



# Dostoyevsky's Conjecture: Evaluating Personality Impressions Based on Laughter

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## Abstract

In 1875, Fyodor Dostoyevsky proposed that an individual's laughter grants special insight into their character. To evaluate this conjecture, we showed video clips of 89 targets laughing and not laughing to unacquainted independent observers, who recorded their impressions of the targets' Big Five personality traits. We correlated the observers' personality impressions with the targets' personalities, as measured by self-reports and reports by informants who knew the targets. Observers judged targets' extraversion more accurately and with greater consensus when targets were laughing than when they were not, consistent with Dostoyevsky's conjecture. However, laughing did not improve the accuracy of observers' judgments of any other traits. Observers also judged targets to be more extraverted, agreeable, conscientious, and open to new experiences when they were laughing than when they were not.

**Keywords** Laughter · Humor · Personality impressions · Big Five · Accuracy · Consensus

If you wish to glimpse inside a human soul and get to know a man, don't bother analyzing his ways of being silent, of talking, of weeping, of seeing how much he is moved by noble ideas; you will get better results if you just watch him laugh.

Fyodor Dostoyevsky, *A Raw Youth* (1875).

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As captured by the quote above, Dostoyevsky believed that the way individuals laugh conveys special information about their character. Considered one of the greatest novelists of the 19th century, Dostoevsky was an astute observer of human psychology. However, to our knowledge,<sup>1</sup> no previous study has examined the validity of his conjecture—that people can accurately judge personality from laughter.

A significant body of research has examined a related phenomenon—how individuals form accurate impressions others' personalities based on a broad array of other potential cues. For example, some studies have focused on how people use behavioral cues, like standardized behaviors in the lab (Ambady & Rosenthal, 1992; Borkenau et al., 2004; Wang et al., 2020) and audio clips of conversations in daily life (Mehl et al., 2006), to form impressions of what others are like. Other studies have examined the extent to which people can form accurate impressions of others based on their living and working spaces (Gosling et al., 2002), personal websites (Marcus et al., 2006; Vazire & Gosling, 2004), social media profiles (e.g., Back et al., 2010; Fernandez et al., 2021; Qiu et al., 2012), game-playing avatars (Harari et al., 2015), and music preferences (Rentfrow & Gosling, 2006). The capacity for individuals to misuse some cues and make erroneous personality judgments has also been well-documented (Todorov et al., 2015). Nonetheless, the weight of evidence suggests that behaviors and environments do provide information about one's personality and that others are able to use these cues to form impressions of personality with some degree of accuracy (Ambady & Skowronski, 2008).

Laughter has not yet been identified as one of the behaviors that provides an informative window into personality, but there are at least two reasons grounded in the existing literature to think that it can. The first reason has to do with the social function of laughter (Curran et al., 2018). Laughter is a “pervasive and characteristic component of human social communication” (Davila Rosset et al., 2009, p. 1109). In particular, laughter promotes and strengthens social bonds (Glenn & Holt, 2013; Wilkins & Eisenbraun, 2009). Laughter is thirty times more likely to occur in the presence of others than in solitary situations (Provine & Fischer, 1989) and, contrary to its common conceptualization, occurs more often in response to non-humorous stimuli than to humorous stimuli (Provine, 1993). Laughter is also a contagious form of behavior (Provine, 2004) and facilitates the transfer of positive emotional states between individuals (Gervais & Sloan Wilson, 2005; Scott et al., 2014). Individuals are perceived as more likeable when they are laughing than when they are not, regardless of whether the laughing is genuine (Reysen, 2006). Even smiling—which accompanies laughing—is associated with positive observer judgments of all the Big Five personality traits (Naumann et al., 2009). These properties underscore laughter's role as a vector conveying useful social information about the person laughing, both about their temporary emotional states (e.g., the laugher is happy) and their enduring traits (e.g., the laugher is agreeable). Given the evident role of laughter in social situations, it is reasonable to assume that individuals are capable of parsing this information and making accurate judgments based on it, at least to some extent.

