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Registered Report

Selfies reflect actual personality – Just like photos or short videos in standardized lab conditions ☆

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ABSTRACT

Social media sites are overflowing with millions of selfies, because people increasingly share what they do and who they are with the rest of the world. We examined whether self-expressions based on selfies elicit enhanced, consensual and accurate interpersonal perceptions compared to commonly employed laboratory conditions. Perceived narcissism was relatively higher and conscientiousness lower when ratings were based on selfies. This effect did not extend to the accuracy of ratings: Across all conditions, unacquainted observers agreed with each other and their ratings were correlated with a criterion measure of target personality. Except for agreeableness and self-esteem, accuracy correlations were somewhat higher when ratings were based on selfies. Randomization-based exploratory lens-model analyses were conducted to bolster the interpretation of our results.

1. Introduction

The accuracy of personality impressions of strangers has been extensively studied in the lab. We have learnt that people tend to agree with each other when judging the personality of others based on physical appearance – and that these impressions are frequently accurate (Albright, Kenny, & Malloy, 1988; Borkenau & Liebler, 1992, 1993; Borkenau, Brecke, Möttig, & Paelecke, 2009; Gosling, Ko, Mannarelli, & Morris, 2002; Naumann, Vazire, Rentfrow, & Gosling, 2009). These findings have been generalized to the context of online self-expression, which is now an essential source of first impressions (Inglehart & Oyserman, 2004). Solely based on our social media profiles, strangers are able to accurately judge our personality (Back et al., 2010; Fernandez, Levinson, & Rodebaugh, 2012; Ivcevic & Ambady, 2012; Marcus, Machilek, & Schütz, 2006; Stopfer, Egloff, Nestler, & Back, 2014; Tskhay & Rule, 2014; Vazire & Gosling, 2004) and associated accuracy scores generally fall between the accuracy estimates for laboratory based zero-acquaintance and ratings provided by someone who knows the target very well (Vazire & Gosling, 2004).

One exceptionally interesting area of online self-disclosure are selfies, which have become the all-encompassing term for digital self-portraits backed up by the eruption of smartphone cameras and photo-sharing platforms. They remarkably illustrate how online self-expression is blurring lines of privacy limits, because their owners share the most intimate and private moments of their lives with the rest of the world (Murray, 2015; Sung, Lee, Kim, & Choi, 2016). While much of the previous research has focused on aspects of strategic self-presentation (e.g., selective self-disclosure; Schlenker, 1980) in the context of selfie-posting behaviors, the available evidence on the value of selfies for consensual and accurate personality judgments is less conclusive.

According to models of self-presentation (e.g., Schlenker, 1980) people tend to regulate the impressions they make on others. In either self-promoting (i.e., emphasizing own achievements and aptitudes) or selectively self-disclosing ways they carefully monitor what information about themselves they convey. These strategies help people to present themselves in more laudatory terms, creating a likeable image and earning appreciation from others (e.g., Sedikides, 1995; Tice, Butler, Muraven, & Stillwell, 1995). In line with those frameworks, frequently observed ways of self-representation on social media give the impression to be performative and unusually analogous to visual (self-)representations in commercials (Veum & Undrum, 2018). Specifically – and opposed to other kinds of photographs –, selfies contain stereotypic poses (e.g., duck face, posing in front of a mirror) that often are perceived to mimic celebrity prototypes, possibly concealing expressions of one's *true* personality (Lobinger & Brantner, 2015).

This tendency may explain why much of the content in selfies has been observed to be covered by behavioral indicators of

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extraversion (i.e., expressions of happiness and an overtly positive physical appearance; Pounders, Kowalczyk, & Stowers, 2016). Likely, such a self-centered, potentially immodest self-presentational mode (Re, Wang, He, & Rule, 2016), evokes more extraverted evaluations of personality. Krämer et al. (2017), for instance, compared mean levels of perceived personality traits (i.e., ratings of unacquainted strangers) based on selfies to photos that were taken by someone else. Relative to the latter, ratings of the same individuals yielded consistently higher extraversion scores, but also more negative evaluations of personality when judges had to base their decisions on selfies (i.e., less open to new experiences, more narcissistic). Likewise, Re et al. (2016) found that external judges rated targets as less likable and more narcissistic in their selfies than in photos taken by others.

While this kind of analysis demonstrated that the mean-level of personality ratings is systematically different (e.g., more extraverted) than that from a benchmark condition, it does not necessarily imply that these ratings are accurate, i.e., that the personality judgments correlate with a criterion measure of personality. Mean-level ratings and accuracy estimates both are empirically, as well as conceptually, unrelated (e.g., Funder & Colvin, 1997; Gagné & Lydon, 2004). Consider for instance raters A and B. Both are asked to assess C's levels of neuroticism, extraversion, openness and self-esteem on a scale ranging from 1 (does not describe C well) to 7 (describes C very well). C's self-report on these attributes looks as follows: 1, 2, 3, 4. A's ratings (4, 5, 6, 7) are elevated as compared to B's which are 3, 4, 5, 6 (or B's ratings are reduced as compared to A's). Yet despite their differences in magnitude, both are congruent, because both sufficiently map onto C's self-report, maintaining the relative value of individual differences (i.e., rank-order consistency; Fletcher, 2002). This example suggests two things: First, that mean placements of each judgment and accuracy estimates are different. Second, it also implies that both can exist independently: Personality judgments – even though they might be skewed – still (can) move in tandem with the accuracy criterion. Though compositional features of selfies may eventually lead to skewed personality judgments of certain traits (Krämer et al., 2017; Re et al., 2016), targets may still maintain their relative placement to each other on that trait judgment, because less extraverted persons would still be perceived as less extraverted than those who score high on that trait.

Despite the fact some studies suggest that selfies contain cues that relate to their owners' personality (e.g., Musil, Preglej, Ropert, Klasinc, & Babič, 2017; Guntuku, Qiu, Roy, Lin, & Jakhetiya, 2015), their findings do not allow concluding how valuable selfies are to spontaneous personality judgments, particularly in comparison to other, well studied laboratory contexts. Much of the limits concern features of the study design, such as inadequate sampling rates of representative stimuli, the choice of arbitrary behavioral cues and the absence of meaningful control conditions (Qiu, Lu, Yang, Qu, & Zhu, 2015). Selfies may approximate the real-world conditions of individuals to greater – or at least comparable – extents as laboratory settings do, because they often are snapshots from our daily routines that reflect identity claims common to offline life (i.e., ecological validity; Deeb-Swihart, Polack, Gilbert, & Essa, 2017). Certainly, clues to our private lives are valid predictors of our personality (e.g., Gosling, Gaddis, & Vazire, 2008). Therefore, selfies can be assumed to elicit physical cues that are indicative of individuals' personality traits, which in turn may be used by observers to form accurate interpersonal impressions. Personality judgments elicited by selfies, therefore, should reflect personality more accurately than – or at least to comparably high extents as – usually applied forms of self-expression in the lab.

1.1. The current study

The current study seeks to assess the accuracy of selfie-based trait-perceptions for narcissism and self-esteem in addition to the five broad personality dimensions of the Big-5. While the Big-5 have been commonly assessed in the context of interpersonal judgment (Borkenau & Liebler, 1992, 1993; Naumann et al., 2009), both narcissistic traits and self-esteem have been discussed to be central vehicles of online self-presentation (e.g., Barry, Doucette, Loflin, Rivera-Hudson, & Herrington, 2017; Bergman, Fearrington, Davenport, & Bergman, 2011; Fox & Rooney, 2015; Sorokowska et al., 2016; Sorokowski et al., 2015; Weiser, 2015).

