viewer. We chose to explore strictly selfies for this reason, and because of the increased likelihood that the selfie was taken explicitly to portray attractiveness.

The purpose of the current study is to compare the vertical spatial orientation of men's and women's selfie profile pictures from Tinder, to which we predict that men will more often choose selfies oriented from below (vs. above), and women will depict selfies more often from above (vs. below). The current study will contribute to research on human attraction by exploring if physical preferences reported from previous studies are embodied by individuals in a realistic mate-attraction setting. Further, the study will inform how men and women represent a vertical orientation for selfies, a contrast to the lateral exploration of this media phenomenon (Bruno et al., 2015, 2016; Lindell, 2015).

## METHODS

### Sampling

A total of 962 profile photos were collected from Tinder. From this total were 508 profiles of women ranging from 18 to 44 years of age ( $M = 24.43$ ,  $SD = 4.7$ ), and 454 profiles of men between the ages of 18–56 ( $M = 30.5$ ,  $SD = 8.39$ ). Standard selfies—informal self-portraits portraying only the selfie-taker (Bruno et al., 2015)—were then parsed from the total. Mirror-selfies were also excluded (26 men, 13 women), because altering the vertical camera position does not affect the relative perspective of the

model to the same effect as non-mirror selfies. Our final data set comprised of 665 selfies, whereby 247 were from men's profiles and 457 were from women's. Selfies accounted for 54% of men's and 90% of women's profile pictures.

As previously specified, Tinder was an ideal online dating platform due to its current popularity and because of the layout's emphasis on the profile photo; only the first name, age, name of employer, and one picture is displayed as users "swipe" to explore Tinder profiles. Thus, the decision to "swipe right," or approve permission of contact by another user is largely founded by physical appearance, as Tinder only presents profiles of users specified from the account's search features (i.e., gender, age range, proximity in kilometers). Collection of the images are compliant with Tinder's privacy policy (Tinder Inc and Privacy Policy, 2016). Analysis of this collection was not subject to review by the University of Saskatchewan's Research Ethics Board (REB); the Standard Operating Procedures from our Human Ethics Policies states that data derived from observing publicly available media does not require REB review provided that no individuals' information may be identified (Research Ethics Office, 2012).

For the study, two Tinder profiles were created—one of a man seeking women, and one of a woman seeking men. To access enough profiles for a sufficient data set, the "Discovery Settings" were set to include Tinder users over the age of 18, within 160 km from the University of Saskatchewan campus, and toward the opposing gender of our profile's user. At that point we could view the profiles of each targeted gender, to which we coded profile images until there were no other users available within our demographic interests. Images were collected on May 10th, 2016.

## Coding

The vertical orientations of the models within the selfie sample set were coded by six research assistants (three males, three females) blind to the hypotheses of the study. Our rationale for assessing selfies' vertical orientation using human scoring rather than an objective measurement was motivated by two factors: (1) to understand how individuals experience the portrait's subject relative to themselves, and (2) because of the inability of Facial Recognition Software to detect the degree of head-tilt due to obscure photographic compositions, poor image resolution, or occluded views of the face (e.g., hair, sunglasses).

Assistants were seated at eye-level to a desktop computer and presented with the following instructions:

*"Please say which vertical location you think you are relative to the person in the picture—above them, below them, or if they are at an equal level to you"*

To decrease the coding time from the large sample set, assistants verbally indicated their relative spatial judgment for each photo while the primary researcher coded their selection on a separate computer. Poses oriented from above were coded as +1, poses from below as -1, and a straight pose as 0 (i.e., no obvious head-tilt; see **Figure 1** for examples of each pose).

The posing choices for all assistants were then compiled in a spreadsheet for further comparison. The directionality of portrait orientation for each selfie was determined to be from above, below, or equal if there was agreement among four of the six raters. Images with less than four agreements were discarded

prior to analysis; this equated to 95 images (14%) and with a moderate inter-rater agreement (Altman, 1999) determined using Cohen's Kappa,  $\kappa = 0.4$ , (95% CI, 0.035–0.044),  $p < 0.001$ . Our choice to only include images with at least four agreements was due to the large number of central posing choices reported by assistants on images with an otherwise adequately reported directional bias.

## RESULTS

Frequencies of the spatial orientation from the selfie sample suggests that distinctly vertical compositions of the camera were commonly used by both men and women, as profile photos with an above or below orientation were presented in 55.1% and 42.1% of pictures, respectively (see **Table 1** for all spatial frequencies). To determine if there was a difference between posing orientation depending on gender, a one-way ANOVA was conducted. However, the ANOVA's homogeneity of variance assumption was violated as indicated by the Levene's test,  $F_{(1, 554)} = 13.55$ ,  $p < 0.001$ ; alternatively, a Welch's ANOVA was used. A significant difference between groups was revealed,  $F_{(1, 398.4)} = 24.94$ ,  $p < 0.001$ ,  $\eta^2 = 0.03$ , demonstrating that men oriented the camera more often from below ( $M = -0.213$ ,  $SD = 0.644$ ) than women ( $M = 0.089$ ,  $SD = 0.644$ ) in selfies presented on Tinder (see **Figure 2** for proportional differences).

To examine if the directionality of men's and women's poses were significantly different from zero (i.e., a straight pose), two one-sample  $t$ -tests were computed. The analyses corresponded with our predictions; men oriented the camera more often from below,  $t_{(206)} = -4.291$ ,  $p < 0.001$ , Cohen's  $d = 0.598$ , and women, more often from above,  $t_{(348)} = 2.577$ ,  $p = 0.01$ , Cohen's  $d = 0.276$ . Taken together, the results illustrate the contrast between how men and women choose to spatially represent themselves in a mate-attraction context.

## DISCUSSION

Selfies exhibited in online dating profile photos were predicted to vary by vertical camera angle depending on the sex of the individual. Our results revealed that profile photos of men and women users of the mobile application, Tinder, exhibited opposing vertical biases; the camera's perspective was presented more often from below for men, and above for women. These findings simultaneously demonstrate a mechanical bias of selfies within a mate attraction context, as profile photos were not only chosen, but also taken by the Tinder user.

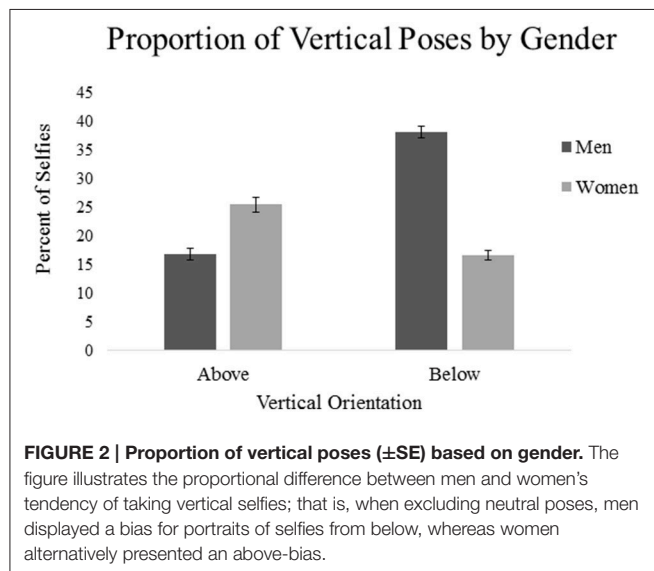
**TABLE 1 | Frequency and percentage of posing.**

Gender	Above	Below	Frontal
<b>FREQUENCY/PROPORTION</b>			
Men	35 (16.9%)	79 (38.2%)	93 (44.9%)
Women	58 (25.5%)	89 (16.6%)	202 (57.9%)
Total	93 (100%)	168 (100%)	295 (100%)





**FIGURE 1 | Examples of vertical camera angle manipulation.** From left to right, the presented images illustrate selfies photographed from an above, frontal, and below perspective. The portraits are modeled by a research assistant to maintain confidentiality of the sampled Tinder users.



**FIGURE 2 | Proportion of vertical poses ( $\pm$ SE) based on gender.** The figure illustrates the proportional difference between men and women's tendency of taking vertical selfies; that is, when excluding neutral poses, men displayed a bias for portraits of selfies from below, whereas women alternatively presented an above-bias.

An effect of manipulating a selfie's vertical spatial dimension is that it creates the illusion of a height disparity between the model and the viewer. The findings of the current study suggest that individuals are intuitively or perhaps consciously aware of this phenomenon, as the composition of profile photos were consistent with the height ideals of the opposite sex. Specifically, men with selfies oriented from below facilitate the perception of tallness, a feature robustly reported from women's mate preferences (Pierce, 1996; Courtiol et al., 2010; Yancey and Emerson, 2014). By contrast, women's prevalence of selfies taken from overhead conveys relative shortness to the viewer, a smaller yet significant height preference reported by men (Pawlowski, 2003; Fink et al., 2007).

Emphasizing this sexual dimorphism (Gray and Wolfe, 1980; Ruff, 2002) may serve to activate assumptions of features that are evolutionarily attractive to the opposite sex. As reported from cross-cultural research by Buss (1989, 1994), tall men are

commonly associated with protection, high social status, and access to resources, whereas shorter women are perceived to symbolize faithfulness and subordination. A comparable theory comes from the area of grounded cognition, though its emphasis on verticality is its link to perceptions of power (Barsalou, 1999). This association derives from the phenomenon proposed by Lakoff and Johnson (1980, 1999) that vertical space is a proxy for power due to its mental representation—powerful is up, less powerful is down (Schubert, 2005). Due to average height differences, men physically tower over women, therefore alluding to a perceived power differential. Research has found this metaphorical transfer to influence attraction; Meier and Dionne (2009) demonstrated that men rated women's portraits as more attractive when presented at the bottom of a computer screen (vs. top), whereas the alternative was found for women viewing men's portraits. Although attractiveness was predicted by its spatial presentation rather than height, we propose that grounded theory is a complementary explanation rather than a central one due to the extensive evidence on height preferences and mate selection.

In addition to manipulating height preferences, we speculate that other physical features related to men's and women's attractiveness can be enhanced by a selfie's camera angle. For men, a broad jawline is a sexual dimorphism (Weston et al., 2007) that is similarly referenced to masculinity. Facial-width has been found to correlate with both perceptions (Alrajih and Ward, 2014; Mileva et al., 2014) and self-reported (Lefevre et al., 2014) dominance, and is a physical preference considered by women for short-term relationships (Valentine et al., 2014). Taking a picture from below thus serves the purpose of creating an illusion of a pronounced jaw, as it obscures the size of the jaw relative to the face. By contrast, women may choose to take a photo from above to distort the head in relation to body size, accordingly deemphasizing a feature commonly misrepresented by women—their weight (Engstrom et al., 2003; Toma et al., 2008). An above camera angle would therefore reduce not only the perceived physical height of the woman, but also to flatter their physical frame. Aside from the conscious effort for women to conform to contemporary trends of body ideals, capturing

a physically appealing figure can also implicitly signal fertility health (Jungheim et al., 2013), a biological advantage which is more strongly linked to reproductive success for females than height (Nettle, 2002b).