<sup>1</sup> We conducted a search in PsycInfo and Google Scholar using two sets of keywords: Set A consisted of three laughing-related terms (“laughter”, “laughing”, and “laugh”) and Set B consisted of six terms related to personality judgment (“personality”, “accuracy”, “big five”, “impression”, “assessment”, and “judgment”). We searched for all combinations of each Set-A term with each Set-B term (i.e.,  $3 \times 6 = 18$  searches). When we identified a particularly relevant study we reviewed its references section and the subsequent studies that had cited that study in case those procedures yielded sources not identified by the original keyword searches.

The second reason to think that laughter might serve as a valid behavioral cue for drawing accurate personality impressions stems from findings showing that laughter-related traits predict a number of personality traits and mental disorders. There is a strong positive correlation between a self-reported propensity to laugh and extraversion (Ruch & Deckers, 1993), and the frequency of daily laughter has been shown to be a positive predictor of Type-A personality attributes in men and a negative predictor of Type-A personality attributes in women (Martin & Kuiper, 1999). Moreover, a meta-analysis and systematic review of humor styles and personality identified a number of correlations between humor styles and the Big Five personality traits (Plessen et al., 2020). For example, self-enhancing humor and affiliative humor are positively correlated with extraversion, agreeableness, conscientiousness, and openness, while self-defeating humor and aggressive humor are positively correlated with neuroticism and negatively correlated with agreeableness and conscientiousness. The relationship between personality and laughter-related traits found in the studies reported above is consistent with findings on gelotophobia (fear of being laughed at), gelotophilia (enjoyment of being laughed at), and katagelasticism (enjoyment of laughing at others). Gelotophobes are more likely to be introverted (Proyer & Ruch, 2010; Rowlings et al., 2010; Tsai et al., 2018), whereas katagelasticists and gelotophiles are more likely to be extraverted (Proyer & Ruch, 2010). Gelotophobes are also more likely than others to meet diagnostic criteria for a Cluster-A personality disorder (odd or eccentric disorders) and more likely to be highly susceptible to anger and aggressive behavior (Weiss et al., 2012). Finally, some manifestations of psychopathy are associated with different dispositions towards laughter, with gelotophiles more likely to exhibit superficial charm and grandiosity, and gelotophobes more likely to engage in manipulation (Proyer et al., 2012). Combined with the literature suggesting that people make use of laughter-related information in impression formation and that laughter serves a social function, these associations between laughter and personality suggest that people may use laughter to make accurate personality judgments.

To understand how the research about laughing reviewed above may play into the process of forming accurate impressions of others, we turn to the Realistic Accuracy Model (RAM; Funder 1995). The RAM holds that accurate personality judgment is a function of four variables multiplied by each other: the *relevance* of a cue to a personality trait, the *availability* of the cue to the observer, the extent to which the cue *is detected* by the observer, and the extent to which the cue *is correctly used* by the observer. According to RAM, “[p]erfect accuracy can be attained only when all terms in the equation equal one, representing perfectly unambiguous and visible cues to the judgment together with optimal observation and integration of those cues” (Funder, 1995, p. 659). Regarding availability, the research showing a relationship between laughter and personality suggests that it is likely that laughter has some relevance to personality traits. Regarding availability and detection, laughter is an audible phenomenon accompanied by observable facial changes and often occurs in the presence of others (Provine & Fischer, 1989), so it is reasonable to assume that laughter cues are available to and susceptible to being detected by observers. The final RAM factor – the extent to which the cue is likely to be used correctly – represents the greatest potential obstacle to laughter being an accurate indicator of personality. However, the social function of laughter suggests it is at least possible that observers have come to understand how personality is related to laughter through their interpersonal experiences. Of course, if observers are mistaken about the links between laughter and personality, it is also possible that laughing targets are more difficult to judge than are non-laughing targets.

In other words, inaccurate lay beliefs about laughter could interfere with accurate judgments of the personality of people laughing.

Regardless of whether laughter improves the accuracy of personality judgments, a related question concerns whether laughter changes how individuals are seen. That is, are people's personalities judged differently when they are laughing versus when they are not? Laughter is thought to be an indicator of a wide range of psychological states associated with personality traits. In particular, laughter can be an indicator of psychological states like cheerfulness and politeness, (e.g., Gupta et al., 2018), which are associated with socially desirable personality traits (e.g., cheerfulness is associated with extraversion, politeness with agreeableness). However, laughter is also an indicator of psychological states like contemptuousness and nervousness, which are associated with less socially desirable personality traits (e.g., nervousness is associated with neuroticism). Therefore, it is not entirely clear whether observers will make more favorable judgments of individuals' personalities when these individuals are laughing than when they are not laughing.