More than in any laboratory self-expressive situation, creating and perpetuating positive self-images has been discussed to be key to selfie-posting behaviors (e.g., Utz, Tanis, & Vermeulen, 2012). We, therefore, investigated whether first impressions derived from selfies yield skewed mean-level trait perceptions (*Question 1: Is personality perceived distinctly on the basis of selfies?*) in comparison to commonly employed experimental conditions in the lab (i.e., portrait, full body image, self-introductory video). These conditions were chosen to resemble those from the comprehensive work of zero-acquaintance interpersonal perception and hence provide a valid point of reference for average accuracy scores (e.g., Borkenau et al., 2009; Borkenau & Liebler, 1992; Naumann et al., 2009).

In a next step, we examined if these perceptions were consensual (*Question 2: Do people consent in their perceptions of personality based on selfies?*) and accurate (*Question 3: Do selfies reflect (common perceptions of) actual personality?*). While the examination of agreement levels between personality judgments (i.e., consensus) can be regarded as a correlate or – perhaps – indicator of accuracy, it may not necessarily be related to what the person is truly like (e.g., Letzring, Wells, & Funder, 2006). Accuracy, in contrast, is broadly defined as the level of agreement between personality judgments and a criterion measure. One often used criterion is self-other agreement (i.e., the degree to which targets' self-reports correlate with observers' ratings of targets; for meta-analytic findings, e.g., Connelly & Ones, 2010). Therefore, examining correlational relationships between observers' judgments and a criterion measure (e.g., Blackman & Funder, 1998; Kenny, Albright, Malloy, & Kashy, 1994) will allow us to estimate the extent of accuracy that is achieved on first impressions derived from selfies. Because selfies provide huge amounts of personal information that are easily accessible, we expected accuracy correlations to be strong across all dimensions of personality. In a subsidiary step, we further examined the relative diagnosticity of interpersonal judgments based on selfies by comparing the magnitude of accuracy estimates for each trait across different self-expressive conditions (selfie, portrait, full body, video; *Question 4: Are personality judgments based on selfies more or less accurate than those based on standardized in-lab conditions?*).

To understand when and why individuals' personality can be accurately inferred by unacquainted others, models of interpersonal judgment (e.g., the Realistic Accuracy Model (RAM), Funder (1995) which is an extension of Brunswik's (1955) lens model) provide a general framework. According to the RAM (Funder, 1995), personality can be inferred accurately by observers in cases where the situation allows the target to express the trait and the observer to utilize cues associated with the trait (cue utilization), the utilized cues meaningfully relate to the target's personality (cue validity). Cue validities were calculated on the basis of correlations between targets' values of individual cues with our accuracy criterion. Cue utilizations were determined by the correlation between cue values and composite ratings provided by the 15 observers. Against this conceptual backdrop, we sought to understand how

accurate personality judgments are achieved on the basis of selfies (*Question 5: What features of selfies reflect actual personality?*).

Our investigation is based on exploratory analyses because previous relevant data on the accuracy of first impressions based on selfies are lacking, particularly in comparison to standardized laboratory-based benchmark conditions. Basing our analyses on a sufficiently large sample size (i.e., ensure adequate power) and applying rigorous tests of robustness of our analyses (i.e., randomization technique) is in line with state-of-the-art recommendations for replicable research (Asendorpf, 2013), helping to focus future research attempts.

2. Method

2.1. Procedure

Targets were asked to participate in a lab session with someone who knew him or her well (composition of acquaintance level: 78%: friends, 22%: partners). During sessions, each of them provided five[1] recent selfies that were uploaded at any social media platform. Upon their arrival at the lab, we first took a standardized full body and portrait picture of both of the participants separately. Immediately after, participants were individually asked to briefly introduce themselves – without any further instructions about the content or length of their self-introductions. Their short speeches were videotaped and ranged in length from 6 to 123 s (M = 26.82, SD = 18.15). At the end of the session, participants provided demographic information and completed personality questionnaires about themselves (i.e., self-reports) and their acquaintance (i.e., informant-reports). Not all measures assessed in this study will be reported, yet are made available in supplementary material.[2] Participants were assured that their ratings would be kept confidential and gave written consent that all picture material (i.e., selfies, full body and portrait pictures) and the self-introductions could be viewed and rated for research purposes.

2.2. Sample size

Two factors guided our final decision for the study's sample size: average effect sizes in accuracy research and practical considerations implied in previous related research. In accuracy research (e.g. Naumann et al., 2009), median levels of effect sizes range from r = .2 to .3 and are r = .21 at average. Based on power analyses, carried out with the R package "pwr", it can be noted that a minimum N of 104 gives a relationship with effect size r = .30 a 80% probability of attaining statistical significance at the .05 level (two-tailed) and the power to detect an effect size r = .25 is almost 80% (.731). Average sample sizes in accuracy research, however, deviate to some extent from those projections and range from 50 to approximately 100 participants (e.g. Back, Schmuckle, & Egloff, 2010: N = 73; Borkenau & Liebler, 1992: N = 100; Hirschmüller, Schmukle, Krause, Back, & Egloff, 2018: N = 99; Naumann et al., 2009: N = 123), presumably to keep rating demands feasible for perceivers, who have to rate each of the personality dimensions in each of the provided stimuli (e.g., in our case: 104[targets] × 5[selfies] × 12[personality dimensions]). Balancing across both criteria and their respective methodological implications, we decided to set our sample size at N > 100. That way we assure to detect effect sizes >.25 with sufficient power, while simultaneously guaranteeing reasonable work load for our raters. Beyond those considerations regarding our primary outcome, we ran additional post-hoc estimations to approximate whether our intraclass-coefficient analyses were sufficiently powered. Based on our study parameters, additional power calculations revealed that the power to detect an effect size ICC = .65 (the smallest ICC in our study) is beyond 80% (.842). Post-hoc power analyses were carried out with the R package "ICC.Sample.Size".

2.3. Targets

All participants (97% students, 3% postgraduates) were recruited from the local campus and were compensated with either money or course credit. Participants in the dyads had known each other for an average of 4.15 (SD = 4.65) years. Self- and informant-ratings of all personality measures showed acceptable internal consistencies (range of alphas: α = .49–α = .90; see Table 1 for a detailed overview) and were sufficiently correlated (range of coefficients: r = .24 for self-esteem to r = .65 for conscientiousness; Table S5). The average-observer accuracy correlations for self- and informant-reported personality traits did not significantly differ from each other, Steiger's Z = −0.07, p = .945. Therefore, both accounts were aggregated to form a composite measure of personality (see Table 1 for an overview of key descriptive values and supplementary Table S5 for extents of self- and informant-agreement for key variables of the study). The final target sample consisted of 104 participants for the selfie, portrait and full body conditions (ages 18–35 years; M = 22.85; SD = 3.25; F: N = 66). The N varies for the video condition because of occasional failures of recording (subsample characteristics: N = 93; ages 18–35 years; M = 22.76; SD = 3.28; F: N = 57).

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jrp.2018.08.007.

2.4. Target personality measures

Targets filled in the German translation of the 15-item Big Five Inventory-SOEP (BFI-S; Schupp & Gerlitz, 2008)[3] on a 7-point scale (1 = strongly disagree to 7 strongly agree). For the measurement of narcissism, we used the German version (Schütz, Marcus, & Sellin, 2004; α = .82) of the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988). Self-esteem was assessed with the German translation of the Rosenberg Self-Esteem Scale (RSES; von Collani & Herzberg, 2003; range of α = .81–.90) which has been reported to be psychometrically equivalent to the US version by Rosenberg (1965; Schmitt & Allik, 2005). Internal consistencies of all questionnaires in our data are comparable to those reported in original publications (see Table 1). Respective informant-reports of all measures consisted of the same items as the self-reports, asked from a third-person perspective and have been used in previous studies on accuracy judgments at zero-acquaintance (e.g., Hirschmüller et al., 2018).

