In Search of the Catbird Seat: Evaluating the Predictive Validity of Personality Trait Judgments
Using a Naturalistic Behavioral Criterion

Andrew Beer

University of South Carolina Upstate

Simine Vazire

University of California Davis

Abstract

To examine manifestations of personality in the course of natural daily life, we tracked 87 participants over a two-day period using the Electronically Activated Recorder (EAR). Coded variables included moods, amount of talking under various conditions (e.g., with one other person, with a group, with a friend, etc.), locations, and a behavioral measurement model of the Five-Factor Model (FFM). The collection of self-, informant-, and stranger-ratings on markers of the FFM allowed for a unique test of the Self-Other Knowledge Asymmetry (SOKA) model. Although effect sizes were typically modest, there was evidence for the validity of both self- and informant-ratings across most major trait dimensions. Stranger ratings only showed evidence of validity in the domain of Extraversion.

Keywords: personality, naturalistic observation, validity, self-knowledge, zero acquaintance, informant ratings

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Personality traits are invisible--putative latent constructs that drive consistent idiosyncrasies in thought, feeling, and behavior. Thus, from a purely objective standpoint, they must generally be inferred rather than directly observed. Despite this theoretical thorniness, attempts to systematically catalog and effectively assess broad dimensions of individual differences have spanned 80 years—much of the time that psychology, as a formal discipline, has existed. The most common method of personality trait assessment has been self-report (Vazire, 2006), founded on the beliefs that individuals (a) have near complete access to their own behavior, and (b) have unique access to their motivations, intentions, and internal emotional states. Indeed, these advantages frequently produce circumstances under which self-report measures of personality traits predict meaningful life outcomes (Ozer & Benet-Martinez, 2006) and quotidian behaviors (Mehl, Gosling, & Pennebaker, 2006).

However, the use of self-reports as a primary source of information about personality certainly leaves some things to be desired (for an extensive review of concerns with self-assessments of various sorts, see Dunning, Heath, & Suls, 2004 for a review of self-reports of personality in particular, see Paulhus & Vazire, 2007). Although individuals have access to most of their behavior, some more automatic or unconscious aspects of behavior may go unnoticed by the actor but be quite impactful on his or her environment and thus an important aspect of one's personality. For example, evading eye contact in personal interactions is an act about which the actor could easily be unaware but may influence interaction partners quite a bit. Moreover, when forming impressions of one's own behavior, people may be overly sensitive to the thoughts and feelings they were having, and place too little emphasis on their overt actions (Andersen, 1984).

Indeed, much has been written about limitations of the actor's perspective for observing his/her own behavior (Jones & Nisbett, 1971; Malle, 2006; Robins, Spranca, & Mendelson, 1996; Watson, 1982).

People may also have biases that distort the accuracy of their self-views, even when they have perfect access to the information they would need to form accurate self-views. There is now a fairly large body of evidence suggesting that self-enhancement is quite common (Alicke, 1985; Kwan et al., 2007; Taylor & Brown, 1988), but that there are also important individual differences in self-bias (Paulhus, 1984; Paulhus & John, 1998). Importantly, the fact that people do not all share the same direction and level of bias about themselves is even more problematic for the accuracy of self-perceptions (Vazire, 2010). If everyone self-enhanced, and did so to more or less the same degree, this would inflate the absolute level of people's self-ratings, but the between-person rank-order accuracy of self-ratings would be intact. Instead, the fact that some people self-enhance, others self-deprecate, and still others are relatively unbiased (Bollich, Rogers, & Vazire, 2015), means that the between-person rank-ordering of people's self-views no longer matches up with the rank-ordering of their actual standing on a trait. Additionally, there are some circumstances in which individuals may have perfectly accurate self-views but may be motivated to willfully and knowingly misrepresent themselves if they believe something may be gained by doing so (e.g., assessments by current or prospective employers, dating website profiles, etc.).