Here we test whether laughter provides additional information about targets' personalities beyond the information provided in their non-laughing state, improving the accuracy of judgments observers make about targets' personality. Independent of whether laughing improves the accuracy of personality judgments, we also test how laughing individuals would be seen differently from non-laughing individuals. Theory and past research do not provide sufficient evidence to make predictions about how laughing changes personality judgments generally or which, if any, personality traits will be judged with most accuracy. Therefore, these analyses are entirely exploratory. We based our analyses on previous exploratory analyses of impressions based on appearance (Naumann et al., 2009) and submitted our pre-registration to conform to those analyses.

## Method

Targets were recorded while they watched humorous videos on a computer. Video clips (including audio) of the targets while laughing and not laughing were shown to observers, who recorded their personality impressions of the targets in terms of the Big Five personality traits. Accuracy of the ratings was computed by correlating the observers' ratings with a criterion measure consisting of the targets' self-reports and reports by informants who knew the targets. We sought to evaluate whether the accuracy of impressions based on laughing targets differed from the accuracy of impressions based on non-laughing targets.

## Participants

**Targets.** Ninety-six potential targets were recruited as targets via a campus-wide newsletter sent out to the University of Texas at Austin and via the Department of Psychology's participant pool. Ninety-four of these targets provided self-ratings of personality and are included in the analyses that require only self-reported data. Ninety undergraduate student targets were rated by observers and are included the analyses that require only observer ratings.<sup>2</sup>

<sup>2</sup> Six of the original 96 targets were dropped due to missing data, underage participation, or experimenter error.

The final sample consists of 89 targets who had both self-ratings of observer ratings of personality (25 males; 64 females,  $M_{age} = 18.9$ ;  $SD_{age} = 1.4$ ). Thirty-nine targets self-identified as white, 21 identified as Hispanic, 9 identified as Asian, 4 identified as African-American, and 15 classified themselves as “other” or multiracial and one provided no information about race or ethnicity. The targets were not financially compensated for their time, but were offered feedback based on the observers’ impressions of their personality as well as one hour of credit that partially fulfilled their classes’ research participation requirement (if they were a member of this class). All data and code are available at <https://osf.io/ds2tz/>.

**Observers.** Ten observers (6 females, 4 males) with a mean age of 20.6 ( $SD = 1.3$ ) from the University of Texas at Austin rated the targets. In light of the difficulty of recruiting observers willing to complete the high number of required ratings, the observers were friends or associates of the lead author. Eight of the observers identified as white, one observer identified as Asian, and one observer identified as multiracial. The observers were offered a payment of \$25 for completing ratings of the targets.

**Informants.** To provide a more robust estimate of the targets’ personalities, we asked targets to nominate three to five family members or friends to complete informant-report versions of the questionnaires. Using online surveys, 83 family members and friends of the targets completed informant-report versions of personality questionnaires that had been completed by the targets. The informants did not receive any kind of compensation for their participation in the study. So to minimize the burden of the online questionnaire that they were asked to complete, no demographic information was collected about the informants. Not all targets were able to recruit informants. Thus, of the 94 targets whose personality data were analyzed, 37 had no informants, 37 had one informant, 14 had two informants, and 6 had three informants.

## Materials

The stimuli designed to elicit laughter from targets consisted of six YouTube videos ranging from user-created videos to clips from popular television shows such as Saturday Night Live and Jimmy Kimmel Live (the videos are listed in Appendix A). Targets viewed these videos on individual computer screens and watched them at their own pace.