2.5. Raters

2.5.1. Observer personality ratings

15 female students (ages 20–28 years; M = 24.41; SD = 2.38) provided zero-acquaintance ratings of targets' personality. Their

[1] We chose to ask targets to provide us with *five* selfies for two major reasons: First, we wanted to ensure that the selection of selfies is not affected by interindividual differences in selfie-posting behaviors. The number of five selfies that were sampled per target appeared to be large enough to capture a variety of behaviors and associated cues and small enough so that the vast majority of participants could provide us with a selection of their *recent* posts (*see* Fox and Rooney (2015) *for average numbers of posted images per week*). At the same time, this approach ensured that our sample remained representative for the general population and was not biased towards those that frequently post their selfies. Second, because our ratings were obtained from human coders, we had to guarantee that the amount of stimuli per target was feasible and that judgments would not be overshadowed by fatigue and loss of motivation, eventually leading to a drop in rating performance.

[2] Due to semantic similarities between the BFI and zero-acquaintance personality judgments, we chose to rely on self- and informant-ratings of the BFI in our report. Additional, cross-validating findings based on the NEO-FFI and an aggregate of the BFI and NEO-FFI are made available on OSF.

Table 1
Means, standard deviations, sample sizes, internal consistencies and mean differences across genders for key self- and informant-reported variables in the study.

Variable	Total sample			Females			Males			Test statistics	
	N	*M* (*SD*)	α	*N*	*M* (*SD*)	α	*N*	*M* (*SD*)	α	*t*	*p*
Self-report											
Extraversion	104	5.36 (1.1)	.75	66	5.20 (0.97)	.68	37	5.32 (1.18)	.85	.56	.572
Neuroticism	104	3.98 (1.33)	.77	66	4.34 (1.28)	.77	37	3.29 (1.02)	.59	**−4.29**	**.000**
Openness	104	5.17 (1.08)	.60	66	5.28 (1.06)	.73	37	4.99 (1.11)	.49	−1.30	.197
Agreeableness	104	5.44 (.88)	.49	66	5.50 (.82)	.42	37	5.08 (.87)	.57	**−2.43**	**.017**
Conscientiousness	104	5.05 (1.1)	.72	66	5.14 (.99)	.77	37	4.61 (1.05)	.62	**−2.54**	**.013**
Narcissism	104	13.11 (5.77)	.81	66	11.53 (5.38)	.81	38	15.84 (5.45)	.74	**3.92**	**.000**
Self-Esteem	104	2.46 (.37)	.77	66	2.40 (.41)	.80	38	2.56 (.26)	.53	**2.27**	**.012**
Informant-report											
Extraversion	103	5.6 (1.2)	.82	66	5.45 (1.16)	.79	37	5.61 (1.19)	.88	.70	0.46
Neuroticism	103	3.49 (1.36)	.72	66	3.87 (1.32)	.72	37	2.83 (1.08)	.56	**−4.11**	**0.00**
Openness	103	5.12 (1.21)	.73	66	5.13 (1.20)	.78	37	5.09 (1.24)	.67	−.18	0.85
Agreeableness	103	5.66 (1.06)	.68	66	5.79 (.93)	.60	37	5.31 (1.19)	.76	**−2.16**	**0.03**
Conscientiousness	103	5.51 (1.1)	.76	66	5.65 (1.01)	.73	37	5.11 (1.15)	.72	**−2.53**	**0.01**
Narcissism	104	15.2 (7.13)	.86	66	12.99 (6.05)	.82	38	19.05 (7.30)	.87	**4.34**	**0.00**
Self-Esteem	104	2.44 (.37)	.78	66	2.41 (.38)	.78	38	2.49 (.35)	.78	1.11	0.27
Composite score											
Extraversion	104	5.48 (0.99)	.81	66	5.33 (.92)	.80	38	5.45 (1.03)	.85	.62	0.54
Neuroticism	104	3.75 (1.17)	.80	66	4.12 (1.11)	.78	38	3.09 (0.89)	.63	**−4.88**	**0.00**
Openness	104	5.15 (1.01)	.78	66	5.21 (.97)	.80	38	5.04 (1.08)	.77	−.86	0.39
Agreeableness	104	5.55 (0.81)	.69	66	5.65 (.73)	.64	38	5.20 (0.84)	.71	**−2.83**	**0.01**
Conscientiousness	104	5.29 (0.99)	.83	66	5.39 (.88)	.81	38	4.88 (1.04)	.82	**−2.66**	**0.01**
Narcissism	104	14.15 (5.70)	.90	66	12.26 (4.84)	.87	38	17.45 (5.63)	.89	**4.96**	**0.00**
Self-Esteem	104	2.45 (0.29)	.79	66	2.40 (.31)	.81	38	2.53 (0.23)	.68	**2.16**	**0.03**

Note. *r* denotes the correlation between self- and informant-reports; The composite measure was based on the average of informant ratings with the targets' self-ratings. Mean differences significant at $p < 0.05$ are boldfaced.

judgments were obtained in four blocks. Ratings were made consecutively across conditions, i.e., first all selfies were rated, followed by all portraits, full-body images and – finally – all self-introductory videos. In each block one single trial consisted of the presentation of a stimulus (i.e., depiction of the target participant) and was followed by our set of items for zero-acquaintance personality judgments. While the order of the blocks was fixed (i.e., selfies, portrait pictures, full-body pictures, videos), the presentation of individual target stimuli within those blocks was randomized. To assure that the repeated measures approach did not interfere with the internal validity of our study design, we made sure that rating sessions were spread out sufficiently across time, with at least one week breaks between different block ratings. Observers were unacquainted with the target participants, and each observer rated all 104 targets using two third-person items from each dimension of the BFI (e.g., "This person is sometimes rude to others"), NPI (e.g., "This person is narcissistic") and RSES (e.g., "All in all, this person is inclined to feel that she/he is a failure"). Our choice of BFI rating-items was based on the 10 Item Big Five Inventory (Rammstedt, Kemper, Klein, Beierlein, & Kovaleva, 2013), which provides two items per dimension per se. In the case of the NPI and RSES we opted for items that have been applied in previous publications on zero-acquaintance ratings of personality (NPI: Naumann et al., 2009; RSES: Hirschmüller et al., 2018). Observer ratings were averaged across the two items per dimension and provided on block-wise separate scales ranging from 1 (strongly disagree) to 6 (strongly agree). No rater reported recognition of any target.

2.5.2. Cues

Selfies, portraits, full body pictures and self-introductory videos were all used to obtain multiple cue values for each target by two independent and trained observers. To inform our cue selection, we selected those from the few studies that examined the link between personality and appearance related cues and cues typically expressed and perceived in selfies (e.g., Lobinger & Brantner, 2015; Qiu et al., 2015; e.g., duckface, selfie in mirror). Because we were particularly interested in coding the static appearance (e.g., style of dress; body appearance), we further drew on cues typically expressed and perceived in zero-acquaintance situations (e.g., Back et al., 2010; Borkenau & Liebler, 1992). In sum, we selected 25 (12 selfie-specific and 13 more general) cues of physical appearance and nonverbal behavior of perceivable information theoretically and empirically deemed relevant to visual self-presentations in the context of social media. Both sets of cues are depicted in Table 4. All cues that have been rated in this study will be reported and respective rater agreement is displayed in supplementary Tables S3a and S3b.