For the current study, subjective measurements of vertical camera angle were ideal to validate how individuals perceived themselves relative to the portrait's model (i.e., taller than or shorter than the model). Consequently, the vertical orientation was only possible to be categorically quantified (i.e., above, below, or central) as opposed to a continuous variable (i.e., degree of vertical angle measured). A resulting trade-off is that we could not compare the extent of vertical exaggeration, only its distinct directionality. An additional short-coming was that unreliable agreements of selfie-composition between raters led to 14% of discarded data, a consequence that could have been eliminated from an objective measurement (e.g., facial-analysis software). Upon inspection of the discarded stimuli, however, it is possible that the variability of posing choices may be due to assistants' sensitivity to report a neutral rather than directional pose, as the data points failed to meet our selected agreement standard often displayed an even split between one vertical directionality and a central pose. The results of the current study therefore capture humanly perceivable differences rather than small deviations of camera angle.

An additional limitation is from the nature of using a content analysis, which is that we have restricted access to fruitful information of the Tinder users. A variable of interest for future examination is the photographic experience of the selfie-taker. Individuals with knowledge of photographic techniques may take more selfies from above, as this perspective is considered as a more flattering presentation of a face (Phillips, 2006). This knowledge may be similarly learned through experience taking selfies. Research has shown that women upload selfies to photo-sharing applications such as Instagram (Sorokowska et al., 2016) more often than men. Women's increased experience taking selfies may be an additive variable for their predominant use of the above camera-tilt.

Future direction should also explore how individual differences modulate the vertical position of selfies. Conformity

to stereotypical gender roles may predict the ideal portrayal of oneself, such that those with higher conformity may choose to exhibit themselves as taller (more masculine) or shorter (more feminine). Research by Bogaert and McCreary (2011) found that men with higher conformity to masculine norms conveyed a larger disparity between their self-reported and actual height. Men's gender conformity is also found to negatively correlate to the height of ideal female partners (Swami et al., 2008). The literature regarding gender norms and height for women is negligible, further insinuating the importance of men's height. However, women who desire to conform to perceived societal norms are more likely to misreport their weight (Larson, 2000). If our hypothesis regarding selfies as a means of deemphasizing weight is truthful, conformity to gender roles may also act as a modulating variable.

In conclusion, the present study provides novel insight on how human mate preferences correspond to mate-attraction behaviors. Our research demonstrates that when taking a selfie for presentation in a mate-attraction context, individuals choose to spatially orient themselves in a manner that is congruent with the opposing sex's height preferences; that is, from below to appear taller for men, and from above to portray relative shortness for women. This phenomenon may arise due to individuals initiating consciously-known selective cues of attraction, or from individual differences that warrant further exploration. The current findings contribute to a greater understanding of how evolutionary and conceptually grounded mechanisms can facilitate behavior in modern dating strategies and for capturing techniques of modern self-portraiture.

## AUTHOR CONTRIBUTIONS

JS designed the study. JS and MF conducted research. JS analyzed data. JS and LE wrote the manuscript.

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## REFERENCES

- Alrajih, S., and Ward, J. (2014). Increased facial width-to-height ratio and perceived dominance in the faces of the UK's leading business leaders. *Br. J. Psychol.* 105, 153–161. doi: 10.1111/bjop.12035
- Altman, D. G. (1999). *Practical Statistics for Medical Research*. New York, NY: Chapman & Hall/CRC Press.
- Barsalou, L. W. (1999). Perceptions of perceptual symbols. *Behav. Brain Sci.* 22, 577–660. doi: 10.1017/s0140525x99532147
- Bogaert, A. F., and McCreary, D. R. (2011). Masculinity and the distortion of self-reported height in men. *Sex Roles*. 65, 7–8. doi: 10.1007/s11199-011-0003-8
- Bruno, N., Bertamini, M., and Protti, F. (2015). Selfie and the city: a world-wide, large, and ecologically valid database reveals a two-pronged side bias in naïve self-portraits. *PLoS ONE* 10:e0124999. doi: 10.1371/journal.pone.0124999
- Bruno, N., Bode, C., and Bertamini, M. (2016). Composition in portraits: selfies and wifes reveal similar biases in untrained modern youths and ancient masters. *Laterality*. 22, 279–293. doi: 10.1080/1357650X.2016.1185108
- Burke, D., and Sulikowski, D. (2010). A new viewpoint on the evolution of sexually dimorphic human faces. *Evol. Psychol.* 8, 573–585. doi: 10.1177/147470491000800404
- Buss, D. M. (1989). Sex differences in human mate preferences: evolutionary hypotheses tested in 37 cultures. *Behav. Brain Sci.* 12, 1–14. doi: 10.1017/S0140525X00023992
- Buss, D. M. (1994). The strategies of human mating. *Am. Sci.* 82, 238–249.
- Courtial, A., Raymond, M., Godelle, B., and Ferdy, J. B. (2010). Mate choice and human stature: homogamy as a unified framework for understanding mating preferences. *Evolution* 64, 2189–2203. doi: 10.1111/j.1558-5646.2010.00985.x
- DeBruine, L. M., Jones, B. C., Little, A. C., Boothroyd, L. G., Perrett, D. I., Penton-Voak, I. S., et al. (2006). Correlated preferences for facial masculinity and ideal or actual partner's masculinity. *Proc. R. Soc. Lond. B Biol. Sci.* 273:1592. doi: 10.1098/rspb.2005.3445
- Ellison, N., Heino, R., and Gibbs, J. (2006). Managing impressions online: self-presentation processes in the online dating environment. *J. Comput. Mediat. Commun.* 11, 415–441. doi: 10.1111/j.1083-6101.2006.00020.x
- Engstrom, J. L., Paterson, S. A., Doherty, A., Trabulsi, M., and Speer, K. L. (2003). Accuracy of self-reported height and weight in women: an

- integrative review of the literature. *J. Midwifery Womens Health* 48, 338–345. doi: 10.1016/S1526-9523(03)00281-2
- Fink, B., Neave, N., Brewer, G., and Pawlowski, B. (2007). Variable preferences for sexual dimorphism in stature (SDS): further evidence for an adjustment in relation to own height. *Pers. Individ. Dif.* 43, 2249–2257. doi: 10.1016/j.paid.2007.07.014
- Fiske, A. P. (2004). “Four modes of constituting relationships: consubstantial assimilation; space, magnitude, time and force; concrete procedures; abstract symbolism,” in *Relational Models Theory: A Contemporary Overview*, ed N. Haslam (Mahwah, NJ: Erlbaum), 61–146.
- Fletcher, G. J., Kerr, P. S., Li, N. P., and Valentine, K. A. (2014). Predicting romantic interest and decisions in the very early stages of mate selection standards, accuracy, and sex differences. *Pers. Soc. Psychol. Bull.* 40, 540–550. doi: 10.1177/0146167213519481
- Frederick, D. A., and Jenkins, B. N. (2015). Height and body mass on the mating market associations with number of sex partners and extra-pair sex among heterosexual men and women aged. *Evol. Psychol.* 13, 1–14. doi: 10.1177/1474704915604563
- Gillis, J. S., and Avis, W. E. (1980). The male-taller norm in mate selection. *Pers. Soc. Psychol. Bull.* 6, 396–401. doi: 10.1177/014616728063010
- Gray, J. P., and Wolfe, L. D. (1980). Height and sexual dimorphism of stature among human societies. *Am. J. Phys. Anthropol.* 53, 441–456. doi: 10.1002/ajpa.1330530314
- Hitsch, G. J., Hortaçsu, A., and Ariely, D. (2006). “What makes you click? Mate preferences and matching outcomes in online dating,” in *MIT Sloan Research Paper No. 4603–06* (Chicago).
- Jackson, L. A., and Ervin, K. S. (1992). Height stereotypes of women and men: the liabilities of shortness for both sexes. *J. Soc. Psychol.* 132, 433–445. doi: 10.1080/00224545.1992.9924723
- Jungheim, E. S., Travieso, J. L., and Hopeman, M. M. (2013). Weighing the impact of obesity on female reproductive function and fertility. *Nutr. Rev.* 71(Suppl. 1), S3–S8. doi: 10.1111/nure.12056
- Lakoff, G., and Johnson, M. (1980). The metaphorical structure of the human conceptual system. *Cogn. Sci.* 4, 195–208. doi: 10.1207/s15516709cog0402\_4
- Lakoff, G., and Johnson, M. (1999). *Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought*. New York, NY: Basic books.
- Larson, M. R. (2000). Social desirability and self-reported weight and height. *Int. J. Obes. Relat. Metab. Disord.* 24, 663–665. doi: 10.1038/sj.ijo.0801233
- Lefevre, C. E., Etchells, P. J., Howell, E. C., Clark, A. P., and Penton-Voak, I. S. (2014). Facial width-to-height ratio predicts self-reported dominance and aggression in males and females, but a measure of masculinity does not. *Biol. Lett.* 10, 1–4. doi: 10.1098/rsbl.2014.0729
- Li, N. P., Yong, J. C., Tov, W., Sng, O., Fletcher, G. J., Valentine, K. A., et al. (2013). Mate preferences do predict attraction and choices in the early stages of mate selection. *J. Pers. Soc. Psychol.* 105, 757–776. doi: 10.1037/a0033777
- Lindell, A. K. (2015). Motor biases do not influence posing orientation in selfies. *Laterality* 22, 49–59. doi: 10.1080/1357650X.2015.1109649
- Main, J. C., DeBruine, L. M., Little, A. C., and Jones, B. C. (2010). Interactions among the effects of head orientation, emotional expression and physical attractiveness on face preferences. *Perception* 39, 62–71. doi: 10.1068/p6503
- Meier, B. P., and Dionne, S. (2009). Downright sexy: verticality, implicit power, and perceived physical attractiveness. *Soc. Cogn.* 27, 883–892. doi: 10.1521/soco.2009.27.6.883
- Mileva, V. R., Cowan, M. L., Cobey, K. D., Knowles, K. K., and Little, A. C. (2014). In the face of dominance: self-perceived and other-perceived dominance are positively associated with facial-width-to-height ratio in men. *Pers. Individ. Dif.* 69, 115–118. doi: 10.1016/j.paid.2014.05.019
- Nettle, D. (2002a). Height and reproductive success in a cohort of British men. *Hum. Nat.* 13, 473–491. doi: 10.1007/s12110-002-1004-7
- Nettle, D. (2002b). Women's height, reproductive success and the evolution of sexual dimorphism in modern humans. *Proc. R. Soc. Lond. B Biol. Sci.* 269, 1919–1923. doi: 10.1098/rspb.2002.2111
- Olivola, C. Y., Eastwick, P. W., Finkel, E. J., Hortaçsu, A., Ariely, D., and Todorov, A. (2009). *A Picture is Worth a Thousand Inferences: First Impressions and Mate Selection in Internet Matchmaking and Speed-Dating*. Unpublished manuscript, Department of Cognitive, Perceptual and Brain Sciences, University College London.
- Pawlowski, B. (2003). Variable preferences for sexual dimorphism in height as a strategy for increasing the pool of potential partners in humans. *Proc. R. Soc. Lond. B Biol. Sci.* 270, 709–712. doi: 10.1098/rspb.2002.2294
- Pawlowski, B., Dunbar, R. I. M., and Lipowicz, A. (2000). Evolutionary fitness: tall men have more reproductive success. *Nature* 403:156. doi: 10.1038/35003107
- Phillips, N. (2006). *Professional Posing Techniques for Portrait and Wedding Photographers*. Buffalo, NY: Amherst Media.
- Pierce, C. A. (1996). Body height and romantic attraction: a meta-analytic test of the male-taller norm. *Soc. Behav. Pers.* 24, 143–150. doi: 10.2224/sbp.1996.24.2.143
- Regan, P. C., Levin, L., Sprecher, S., Christopher, F. S., and Gate, R. (2000). Partner preferences: what characteristics do men and women desire in their short-term sexual and long-term romantic partners? *J. Psychol. Human Sex.* 12, 1–21. doi: 10.1300/j056v12n03\_01
- Research Ethics Office (2012). *Research Ethics Office and Research Ethics Boards Standard Operating Procedures*. Available online at: <http://research.usask.ca/documents/ethics/SOP102.pdf>
- Ruff, C. (2002). Variation in human body size and shape. *Annu. Rev. Anthropol.* 31, 211–232. doi: 10.1146/annurev.anthro.31.040402.085407
- Schubert, T. W. (2005). Your highness: vertical positions as perceptual symbols of power. *J. Pers. Soc. Psychol.* 89, 1–21. doi: 10.1037/0022-3514.89.1.1
- Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Pisanski, K., Chmiel, A., and Sorokowski, P. (2016). Selfies and personality: who posts self-portrait photographs? *Pers. Individ. Dif.* 90, 119–123. doi: 10.1016/j.paid.2015.10.037
- Sulikowski, D., Burke, D., Havlíček, J., and Roberts, S. C. (2015). Head tilt and fertility contribute to different aspects of female facial attractiveness. *Ethology* 121, 1002–1009. doi: 10.1111/eth.12412
- SurveyMonkey Intelligence (2016). *The Top Food and Lifestyle Apps on Mobile*. Available online at: <https://www.surveymonkey.com/intelligence/apps/all/top/food-lifestyle/> (Accessed September 15, 2016).
- Swami, V., Furnham, A., Balakumar, N., Williams, C., Canaway, K., and Stanistreet, D. (2008). Factors influencing preferences for height: a replication and extension. *Pers. Individ. Dif.* 45, 395–400. doi: 10.1016/j.paid.2008.05.012
- Tinder Inc and Privacy Policy (2016, June 16). Available online at: <https://www.gotinder.com/privacy> (Accessed September 15, 2016).
- Toma, C. L., Hancock, J. T., and Ellison, N. B. (2008). Separating fact from fiction: an examination of deceptive self-presentation in online dating profiles. *Pers. Soc. Psychol. Bull.* 34, 1023–1036. doi: 10.1177/0146167208318067
- Valentine, K. A., Li, N. P., Penke, L., and Perrett, D. I. (2014). Judging a man by the width of his face the role of facial ratios and dominance in mate choice at speed-dating events. *Psychol. Sci.* 25, 806–811. doi: 10.1177/0956797613511823
- Weston, E. M., Friday, A. E., and Liò, P. (2007). Biometric evidence that sexual selection has shaped the hominin face. *PLoS ONE* 2:e710. doi: 10.1371/journal.pone.0000710
- Yancey, G., and Emerson, M. O. (2014). Does height matter? An examination of height preferences in romantic coupling. *J. Fam. Issues* 37, 53–73. doi: 10.1177/0192513X13519256