To reduce the burden on the observers (who were rating almost one hundred targets on five personality dimensions) and on the informants (who were completing the questionnaire for their family and friends without any form of compensation), we needed to assess personality using a brief instrument. Therefore, we assessed personality using the Ten-Item Personality Inventory (TIPI; Gosling et al., 2003), a widely used measure of the Big Five personality traits. The TIPI asks participants to rate the extent to which a pair of traits applies to a given target on a seven-point scale (with 1 being “*disagree strongly*” and 7 being “*agree strongly*”). For instance, self-reported extraversion is assessed by asking participants the degree to which they agree that they see themselves as “*extraverted, enthusiastic*” and “*reserved quiet*” (reverse-scored). The TIPI takes approximately one minute to complete and has good psychometric properties, including strong convergence with other measures of the Big Five and good test-retest reliability (Gosling et al., 2003).

## Procedure

Upon arrival at the testing site, target participants were given a consent form, which informed them that their observation of humorous stimuli would be recorded and shown to other undergraduate students who would use the video clips as the basis for making personality ratings. The targets also completed the self-report version of the TIPI, a demographic questionnaire, and were asked to provide the names and email addresses of three to five friends or family members (informants) who knew them well enough to describe their personality. The computers on which the targets viewed the stimuli also recorded the targets using a camera embedded in the upper frame of the screen, capturing the targets' heads down to their shoulders. Targets were told that they were free to laugh or not laugh, and to view the list of videos at their own pace. After the targets finished viewing the clips, they were asked which video they found the funniest so that a clip of their laughter could be more easily located in the 45-minutes of footage.

Informants were contacted via email and asked to provide personality ratings of the person who nominated them. They were given about a week to complete the questionnaire. The videos of the targets were sent to two independent editors for editing. The editors were instructed to extract two different clips (including audio) from each target video: a ten-second clip in which the target had a neutral expression, was not laughing, and was not behaving unusually, and a ten-second clip in which the target was laughing. Each editor created approximately half of the non-laughing clips and half of the laughing clips. In relation to the laughing clips, editors were instructed to choose the most expressive laugh or if that one was substantially interrupted by extraneous noise, the next most-expressive laugh. The editors were then instructed to cut a ten-second clip starting from the beginning of the laugh (including where the laugh was not sustained for ten seconds).

Observers then watched the clips prepared by the editors. All clips rated by observers contained both audio and video of the target but did not contain the video or audio of the laughter-inducing stimuli that the targets were watching. The perspective of the camera made it clear to observers that the targets were watching stimuli on a screen while being filmed. The ten observers were divided into two groups. Group 1 first watched a block of laughing videos (which contained half of the targets) and then a block of non-laughing videos (which contained the other half of the targets). Group 2 watched a block of non-laughing videos and then a block of laughing videos. The order of targets within blocks was randomized for each observer. Thus, each observer rated every target but rated each target only once (either in a laughing clip or a non-laughing clip). This means that there are five observer ratings per clip. The observers rated targets using the TIPI. Observers were instructed to complete the ratings at any location they wished, but were asked to rate the targets without consulting any other person. Additionally, the observers were instructed to indicate whether they knew or recognized the targets; any personality ratings from those instances were dropped from subsequent analyses.