For these reasons and others, psychologists will frequently turn to others for personality information regarding a given target individual. The initial sense is that knowledgeable informants (e.g., friends, spouses, co-workers, roommates, etc.) have access to a wide variety of behaviors over time and across situations. Moreover, while close others certainly have biases

about each other's personalities (Leising, Erbs, & Fritz, 2010; Leising, Gallrein, & Dufner, 2014) their biases tend to be more uniformly positive than self-biases and thus less disruptive of the between-person rank ordering on a given trait. Indeed, informant judgments of personality do predict behavior (Connelly & Ones, 2010; Hofstee, 1994; Kolar, Funder & Colvin, 1996). However, informants are not without their blind spots either. For example, Vazire (2010) found that friends' ratings of personality were less accurate for traits low in observability (e.g., neuroticism).

Since it appears we cannot fully trust ratings by the self or knowledgeable informants, the general temptation has been to simply aggregate across sources of data to achieve the most valid estimate of an individual's standing on a given trait domain (see Letzring, Wells, & Funder, 2006, for an extensive discussion). This logic is generally sound, and in a perfect world, we would simply collect massive amounts of data from multiple sources. However, this is a laborious process for those interested in practically applying the research findings, and in terms of theory, it seems clear that aggregation only buys predictive validity in some circumstances—in others, one source or another predicts a relevant outcome just as well on its own (Vazire & Mehl, 2008). In addition, to the extent that some of the variation across judges is non-random (e.g., a positive evaluative bias), these errors would be compounded or sustained—not eliminated—in an aggregate.

Considerations such as these require a more careful analysis of sources of personality data. Recently, Vazire (2010) put forth a general model to aid in determining which data source might be the most valid for a given trait assessment, based on previous work by John and Robins (1993) and Luft and Ingham (1955). The Self-Other Knowledge Asymmetry (SOKA) model utilizes two primary dimensions—which can be considered as properties of the traits

themselves—to explicate the issue of source validity. The first consideration is the observability of the trait. Traits with clear, frequent, and publicly available behavioral manifestations should be judged quite accurately by knowledgeable informants. In extreme cases, such as extraversion, it is reasonable to assume that aggregating a few independent judgments from someone almost entirely unacquainted with the target individual may yield a fairly accurate estimate. On the other hand, traits defined more by internal affective or cognitive aspects, such as neuroticism, should be judged more accurately by the target herself than by others. However, these predictions must be qualified based on the second factor in the SOKA model, evaluativeness, or the extent to which the trait in question has a clearly socially desirable pole. For example, high agreeableness (warmth, compassion) is a quality generally admired by others and sought after in social relationships (Cuddy, Fiske, & Glick, 2006; Graziano & Eisenberg, 2007) and thus would be considered highly evaluative. Traits such as this should be especially susceptible to both positive and negative self-biases (i.e., by individual differences in self-enhancement/self-deprecation) and thus accuracy for self-judgments, in particular, should be impaired. Traits for which there is no clear polar preference in the population should be less susceptible to such biases, leaving self-judgments largely unaffected. Thus, knowledgeable informants should be more accurate than the self for highly evaluative traits. Overall, self-reports should be more accurate than other-reports for traits low in observability (especially if they are also low in evaluativeness) and other-reports should be more accurate than self-reports for traits high in evaluativeness (especially if they are also high in observability).

How, then, should one test these predictions? The first step is to determine where traits lie on the observability and evaluativeness continua. Happily, some data exist about this for the Big Five traits (John & Robins, 1993). These data suggest that Extraversion and Neuroticism are

generally lower in evaluativeness (relative to Agreeableness, Conscientiousness, and Openness), and that Extraversion is considerably more observable than the other domains. If one were to plot the major dimensions of the Five Factor Model along the observability and evaluativeness continua, it might resemble something like Figure 1, which yields predictions for accuracy across sources as seen in Table 1.