3. Results

3.1. Question 1: Is personality perceived distinctly on the basis of selfies?

Repeated measures ANOVAs indicated a main effect of condition on ratings of all personality traits (range of *F*-values: 5.77–46.45; see Table 2). Breaking down experimental variation into component parts, Bonferroni corrected mean comparisons were carried out to specify where exactly differences between groups occurred. Supplementary Table S1 gives a detailed overview of mean differences and exact *p*-values. In line with previous findings and compared to the other conditions of our study, levels of narcissism were higher when judgements were based on selfies ($F(3, 92) = 43.12$, $p < 0.0001$, $d = 1.36$). Levels of perceived extraversion were evenly elevated when rated on the basis of selfies and videos ($F(3, 92) = 5.77$, $p < 0.001$, $d = 0.50$) and while both were higher than those based on full-body images or portraits, only ratings based on selfies differed significantly from those based on the other two conditions (see Table 2). Relative to the other conditions, levels of perceived conscientiousness and openness were lowest when ratings were based on selfies (C: $F(3, 92) = 46.45$, $p < 0.0001$, $d = 1.41$; O: ($F(3, 92) = 6.39$, $p = 0.003$, $d = .524$). In the case of conscientiousness, mean-levels in the selfie condition were significantly lower in comparison to all other experimental

Table 2
Repeated measures comparison of mean-values of zero-acquaintance personality judgments in each condition.

	Experimental condition									
	Selfie		Portrait		Full body		Video		Test statistics	
Trait	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*
Extraversion	4.30^{a}	.38	4.11^{b}	.50	4.11^{b}	.54	$4.24^{a,b}$	.56	**5.77**	**.001**
Neuroticism	$3.02^{a,b}$	.32	2.99^{a}	.35	3.11^{b}	.38	2.91^{c}	.42	**8.57**	**<.001**
Openness	3.38^{a}	.46	3.42^{a}	.50	3.43^{a}	.47	3.58^{b}	.67	**6.30**	**.003**
Agreeableness	3.73^{a}	.30	3.59^{c}	.39	$3.71^{a,b}$	.39	3.88^{d}	.41	**18.03**	**<.001**
Conscientiousness	3.96^{a}	.46	4.14^{c}	.45	4.13^{c}	.48	4.41^{b}	.44	**46.45**	**<.001**
Narcissism	2.74^{a}	.47	2.24^{c}	.40	2.36^{b}	.48	$2.22^{b,c}$	.55	**43.12**	**<.001**
Self-Esteem	4.82^{a}	.23	4.78^{a}	.36	4.76^{a}	.32	5.06^{b}	.27	**40.40**	**<.001**

Note. Due to occasional failures of video recording and repeated measures-based listwise deletion the final *N* for this analysis was 93; $N_{observers}$ = 15; in the case of full-body images, ratings of only 14 observers were available due to operational reasons; a, b, c, d = groups with different letters indicate a significant group differences from each other at ≤.05 (Bonferroni corrected); see supplementary Table S1 for a detailed overview of mean differences and exact *p*-values.
Mean differences significant at $p < 0.05$ are boldfaced.

conditions. Means of perceived openness obtained in the selfie-condition differed only in comparison to those based on video snippets. For perceived neuroticism, the lowest rating levels arose in the video condition and these levels were significantly lower than those based on selfies or full-body images (while the latter two didn't differ from each other; $F(3, 92) = 8.57$, $p < 0.0001$, $d = .607$). Levels of perceived agreeableness were comparably high in the selfie, full-body and video condition, but only those based on videos differed significantly from all other ratings; in addition ratings based on selfies differed significantly from those obtained on the basis of portraits ($F(3, 92) = 18.03$, $p < 0.0001$, $d = .881$). Furthermore, a significant difference was found for perceived self-esteem ($F(3, 92) = 40.40$, $p < 0.0001$, $d = 1.32$). Compared to all other conditions, the highest values of perceived self-esteem emerged in the video condition, while ratings based on selfies, portraits and full body imaged did not differ from each other.

3.2. Question 2: Do people consent in their perceptions of personality based on selfies?

Support for our second question was provided by pairwise intraclass correlations (ICC; Shrout & Fleiss, 1979) of personality ratings among all observers. Overall, average-rater correlations (*ICC* (2, *k*)) ranged from .66 for neuroticism to .83 for extraversion (averaged ICC across traits: .72). They were in the statistically significant range, comparable to the coefficients obtained in the other three conditions and resembled figures reported in previous studies of interpersonal perception (e.g., Borkenau & Liebler, 1992, 1993; Naumann et al., 2009). Table 3 gives a detailed overview of agreement scores across experimental conditions and perceived personality traits.

3.3. Question 3: Do selfies reflect (common perceptions of) actual personality?

We conceptualized accuracy as the extent of shared variance between our accuracy criterion (i.e., the aggregate of self- and informant-ratings) and personality ratings by unacquainted observers, i.e., the correlation between aggregated overall perceiver ratings and the accuracy criterion. The intraclass correlations (ICC(2, 1); Shrout & Fleiss, 1979) reliability for the self-informant aggregates was strong and significant on levels $p < .0001$. ICC (2,k) reliabilities for the criterion measures were as follows: Extraversion ICC (2,*k*) reliabilities for the criterion measures were as follows: Extraversion: .81; Neuroticism: .79; Openness: .72; Agreeableness: .65; Conscientiousness: .77; Narcisissm: .88; Self-Esteem: .81 (mean .78).

All correlations were mostly moderate in size (Cohen, 1992). Across traits, accuracy coefficients varied to some degree. Partly consistent with previous work, aggregated observers' ratings were accurate at above chance levels (i.e., within the range of $r = .26$ and .42; *p*-values ≤.05) for extraversion, neuroticism, openness, narcissism and the largest coefficients emerged for conscientiousness. In contrast, as depicted in Table 3, raters were not accurate at judging agreeableness ($r = .15$, $p = .135$) and self-esteem ($r = .14$, $p = .143$). Steiger's Z formula for the comparison of elements of a correlation matrix were applied to test whether differences between (dependent) correlations were statistically significant (Meng, Rosenthal, & Rubin, 1992; Steiger, 1980). Accuracy coefficients for conscientiousness differed significantly from those of agreeableness ($Z = 2.16$, $p = .031$) and self-esteem ($Z = -2.18$, $p = .029$).[3]

3.4. Question 4: Are personality judgments based on selfies more accurate than those based on standardized in-lab conditions?

We assumed that – compared to the other conditions – selfies contained clues to the private life of the target individuals. This advantage should then allow observers to form accurate personality judgments that are comparable to those in the other conditions. The extent of accuracy for each personality trait across conditions is displayed in Table 3. While on average, the highest correlation coefficients emerged for selfie-based personality judgments (selfies: $r = .26$; portraits: $r = .15$; full-body: $r = .22$; video: $r = .22$), and were particularly enhanced for conscientiousness and extraversion, no significant and meaningful differences between judgments based on selfies and those from commonly applied lab-conditions arose. Supplementary Tables S2a and S2b provide detailed Z-values and corresponding exact p-levels across all possible between condition comparisons that include personality judgments based on selfies.

[3] One of the reviewers raised an interesting point about the possibility to carry out multiple regression analyses, in order to learn more about the individual – and perhaps incremental – predictive validity of the four judgment modalities for our accuracy criterion. In turn, we ran additional analyses, yet none of the other experimental conditions explained variance in our accuracy outcome over and above what has been established in the selfie condition. In other words, in our stepwise regression, not any of the remaining predictors contributed significantly to the selfie condition and were excluded from further model specifications. Importantly, overall close to 1 VIF factors and tolerance values do not indicate breaches of multicollinearity among our predictor variables, which – once more – speaks to the internal validity of our repeated measures design. This pattern of results neatly replicates our main findings, however those analyses do not add further information beyond what is established on the basis of our primary accuracy outcome and respective Fisher's Z-tests of correlation coefficients. Respective analyses will, therefore, be uploaded to our open science project bin.

Table 3
Consensus and accuracy: Agreement among observers based on selfies and standardized in-lab conditions and correlations with actual personality.