## Results

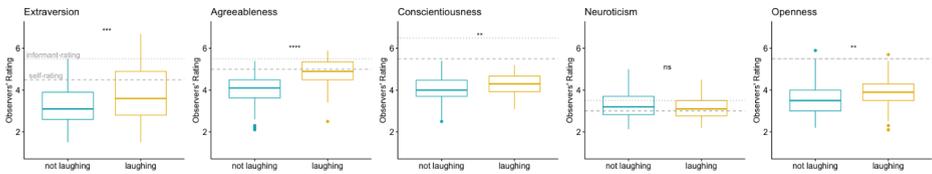
### Defining accuracy

We evaluated accuracy with respect to two different criteria. Following previous personality research (e.g., Funder 1995; Naumann et al., 2009), our first criterion combined targets' self-ratings of their traits on the TIPI with their informants' TIPI ratings. Following Naumann et al., (2009), we computed this criterion for each trait by taking the average of all available informants' trait ratings of a target and then averaging that combined informant score with the targets' self-ratings. In this way, the first accuracy criterion, which we call "self+informant," is comprised of  $\frac{1}{2}$  self-ratings and  $\frac{1}{2}$  informant ratings. To determine the extent to which targets and their informants agreed about the targets' personality traits, we computed interjudge agreement between the self-ratings and average informant-ratings in terms of intraclass correlations for the 57 participants who had at least one informant rating. The self+informant criterion for personality traits generally showed levels of agreement that were good ( $ICC[1, k]=0.66$  and  $0.61$  for extraversion and conscientiousness, respectively) to fair ( $ICC[1, k]=0.49$  and  $0.42$  for neuroticism and agreeableness, respectively) (Cicchetti, 1994). However, the self+informant criterion for openness to experience showed poor levels of agreement ( $ICC[1, k]=0.21$ ). As noted above, only 57 of 94 participants who provided personality data had at least one informant rating, which means that we were able to calculate the self+informant criterion for only about 60% of the sample. Therefore, as our second accuracy criterion, we used the self-reported TIPI ratings alone, which allowed us to take advantage of our full sample. Using self-reports as the sole criterion is common practice in studies of accuracy (e.g., Kosinski et al., 2013; Penton-Voak et al., 2006).

Observer accuracy is indexed by the correlation between observers' ratings of participants' traits and each accuracy criterion. Again, following previous research, we considered two forms of observer accuracy: aggregated observer accuracy and single observer accuracy. The first observer accuracy index—aggregated-observer accuracy—is one of the most commonly used accuracy indices (Kenny, 1994). It reflects the level of accuracy achieved for a group of observers independent of the idiosyncrasies of any single observer (Block, 1961). One strength of aggregated-observer accuracy is that it depends on multiple items (i.e., judges) and is thus more reliable than single-observer accuracy. We computed aggregated-observer accuracy both when targets were laughing and not laughing by correlating the average of the five observers' ratings with each accuracy criterion (self-rating and self+informant rating).

With regard to consensus of observers' judgments, the intraclass correlations for extraversion, agreeableness, and openness were fair to good when targets were not laughing ( $ICC[1, k]=0.59, 0.66, 0.56$ ) and when they were laughing ( $ICC[1, k]=0.80, 0.47, 0.55$ ). Observers' agreement about targets' extraversion was higher when targets were laughing than when they were not laughing, suggesting that observers use laughter as a cue for judging targets' levels of extraversion. Intraclass correlations were poor for conscientiousness and neuroticism ratings whether targets were laughing or not laughing ( $ICC[1, k]<0.4$ ), indicating that observers did not agree about targets' ratings on these traits regardless of whether targets were laughing or not.

The second observer accuracy index we considered—single-observer accuracy—reflects how accurate a single, typical observer would be when judging a set of targets. We computed



**Fig. 1** Do observers' ratings of personality depend on whether targets are laughing? (Note: Box plots depicting median, interquartile range, range, and outliers of observers' personality ratings when targets were not laughing compared to when they were laughing. Observer ratings were aggregated across all five observers' ratings of the target in each condition. Horizontal dashed lines represent targets' median self-rating; horizontal dotted lines represent targets' median informant-ratings.<sup>3</sup> Significant differences between observers' ratings when targets were laughing and not laughing are depicted.  $**p < .01$ ,  $***p < .001$ ,  $****p < .0001$ .)

<sup>3</sup> The median of openness self-ratings and informant-ratings were equivalent, which is why only one dashed horizontal line is represented. The informant-ratings are a little more positive than self-ratings for some traits, and the observer medians converge more with the self and informant medians for some traits (e.g., neuroticism) than for others. Median scores of the self- and informant-ratings indicate the degree to which the informant, self, and observer median ratings converge but provide no indication of the degree to which the observers are able to judge the relative standing of the targets (which is what our main analyses test).

single-observer accuracy when targets were both laughing and not laughing by correlating each observer's rating of each trait with both accuracy criteria separately for each observer. Using Fisher's  $r$ -to- $z$  transformation, we averaged across the five observers' accuracy correlations for each of the five personality traits when targets were laughing and not laughing before transforming the average back into a correlation. By using two accuracy criteria (self and self+informant) as well as two forms of observer accuracy (aggregate observer and single observer), we ended up with four accuracy indexes.