In order to test these predictions, Vazire (2010) asked participants to engage in a series of laboratory tasks relevant to three primary domains (extraversion, intellect, and neuroticism) and found general support for the SOKA model in that (a) self-ratings of Neuroticism (low observability, low evaluativeness) predicted neuroticism-relevant behaviors (e.g., nervous hand movements during a speech) better than did ratings of Neuroticism by knowledgeable informants or strangers, (b) informant-rated intellect (high observability, high evaluativeness) predicted intellect/creativity-related behaviors (e.g., performance on a creativity test) better than did ratings of intellect by the self or strangers, and (c) self-, informant-, and stranger-rated Extraversion (high observability, low evaluativeness) predicted extraversion-relevant behaviors (e.g., talking) equally well.

These initial findings are certainly interesting, but as is the case with any new theory, further tests of its generalizability are warranted. Specifically, there has been a recent push to take personality and social psychology back outside the laboratory (Baumeister, Vohs, & Funder, 2007; Furr, 2009). Personality psychology, in particular, is a science concerned with consistent, quotidian thoughts, feelings, and behavior. The move into the laboratory and away from the field has been driven primarily by practicality: observing behavior as it naturally unfolds is difficult and time-consuming. However, recent innovations in technology and experience sampling have facilitated naturalistic observation. One particularly useful method for personality

research has been the Electronically Activated Recorder (EAR; Mehl, Pennebaker, Crow, Dabbs, & Price, 2001; Mehl & Holleran, 2007; Mehl & Robbins, 2012), which systematically samples ambient sounds in a given individual's natural environment. This method has already helped to shed light on several topics, including narcissism (Holtzman, Vazire, & Mehl, 2010), gender (Mehl, Vazire, Ramírez-Esparza, Slatcher, & Pennebaker, 2007) and ethnic (Ramirez-Esparza & Mehl, 2009) personality stereotypes, mood fluctuations (Hasler, Mehl, Bootzin, & Vazire, 2008), well-being (Mehl, Vazire, Holleran, & Clark, 2010) and depression (Mehl, 2006; Slatcher & Trentacosta, 2011; Robbins, Mehl, Holleran, & Kastle, 2011), and even determinants of problem behavior in children (Slatcher & Robles, 2012). Especially noteworthy are two studies which employed this methodology and have bearing on the current question: which source of personality information is most valid for a given trait? Mehl, Gosling, and Pennebaker (2006) investigated—among other things—the predictive validity of self-reported standings on Big Five variables, finding significant trait-behavior relations for Extraversion (e.g., talking), Agreeableness (e.g., time spent in public), Conscientiousness (e.g., time spent in class), and Neuroticism (e.g., time spent arguing). Vazire and Mehl (2008) took a slightly different approach, gathering self and informant predictions of specific classes of behavior and comparing these estimates to EAR-derived measures of these same behaviors. Specifically, they asked participants to estimate the relative frequency (compared to the average person) with which they engaged in a behavior (e.g., watching TV), obtained parallel estimates from knowledgeable informants, and then examined the predictive power of these estimates both jointly and separately. Individually, each perspective predicted relevant behavioral criteria equally well (mean r across 20 behaviors for self and single informants were .26 and .23, respectively), and both perspectives provided unique predictive validity in regression analyses.

The Current Study

The current study aims to build on this previous work and provide a further test of Vazire's (2010) SOKA model. To this end, we gathered self-, knowledgeable informant-, and stranger-ratings of Big Five variables and compared these to relevant EAR-derived behavioral codings from observation over two-day periods. To our knowledge, this is the first study which includes each of these three rater sources in conjunction with naturalistic observation, allowing for a unique test of the SOKA model.