Variable	Selfies			Portrait			Fullbody			Video		
	ICC	*r*	*p*	*ICC*	*r*	*p*	*ICC*	*r*	*p*	*ICC*	*r*	*p*
Extraversion	.81	.26	.008	.80	.12	.219	.81	.17	.081	.83	.2	.052
Neuroticism	.68	.23	.020	.65	.11	.288	.63	.27	.006	.70	.12	.274
Openness	.81	.28	.005	.79	.12	.211	.81	.19	.059	.80	.34	.001
Agreeableness	.66	.15	.135	.64	.16	.111	.65	.17	.083	.72	.19	.075
Conscientiousness	.74	.42	.000	.75	.31	.002	.75	.35	.000	.86	.34	.001
Narcissism	.66	.27	.005	.48	.19	.051	.57	.23	.019	.70	.26	.011
Self-Esteem	.65	.14	.143	.66	.06	.517	.65	.2	.041	.58	.07	.518
average |r|-value		.26	.008		.15	.124		.22	.025		.22	.034

Note: $N = 104$ for the selfie, portrait and full-body condition; due to occasional failure of video recordings: $N = 93$ in the video condition; $N_{observers} = 15$; in the case of full-body images, ratings of only 14 observers were available due to operational reasons; Consensus among observers was calculated using the intraclass correlation (ICC (2, *k*)). Accuracy was determined by correlating observer ratings with the criterion measure of actual personality.

3.5. Question 5: What features of selfies reflect actual personality?

To assess *how* accuracy was achieved when personality ratings were based on selfies, we applied lens model analyses (e.g., Borkenau & Liebler, 1992; Brunswik, 1955) and examined estimates of cue utility and cue validity (see Table 4). To avoid focusing our attention on findings that could merely be measurement noise and given the high number of non-independent statistical tests within our lens model analyses and, therefore, the subsequent rise of results by spurious correlations, we used Sherman and Funder's (2009) randomization test. Here, the chance distribution of significant correlates is assessed across a random 10,000 trials. This allowed us to estimate (1) the average absolute correlation for individual cue validity and utilization scores and (2) whether the number of correlations between the cues and our accuracy criterion (cue validities) or personality ratings (cue utilities) by unacquainted raters respectively was significantly higher than what would be expected by chance (Sherman & Funder, 2009). Tables 4 and 5 summarize the results of the randomization technique for each of the assessed trait separately. In addition, Table 4 details cue validity and cue utility values.

In a subsequent step, we further analyzed which individual cues were used for judgments of which personality dimension in particular. Based on observer ratings we computed cue utilization scores for each single cue (see right section of Table 4). For both, selfie-specific and global physical appearance cues, a substantial number of correlates with observers' judgments emerged across traits. The highest correlations emerged for perceived neuroticism and agreeableness and narcissism. Here the chance of finding 9 (and 8 respectively) significant correlations at the $p < .05$ level was $p < .0001$. For perceived extraversion, conscientiousness, narcissism and self-esteem the chance of finding 6 significant correlations at the $p < .05$ level is $p < .0001$. The least significant correlates emerged for perceived openness, where the chance of finding 3 significant correlations at the $p < .05$ level was $p = .033$. For example, targets rated as extraverted were more likely to post selfies depicted in the mirror ($r = .24$, $p = .013$) or to smile on their self-portrayals ($r = .24$, $p = .012$) and, for instance, less likely to use filters ($r = -.22$, $p = .022$). Interestingly, however, and opposed to our expectations based on previous publications involving personality judgments on the basis of selfies, the highest cue utilizations for smile emerged for conscientiousness ($r = .61$, $p < .0001$), agreeableness ($r = .55$, $p < .0001$), openness ($r = .46$, $p < .0001$), self-esteem ($r = .52$, $p < .0001$) and were all statistically higher than those for extraversion (all *Z* scores >1.75). Targets perceived as neurotic, in contrast, were rated to smile less ($r = -.18$, $p = .060$), post selfies that were taken inside ($r = .39$, $p < .0001$), contain a facial expression with their mouth open ($r = .35$, $p < .0001$) and these cue utilization scores were lest similar to those of narcissism (vector correlation: $r = .01$, $p = .919$). This similarity, however, did not emerge for cue utility ratings based on global physical appearance cues. Overall, regarding the number of significant correlates, a very similar pattern of results emerged on the basis of global cues of physical appearance and is detailed in the last rows of Table 4. As depicted in the right column of Table 4, the high number of significant cue utilization scores across traits resembles the overall structure of findings in the other conditions.

In a next step, we analyzed whether significant and meaningful relations between our personality criterion and expressed cues emerged. Only in the case of global physical appearance cues (see lower part of Table 4) and only for openness, agreeableness and conscientiousness a substantial and statistically significant number of correlations emerged. Here the likelihood of finding 8 (7 and 8 respectively) significant correlations at the $p < .05$ level was $p < .0001$ ($p = .003$ and $p < .0001$ respectively). The magnitude of cue validities were then computed as the average absolute correlation (based on randomization). Average cue validity coefficients of all three traits were comparable in scale ranging from $r = .18$ (Agreeableness) to $r = .21$ (Openness), and reached statistical significance.

Again, this pattern of less and weaker statistically significant correlates was replicated across the remaining for experimental conditions (see left column of Table 5). Overall, absolute average cue validities ranged from $r = .09$ to $r = .20$.

4. Discussion

We sought to examine whether self-expressions based on selfies elicited enhanced (i.e., elevated mean-levels for extraversion or narcissism), consensual and accurate personality ratings, whether accuracy scores are comparable to those acquired under standardized in-lab conditions and how accurate personality judgments are achieved (cue validity, cue utility).

Our results can be summarized briefly. Mean-levels of perceived traits differed across the four experimental conditions, and these perceptions were consensual. All *F* scores (calculated from repeated measures ANOVAs) were at least significant at the $p < 0.001$ level, and there was evidence for a consistent pattern of enhanced positive relations between emotionality and self-presentation behaviors in selfies. In particular, selfie-takers were by and large perceived to be more narcissistic, more extroverted, and less conscientious than in instances where the same individuals were judged on the basis of photos or videos taken by others. Importantly, however, perceived extraversion was equally elevated in the video condition. This suggests that not only trait perceptions change across contexts, but they change meaningfully with the situational characteristics. Both, the selfie and video condition offer

Table 4
Lens model analysis of personality judgments based on selfies.