## Do observer ratings of personality differ depending on whether targets are laughing?

Before examining whether laughing improved the accuracy of observers' ratings of targets' personality, we first examined whether observers' ratings of personality differed depending on whether targets were laughing. This set of analyses was not pre-registered. As shown in Fig. 1; Table 1, observers' judged targets to be more extraverted,  $t(89) = -4.0$ ,  $p = .0002$ ; agreeable,  $t(89) = -8.2$ ,  $p < .0001$ ; conscientious,  $t(89) = -2.8$ ,  $p = .006$ ; and open to experience,  $t(89) = -2.8$ ,  $p = .006$ , when the targets were laughing as compared to when they were not laughing. There was no effect of laughing on observers' ratings of neuroticism ( $p = .4$ ). In sum, observers' judgments of targets' personality traits were more positive overall when targets were laughing, regardless of the accuracy of these judgments.

**Table 1** Means and SDs of Observer ratings

Personality Trait	Not Laughing		Laughing		<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
Extraversion	3.23	0.91	3.83	1.25	-4.0	89	0.0002	0.42
Agreeableness	4.06	0.77	4.85	0.64	-8.2	89	<0.0001	0.86
Conscientiousness	4.08	0.58	4.28	0.51	-2.8	89	0.006	0.30
Neuroticism	3.23	0.61	3.15	0.50	0.85	89	0.4	0.09
Openness	3.56	0.80	3.90	0.70	-2.8	89	0.006	0.30

*Note.* Means and standard deviations of personality ratings when targets were not laughing and laughing, aggregated across observers

## Are observers' ratings of personality more accurate when targets are laughing?

As previously mentioned, we defined observer accuracy using four indexes: the extent to which single observer and aggregate observer ratings were correlated with self-ratings and with self+informant ratings. As shown in Table 2, targets' personality was not evident to observers when targets were not laughing. However, although observers were unable to accurately judge targets' extraversion when targets were not laughing, observers judged targets' extraversion quite accurately when targets were laughing. Put differently, observers' extraversion ratings only correlated with targets' self- and informant-ratings when targets were laughing. This pattern suggests that laughing reveals information about people's extraversion that might not be evident to observers otherwise. Laughing did not seem to help observers judge targets' other traits more accurately, and observers were generally unable to accurately judge targets' personality when they were not laughing. Of the five traits, observers accurately judged only targets' agreeableness when they were not laughing; even then, they were only able to judge targets' self+informant ratings of agreeableness, not targets' self-rating of agreeableness.

We also examined whether targets' laughing improved the accuracy with which observers judged targets' personality compared to when they were not laughing. We did this by conducting hierarchical regression analyses predicting the accuracy criteria (i.e., self-ratings and self+informant ratings of each trait) from observers' ratings of each trait when targets were laughing and observers' ratings of each trait when targets were not laughing. We entered the observers' ratings when targets were not laughing in Step (1). We simultaneously entered observers' ratings of targets when targets were both not laughing and laughing in Step (2). The unstandardized regression coefficients from Step 2 and change in *R* are presented in Table 3. A significant change in *R* suggests that laughing contributes to better observer accuracy of the target over and above observer's accuracy of the target when targets are not laughing.

As the results show, observers' ratings of targets' extraversion were more accurate when targets were laughing than when targets were not laughing. Observers' ratings of targets' agreeableness were also more accurate when targets were laughing, but this was only true when we used self-ratings as the accuracy criterion; laughing did not significantly improve observer accuracy for agreeableness when we used the self+informant criterion. In addi-

**Table 2** Accuracy of personality judgments when targets were not laughing and laughing

Personality Trait	Not Laughing				Laughing			
	Aggregated Observer		Single Observer		Aggregated Observer		Single Observer	
	<i>r</i> (self)	<i>r</i> (self+informant)	<i>r</i> (self)	<i>r</i> (self+informant)	<i>r</i> (self)	<i>r</i> (self+informant)	<i>r</i> (self)	<i>r</i> (self+informant)
Extraversion	0.12	-0.01	0.07	-0.02	0.29**	0.36**	0.22*	0.26
Agreeableness	0.16	0.42**	0.11	0.30*	0.28**	0.21	0.17	0.15
Conscientiousness	0.11	-0.01	0.08	0.00	0.08	-0.04	0.03	-0.02
Neuroticism	0.03	0.08	0.02	0.05	-0.05	-0.25	-0.03	-0.13
Openness	0.12	0.05	0.09	0.04	0.11	0.23	0.08	0.14