Predictions

Given the extant data (cf. Mehl, Gosling, & Pennebaker, 2006; Vazire & Mehl, 2008) and the theoretical predictions derived from the SOKA model (Vazire, 2010), we expected (1) that self-ratings of personality will predict relevant acoustically-encoded behavior in low evaluativeness domains, namely, Extraversion and Neuroticism, and to a lesser degree Agreeableness and Conscientiousness, and (2) that informant-ratings of personality will predict relevant acoustically-encoded behavior in high observability domains, namely, Extraversion, and to a lesser degree Agreeableness and Conscientiousness. The nature of the criterion variables will of course limit predictive power for low observability traits in general. Based on Vazire and Mehl's (2008) findings we also predict (3) that self- and informant-ratings will provide incremental predictive validity for some of these behaviors. However, given the dissimilarity in bandwidth (cf. Ashton, Jackson, Paunonen, Helmes, & Rothstein, 1995) between the predictors and criteria in this study (general trait measures versus specific behavioral manifestations over a relatively short observation period), we would expect (4) that the effect sizes in this study will be unlikely to exceed .30 in most cases (for a similar case, see Mehl, Gosling, & Pennebaker, 2006).

Given previous findings regarding the validity of judgments of Extraversion under conditions of near zero acquaintance (Beer & Watson, 2008; Borkenau & Liebler, 1992; Naumann, Vazire, Rentfrow, & Gosling, 2009; Norman & Goldberg, 1966; Vazire, 2010) and Extraversion's status as a highly observable trait, we would expect that (5) strangers' ratings of Extraversion will correspond to relevant target behavior as well as do self and informant ratings.

Method

Participants

The initial participant pool consisted of 114 college students (84 female, 66 Caucasian, 44 African American) mostly recruited from lower-level psychology courses. Individuals received partial fulfillment of a course requirement in exchange for their participation. One participant withdrew from the study, and missing or incomplete data also generate some instability in the sample size for various analyses. Additionally, sporadic equipment failure impacted approximately 20% of cases, thus the effective maximum sample size for key analyses was 87. These 87 participants did not differ significantly in terms of personality or demographics (62 female, 49 Caucasian, 35 African American) from the initial pool of 114 participants.

Phase 1: Initial Laboratory Session

Participants arrived at the laboratory individually and were asked to complete a demographic survey, some brief personality measures, and compile some lists of personal facts and preferences in open-ended form. After this, the experimenter introduced the EAR, explaining how the device worked and the parameters of the remainder of the study. Participants were asked to wear the EAR as often as possible but to keep the device out of harm's way (e.g.,

water, contact sports). Participants were also informed of the confidentiality policies, which included the freedom to delete any or all recorded data during or subsequent to the return of the device 48 hours later (for a description of similar confidentiality policies, see Mehl & Pennebaker, 2003).

Phase 2: Assessment of Naturalistic Behavior

Participants wore the EAR for two consecutive days, always starting on a Monday. The EAR was scheduled to record for thirty-second intervals once every 12 minutes. In addition, the EAR was set to hibernate between the hours of 11:30pm and 7:30am. Thus, the maximum number of possible 30-second observations for each participant was 160. The average number of total files received per person was 137 ($SD = 44$). As mentioned previously, the devices occasionally experienced sudden, unexplained failure resulting in massive data loss due to the fact that these failures typically occurred relatively early in the observation process. As a result, we decided only to use cases in which at least 150 recordings were present upon return of the device. This effectively reduced the pool from 114 to 87 participants. However, in this subset of participants, the average number of total files received per participant was 158. Most importantly, the subset of participants with at least 150 available files did not differ significantly from the full sample in terms of self- or informant-reported personality variables.