Cue validity								Cue utilization						
N	*E*	*O*	*A*	*C*	*Nar.*	*SE*	Cues	*N*	*E*	*O*	*A*	*C*	*Nar.*	*SE*
Objective count or categorization														
−.03 (.737)	.05 (.618)	.04 (.68)	−.04 (.68)	.06 (.562)	**.22 (.027)**	.07 (.484)	Selfie in mirror	**−.33 (.001)**	**.24 (.013)**	−.01 (.914)	**.24 (.016)**	.02 (.806)	−.10 (.312)	**.27 (.005)**
.03 (.742)	.07 (.466)	−.18 (.073)	.10 (.292)	.17 (.086)	−.05 (.616)	.02 (.817)	Hand gesture	**.24 (.016)**	**−.23 (.018)**	0 (.965)	−.01 (.941)	**.29 (.003)**	−.19 (.058)	−.1 (.321)
−.18 (.06)	**.23 (.019)**	.03 (.76)	−.14 (.169)	.04 (.709)	.19 (.058)	−.04 (.658)	Selfie with a pet (“pelfie”)	−.11 (.251)	.09 (.377)	−.07 (.451)	0 (.981)	−.02 (.83)	−.01 (.921)	.07 (.494)
−.15 (.142)	−.14 (.159)	−.1 (.31)	−.03 (.769)	−.02 (.847)	.02 (.862)	.01 (.944)	Emojis/captions	**.22 (.026)**	**−.36 (.001)**	**−.23 (.016)**	**−.30 (.002)**	−.03 (.776)	.03 (.742)	**−.29 (.002)**
.01 (.912)	−.13 (.184)	.15 (.123)	−.01 (.89)	−.15 (.141)	−.09 (.351)	.04 (.682)	Outside vs. inside	**.39 (.001)**	−.11 (.28)	−.10 (.293)	**−.31 (.001)**	**−.24 (.014)**	**.27 (.006)**	**−.30 (.002)**
.07 (.451)	−.1 (.294)	.12 (.233)	−.09 (.383)	−.06 (.528)	.01 (.949)	−.02 (.871)	Taken during holidays	**.38 (.001)**	−.18 (.071)	−.11 (.277)	**−.29 (.003)**	**−.25 (.01)**	**.23 (.018)**	**−.35 (.001)**
−.04 (.652)	.04 (.685)	.01 (.925)	−.07 (.489)	−.15 (.123)	0 (.980)	−.01 (.886)	Face visible	**−.23 (.021)**	.06 (.526)	.02 (.828)	.09 (.362)	**−.23 (.017)**	−.1 (.328)	−.06 (.565)
−.12 (.214)	**−.22 (.027)**	.02 (.853)	**−.21 (.036)**	−.03 (.728)	−.01 (.919)	.06 (.575)	Photoshopped (e.g., filters)	**−.24 (.015)**	**−.22 (.022)**	−.07 (.48)	**.24 (.013)**	−.12 (.228)	**−.35 (.001)**	−.17 (.082)
−.01 (.958)	−.15 (.136)	−.03 (.798)	.03 (.777)	.06 (.566)	−.1 (.292)	−.01 (.918)	Duckface	−.19 (.055)	−.09 (.355)	.02 (.861)	**.21 (.03)**	.17 (.085)	**−.37 (.001)**	.05 (.613)
−.05 (.58)	−.09 (.382)	.05 (.59)	−.12 (.214)	**−.24 (.013)**	.08 (.445)	.01 (.894)	Mouth open	**.35 (.001)**	**−.25 (.011)**	**−.23 (.017)**	**−.45 (.001)**	**−.33 (.001)**	**.4 (.001)**	**−.37 (.001)**
−.1 (.307)	−.12 (.242)	−.09 (.349)	.08 (.403)	.11 (.251)	.01 (.901)	.12 (.211)	Raised eyebrows	.05 (.586)	**−.25 (.011)**	−.03 (.758)	.03 (.77)	.16 (.099)	−.19 (.059)	−.07 (.489)
.08 (.434)	.11 (.272)	.1 (.333)	**.23 (.018)**	.14 (.17)	−.14 (.146)	.05 (.65)	Resting bitch face	**−.20 (.04)**	.16 (.102)	**.39 (.001)**	**.50 (.001)**	**.46 (.001)**	**−.37 (.001)**	**.46 (.001)**
.07	**.12**	.08	.10	.10	.08	.04	**Average abs. *r***	**.24**	**.19**	.11	**.22**	**.20**	**.22**	**.21**
.574	**.02**	.544	.163	.105	.51	.995	***p* finding avg. abs. *r***	**0**	**0**	.071	**0**	**0**	**0**	**0**
0	2	0	2	1	1	0	**No. of sig. *r***	**9**	**6**	**3**	**8**	**6**	**6**	**6**
1	.142	1	.116	.443	.423	1	***p* finding no. of sig. *r***	**.001**	**.001**	**.033**	**.001**	**.001**	**.001**	**.001**
Physical appearance cues														
.01 (.952)	.17 (.092)	**−.26 (.007)**	**.27 (.006)**	**.3 (.002)**	.03 (.77)	.1 (.316)	Physical attractiveness	−.06 (.516)	**.53 (.001)**	−.03 (.801)	−.07 (.482)	**.4 (.001)**	**.32 (.001)**	**.68 (.001)**
−.05 (.597)	.08 (.421)	**−.29 (.003)**	**.27 (.006)**	**.22 (.024)**	.03 (.739)	.1 (.331)	Fashionable appearance	0 (.988)	**.48 (.001)**	−.03 (.74)	−.13 (.181)	**.37 (.001)**	**.39 (.001)**	**.6 (.001)**
−.01 (.955)	.07 (.46)	**−.32 (.001)**	.19 (.05)	**.31 (.001)**	.04 (.678)	.08 (.426)	Refined appearance	.13 (.181)	**.33 (.001)**	−.06 (.572)	−.17 (.078)	**.44 (.001)**	**.32 (.001)**	**.5 (.001)**
−.13 (.206)	.17 (.078)	**−.22 (.024)**	.09 (.378)	**.24 (.016)**	.19 (.057)	.1 (.311)	Confident	**−.26 (.008)**	**.63 (.001)**	−.18 (.065)	−.11 (.257)	.13 (.205)	**.41 (.001)**	**.56 (.001)**
−.06 (.567)	.11 (.263)	**−.27 (.006)**	**.19 (.049)**	**.22 (.023)**	.1 (.309)	.08 (.416)	Healthy	−.12 (.234)	**.48 (.001)**	−.05 (.613)	−.03 (.737)	**.36 (.001)**	**.31 (.001)**	**.62 (.001)**
.03 (.736)	.11 (.247)	**−.24 (.015)**	**.23 (.021)**	**.27 (.006)**	0 (.999)	.11 (.249)	Emotionally positive	**−.2 (.042)**	**.45 (.001)**	**.22 (.028)**	**.3 (.002)**	**.49 (.001)**	−.07 (.47)	**.62 (.001)**
−.08 (.395)	.03 (.777)	**.21 (.031)**	−.03 (.775)	−.04 (.666)	.01 (.922)	.02 (.844)	Anxious-avoidant	.19 (.059)	**−.24 (.016)**	.13 (.182)	0 (.992)	.10 (.326)	−.06 (.575)	−.11 (.264)
−.03 (.781)	.11 (.261)	−.16 (.101)	**.23 (.018)**	.19 (.055)	.08 (.403)	.09 (.382)	Charming	−.19 (.051)	**.50 (.001)**	.02 (.804)	.05 (.632)	**.29 (.003)**	**.23 (.019)**	**.6 (.001)**
−.27 (.005)	.1 (.297)	**−.26 (.008)**	**−.2 (.045)**	−.06 (.547)	**.34 (.001)**	.11 (.257)	Arrogant	−.05 (.645)	**.27 (.006)**	**−.5 (.001)**	**−.48 (.001)**	**−.37 (.001)**	**.65 (.001)**	.01 (.888)
−.24 (.014)	**.21 (.037)**	−.19 (.055)	−.04 (.689)	.05 (.593)	**.35 (.001)**	.09 (.348)	Dominant	**−.20 (.04)**	**.54 (.001)**	**−.40 (.001)**	**−.37 (.001)**	**−.27 (.006)**	**.61 (.001)**	**.23 (.017)**
−.17 (.08)	.11 (.27)	−.14 (.167)	.16 (.108)	.02 (.812)	.02 (.809)	**.18 (.063)**	Skin visible	−.19 (.051)	**.39 (.001)**	.01 (.904)	.05 (.648)	.15 (.137)	.17 (.076)	**.37 (.001)**
−.05 (.584)	.11 (.277)	−.1 (.299)	.15 (.118)	**.26 (.007)**	.08 (.417)	.04 (.685)	Visual acuity	−.16 (.095)	**.43 (.001)**	.1 (.318)	−.02 (.814)	**.31 (.001)**	.18 (.067)	**.5 (.001)**
.1 (.302)	.06 (.522)	−.13 (.197)	**.25 (.01)**	**.3 (.002)**	−.12 (.234)	.02 (.822)	Smile	−.18 (.06)	**.24 (.012)**	**.46 (.001)**	**.55 (.001)**	**.61 (.001)**	**−.42 (.001)**	**.52 (.001)**
.10	.11	**.21**	**.18**	**.19**	.11	.09	**Average abs. *r***	**.15**	**.43**	**.18**	**.17**	**.33**	**.32**	**.46**
.248	.146	**<.001**	**.004**	**<.001**	.15	.33	***p* finding avg. abs. *r***	**.027**	**<.001**	**.005**	**.009**	**<.001**	**0**	**<.001**
2	1	**8**	**7**	**8**	0	2	**No. of sig. *r***	3	**13**	**4**	**4**	**10**	**9**	**11**
.119	.352	**<.001**	**.003**	**<.001**	1	.129	***p* finding no. of sig. *r***	.064	**<.001**	**.042**	**.040**	**<.001**	**<.001**	**<.001**