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# Self in Art/Self As Art: Museum Selfies As Identity Work

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Selfies, digital images characterized by the desire to frame the self in a picture taken to be shared with an online audience, are important reflections of the contemporary self. Much extant psychological research on selfies has taken a pathologizing view of the phenomenon, focusing on its relationship to narcissism. Our investigation seeks to contribute to a holistic, contextualized and cultural perspective. We focus on the context of museums, places where art, history, education, and culture merge into the selfie taking behaviors of patrons. First, we explore theory salient to our topic of selfie taking, finding selfies to be an important way to construct ongoing series of narratives about the self. We use concepts of identity work, dramaturgy, and impression management to understand it in this light. We relate embodiment within the museum to the selfie's performative acts and expand upon notions that emphasize and distinguish the aesthetic elements present in many aspects of everyday life. We also question the ability of the museum selfie to destabilize. We also explore the contextual effects of mimicry and social norms. After describing our ethnographic and netnographic method, we investigate the museum selfie phenomenon. We begin with some observations on the extent of selfie-taking in contemporary culture as well as its evolution. Then, we consider selfies as a type of dynamic art form. Our analysis identifies a range of different types of museum selfies: art interactions, blending into art, mirror selfies, silly/clever selfies, contemplative selfies, and iconic selfies. Considered and studied in context, the museum selfie phenomenon reveals far more than the narcissism of the sort explored by past psychological research. The museum provides a stage for identity work that offers an opportunity for the selfie to be used not only for superficial performances but also in the pursuit of more profound self-reflection and its communication. Our ethnographic exploration of the selfie sees it as more than a quest for attention but less than a genuinely destabilizing social force. Selfie taking is complex and multidimensional, a cultural and social act, a call for connection, an act of mimicry, and part of people's ever-incomplete identity projects.

**Keywords:** selfie, museum, identity, embodiment, performance, aesthetic consumption, self-presentation

## INTRODUCTION

If our photographs are reflections of the way we see the world, selfies are reflections of the way we see ourselves. Yet they are more than mere self-reflection. They are intended for wider audiences, as if they were a form of art. As Iqani and Schroeder (2015, p. 408) explain, "an instructive starting point for thinking about the historical context of today's selfie is the artistic self-portrait.



In the West, self-portraits emerged as an important visual genre in and around the 16th century, typified by painters such as Albrecht Dürer and Rembrandt. These painters used self-portraiture to enshrine themselves as artists, as well as to reveal the inner depths of their character". Carbon (2017) uses an art history perspective to explore this artful element of selfies. He finds that selfies aim to communicate and express complex, multidimensional cultural messages similar to those of self-portraits from the domain of artistic painting have done for centuries (see Schroeder, 2002, 2013). Selfies "reveal something about the creator in particular, but also something about humans in general" (Carbon, 2017, p. 17). This connection between photographs, art, communications, and the self are key elements of our investigation. Contemporary selfie taking is a complex, enculturated, and multidimensional phenomenon. To genuinely understand it in all of its complexity, the field must study it with a myriad of different investigative approaches. Hence, we contribute to this multidisciplinary discourse with a cultural approach and ethnographic methodology.

Selfies are public reflections of the way we view and present ourselves, an intriguing combination of inward and outward looking. Their pervasiveness has been facilitated not only by networked technology and devices such as front facing cameras and selfie sticks, but also by the internalized social conventions that make the capture and sharing of self images desirable and acceptable (Larsen and Sandbye, 2014). That these conventions are shifting is evidenced by the changing and amorphous definitions of what constitutes a selfie (Hess, 2015; Senft and Baym, 2015). Sorokowski et al. (2015, p. 124) define selfies as photographs "of oneself (or of oneself and other people), taken with a camera or a camera phone held at arm's length or pointed at a mirror, that [are] usually shared through social media". This fundamental notion captures the core elements of the selfie phenomenon. However, that phenomenon is constantly changing as the practice evolves. Some literature now adopts a broader definition to accommodate group selfies, partial selfies of body parts, timers, selfie sticks, and highly manipulated photos facilitated by app technologies such as Snapchat. Rather than confining the selfie phenomenon to a particular technology or genre of photograph or video, we follow the broad definition of Dinhopl and Gretzel (2016, p. 127), which identifies selfies as "characterized by the desire to frame the self in a picture taken to be shared with an online audience".

Psychological research on selfies has emerged as a vital and growing sub-field. Psychology research has explored motivations for selfie-posting (Pounders et al., 2016; Sung et al., 2016), age and gender differences in posting selfies (Dhir et al., 2016), and self-esteem based effects of selfie posting (Wang et al., 2017). Much of this research has frequently taken a pathologizing perspective on the phenomenon, focusing on the relationship between narcissism and posting selfies (e.g., Fox and Rooney, 2015; Lee and Sung, 2016). In particular, by focusing on extremes of high selfie posting behavior and viewing the activity in an excessive, individualistic, and decontextualized manner, psychological research may be obscuring some of the most interesting aspects of the phenomenon. Indeed, like Internet

and social media consumption itself, psychology research has linked selfie production to shallow relationships, lack of intimacy, loneliness, anorexia, risks to mental health, and a general lack of mental well-being (Adamkolo and Elmi-Nur, 2015, pp. 22–24).

Recent psychological research has begun to offer more nuanced views of the selfie phenomenon. For example, Sorokowski et al. (2015, p. 125) find that the measures of narcissism are "significantly and positively correlated with" the posting of selfies on social media sites, and also that the "link between narcissism and selfie posting is stronger among men than women". However, another study found that posting selfies is a fairly common practice on social media sites, becoming "a typical way of communicating with others" and generally not related to narcissism (Barry et al., 2017, p. 7). Qiu et al. (2015) picture-coding scheme for selfies presents a psychological framework for image content analysis of selfies. The authors included facial expressions and position of the self as variables and categorized location as public or private. Their study emphasized the importance of context for representation in selfies. These results, along with the shifting definition of selfies, point to a dynamic and complex phenomenon which is increasingly embedded in contemporary communications.

We believe that an alternative approach would be useful in recontextualizing selfie taking away from pathologies and toward an alternative view. Relevant to this view are historical approaches such as those of Schroeder (2002, 2013), Iqani and Schroeder (2015), and Carbon (2017). The view we propose is that selfie taking is a complex and multidimensional phenomenon embedded in a wider set of evolving contemporary social practices. Drawing inspiration from the work of Rounds (2006) and Burness (2016), we chose to examine selfie taking in the context of contemporary art museums.

Museums, obviously, are sites in which art, culture, and photography have a long history. Museums are also, it turns out, important sites of "identity work" which encompasses the psychological "processes through which we construct, maintain, and adapt our sense of personal identity, and persuade other people to believe in that identity" (Rounds, 2006, p. 133; see also Howard, 2000). Museums have been found, perhaps unsurprisingly, to be an increasingly important site for selfie taking behavior. For instance, Blühm (2016) discusses how the management of the Groninger Museum in the Netherlands has been altered by social media and the rise of selfie taking. Burness (2016, p. 95) provides an extensive overview of the museum selfie phenomenon, and quotes poet laureate Ken Goldsmith as saying that the Mona Lisa and other iconic artworks have become "wallpaper for selfies". She finds the moral panic surrounding potential damage to artwork from careless selfie takers at museums to be prevalent. Given the aforementioned importance of the selfie's connections to art and also the need for a more contextualized understanding of a phenomenon that has been largely studied as the isolated and decontextualized behavior of narcissistic individuals, we find the museum setting ideal for an identity work-focused investigation of the selfie.