To assess obtrusiveness of the methodology and general compliance, we asked participants a series of questions upon conclusion of the study, to which they responded using a 5-point scale (1 = not at all, 5 = a great deal). These self-reports indicate that participants were generally only somewhat aware of the EAR ($M = 2.96$, $SD = .96$) and did not feel uncomfortable wearing it ($M = 1.84$, $SD = 1.15$). They also reported that they were not impeded ($M = 1.45$, SD

= .82) by the EAR, nor did it alter daily behavior ($M = 1.55$, $SD = .75$). Though participants did report others being aware of ($M = 3.58$, $SD = 1.14$) and talking about ($M = 3.69$, $SD = 1.01$) the EAR, they did not feel that others altered their behavior due to the presence of the EAR ($M = 2.20$, $SD = 1.20$). On average, participants estimated that they spent 85% ($SD = 12\%$) of their waking hours wearing the EAR, and on a scale of 1 (not at all typical) to 5 (very typical) they rated the two-day observation as fairly typical ($M = 4.01$, $SD = 1$). Though these estimates are for the full sample, the parallel estimates from participants with 150 or more available files were basically identical.

A team of 5 coders evaluated the resulting files using a revised and expanded version of the Social and Environmental Coding of Sound Inventory (SECSI; Mehl et al., 2006). The system assesses four major categories: interactions (e.g., talking with a group, talking with one other, on the phone, etc.), activities (e.g., eating, sleeping, watching television), moods (e.g., laughing, singing, crying), and locations (e.g., in apartment, in transit, in public). In addition to these categories, coders evaluated each segment in terms of the six basic emotions (happiness, sadness, anger, fear, surprise, disgust) and, in the event of conversation, the type of conversation (e.g., deep, gossip, practical). Finally, we constructed an auditory behavioral measurement model for the Big Five, covering Extraversion (behavioral classes included dominance, affiliation, and energy), Neuroticism (worrying, complaining, sadness), Openness to Experience (creativity, unconventionality, spirituality), Agreeableness (sympathy, concern for others, affection), and Conscientiousness (cleaning, hygiene, responsibility).

Coders were asked to listen to each file in a given case and evaluate it with respect to the 58 distinct categories (for a complete list and description of all categories, see the appendix). For example, if the participant was talking angrily about a friend to another friend over lunch, the

coder would be expected to mark a “1” in the spreadsheet under “talking with one other”, “talking with friend”, “gossip”, “anger”, “in public”, and “eating”, perhaps among other things, depending on the circumstances. To establish reliability, the five coders all evaluated four semi-randomly selected (to reflect the breadth of the target demographics) complete cases, which consisted of 632 total files. ICC[2, k] exceeded .70 for most categories with a reasonable base rate of occurrence (see Table 2 for specific information). Particularly unreliable or incredibly low frequency behaviors were generally omitted from further analysis.

These raw codings were then converted to time-use estimates by dividing the number of coded instances in a given category by the number of total usable files¹. The latter was defined by files in which some ambient sound of any kind could be detected. In the case of complete silence (which should be rare, given that the EAR successfully captured things as quiet as the turning of pages), coders were instructed to flag the file, and long periods of silence were compared to participant diaries to confirm non-compliance (e.g., left EAR in the car). These flagged files were subtracted from the total number of files to produce the denominator in the time-use estimates. For the 87 participants who met the base file requirement, an average of 128 files per person were deemed usable ($SD = 18$). Conversely, the omitted cases only averaged 48 usable files per participant ($SD = 29$), further justifying the omission of these cases from further analysis. These proportions would serve as the central criterion for all subsequent analyses.

Phase III: Second Laboratory Session

Exactly 48 hours after having received the EAR, participants returned to the laboratory, at which point they completed the EAR compliance questionnaire. They then took part in a brief videotaped interview and were asked to provide the email addresses of two people who knew

them well. We then contacted these individuals and asked them to complete a personality inventory (administered online) about the target individual (see Vazire, 2006 for a description of the general procedure). Of the possible 228 informants, we received 138 responses, with two informant reports for 50 participants, one for 88, and zero for 26.

Participants were also given the opportunity to review their EAR files at this point. Most declined the opportunity, though approximately 10% requested a copy of their files for personal use. Only two participants asked that we delete specific files (a total of three files), and, as mentioned previously, one participant asked that all files be deleted.