Note. $N_{targets}$ = 104. $N_{observers}$ = 15; in the case of full-body images, ratings of only 14 observers were available due to operational reasons; Coefficients represent point-biseral correlations when cues are coded as present (1) or absent (2), and Pearson correlations when cues are rated on a dimensional, equidistant scale. Cue validities represent the correlation between targets' criterion measure of respective personality traits [neuroticism (*N*), extraversion (*E*), openness to experience (*O*), agreeableness (*A*), conscientiousness (*C*), narcissism (*Nar.*), self-esteem (*SE*)] and individual cues. Cue utilizations represent the association between individual cues and averaged-observer ratings. Selfie-specific cues were rated on a dichotomous scale (1 = present; 2 = not present). All *p*-values are two-tailed and displayed in brackets below correlational coefficients.
Mean differences significant at $p < 0.05$ are boldfaced.

Table 5
Randomization test based number of significant correlations between cues and our accuracy criterion (cue validity) or personality ratings by unacquainted raters (cue utility).

Cue validity								Cue utilization						
N	*E*	*O*	*A*	*C*	*Nar.*	*SE*	Physical appearance cues	*N*	*E*	*O*	*A*	*C*	*Nar.*	*SE*
Portrait														
.08	.10	.11	**.14**	.08	.13	.11	Average abs. corr.	**.29**	**.38**	**.20**	**.21**	**.25**	**.18**	**.34**
.420	.308	.262	**.162**	.402	.210	.253	*p* finding avg. abs. corr.	**.003**	**<.001**	**.045**	**.036**	**.010**	**.062**	**<.001**
1	1	2	**4**	1	3	2	No. of sig. corr.	**8**	**12**	**4**	**5**	**7**	**5**	**10**
.406	.401	.149	**.023**	.416	.052	.151	*p* finding no. of sig. corr.	**.001**	**.000**	**.023**	**.009**	**.001**	**.009**	**.000**
Full-body														
.11	.13	**.13**	.11	.11	**.14**	.15	Average abs. corr.	**.23**	**.30**	**.18**	**.17**	**.19**	**.22**	**.29**
.275	.182	**.185**	.258	.266	**.145**	.142	*p* finding avg. abs. corr.	**.017**	**.002**	**.067**	**.079**	**.048**	**.026**	**.048**
2	2	**4**	1	1	**4**	3	no. of sig. corr.	**8**	**8**	**6**	**4**	**5**	**7**	**10**
.146	.149	**.012**	.404	.415	**.020**	.059	*p* finding no. of sig. corr.	**.001**	**.001**	**.004**	**.026**	**.009**	**.001**	**.000**
Video														
.12	**.16**	.071	.16	**.18**	.09	.08	Average abs. corr.	**.29**	**.31**	**.14**	**.22**	**.35**	**.37**	**.15**
.217	**.111**	.474	.100	**.066**	.391	.449	*p* finding avg. abs. corr.	**.003**	**.001**	**.148**	**.028**	**<.001**	**.119**	**<.001**
3	**4**	0	3	**6**	1	0	No. of sig. corr.	**8**	**10**	**4**	**5**	**11**	**11**	**4**
.074	**.035**	1.00	.072	**.009**	.346	1.00	*p* finding no. of sig. corr.	**.002**	**.000**	**.033**	**.017**	**.000**	**.000**	**.032**

Note. $N = 104$ for the selfie, portrait and full-body condition; due to occasional failure of video recordings: $N = 93$ in the video condition; Cue validities represent the correlation between targets' criterion measure of respective personality traits [neuroticism (*N*), extraversion (*E*), openness to experience (*O*), agreeableness (*A*), conscientiousness (*C*), narcissism (*Nar.*), self-esteem (*SE*)] and individual cues. Cue utilizations represent the association between individual cues and averaged-observer ratings. Mean differences significant at $p < 0.05$ are boldfaced.

the target to controllably (and, perhaps, in line with socially desirable images) shape others' impressions of them. In the portrait and full-body condition, however, deliberate attempts to control channels of self-disclosure may be limited, because both represent snapshots of spontaneous self-expressive behaviors that are more challenging to manipulate (e.g., snapshot of facial expression, body posture; Naumann et al., 2009).

What is more, these consensual trait-perceptions were accurate: Except for agreeableness and self-esteem (see Borkenau & Liebler, 1992; Hirschmüller et al., 2018) for reference accuracy scores in laboratory conditions) zero-acquaintance personality judgements significantly correlated with our criterion measure (i.e., self-informant composite) of personality and the highest coefficients emerged for conscientiousness followed by openness and narcissism. Given that previous studies did report difficulties in assessing agreeableness on the basis of short measurements of personality (e.g. Hahn, Gottschling, & Spinath, 2012), and against the backdrop of the fact that this domain had by far the poorest internal consistency of the measured traits, we re-examined whether the absence of accuracy was due to potential breaches of scale homogeneity per se. Additional analyses revealed that of the three underlying items, only two were sufficiently correlated; in fact Cronbach's alphas increased to .57 (from .47) in the case of self-report and to .71 (from .67) in the case of informant-reports, if the item "has/have a forgiving nature" was removed from the scale. We therefore rerun our analyses based on a new accuracy criterion derived on the remaining two agreeableness items. These additional analyses, however, did not alternate the picture gathered by our initial analyses, suggesting that lack of findings may not be due to poor psychometric properties of the scale per se.

In order to bolster our interpretation of accuracy coefficients, we compared them to zero-acquaintance ratings from other self-introductory experimental conditions. Overall, the scope of accuracy correlations was comparable to those reported in previous work (e.g., Vazire & Gosling, 2004). Specifically, accuracy coefficients derived from judgments based on selfies were somewhat elevated compared to the other conditions. Partly this finding is in line with previous research suggesting that accurate personality judgments can emerge even when based solely on physical information (e.g., Borkenau & Liebler, 1992) and that the accuracy of those judgments is only marginally improved when the scope of available information was increased (e.g., Kenny et al., 1994). In other words, what we learn on the basis of selfies about someone cannot be exceeded by any further knowledge we gain in standardized conditions. These interpretations, however, need to be considered with caution, given that – except for conscientiousness – accuracy coefficients across conditions were not statistically different from each other.

Lastly, our findings were explained to some degree by two factors of accurate personality judgments (Brunswik, 1955; Funder, 1995): the existence of valid cues and the use of available cues. Because each cue by itself, taken individually, would be an inefficient predictor of any personality trait, we relied our analyses on randomization tests to guide our interpretations of cue validities (and utilities) with more confidence. The examination of the general probability of a significant number of correlates to emerge showed that only for agreeableness, openness and conscientiousness a number of cue validities emerged that was robust to the potential threat of multiple testing inflation (and therefore inadequate significance thresholds).

Beyond statistical considerations, on the other hand, the pattern of observed cue validities and utilities was – in some instances – less plausible, such as positive correlations between cue codings of "resting bitch face" and ratings of agreeableness ($r = .50$). Given that overall accuracy coefficients for agreeableness did not reach significance in our study, we think that this finding is (likely) spurious and – therefore – negligible.