By locating it in a specific public place, one that combines history, education, and culture, we embed our understanding

of selfie taking in a broader, more cultural, and more social direction than past psychological research. Respectfully extending the museum scholarship emphasis of Rounds (2006) and Burness (2016), we bring a deepened psychological perspective to the contextualized phenomenon of the museum selfie. We begin our investigation with a look at several relevant theories. First, we extend a Lacanian “mirror stage theory” perspective (Lacan, 1977), taking its interlinked notions of self image, maturity and visual development in a technological direction. We consider whether the hall of mirror effects of our devices might reveal something about the regressive possibilities of contemporary adult identity. Does selfie taking, studied in context, act merely to elevate the self, or to provide a complex amalgam of self and setting, as Dinhopl and Gretzel (2016) suggest in their contextualized study of travel related selfie taking? In summary, our perspective seeks a cultural viewpoint on selfie taking, considering it to be a set of social practices intimately linked to the most intimate of pursuits: identity work.

Psychological impression management theory posits that people are inclined to create and share impressions of themselves which are biased in the direction of their desired identities (Markus and Nurius, 1986). Similarly, the sociologist Goffman (1959) emphasized the importance of self-presentation strategies to control impressions of the self, often also highlighting the role of factors and contexts external to the individual. Schau and Gilly (2003), Belk (2013) and a range of other researchers have described and analyzed the self-presentation related motives that individuals bring to their digital communications. Murray (2015) portrays selfies as effective outlets of self-definition, creative forms of self-fashioning, and therefore powerful means of self-expression. In Belk's (1988, 2013) “extended self” perspective, selfies represent digital possessions that play an important role in establishing and signaling identity. A recent investigation by Pounders et al. (2016) found that “consumers were motivated to post-selfies to convey a positive self-image”. Findings from this study also revealed that desired images included looking happy, having fun and projecting a positive physical appearance. Our identity work investigation complicates this perspective. What messages are conveyed by selfies taken with art? Is this mere happiness and beauty, or might it be something more? More importantly, what are the social and cultural contexts in which selfie taking in general might be more productively viewed?

The paper proceeds as follows. First, we explore theory salient to our topic. We examine theory linking identity and consumption, museums and embodiment, the aesthetics of consumption, performance and staging, and mimicry and social norms. Then, we offer some elaboration of our ethnographic and netnographic approach to the contextualized study of museum selfies. The next section presents our findings, which center upon a categorization of the different types of selfies we observe being taken in art museum contexts. Finally, we offer a concluding section that discusses the implications of our findings. Our results may have useful implications to help psychologists and others scholars of the selfie develop a more multifaceted

view of selfies than is exhibited in the current pathologizing literature.

## LITERATURE REVIEW

The dichotomized view of selfies as authentic expressions of identity and self-absorbed distortions persists throughout most of the scholarship on the topic. Carbon (2017) positions selfies as artifacts in a long history of self-portraits in art while Wendt (2014) more cynically sees them as parodies of portraits in the social media age, exemplified by artificial poses such as “duck face”. Jones (2002) argues that the selfie is an inflated performance of the self. Similarly, Levin (2014, p. 20) describes selfies as “portraits of the self in the act of self-portrayal,” emphasizing the practice rather than the outcome. Wendt (2014) emphasizes that visual social media encourage selfie-taking, animating users to create infinite versions of themselves through selfies, and keep users continuously engaged with images of themselves. Others conceptualize selfies as means of communication that afford a transformation of a personal experience into a shared one (Molz, 2012).

What does seem clear is that selfies are a means by which individuals can insert images of themselves into communications in a way never before possible. Our discussion of selfies is thus influenced by a perspective that views them as communicative aspects not only of individual identity, but of individual aspects of the networked self (Papacharissi, 2010). Online selves influence one another. They are ever more carefully curated (e.g., social media users delete posts that do not receive the desired number of likes in order to not taint their social media identity), which spurs a quest for the extraordinary and high scrutiny of what is share-worthy (Dinhopl and Gretzel, 2016). Rettberg (2014, p. 35) offers the most fully realized view of this highly interconnected and highly contextualized sense of the selfie. Her work connects the selfies with visual identity, time lapse photography, and changes in digital profile pictures to argue for an embedded view in which “digital self-presentation and self-reflection is cumulative” and part of an ever-evolving progressive series. This view accords well with the identity work and art emphasis of the museum selfie.

## Identity Work Involving Objects and Places

Identity emerges from “a dialectic between internal identification and external ascription” (Howard, 2000, p. 375). It is the mediating function between what is inside the self and what is outside, between the agent who chooses to act and the structures that provide the opportunities for acting, alternatives among which actions may be chosen, and the consequences of acting. Our identity work, the generator of our individuality, “is not so much a state to be achieved as a mode of life to be pursued” (Appiah, 2006, p. 5). Identity work, like serial selfie taking, is processual. Identities and profile pictures always exist as works in progress.

Consumer culture theoreticians Ustuner and Holt (2007, p. 51) use the term “identity project” to refer to the self-narratives

that people form as they continuously develop their identities by projecting “the constructed past into the imagined future”. According to them, people selectively update the narratives they tell themselves and others about their lives and who they are “as they interpret and incorporate the real twists and turns [that occur] as their lives progress” (p. 51). This continuous act of story building and storytelling seems highly salient to our contemporary culture (Mick and Buhl, 1992). Cultural communications such as art, fashion, and advertising symbols are used as sources of ‘symbolic resources’ by people, who seek in them “new ideas and better concrete versions of old ideas with which to advance their [identity] project” (McCracken, 1987, p. 122). In this research, we build on the notion, also developed by Kozinets et al. (2004) that physical spaces and objects are also used as symbolic resources in contemporary identity projects. As Burness (2016, p. 115) states, museum selfies “point to the social role that objects play in the lives of our visitors and the important role that museums have in facilitating those relationships”.

Rounds (2006) suggests that visiting a museum can simultaneously serve both the construction and signaling of identity. Museums allow visitors to associate their self with something that is larger than themselves. According to Rounds, museum visitors can transfer the special aura of importance that the displayed objects hold onto themselves. Hromack (2014) makes a more traditional possession-related and “extended self” type argument (cf. Belk, 1988), claiming that selfies are a gesture of ownership, a way of owning the art through its image. Selfies allow individuals to weave museum objects into their own identity. Foster (2014, p. 4) states that “taking a good selfie requires that both the creator/subject and the viewer look carefully at the artwork or artifact, granting a new perspective and a personal connection to a potentially lifeless object”. Also, museums as physical and cultural locations provide opportunities to both confirm existing identities and explore alternative selves; they are spaces of identity enactment. Mukherjee et al. (2015) describe museum spaces as offering psychological affordances that facilitate the directing, shaping, scaffolding and (re)producing of the psyche. Falk (2006, p. 151) also underlines the deep connection between identity and museum visitor experiences, basing his contextual viewpoint on the multiple selves view that “all individuals enact multiple identities, many of which are situational and constructed in response to a social and physical context”. Pekarik et al. (1999) highlight the introspective quality of museum experiences and therefore the opportunity to reflect not only on what is seen but also on one’s identity in relation to the museum displays.

Selfies often contain props. Brand-related selfies are “a nodal point” where the consumer’s own attempt to create their identity and share its positive impressions meet the corporate interest in managing the official impressions of the brand (Rokka and Canniford, 2016). This intersection potentially destabilizes both consumer-generated and corporate brand impressions (Hess, 2015). In their study, which centered upon people’s sharing of selfies with champagne brands, Rokka and Canniford (2016) find that the framing and tone of brand-related selfies resemble consumer generated advertising. People put themselves and the

brand together. In this case, they borrow from the champagne brand’s meanings, but also, by sharing it with their network of friends and followers, they lend it social meanings of their own.

Commercial impressions of corporately controlled brands might be quite different from cultural impressions of ostensibly civic artistic works. We might ask if the combination of museum, person, art, and selfie is also a destabilizing force. Does it destabilize the artwork by publicizing it, reproducing it, cheapening it, and reducing its ineffable Benjaminian aura? Does it destabilize personal identity, and perhaps also the innately narcissistic tendency of the selfie practice? Does it do this by moving the focus away from the person, the expression, and the present time to the museum setting, the art work, the cultural legacy, and historical time? Rounds (2006) and Burness (2016) seem to conclude with a sanguine view that museum selfies are stabilizing forms of self-expression inspired by museum objects, a means of discovering and asserting one’s sense of self. In this paper, we will explore further these conflicting notions of psychological destabilization and stabilization. We will investigate not only if museum selfies are a destabilizing force, but also whether or not the frame of destabilization holds up to scrutiny. Throughout, we will interrogate whether museum selfies signal something about the meaning and purpose of being at the museum. Do they reveal something significant about art, contemporary identity, and the experience that brings the two together?

## Museums and Embodiment

Identity is implicitly linked with the body and, in this study, we explore the concept of lived embodied experience in museums. The study of embodiment, the combined conscious and unconscious sense of being physically present as a body in a particular space, has gained ground as an important concept in the social scientific study of experience (Lakoff and Johnson, 1999). The role of the body in lived experience seems central to the understanding of selfies. For instance, Adamkolo and Elmi-Nur (2015, p. 21) found that women tilted their head by 150% more than men in their shared selfies, a result which they related both to gender imbalance as well as to expressiveness, sexual provocativeness, and “moral decadence and abuse”.

In museum selfie research, studying the position of the body in regards to artwork has been an important concern (Larson, 2014; Burness, 2016). The museum, in this literature, is a type of consumption experience in which the entire body moves through space. As Falk (2006, p. 126) avers, the museum “visitor is maintaining or building identity” by being “actively engaged in using the social and physical context of the museum to make personal meaning”. Past research finds a strong relationship between museum visitation and notions of embodiment (Joy and Sherry, 2003; Burness, 2016). Museum goers “succumb to experiences” (Joy and Sherry, 2003, p. 261) in which the museum and its art act as “a background” and “a stage for what is seen” (ibid: 264).

In our research, museums act as stages for the entire embodied self, rather than merely being sites subjected to the visitor gaze. Museum experiences and selfies both are highly personalized, embodied and felt practices (Warfield, 2014; Burness, 2016).



Taking selfies is a personalized way of moving through the museum. This personal, social, and physical meaning-making is an important focus of our investigation.