*Note.* Aggregated observer is the correlation between the aggregated observers' ratings and the accuracy criterion. Single observer is the mean of the five pairwise correlations between each observer's rating with the accuracy criterion. We captured accuracy using two criteria: 1) a self-rating ( $N=89$ ) and a self+informant rating (i.e., the aggregate of self-rating and average informant-rating,  $N=55$ ). \* $p < .05$ , \*\* $p < .01$

**Table 3** Does Observer Accuracy Improve when targets are laughing?

Personality Trait	Self			Self+informant		
	Not Laughing <i>b</i>	Laughing <i>b</i>	$\Delta R$	Not Laughing <i>b</i>	Laughing <i>b</i>	$\Delta R$
Extraversion	0.13	0.32**	0.21**	-0.03	0.39**	0.45**
Agreeableness	0.19	0.50*	0.14*	0.56**	0.32	0.03
Conscientiousness	0.21	0.13	-0.12	0.00	-0.09	-0.05
Neuroticism	0.05	-0.12	0.04	0.12	-0.57	0.29
Openness	0.18	0.20	0.04	0.09	0.29	0.28

*Note.* *b* is the unstandardized regression coefficient from Step 2 of the hierarchical regression model controlling for the other variable (e.g., the coefficient of observers' ratings of non-laughing targets on the accuracy criterion when controlling for the coefficient of observers' ratings of ).  $\Delta R$  is the increase in the multiple correlation obtained when observers' ratings of laughing targets are added to the regression equation with observers' ratings of non-laughing targets in Step 2. We captured accuracy using two criteria: 1) a self-rating ( $N=89$ ) and 2) a self+informant rating (i.e., the aggregate of self-rating and average informant-rating,  $N=55$ ). \* $p < .05$ , two-tailed. \*\* $p < .01$

tion, laughing did not significantly improve observer accuracy for any other personality traits.

## Discussion

The potential for laughter to offer a window into a person's character has been noted long before Dostoevsky made his conjecture. As far back as the fifth century B.C., the ancient Greek thinker Herodotus believed that "laughter connotes scornful disdain, disdain feeling of superiority and this feeling and the actions which stem from it attract the wrath of the gods" (Lateiner, 1977, p. 181). Consistent with the intuitions of Dostoyevsky and Herodotus, our study suggests that laughter serves as a cue to others about who we are. Specifically, laughter informs observers' impressions of targets' extraversion.

Observers agreed more about targets' extraversion when targets were laughing than when they were not laughing. This increased consensus was accompanied by increased accuracy; across three out of four accuracy indices, judgments of extraversion were more accurate when targets were laughing than when they were not. Moreover, the variance in extraversion ratings was higher when targets were laughing than when they were not, and was substantially higher than ratings of any other trait (see Fig. 1; Table 1). The relatively large variation in observers' extraversion ratings suggests that laughter helps observers distinguish relatively extraverted targets from those who are more introverted. Taken together, these results suggest that (1) laughter provides cues to extraversion that are not available when people are not laughing, (2) these cues are interpreted consistently across observers, and (3) these cues increase the accuracy of personality judgments.

The finding that laughter appears to contain cues to extraversion may reflect laughter's role in sociability. After all, laughter is a behavior that has been described as a "social play vocalization that is unusual in solitary settings" (Provine, 2004, p. 215), and extraversion is the trait most closely associated with socializing behaviors (Harari et al., 2020). It may be that the extraverts' laughter signals an openness to and enjoyment of social interaction, which his correctly interpreted by observers as an indicator of extraversion.

What then of the accuracy of ratings of the other Big-Five traits? Our results provide some evidence that observers could discern agreeableness more accurately in the laughter videos, but the evidence was not sufficiently robust across measures to warrant any firm conclusions. Instead, these results may serve as a starting point for future research that relies on a target, informant, and observer pool that is both larger and more representative than those in the current study.