Phase 4: Stranger Ratings

Several months after the conclusion of the laboratory sessions and as part of a subsequent study, we obtained personality ratings about the target individuals from a sample of individuals who were entirely unacquainted with these targets. In this study, judges made three separate personality evaluations of each target after having received three different kinds of information about the target: a three-item list of individuating facts written by the target participant about him/herself, a three-item list of personal values also written by the target participant (see Beer & Brooks, 2011, for a description of these types of information), and a muted video segment from the laboratory session. These three estimates were averaged within-rater, and each target was judged by three raters. Thus, the stranger-generated personality estimates for subsequent analyses represents an aggregate of nine ratings from three judges per target.

Measures

We assessed personality using the Big Five Inventory (BFI; John, Naumann, & Soto, 2008). The 44-item version of the BFI contains 8-item scales assessing Neuroticism and

Extraversion, a 10-item Openness scale, and 9-item measures of Agreeableness and Conscientiousness. The participants rated themselves using a five-point scale (1 = disagree strongly, 5 = agree strongly) in response to a series of adjectives and phrases following a stem statement (“I see myself as someone who...”). This instrument was used for all ratings, and the informant- and stranger-rating forms featured a modified stem (“I see this person as someone who...”). Coefficient alphas for the scales ranged from .75 to .91, from .83 to .90, and from .87 to .94 for self-, informant-, and stranger-ratings, respectively. Behavior was acoustically captured via the EAR, which in this case was a Dell Axim v50, housed in a protective case.

Results

Descriptive Statistics: Behavior

As described above, coders evaluated each audio file for the 87 eligible participants along 58 dimensions. Table 2 provides the frequency estimates and inter-coder reliability for these behavioral variables. The reliability estimates are based on the five coders’ ratings of four participants’ complete files, whereas all other target participants’ files were only coded by one coder, and thus were less reliable. As the first column of the table indicates, the intraclass (ICC [2, k]) correlations that captured inter-coder reliability exceeded .70 in most (30) cases. There were 12 behaviors that did not occur in any of the 4 cases used for establishing reliability estimates and 16 behaviors for which the intraclass correlations were lower than .70. Several of the latter instances occurred for variables that were generally low base rate behaviors in this population (e.g., energy, worrying, substance use). Due to the sampling method utilized for obtaining reliability estimates, we thought it prudent to retain all variables for subsequent

analyses, with the understanding that the low reliability for some of these variables would certainly impact the likelihood of observing convergent relations with the trait predictors.

Descriptive Statistics: Personality Measures

Table 3 provides the means and standard deviations for judgments of the FFM by source. Since there were no significant differences for any source between trait estimates for participants with eligible EAR files (greater than 150 files obtained) and those falling short of that requirement, we have provided the full scale estimates for the sample. These descriptive statistics may give some clues to the validity of each source. For example, some recent work has indicated that informants recruited using methods similar to that employed in this study may suffer from a “pal-serving bias” (Leising, Erbs, & Fritz, 2010) which may appear in the form of means closer to the extreme ends of the scale and smaller standard deviations (restricted variance) on evaluative traits (cf. Wood & Wortman, 2012). For Agreeableness, Neuroticism, and Conscientiousness, we observed no mean differences among the three judgment sources. Informants rated targets as significantly more Open to Experience than did strangers ($t(193) = 6.05, p < .01$) and marginally significantly more Open than the targets rated themselves ($t(194) = 1.85, p = .06$). A similar pattern emerged for Extraversion, with informants rating targets significantly higher than did strangers ($t(193) = 5.63, p < .01$) or the targets themselves ($t(194) = 2.45, p < .05$). However, Extraversion is the least evaluative of the Big Five traits so these mean differences do not necessarily reflect a strong positivity bias among informants.