## Consumption of Aesthetics

Another way to think about selfie taking in the museum is to relate it to the consumption of aesthetics. Leder et al.'s (2004, p. 489) perspective on art is that the "cognitive processing of art produces affective, often positive and self-rewarding aesthetic experiences". Aesthetics, the philosophies of art and beauty, are a school of philosophy dealing with concepts of order, harmony, and beauty in the material world. What these philosophies have in common is "the idea that aesthetic experience is central to a life of higher order; that is, aesthetic experience is distinguished from the material aspects of life and privileged because of its importance in human development" (Venkatesh and Meamber, 2006, p. 20). In this case, selfie taking in the museum could be understood as an aesthetic pursuit, perhaps relating to the ability of art's harmonious visual properties to enhance self images and self expressions of those who utilize them. Alternatively, perhaps the museum selfie acts out an intention to disrupt or destabilize the stodgy museum setting and ossified artwork by turning it into a mundane backdrop, thereby adding a level of contemporary disharmony to art's more balanced visual impression.

These notions of harmony and disharmony as well as stabilization and destabilization build upon the notion that there are aesthetic elements present throughout many of the ostensibly mundane aspects of everyday life. Historically, people's participation in the arts was not perceived as an element of their ordinary day-to-day existence. However, Venkatesh and Meamber (2006), following many eminent scholars have suggested that art and everyday life are interlinked. Art, these scholars assert, has wrongly become a privileged term. In fact, "the artificiality of the separation between 'high art' and popular culture" has become increasingly apparent "as global media and information technologies accelerate the correspondence between the domains of art, popular culture, and commerce" (Venkatesh and Meamber, 2006, p. 24). Not only do everyday experiences have aesthetic qualities, but we can also conceive of aesthetics as playing a critical role in the creation and expression of contemporary personal identity (Venkatesh and Meamber, 2008; Schroeder, 2013; Iqani and Schroeder, 2015; Carbon, 2017), and thus as a cultural element, a defining "code" of current identity projects (Rounds, 2006). Our investigation seeks to broaden and develop Venkatesh and Meamber's (2008, pp. 51–52) conception of people as "aesthetic subjects" who view not only everyday experiences and artistic products in an aesthetic sense, but who fluidly transfer aesthetic impressions from artistic surroundings to their own captured photographs of themselves. It also seeks to understand the viewpoint and implications of the creative and artistic notion that people become the "aesthetic objects" of their own selfies.

## Performance and Staging

Following the dramaturgical framing of Goffman (1959, p. 62), who noted the value of "dramatically inflated actions" such as museum selfie taking, we can productively view the phenomenon

as a type of performance that occurs upon a particular sort of stage. Placing deliberate staging at the center of their typology of selfies, Presi et al. (2016) separate brand selfies based on the level of staging. Past research on museums finds many instances of visitors using the physical surroundings as a place of performance (Joy and Sherry, 2003; Kozinets et al., 2004; Hollenbeck et al., 2008). Prompted by cues in the built environment around them, individuals visiting these spaces strike poses in the act of playing and in the sense of informal performing for one another (Kozinets et al., 2002, 2004; Joy and Sherry, 2003).

In museums and in selfies, people perform their identities before one another as cultured, cultural beings (Falk, 2006; Rounds, 2006). With his notion of "enactments," Rounds (2006) combines notions of embodiment and identity with the idea of museum consumption. The museum, he says, "offers a perfect setting for public performance of identity. It is a space designed for the display and performance of meaning. Visitors take advantage of that character to enact their own identities, borrowing for those identities a bit of the aura of special importance held by the objects on display" (Rounds, 2006, p. 142).

Larson (2014) describes how the *Sugar Baby* art installation in Brooklyn is utilized by visitors and their cellphone cameras. The 75-foot tall white female sphinx with a "Jemina-like face" and massive exposed breasts (p. 505) provided an almost irresistible backdrop for photographic engagement, and specifically selfie taking. Reflecting on the complex motivations for such observed behaviors by "fashionable young women, black and white" (p. 506), Larson (2014) writes that there is "some deep human trait...some need to insert 'the self' into every situation" (p. 511). She concludes that the art work stands somehow above this effrontery and intrusion: "She is bigger than life. She has absorbed every insult that has come her way and has transcended it" (ibid). The disruptive social transgressions and disruptions inherent in the performance of the artist, the art, and the art viewer have powerful psychological implications for our understanding of the phenomenon. In our research, we seek to study how people perform with art and capture their performance for particular purposes.

## Mimicry and Social Norms

A closer examination of the contextual effects of being in museums holds an important place in understanding selfie taking behavior. As Dimberg et al. (2000) note, mimicry is an unconscious and automatic process that is subjectively experienced as too strong for suppression. Chartrand and Bargh (1999) show that mimicry has strong adaptive effects: it creates liking and help to achieve an affiliation objective. Using the term "Chameleon effect" to refer to "non-conscious mimicry of postures, mannerisms, facial expressions, and other behaviors of one's interaction partners...." Chartrand and Bargh (1999, p. 893) see mimicry as an essential and important part of human social existence. However, Bourgeois and Hess (2008) find that mimicry does not require close relationships with interaction partners and, in fact that it can act as a powerful social cue and a signaling behavior.



Selfies are not only a social artifact but also a social practice (Senft and Baym, 2015). In the museum setting, parts of the surroundings are structural and aesthetic, such as the building and the collection of art, and part of the situation is composed of the social surroundings, which, as Belk (1975, p. 159) elaborates, constitute “other persons present, their characteristics, their apparent roles, and interpersonal interactions”. In the museum setting, these social surroundings might also include the sociotechnical aspects of other museum visitors taking selfies. In our research, we explore the embedded nature of selfie taking as a natural way in which people “do museums”—and much else. In response to this radical change, museum policies are moving toward providing more participatory experiences to accommodate the social trend of selfie-taking (Johnson et al., 2015). In our investigation, we inquire about the collective behavior of selfie taking in museums, particularly around certain exhibits or in certain places. We examine our field sites as situations or surroundings, and look for evidence of mimicry and for the establishment of contagious social norms of selfie taking practice.

## METHODOLOGY

Cultural psychology has long had “an affinity” with ethnographic methods based in a combination of participation and observation (Miller et al., 2003). Because our study is interested in a multidimensional, dynamic, complex, and contextual understanding of the selfie phenomenon, we found the use of ethnographic methods entirely appropriate to our psychological investigation. We used ethnographic methods to collect data on museum visitors and their selfies in North America, Europe and South America, and extended this approach into the online realm with the method of netnography. We briefly describe these approaches and their use in our study in the following section.

### Ethnography and Netnography

Ethnography is the established and venerable technique of cultural investigation which originated in the field of anthropology. Netnography is a specific adaptation of ethnography designed to maintain ethnography’s cultural approach and apply it to the study of online social interactions and experiences (Kozinets, 2015). Found useful in a range of studies in social sciences fields (Bengry-Howell et al., 2011), including psychology (e.g., Orsolini et al., 2015) netnography “links to a human consciousness project most closely aligned with gestalt psychology, cyber-psychology, and the anthropology of consciousness” (Kozinets, 2017, p. 382). Netnography adds novel procedures and research practices to the traditional routines of anthropology (Kozinets, 2002) that include locating sites and topics using search engines and handling large digital datasets with a combination of automated and manual techniques (Kozinets, 2015).

As qualitative research applied to questions of cultural psychology, ethnography and netnography help us to focus on data and analysis showing how psychological and behavioral

tendencies can be understood through a deep investigation of their cultural underpinnings. Applied to a psychological phenomenon like museum selfie taking, ethnography and netnography reveal contexts of art, culture, expression, and self-representation that link to wider cultural phenomena such as media, technology, and fashion that influence the manifest behaviors. It therefore combines micro and macro-level collection and analysis of data in a study which shows the inseparability and co-constitution of selves, identities, identity projects, social networks, and cultures.

## Data

We focused our ethnographic observations on art museums as the most visually oriented genre of museums. Prolonged and deep as well as online and offline engagement with the phenomenon served as the key determinants of our selected research approaches. We not only collected primary data but also immersed ourselves in media accounts of selfie-taking in museums. Offline participant observation involved visits to the Broad Museum and LACMA in Los Angeles, California, the Pace Art and Technology Gallery in Palo Alto, California, and the Inhotim Museum in Brazil during 2016. During these visits the researchers observed selfie-taking at the museums and engaged in selfie-taking themselves, seeking out popular selfie spots within the museums that had been identified through online searches as well as prior observations at the museums. We shared these selfie images on our social networks, and kept field observations and reflective notes regarding their consequences, thus deepening our understanding of the internal processes and motivations of the behavior.

The online data collection efforts were focused on the social media platform Instagram because of its visual focus, posting to a public domain and extensive use of searchable hashtags. Searches were conducted in October 2016 and encompassed searching for related hashtags as well as location tags for particular museums. The search started with the general #museumselfie hashtag (29,139 posts) and continued with the museums that were included in the participant observation component of the research (#broadmuseum, 20,279 posts; #LACMA, #532,061 posts, #inhotim, 144,346 posts; #pacegallery, 27,863 posts as well as the respective location tags for these museums). The search was then expanded to include two museums that were prominently featured in the #museumselfie posts: the Louvre and the Musée D’Orsay in Paris (#louvremuseum, 136,853 posts; museedulouvre, 167,107 posts; #museedorsay, 98,584 posts; #dorsaymuseum, 1,136 posts). In recognition of the prominence of selfie-taking in connection with specific museum objects/exhibitions, the search also included #monalisa (504,733 posts) and #infinityroom (22,236 posts). Screenshots were taken of those posts that were images of the self (they had to include at least parts of the body in evidence). These screenshots included the hashtags and photo description as well as the visible comments. For each search, the most recent posts (up to 1 week prior to the search date) were investigated. In its entirety, our data set consisted of our observations, photographs, field notes, reflexive notes, downloaded photographs and screenshots.

## Coding and Analysis

The research followed a hermeneutic interpretive approach aimed at identifying emerging themes by iteratively circling back and forth between data and interpretation, from site to text. Visual and other semiotic data analysis techniques (Kozinets, 2015) were used on the corpus of fieldnotes, images that were created and collected, as well as on the textual descriptions of the Instagram posts.

## Findings

We begin with some observations on the extent of selfie-taking in consumer culture as well as its evolution. Google Trends shows that selfie as a search term emerged in December 2012. Instagram currently features 277,724,072 posts that are tagged with the hashtag “#selfie”. That museums play an important role in facilitating selfie-taking becomes apparent through the extensive use of the selfie subcategory hashtags “#artselfie” (36,426 posts on Instagram) and #museumselfie (29,139 posts). Google Trends indicates that museumselfie as a search term emerged much later than the general selfie term, namely in January 2014. This was likely spurred by the creation of the first Museum Selfie Day in January 2014, an annual online event in which many museums participate and that encourages individuals to post-selfies taken in museums on Twitter or Instagram. This shows that selfie-taking in museums is not only a widespread but also a persistent phenomenon that engages 1000s of individuals on Instagram alone. The significance of the selfie-taking in museums phenomenon to practitioners is reflected in curatorial museum scholarship such as by Larson (2014) and Burness (2016). On a pragmatic level, it is apparent in the so-called “selfie museums” in Southeast Asia that present art objects especially selected for their suitability as selfie backgrounds (Nationalpost.com, 2015).