Our analyses also showed that observers' mean ratings of personality were different in the laughing and non-laughing videos, with laughing targets appearing more extraverted, conscientious, agreeable, and open to experience. The finding points to laughing as a possible mechanism by which extraverts come to be seen more positively than introverts across a broad range of characteristics (Wilmot et al., 2019). This finding is also consistent with previous research showing that smiling—a valid cue only for extraversion and agreeableness—is associated with positive observer judgments of all the Big Five personality traits (Naumann et al., 2009). If laughing increases the overall positivity of impressions observers form, perhaps people can increase the positivity of these impressions simply by laughing. Research is needed to understand the extent to which different kinds of laughter elicit positive impressions and the extent to which genuine laughs can be generated at will by targets.

Our study contributes to the literatures on nonverbal behavior, accuracy in impression formation, and the social function of humor. Most obviously, our findings highlight the importance of yet another non-verbal behavior—laughter— for both accurate and positive

impression formation. Nevertheless, the present research was subject to a number of limitations. The most conspicuous limitation is that we did not collect information on the specific cues expressed in the laughing and non-laughing videos. Unfortunately, in line with the conditions of IRB approval, the videos were destroyed such that cues cannot be recovered from this set of stimuli. Therefore, future research should focus on illuminating the different cues that distinguish the laughter of an extravert from that of an introvert. Such research may benefit from considering three relevant findings from the broader literature. First, extraverts self-report a greater propensity to laugh than introverts do (Ruch & Deckers, 1993); so, the cues that reveal themselves during laughing may be the product of a high frequency or duration of laughter, or an easier laugh borne of greater experience laughing. Second, gender differences in how positive and negative affect are reflected in smiling (Vazire et al., 2009) and in the capacity to differentiate genuine and simulated laughter (McKeown et al., 2015) suggest that any search for cues should consider the impact of gender. Third, several different kinds of laughter have been documented (e.g., Keyton & Beck 2010), highlighting the need to examine laughter in different settings (e.g., social vs. solitary settings). At the same time, researchers should think generatively about novel cues that could distinguish the laughter of introverts and extraverts. For example, introverts may be more likely to cover their mouth, less likely to show teeth, or avert their gaze when laughing. Extraverts may be more likely to generate extraneous bodily movements like clapping or bouncing in their seats.

The present research was also limited in the number and representativeness of observers, targets, and informants. Also, the observers were aware of the purpose of the study and, therefore, could have attended more closely to laughter-related cues that they might have done had they been blind to the study goals. It is also possible that because targets' laughter was stimulated by humorous videos that our results cannot be easily generalized to laughter in real-world situations. Reliance on humorous videos may limit the generalizability of our findings in two ways. First, it was apparent to observers that the targets were laughing at stimuli they were watching on screens, so this contextual cue may have influenced observers' impressions of personality (Reed & Castro, 2021). Second, observers did not judge laughter where it more commonly occurs – in human interaction. Although some have argued that observing video content has an implicit social dimension (Fridlund, 1991), it may be that the laughter elicited in our study is qualitatively different to laughter elicited from genuine human interactions. Accordingly, it would be valuable for future research to study laughter in a more naturalistic social context. A final limitation of the study is that the effects documented here might be found for any expressive behaviors, not just laughing. A future study could therefore include additional expressive conditions (e.g., targets filmed dancing) to discriminate the effects of laughter from other expressive behaviors.

We have yet to examine impressions of others based on targets being silent, talking, weeping, or seeing how much they are moved by noble ideas, so we cannot assess Dostoevsky's conjecture in full. However, our results do suggest there is some merit to his claim that laughter offers some insight into a human soul, especially if you happen to be interested in the extraverted part of the soul.

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**Data Availability (data transparency)** All data is available at <https://osf.io/ds2tz/>.

**Code Availability (software application or custom code)** All code is available at <https://osf.io/ds2tz/>.

## Declarations

**Conflicts of interest/Competing interests (include appropriate disclosures)** The authors have no relevant financial or non-financial interests to disclose. The authors have no conflicts of interest to declare that are relevant to the content of this article. All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript. The authors have no financial or proprietary interests in any material discussed in this article.

**Ethics approval (include appropriate approvals or waivers)** This study was the subject of IRB approval at the University of Texas at Austin.

**Consent to participate (include appropriate statements)** Informed consent was obtained from all individual participants included in the study.

**Consent for publication (include appropriate statements)** All authors consent to the publication of this article.

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