Bivariate Relations: Preliminary Analysis

Another method for examining potential issues with scale validity involves examining the inter-trait associations. Table 4 provides the multitrait-multimethod matrix (MTMM) for all trait

judgments in this study. First, there is evidence of an acquaintanceship effect (Funder & Colvin, 1988; Watson, Hubbard, & Wiese, 2000) as evidenced by the convergent relations across the three sources. Self-informant agreement was quite strong for Neuroticism, Extraversion, and Openness to Experience, and somewhat weaker (though still statistically significant) for Agreeableness and Conscientiousness. The self-stranger convergent correlations were significant for all traits except Conscientiousness ($r = .07$, n.s.), though all effects were small ($r_s < .30$). Finally, the informant-stranger relations tended to be weak, with only Extraversion ($r = .34$, $p < .05$) showing significant agreement. The discriminant relations, however, are probably of more interest in the current study. The heterotrait-heteromethod relations tended to be quite small in most cases, with only 5 of the 60 correlations reaching significance and all being fairly small in magnitude ($r_s < |.34|$). Four of these correlations could be found off the diagonal in the self-informant heteromethod block. Still, the convergent-discriminant pattern for self and informant judgments was largely solid. The stranger judgments, however, showed little convergence and all but one heterotrait-monomethod relation (Openness-Conscientiousness) was significant, with a few being quite strong (e.g., Neuroticism-Extraversion, $r = -.55$, $p < .01$). Though shared method variance was evident in all three sources, there was a general trend toward more and stronger intercorrelations among trait judgments with decreasing acquaintanceship, parallel with previous findings (Beer & Watson, 2008b). This stronger halo effect may serve to depress each scale's relations with external criteria for informant- and especially stranger-ratings. Thus, one might expect that informant- and stranger-ratings may fare worse in terms of behavior prediction, in general, than self-ratings of personality, in part due to the lower differentiation among traits among those raters.

Bivariate Relations: Criterion Validity

The central focus of this study is behavior prediction from personality judgments. What follows is a trait-by-trait analysis of the criterion validity of trait judgments by each source. In addition to the aggregates described previously, we calculated single-informant and single-stranger estimates for each personality variable. The single-informant estimates were obtained by simply excluding the second informant from each aggregated informant estimate. The single-stranger ratings still include some aggregation, as each estimate represents the average of three successive judgments made by one perceiver. However, the single-stranger estimates result from calculating the trait-behavior correlation for each of three perceivers across targets, Fisher-transforming these correlations, averaging them, and then back-transforming these estimates. We will primarily discuss the aggregated estimates, but the single-rater estimates are available for comparison purposes. These help address the question of whether any differences across the three sources (self, informant, stranger) could be due to the fact that there was greater aggregation for some sources than others (stranger > informants > self), which would have led to greater reliabilities and therefore more opportunity for predictive validity.

Given the mismatch in bandwidth of the predictors (generalized trait measures as assessed by questionnaire) and criteria (EAR-coded behavior over a two-day period as assessed by frequency counts) in this study, we chose to employ a slightly relaxed alpha level (.10 versus the typical .05). This allowed us to detect effects of the typical size (r s in the .20s) observed in previous studies connecting trait ratings and EAR-coded behaviors (cf. Mehl, Gosling, & Pennebaker, 2006). However, we acknowledge that our analyses do not give us enough power to make precise estimate of effect sizes, and should be followed up with more data to refine the effect size estimates (however, this is quite difficult to do with EAR data, as it is time-consuming to code).

For each section, we first identified (a priori) a subset of trait-relevant behaviors and then examined the correlations between trait judgments from each source and these criterion behaviors. We begin with Extraversion, the trait with the most theoretically relevant acoustically coded behavioral manifestations, and progress to Openness to Experience, the trait with the fewest theoretically relevant acoustically coded behavioral manifestations.