That selfies serve as important digital possessions for the extended digital and networked self becomes evident through the existence of the basic museum selfie that portrays the face of the person in front of museum objects/art. The museum object is clearly delineated from the person and often appears in its entirety in the picture. Significance is seemingly transferred to the self through proximity, and both art object and personal image are prominently featured. What is important is that this selfie communicates a very intimate, personal relationship with the art. No other museum visitors are visible and the descriptions often read something like “Vincent and me”. These selfies tangibilize the museum experience and make it possible to ascribe a fleeting moment in time visibly and irrevocably to one’s self. Because they are uploaded to the publicly accessible Instagram platform, they are not only a digital possession but also serve as an important piece in the online narrative about the self which must be read in the entire context of a person’s posting behavior on the medium to be fully comprehended in context.

Beyond this expected, general museum selfie type, which did not occur as frequently as we were expecting, the data analysis and observations revealed a multitude of other categories that contribute to identity projects in different ways. We describe and explain them in the following sections.

## Selfies As Art

Selfie-taking as an aesthetic consumption experience and the self as an aesthetic object come into play in a variety of ways in the selfies taken at museums. First, we find evidence for the “art as wallpaper” selfie as suggested by Goldsmith in Burness (2016). In these selfies, fragments of artwork form the background for close-up views of the self. The art serves one purpose only: beautification of the self that is portrayed in the selfie. Abstract art and big installations, as for example prominently displayed in the Inhotim museum in Brazil, lend themselves particularly well to these kinds of selfie projects, and the purpose of art as art (rather than as stage or backdrop) appears destabilized. Second, we identified selfies that strive to be artistic and therefore identify the selfie-taker as an artist. These selfies are different from others in that they play with light, camera angles and unique perspectives, and echo more closely than most other analyzed selfies the standards of self portraiture described by Carbon (2017). The selves portrayed in these pictures often strike an artistic-looking pose, such as looking off meaningfully into the distance, or with the hand gesticulating, touching the face or the chin. Rarely do the creators of these more artistic selfies look directly into the camera, as is the conventional practice. Instead, the subjects of these selfies are deliberately posed and framed to seem more like traditional portraits.

## Performances of the Self in Museums

Several types of selfies emerged from the data that pertain to two types of performances of the self. First, there is the embodied person performing for the camera (and for physically present other persons) in the museum context. Second, there are extended performances of the self that are shared in online communication spaces, and manifest through additional performance details such as captions, titles, comments, and hashtags. One selfie genre relates to interactions with the art. Poses held by statues or figures in paintings are replicated by the selfie-takers, sometimes pretending to touch the art—a practice that, as Burness (2016) emphasizes, is strictly forbidden and widely feared by museum curators and staff.

Blending into the art is another specific sub-genre facilitated by the exhibits. For example, inserting oneself into projected images at the Pace Gallery allows the art to appear on one’s body/face. The Infinity Room at the Broad Museum as well as the Urban Light installation at LACMA and several other smaller exhibits allow visitors to locate themselves as physically present inside the art installation or art work. Being located inside the art seems to encourage additional performances and trigger the need to see and show oneself performing, which is satisfied through selfie-taking and sharing. One of the selfies we found in this sub-genre had a poignant descriptor: “We are part of the art”.

Another type of selfie that fits within this group is the mirror selfie. Mirrored objects in museums (whether they are curated museum objects or simply reflective surfaces such as polished glass tables) act as magnets that attract selfie-taking performers. These visual watering holes bring museum visitors thirsty for reflection face to face with their own images, prompting a

need to capture and share that moment of unexpected self-discovery. Mirrors also make it possible to show off more of the self without having to use a selfie stick (which are devices that artificially extend one's reach and that are often prohibited in museums). Due to these qualities, museum objects that have mirrored surfaces appear very prominently in museum selfies. However, they are far less prominent in the actual, physical space of the museum than their prominence in selfies might suggest. The argument that object significance can be transferred to the self through the selfie does not, therefore, apply to these cases. One object that appears frequently in the Louvre selfies, for instance, is a baroque commode with a mirror. Clearly, what is being communicated here has less to do with the object itself or its baroque origins than with its surface. Yet, as we will see, although they like to present surfaces used to simply reflect, many museum selfies are far from superficial.

One type of performance that appears in museum selfies is the silly/clever selfie. Making funny faces or striking particularly silly poses adds individuality and makes the selfie unique, thus increasing its social media share-worthiness. It allows selfie-takers to express their personality and show off. These selfies are often accompanied by particularly clever or funny descriptions. For example, one burly, smirking young man poses in front of the Mona Lisa and captions his selfie, "One of these faces is worth one billion dollars!!" A couple posted a picture of themselves and used the caption, and its hashtags, to tell a deeper story: "Vicky and I at the Louvre. There's a kinda famous painting behind us ☺ #MonaLisa #ThisMuseumIsHuge #ThePaintingIsNot".

In a more physical form of silliness, many people pose in front of the Louvre's pyramid with their outstretched hands, as if touching the apex of the pyramid with one fingertip. One, with a man grabbing the pyramid playfully and a young girl mugging surprise, was simply captioned "Gotcha!" In many of these photographs, selfie takers assume a performative stance, "playing to the moment" and spotlighting what is unique about the place, the object, the situation, the time, and, of course, themselves, in ways that might be otherwise difficult to perform in the "flow of routine life" (Rounds, 2006, p. 142).

We also found that other museum patrons provided selfie takers a comfortable and respectful berth when they were framing, posing, and shooting their self-portraits. Writing in a time before the rise of selfies, Rounds (2006, *ibid*) describes an eerily familiar scene: the museum viewer "strikes a contemplative pose" and "other patrons respond in kind, moving as if in response to an invisible choreographer, avoiding intrusions between patron and painting, signaling respect for the aesthetic experience in progress". That such observations of general museum behavior bear such an uncanny similarity to the occurrences that happen around selfie taking in our study points to the aesthetic linkage between selfie taking and art appreciation. At the level of cultural psychological reality as embodied in the movement of people around one another in museum spaces, art and selfie seem to be intertwined.

Another type of very common performance reflected in the selfies is the performance of contemplation. These selfies show the self from behind, looking at the artwork. This selfie type is often accompanied by a more profound type of statement in the description. In one, in which the person appears as a silhouette in front of the giant transparent clock face at the Musée D'Orsay, the Instagram selfie caption reads: "Life is truly precious and I think every second becomes a privilege. Whether it be a second longer to admire a piece of art, embrace a loved one, or simply take another breath, every second becomes infinitely valuable if you recognize its worth". Others write similarly reflective captions: "Life is made of small moments like these"; "If only, sometimes, time would just stand still, in the exact moment you want it to"; "Time is a storm for which we have no umbrella"; "A photograph is a fragment of time that will never return". The identity communicated through the use of such captioned selfies is introspective and rich with a sense of transcendent meaning. The spiritual type of identity work conveyed here is one of an appreciation not only of art, but of the aesthetic moments that art brings and of the precious, transitory pleasures of life itself. These contemplative and beautiful posts, where faces are indistinct or absent and captions seek to capture and communicate universal truths to a potentially limitless audience, seem far from the extant stereotype of the superficial and narcissistic selfie.

Performances of the self in museums seem to involve concentric circles of stages, from the micro-stage of the object to the exhibit to the museum space itself and even beyond, with many selfies being taken outside of museums. As observed by Hromack (2014), selfie-taking assigns greater significance to gallery spaces than ever before. The core of these stages is allowing the self to be the focus of the gaze. However, these gazes can be complex and the selves can be ironically positioned rather than self-centered. One photograph featured a young man with a red beard who resembles Van Gogh posing in front of the iconic artist's self-portrait and challenging viewers in the caption to "Spot the difference". A woman posed next to a Greek statuary encourages viewers to identify "Which one is the work of art?" Many selfies are taken in general museum areas, not featuring any particular object except the self, as if to state, more clearly than in any other selfie case: "I am in the museum, therefore I am the art".

## Iconic Selfies

Iconic selfies suggest the strong influence of social norms and established social behaviors. Burness (2016, p. 99) celebrates the individualistic aspect of museum selfie taking, positing that it constitutes an "individual's performance of self, [in which] identity is *performative* as a social role is selected" from a range of available roles [*italics in the original*]. Truly, the possibilities are endless for performance and creativity in a space that celebrates artistry and innovation. Yet our analysis of the netnographic data finds a disheartening conformist similarity and consistency in the many of the selfies taken at museums. Their similarity is based not only on the location but also on the poses taken and the perspectives portrayed. Through our netnographic analysis, which paid attention to similar hashtags, times, and places, we

were able to see social mimicry enacted online. When someone took a selfie in a particular place, others often felt compelled to do exactly the same. Part of the identity work then may not only be establishing the self as unique and creating personalized narratives but, importantly, also to show that one did the museum as one is supposed to do it. One stands in line obediently at the Louvre, in order to get close to the Mona Lisa. Once close, one turns one's camera upon oneself, frames the masterpiece in the background, and takes the selfie. Then, one moves along for the next selfie taker. Mimicry also allows one to establish the self as immersed in a social world of significance and meaning, a consocial experience in which a temporary connection is made with others, to be extended online.

From this perspective of the social self emerges the notion of the iconic museum selfie. The Mona Lisa selfie is the most prominent example of this category. Not only has it been advocated by celebrities but also extensively written and blogged about. One blogger writes: "Everyone else looked at her backward. So I did, too". It has become so ubiquitous that selfie-takers now have to try to make it special in order to make it share-worthy, e.g., by trying to have nobody else in the selfie, which is almost impossible. Another example of an iconic selfie is taken in front of the clock in the Musée D'Orsay. Our dataset is filled with similar silhouettes of similar bodies posed in front of the famous clock. Some try to individualize with strange poses or photos shot from different angles. Most simply pose in the same manner before the giant clock which leads out to the sky.

Another example is technologically driven rather than spatially cued. One of the latest developments in the museum selfie genre is a selfie taken using the Snapchat app to swap faces with those portrayed in famous paintings. Whether extraordinary or not, the iconic selfie has to be taken in order to complete the museum visit. The sheer amount of iconic selfies appearing on Instagram for the particular museums provides a glimpse at how long the selfie-takers had to wait to be able to snap the particular picture of themselves. This fact suggests how important it must be, and how much the internal pressure to conform to standard must feel for them to include the iconic selfie in their self narratives, to perform the identity work, and to feel a sense of completion of their visit to the museum.

## Selfie-Taking as an Embodied Museum Experience

As indicated by our extensive data about performance, selfies turn museums into playgrounds. Selfies encourage physical engagement with museum objects. They involve poses, contorting the body in order to get the selfie poses right, waiting in line to get to the important work of art, walking through the museums with cameras, and walking around other visitors who are taking their selfies. Although some of this action is detectable in the posted selfies themselves, most of it was directly observed during our museum visits. Selfies encourage a certain consciousness of the body and its placement in space. Which body parts are framed as part of the selfie becomes an important decision in the selfie-taking process. The entire self,

body, mind, and even spirit seem involved in the aesthetic process of selfie museum taking and sharing.