Moreover, across all experimental conditions and relative to cue validity correlations, more and stronger cue utilization correlations emerged (see last row of both cue sections of Table 4 and entire Table 5). This suggests, that raters relied their judgments on cues that were widely unrelated to the true personality of our targets. In line with this finding, the sparse subset of valid cues (range: 4–8) was not necessarily always picked up by unacquainted raters (i.e., cue utilities). This overall lack of conjoint effects of cue validities and utilities, suggests that the examined set of cues failed to sufficiently describe potential underlying processes of accurate personality judgments. More focused versions of Tables 4 and 5 that could potentially be of use for future studies, attempting to replicate and extend our set of findings are provided the supplementary materials (see Tables S6a–S6c).

Some inconsistencies in our study with the broader literature on zero-acquaintance judgements, point to a few important limitations of our research that have to be addressed. The current study

used a single informant. As a result, we know little about the unique perceptual biases each informant may have had. If possible, future research efforts should bring together and average multiple informant-reports (i.e., perceiver effects; Ready, Clark, Watson, & Westerhouse, 2000; Srivastava, Guglielmo & Beer, 2010; Wood, Harms, & Vazire, 2010). Relatedly, our analyses do not comprise acquaintance level as a covariate, which is an important boundary condition to the validity of informant-reports (Ambady, Bernieri, & Richerson, 2000; Letzring et al., 2006). Our decision is based on the fact that variability levels in that variable were low (i.e., 78% of the informants were friends of the target subject and the remaining 22% were partners) limiting the value and impact of those analyses.

One further important limitation of the current study is the fact that we only recruited females to provide us with cue and personality ratings of our target participants. Initially, our decision was based on recent research, indicating that, on average, women might be better judges of personality than men, potentially because they have a more precise understanding of what the normative person is like (Chan, Rogers, Parisotto, & Biesanz, 2011). The choice of a homogeneously female sample of observers limits the generalizability of our results. Thus, we cannot approximate the extent to which gender potentially moderated the extent of judgment accuracy in our study (i.e., perceiver effects; Ready et al., 2000; Srivastava et al., 2010; Wood et al., 2010). To account for this drawback, future research should collect and average target ratings across genders, in order to reduce the influence of each perceiver's individual biases. However, the same point could be made for other perceiver characteristics, which also have been discussed to be associated with distinct biases (e.g. personality traits; Letzring, 2008; Human & Biesanz, 2011). Yet, those analyses imply a different set of research questions and analyses, which would be beyond the scope of this paper.

Another restriction of our study was that each target was repeatedly evaluated by the same raters across experimental conditions. As a consequence, the observation of a target in one condition may have possibly influenced the assessment of that same participant in the subsequent self-expressive condition and that may explain why accuracy estimates in our study were somewhat lower than those reported in the broader literature (e.g., Borkenau & Liebler, 1992; Naumann et al., 2009). Being aware of this threat to the internal validity of our experimental design, we made sure that rating sessions were spread out across several weeks, with at least one week breaks between different block ratings. That way, we attempted to keep carry-over effects as minimal as possible. One potentially helpful indicator of this intervention is the pattern of intercorrelations among rating scores across judgment modalities (see Table S4). Here, two observations seem important: First, selfie-based ratings did not correlate to bigger extents with ratings in the other conditions than ratings based on the other three conditions between each other. Especially in the case of extraversion ratings zero-order correlations with ratings in the video condition are small and non-significant ($r = .17$; see Table S4), signifying that the preceding presentation and evaluation of selfies did not carry over to later judgments. Second, the scope of correlation coefficients did not exceed the range of previously published studies that did involve independent groups of unacquainted observers across judgment modalities. While those extensive correlation tables are rarely reported, we drew from unpublished data of our previous studies with independent samples of raters across experimental conditions. For instance, in *anonymized* (2015) we compared the validity of zero-acquaintance ratings of neuroticism across four different situations. Across situations correlation coefficients ranged from .32 to .50 approximately, resembling the pattern of results in our study, where correlation coefficients of ratings across conditions ranged from .36 to .61.

Nonetheless, to dispel doubts of independency between ratings across experimental sufficiently, future studies should rely their zero-acquaintance judgments on different groups of raters across modalities, to explicitly ensure that participants' prior knowledge cannot influence the assessment of his or her subsequent rating behavior.

Additionally, it must be noted that selfies as tools of self-expression come along with several challenges, particularly when transferred to and compared with laboratory conditions (i.e., standardized forms of self-portrayal). One could argue that the ecological validity of selfies is high and, perhaps, higher than the validity for portraits, full-body images and self-introductory videos. Selfies capture target participants across a wide range of activities and situations, providing a comprehensive picture of the usual social environment of the targets. Therefore, people likely reveal more about themselves in selfies than in less variable contexts (e.g., laboratory conditions). At the same time, however, there is considerable intra- and interpersonal heterogeneity concerning compositional or contextual features of selfies (e.g., snapshots from daily activities or travel selfies; alone or in a group of people). While our instruction did require to make "five recently posted selfies" available, we did not make any further specifications that may have limited the variation of cues and, thereby, enhanced the comparability of selfies across targets. While a few research efforts tried to extract valid cues in selfies that relate to targets' personalities, many failed to identify systematic and replicable sets of cues that relate to personality traits in lawful ways (Guntuku et al., 2017; Musil et al., 2017; Qiu et al., 2015). Likely, the diversity of selfie contents requires a large amount of processing capacity in order to distil and rate valid cues. The extent of required capacity is difficult for humans to retain and access. A solution to this issue would be the use of automated approaches that generate consistent algorithms, optimizing the judgmental accuracy through the extraction of valid and standardized cues. Finally, both the target and observer samples were convenience samples drawn from the general student population and were thus not representative of the general population.

Whereas the present study sets up a complementation of previous sparse and scattered findings on selfie-based perception and accuracy of personality traits, our results warrant replication, and correlational analyses in the context of the lens model need to be interpreted conservatively. Our findings reflect people's ability to judge the personality of strangers with modest accuracy. Furthermore, they provide a very initial impression of what cues might be associated with accurate judgments in selfies. These results, however, stem from exploratory and widely descriptive lens model analyses. Descriptive investigations that compare many variables to each other often are necessary starting points in research (Funder, 2009). Yet, such studies are challenged by the difficult task of evaluating the degree to which the results might capitalize and take advantage of chance findings. We, therefore, based our analyses on a sufficiently large sample size (i.e., ensure adequate power) and applied rigorous tests of robustness (i.e., randomization technique), attempting to contribute to replicable research practices (Asendorpf et al., 2013) that may help to narrow prospect research questions and efforts.

5. Conclusion

Self-presentations as displayed in selfies do convey accurate information about what people are like. They epitomize a particular subsection of self-photographs with their own conventions, representational techniques, and poses (e.g., duck face, selfies taken using a mirror). Thus, both targets and perceivers may profit from knowing about potential biases in selfie perception. Our

study indicated, that when viewing selfies, observers form comprehensible impressions of the targets and come to an agreement about what the targets are like. What's more, their impressions are essentially accurate, because personality impressions based on selfies correspond to criterion ratings of personality. Accuracy, importantly, was not affected by skewed mean-level ratings of the traits assessed. Selfie owners' levels of conscientiousness and openness were the easiest traits to judge accurately; ratings of narcissism and extraversion, although accurate, tend to be skewed. Strong selfie-based accuracy estimates suggested that, what we learn on the basis of selfies about someone may not be exceeded by any further knowledge we gain in standardized conditions. However, to better understand mechanisms underlying accurate personality judgments based on selfies, further studies are needed to distill valid cues that might help guiding processes of impression formation of naïve observers. Here, automated approaches will be of particular importance, to fully capture the variety of cues that are depicted in selfies.

6. Availability of data

Due to privacy consideration regarding subjects in our dataset, including the federal data protection act (i.e., Bundesdatenschutzgesetz, BDSG), we cannot make all materials used here publicly available (i.e., target pictures and video footage). All datasets and corresponding R or SPSS codes, however, are publicly available at https://osf.io.[4]

Declaration of conflicting interests

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