## DISCUSSION AND CONCLUSION

In our investigation of museum selfie taking we find reflections not only of individuals and their identities, but of consumer culture, the ways it is changing, and the ways that it destabilizes patrons, museums and art. First, the performance of selfie taking destabilizes the experience of being a body in a museum filled with art. The body is tethered to technology, holding the phone. The body bends and leans to get better angles, find more flattering light, more favorable positions. The body becomes an object to be photographed along with the art. In some sense, the body is led through the museum by a more overwhelming project than merely seeing the art in the gallery: the identity project of representing the self in the act of being-in-the-gallery and the even more important one of somehow asserting that the self is as worthy of art-like status as the art.

This phenomenon does not seem to reflect only the narcissism of the sort explored by researchers such as Fox and Rooney (2015), Sorokowski et al. (2015), and Lee and Sung (2016). Many posts did not feature the selfie poster's face, many contained the back of the head while the person viewed or admired the art, many featured only a silhouette. The addition of a rich context and the cultural data and analysis provided by our method allows us to recontextualize the selfie back into human cultural life and propose an alternate and multidimensional view of the phenomenon as identity work and, indeed, identity work which is fragmentary and always somehow frustratingly incomplete.

Our findings reinforce past conceptions of selfies as important forms of collective communications (Molz, 2012) and a way to build, assert, and curate lasting narratives of the self (Papacharissi, 2010; Dinhopl and Gretzel, 2016) that contribute to an ongoing process of social media-assisted identity work (Rettberg, 2014). However, we extend these conceptions by showing the complexity and variety of ways that people use museum selfies as a part of their identity projects. As our many examples of museum selfie taking in action demonstrate, there is little doubt that physical spaces and objects such as sculptures and paintings, and museums themselves, are used as symbolic resources to build ongoing narratives of the self, just as brands are (Rokka and Canniford, 2016). Art works and museum spaces become props, background material, and stages upon which individuals act out the experiences that give their identity its uniqueness and their life its meaning.

Further, we find that the combination of museum, person, and selfie may amplify and complicate the ostensibly destabilizing forces of art, museums and their patrons. Notions of art viewers using art and their own aesthetic power over it to transcending the authoritarian powers of museum have a long basis in the history of art. To provide only one example, the panoramic size of Monet's *Water Lilies* was intended by the artist to challenge the limited wall space and thus to allow viewers to contest the authority of the museum, and in some sense to breach the boundaries separating art from its audience (Ames, 1992). To



use a more recent example, the *Sugar Baby* installation posed a powerful question to art patrons about their willingness to turn art into a background stage and sacrifice their own “sense of self-awareness when addressing an art object,” according to Larson (2014, p. 505). The art and the installation sought to destabilize the urge to photograph oneself against it, to “use” the gigantic Jemima figure in this way and reinforce her link to the suffering and abuse of black women. The artist and her brilliant work of art deliberately play on contemporary norms of selfie taking to destabilize power perceptions: “Walker is thus effortlessly able to prove to us that all those old power relationships from the time of slavery have not lost their sting, nor their roots in human self-centeredness. She sets up the conditions, and if you are alert, you see yourself and your reflection, and you may have learned something” (Larson, 2014, p. 506). For most people observed by Larson, however, nothing is learned.

Hence, museums are not simple places for learning about and enjoying art, they have always been contested spaces where we are goaded to realize something about ourselves. The many profound and spiritual statements about time which appear in selfies featuring the Musée D’Orsay attest to the undiluted power of art to inspire self-reflection. These museum stages therefore provide much more than an opportunity for superficial performance and conformist mimicry.

Our ethnography and especially our netnography of museum selfies tells a nuanced story about contemporary aesthetics. The practices we observe include enactment of the urge to put one’s self into the artwork, to shoot into shiny surfaces, to line up behind others and to collect the expected photographs of famous art works. Alongside the enactment of these typical urges, we also see how commonplace are attempts to subvert the art by making silly or idiosyncratic expressions in front of it. In the end, the acting out of these anti-authoritarian impulses seems like a predictable attempt to destabilize art’s authority. Networked digital technology seems poised to empower these efforts, to unleash a creative, individual, and aesthetic self as never before. Yet, for the most part, as our portrait of the conforming patron within the artistic environment attests, this creativity goes unrealized. The art, like *Sugar Baby*, remains spiritually pure, aesthetically untouched, never fully apprehended. Its surface reflection may be captured, digitized, and shared, but its true depths remain unplumbed, blurred out of focus by the cellphone’s public gaze. Patrons’ use of smartphone technology seems to change everything in the gallery, but it actually challenges nothing. Rather than the celebratory conclusion of Burness (2016, p. 115) who finds that “visitors engaging in self-representational social photography are paying the ultimate compliment to museums by weaving museum objects into their identity,” we must take a much more balanced view.

Our investigation thus broadens and develops Venkatesh and Meamber’s (2008, pp. 51–52) conception of individuals as “aesthetic subjects” who view everyday experiences and artistic products in an aesthetic sense. Complicating their rather harmonious view of the aesthetic self, we see members of the public actively at work, struggling with their identities as social and creative beings, unable to fully realize either one. Their attempts to transfer aesthetic impressions from art works to their

own captured photographs of themselves are always incomplete in themselves, always only snapshots of a much longer narrative that they continuously construct on social media. This sense of needing to do something beyond being with the art is exacerbated and proliferated by the public spaces of museums, where patrons observe each other posing and getting into line before certain art works. Every museum becomes a stage, as we have seen. Every museumgoer becomes not only the “aesthetic object” (Venkatesh and Meamber, 2008, p. 52) of their own selfie, but a performer within their own documentary project of selfie taking. And yet, as Karwowski and Brzeski (2017) also find, many of them are ill-equipped to provide meaningfully creative output.

Every artwork is in some way a selfie, every photograph of course reveals its taker. It also can reveal its takers’ abilities and inabilities. Selfie taking, after all, is not merely a manifestation of the mirrored self-questing for its own sense of identity. It is also a social act, a call for connection, a response to competition, and act of mimicry. Our findings reveal how ubiquitous smartphone cameras and networking technology blur the way people understand the connection between museum art and their own self-portraiture. These technologies and behaviors allow people to use special locations, such as art galleries and museums to express aspects of themselves and borrow particular cultural meanings, such as the aesthetic sophistication of art.

At the museum, as in life, people taking their portraits, again and again, visually producing themselves and visualizing themselves as beings who exist “in a world they desire, full of people who want them and who want to watch them” (Kozinets et al., 2004, p. 670). Once upon a simpler time, many of these galleries existed to elevate art in a serious and educational spirit. Now, they are transforming under economic pressure to accommodate the playfulness of patrons. The fact that museums like the Groninger, curators like Blühm (2016), and artists like Kara Walker, the creator of *Sugar Baby*, must respond to this tension, points to the significant role of the museum selfie in the identity project of the art museum patron. In the field of psychology, and beyond, we would be wise to continue to explore the varying contexts and multidimensional aspects of this rich and powerful phenomenon, what it tells us about the notion of the self in contemporary society, and what it portends about where the sense of contemporary selfhood is heading.

## ETHICS STATEMENT

The study was exempt as the participant observations were focused on the researchers’ own experiences, only took place in public spaces and did not involve any direct interactions with subjects. The online component of the research used only publicly available posts and did not report individual data in the manuscript.

## AUTHOR CONTRIBUTIONS

RK contributed to the theoretical framing, analysis of the data, as well as creation of the entire final document. UG and AD were

responsible for the data collection and analysis. AD contributed to the literature review. UG was involved in all sections of the paper.

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## REFERENCES

- Adamkolo, M. I., and Elmi-Nur, H. (2015). Communicating 'the self' through digital images: gender bias and mental health risks associated with selfie use on social network sites. *Glob. Media J. Malays. Ed.* 5, 16–36.
- Ames, M. M. (1992). *Cannibal Tours and Glass Boxes: The Anthropology of Museums*. Vancouver, BC: UBC Press.
- Appiah, K. A. (2006). The politics of identity. *Daedalus* 135, 15–22. doi: 10.1162/daed.2006.135.4.15
- Barry, C. T., Doucette, H., Loflin, D. C., Rivera-Hudson, N., and Herrington, L. L. (2017). "Let me take a selfie": associations between self-photography, narcissism, and self-esteem. *Psychol. Pop. Media Cult.* 6, 48. doi: 10.1037/ppm0000089
- Belk, R. W. (1975). Situational variables and consumer behaviour. *J. Consum. Res.* 2, 157–164. doi: 10.1086/208627
- Belk, R. W. (1988). Possessions and the extended self. *J. Consum. Res.* 15, 139–168. doi: 10.1086/209154
- Belk, R. W. (2013). Extended self in a digital world. *J. Consum. Res.* 40, 477–500. doi: 10.1086/671052
- Bengry-Howell, A., Wiles, R., Nind, M., and Crow, G. (2011). *A Review of the Academic Impact of Three Methodological Innovations: Netnography, Child-Led Research and Creative Research Methods*. Southampton: University of Southampton.
- Blüthm, A. (2016). Managing change at the Groninger Museum. *Mus. Manage. Curatorship* 31, 96–101. doi: 10.1080/09647775.2016.1139358
- Bourgeois, P., and Hess, U. (2008). The impact of social context on mimicry. *Biol. Psychol.* 77, 343–352. doi: 10.1016/j.biopsycho.2007.11.008
- Burness, A. (2016). "New ways of looking: self-representational social photography in museums," in *Museums and Visitor Photography: Redefining the Visitor Experience*, ed. T. Stylianou-Lambert (Boston, MA: Museums Etc), 152–183.
- Carbon, C.-C. (2017). Universal principles of depicting oneself across the centuries: from renaissance self-portraits to selfie-photographs. *Front. Psychol.* 8:245. doi: 10.3389/fpsyg.2017.00245
- Chartrand, T. L., and Bargh, J. A. (1999). The chameleon effect: the perception-behavior link and social interaction. *J. Pers. Soc. Psychol.* 76, 893. doi: 10.1037/0022-3514.76.6.893
- Dhir, A., Pallesen, S., Torsheim, T., and Andreassen, C. S. (2016). Do age and gender differences exist in selfie-related behaviours? *Comput. Hum. Behav.* 63, 549–555. doi: 10.1016/j.chb.2016.05.053
- Dimberg, U., Thunberg, M., and Elmehed, K. (2000). Unconscious facial reactions to emotional facial expressions. *Psychol. Sci.* 11, 86–89. doi: 10.1111/1467-9280.00221
- Dinhopl, A., and Gretzel, U. (2016). Selfie-taking as touristic looking. *Ann. Tour. Res.* 57, 126–139. doi: 10.1016/j.annals.2015.12.015
- Falk, J. H. (2006). An identity-centered approach to understanding museum learning. *Curator Mus. J.* 49, 151–166. doi: 10.1111/j.2151-6952.2006.tb00209.x
- Foster, M. (2014). Online and plugged in? *Public Hist. Rev.* 21, 1–19.
- Fox, J., and Rooney, M. (2015). The Dark Triad and trait self-objectification as predictors of men's use and self-presentation behaviors on social networking sites. *Pers. Individ. Diff.* 76, 161–165. doi: 10.1016/j.paid.2014.12.017
- Goffman, E. (1959). *The Presentation of Self in Everyday Life*. Garden City, NY: Anchor.
- Hess, A. (2015). Selfies: the selfie assemblage. *Int. J. Commun.* 9, 18.
- Hollenbeck, C. R., Peters, C., and Zinkhan, G. M. (2008). Retail spectacles and brand meaning: insights from a brand museum case study. *J. Retailing* 84, 334–353. doi: 10.1016/j.jretai.2008.05.003
- Howard, J. A. (2000). Social psychology of identities. *Annu. Rev. Sociol.* 26, 367–393. doi: 10.1146/annurev.soc.26.1.367
- Hromack, S. (2014). *The Museum Selfie*. Available at: [http://whitney.org/WatchAndListen?play\\_id=916](http://whitney.org/WatchAndListen?play_id=916)
- Iqani, M., and Schroeder, J. E. (2015). # selfie: digital self-portraits as commodity form and consumption practice. *Consumpt. Mark. Cult.* 19, 1–11.
- Johnson, L., Adams Becker, S., Estrada, V., and Freeman, A. (2015). *The NMC Horizon Report: 2015 Museum Edition*. Austin, TX: New Media Consortium.
- Jones, A. (2002). The 'eternal return': self-portrait photography as a technology of embodiment. *Signs* 27, 947–978. doi: 10.1086/339641
- Joy, A., and Sherry, J. F. (2003). Speaking of art as embodied imagination: a multisensory approach to understanding aesthetic experience. *J. Consum. Res.* 30, 259–282. doi: 10.1086/376802
- Karwowski, M., and Brzeski, A. (2017). Selfies and the (creative) self: a diary study. *Front. Psychol.* 8:172. doi: 10.3389/fpsyg.2017.00172
- Kozinets, R. V. (2002). The field behind the screen: using netnography for marketing research in online communities. *J. Mark. Res.* 39, 61–72.
- Kozinets, R. V. (2015). *Netnography: Redefined*. London: Sage. doi: 10.1002/9781118767771.wbiedcs067
- Kozinets, R. V. (2017). "Netnography: radical participative understanding for a networked communications society," in *Handbook of Qualitative Research on Psychology*, eds C. Willig and W. Stainton-Rogers (London: Sage), 376–382.
- Kozinets, R. V., Sherry, J. F., DeBarry-Spence, B., Duhachek, A., Nuttavuthisit, K., and Storm, D. (2002). Themed flagship brand stores in the new millennium: theory, practice, prospects. *J. Retailing* 78, 17–29. doi: 10.1016/S0022-4359(01)00063-X
- Kozinets, R. V., Sherry, J. F., Storm, D., Duhachek, A., Nuttavuthisit, K., and DeBarry-Spence, B. (2004). Ludic agency and retail spectacle. *J. Consum. Res.* 31, 658–672. doi: 10.1086/425101
- Lacan, J. (1977). *Ecrits, A Selection*, trans. A. Sheridan. London: Tavistock.
- Lakoff, G., and Johnson, M. (1999). *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought*. New York, NY: Basic books.
- Larsen, J., and Sandbye, M. (2014). "The (im)mobile life of digital photographs: the case of tourist photography," in *Digital Snaps: The New Face of Photography*, eds J. Larsen and M. Sandbye (New York, NY: Palgrave-Macmillan), 25–46.
- Larson, K. (2014). A subtlety, or the marvelous sugar baby. *Curator* 57, 505–511. doi: 10.1111/cura.12088
- Leder, H., Belke, B., Oeberst, A., and Augustin, D. (2004). A model of aesthetic appreciation and aesthetic judgments. *Br. J. Psychol.* 95, 489–508. doi: 10.1348/0007126042369811
- Lee, J. A., and Sung, Y. (2016). Hide-and-seek: narcissism and "selfie"-related behavior. *Cyberpsychol. Behav. Soc. Netw.* 19, 347–351. doi: 10.1089/cyber.2015.0486
- Levin, A. (2014). *The Selfie in the Age of Digital Recursion. InVisible Culture*, (20). Available at: <http://ivc.lib.rochester.edu/category/issues/archives/issue-20/> [accessed March 1, 2017].
- Markus, H., and Nurius, P. (1986). Possible selves. *Am. Psychol.* 41, 954. doi: 10.1037/0003-066x.41.9.954
- McCracken, G. (1987). "Advertising: meaning or information," in *NA-Advances in Consumer Research*, Vol. 14, eds M. Wallendorf and P. Anderson (Provo, UT: Association of Consumer Research), 121–124.

- Mick, D. G., and Buhl, C. (1992). A meaning-based model of advertising experiences. *J. Consum. Res.* 19, 317–338. doi: 10.1086/209305
- Miller, P. J., Hengst, J. A., and Wang, S. (2003). "Ethnographic methods: applications from developmental cultural psychology," in *Qualitative Research in Psychology: Expanding Perspectives in Methodology and Design*, eds P. M. Camic, J. E. Rhodes, and L. Yardley (Washington, DC: American Psychological Association), 219–242. doi: 10.4135/9781412986281.n109
- Molz, J. G. (2012). *Travel Connections: Tourism, Technology, and Togetherness in a Mobile World*. New York, NY: Routledge.
- Mukherjee, S., Salter, P. S., and Molina, L. E. (2015). Museum spaces as psychological affordances: representations of immigration history and national identity. *Front. Psychol.* 6:692. doi: 10.3389/fpsyg.2015.00692
- Murray, D. C. (2015). Notes to self: the visual culture of selfies in the age of social media. *Consumpt. Mark. Cult.* 18, 490–516. doi: 10.1080/10253866.2015.1052967
- Nationalpost.com (2015). *Snap happy?: A Trip to the Selfie Museum in Manila, the Selfie Capital of the World*. Available at: [http://news.nationalpost.com/arts/weekend-post/snap-happy-a-trip-to-the-selfie-museum-in-manila-the-selfie-capital-of-the-world?\\_lsa=79e4-1edb](http://news.nationalpost.com/arts/weekend-post/snap-happy-a-trip-to-the-selfie-museum-in-manila-the-selfie-capital-of-the-world?_lsa=79e4-1edb) [accessed October 30, 2016].
- Orsolini, L., Papanti, G. D., Francesconi, G., and Fabrizio, S. (2015). Mind navigators of chemicals' experimenters? A web-based description of E-psychonauts. *Cyberpsychol. Behav. Soc. Netw.* 18, 296–300. doi: 10.1089/cyber.2014.0486
- Papacharissi, Z. (ed.) (2010). *A Networked Self: Identity, Community, and Culture on Social Network Sites*. New York, NY: Routledge.
- Pekarik, A. J., Doering, Z. D., and Karns, D. A. (1999). Exploring satisfying experiences in museums. *Curator* 42, 152–173. doi: 10.1111/j.2151-6952.1999.tb01137.x
- Pounders, K., Kowalczyk, C. M., and Stowers, K. (2016). Insight into the motivation of selfie postings: impression management and self-esteem. *Eur. J. Mark.* 50, 1879–1892. doi: 10.1108/EJM-07-2015-0502
- Presi, C., Maehle, N., and Kleppe, I. A. (2016). Brand selfies: consumer experiences and marketplace conversations. *Eur. J. Mark.* 50, 1814–1834. doi: 10.1108/EJM-07-2015-0492
- Qiu, L., Lu, J., Yang, S., Qu, W., and Zhu, T. (2015). What does your selfie say about you? *Comput. Hum. Behav.* 52, 443–449. doi: 10.1016/j.chb.2015.06.032
- Rettberg, J. W. (2014). *Seeing Ourselves Through Technology: How we Use Selfies, Blogs and Wearable Devices to See and Shape Ourselves*. New York, NY: Palgrave Macmillan.
- Rokka, J., and Canniford, R. (2016). Heterotopian selfies: how social media destabilizes brand assemblages. *Eur. J. Mark.* 50, 1789–1813. doi: 10.1108/EJM-08-2015-0517
- Rounds, J. (2006). Doing identity work in museums. *Curator* 49, 133–150. doi: 10.1111/j.2151-6952.2006.tb00208.x
- Schau, H. J., and Gilly, M. C. (2003). We are what we post? Self-presentation in personal web space. *J. Consum. Res.* 30, 385–404. doi: 10.1086/378616
- Schroeder, J. E. (2002). *Visual Consumption*. New York, NY: Routledge.
- Schroeder, J. E. (2013). *Snapshot Aesthetics and the Strategic Imagination*. In *Visible Culture*, (18). Available at: <https://tinyurl.com/k3mtwot> [accessed March 1, 2017].
- Senft, T. M., and Baym, N. K. (2015). Selfies introduction~ What does the selfie say? Investigating a global phenomenon. *Int. J. Commun.* 9, 19.
- Sorokowski, P., Sorokowska, A., Oleszkiewicz, A., Frackowiak, T., Huk, A., and Pisanski, K. (2015). Selfie posting behaviours are associated with narcissism among men. *Pers. Individ. Diff.* 85, 123–127. doi: 10.1016/j.paid.2015.05.004
- Sung, Y., Lee, J. A., Kim, E., and Choi, S. M. (2016). Why we post selfies: understanding motivations for posting pictures of oneself. *Pers. Individ. Diff.* 97, 260–265. doi: 10.1016/j.paid.2016.03.032
- Ustuner, T., and Holt, D. B. (2007). Dominated consumer acculturation: the social construction of poor migrant women's consumer identity projects in a Turkish squatter. *J. Consum. Res.* 34, 41–56. doi: 10.1086/513045
- Venkatesh, A., and Meamber, L. A. (2006). Arts and aesthetics: marketing and cultural production. *Mark. Theory* 6, 11–39. doi: 10.1177/1470593106061261
- Venkatesh, A., and Meamber, L. A. (2008). The aesthetics of consumption and the consumer as an aesthetic subject. *Consumpt. Mark. Cult.* 11, 45–70. doi: 10.1080/10253860701799983
- Wang, R., Yang, F., and Haigh, M. M. (2017). Let me take a selfie: exploring the psychological effects of posting and viewing selfies and groupies on social media. *Telematics Inform.* 34, 274–283. doi: 10.1016/j.tele.2016.07.004
- Warfield, K. (2014). *Making Selfies/Making Self: Digital Subjectivities in the Selfie*. Available at: <http://kora.kpu.ca/facultypub/8/> [accessed February 16, 2015].
- Wendt, B. (2014). *The Allure of the Selfie. Instagram and the New Self-Portrait*. Amsterdam: Notebooks.

**Conflict of Interest Statement:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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