Extraversion. Given the conceptual definition of extraversion, we expected that trait judgments should predict behaviors related to sociability (e.g. various talking behavior, socializing, affiliation, being in public places), positive emotionality (e.g., laughing, singing, happiness), and general activity or arousal seeking (e.g., energy, listening to music, being in transit). Furthermore, in accordance with the SOKA model, we expected that self-, informant-, and stranger-ratings would show relatively equivalent criterion validity in this domain. Table 5 provides the relevant relations between self-, informant-, and stranger-rated Extraversion and theoretically relevant behavioral manifestations of extraversion.

In terms of sociability, all three sources predicted talking with friends, while only informant judgments predicted talking with one other person. Interestingly, all three correlations with “talking with a significant other” were negative ($r_{\text{self}} = -.19, p < .10$; $r_{\text{informant}} = -.15, \text{n.s.}$; $r_{\text{stranger}} = -.23, p < .05$). Although it is not surprising that this relation is not positive, the fact that more of one’s time spent talking with a romantic partner tends to occur in more introverted individuals was unanticipated. In line with expectations, both self- and informant-ratings of Extraversion predicted engaging in gossip ($r_{\text{self}} = .20, p < .10$; $r_{\text{informant}} = .21, p < .10$) and practical conversations ($r_{\text{self}} = .21, p < .10$; $r_{\text{informant}} = .23, p < .10$), and stranger-ratings of Extraversion predicted affiliative behavior ($r = .24, p < .05$). However, none of the three sources predicted socializing at a better-than-chance level.

In terms of general activity or arousal seeking, informant- and stranger-rated Extraversion predicted time spent in transit ($r_{\text{informant}} = .30, p < .05$; $r_{\text{stranger}} = .21, p < .10$), stranger ratings predicted time spent listening to music ($r = .24, p < .05$), and all three sources predicted energetic behavior ($r_{\text{self}} = .21, p < .10$; $r_{\text{informant}} = .23, p < .10$; $r_{\text{stranger}} = .22, p < .10$).

Finally, in terms of positive emotionality, self- and stranger-reports both predicted laughing ($r_{\text{self}} = .22, p < .05$; $r_{\text{stranger}} = .23, p < .05$), self-reports predicted singing ($r = .21, p < .10$) and stranger-rated Extraversion predicted coded happiness ($r = .39, p < .01$).

In summary, each perspective on Extraversion showed some degree of criterion validity, with aggregated stranger-ratings showing the strongest relations overall. This is not entirely surprising, given previous findings with respect to the validity of stranger-rated extraversion in low acquaintance situations (Beer & Watson, 2008a, 2010; Naumann et al., 2009; Norman & Goldberg, 1966; Vazire, 2010; Watson, 1989) and predictions derived from the SOKA model. The benefit of aggregation is somewhat pronounced, however. When using single informants and single strangers (results in parentheses in Table 5), the average absolute magnitude of the predictive validity of self-ratings (mean absolute $r = .14$), informant-ratings (mean absolute $r = .16$) and stranger ratings (mean absolute $r = .14$) show that these three sources predicted Extraversion-related behavior at similar levels.

Neuroticism. Given the conceptual definition of neuroticism, we expected that trait measures of the construct should predict behaviors related to negative mood states² (e.g., sadness, anger, crying, complaining), social withdrawal (e.g., time at home or indoors), and markers of mental or physical illness (e.g., sleeping, coughing, less working). Given that Neuroticism could be considered relatively low in observability and in evaluativeness, we

expected self-ratings to more strongly predict relevant behaviors than informant- or stranger-ratings and informant-ratings to outperform stranger-ratings.

Table 6 provides the correlations between self-, informant-, and stranger-ratings of Neuroticism and neuroticism-relevant behavior, as captured by the EAR. Contrary to predictions, informant-ratings seemed to best predict behavior, with at least one of the aggregated- or single-informant estimates of Neuroticism significantly predicting 6 of the 11 relevant behaviors and yielding estimates approaching statistical significance for 2 of the remaining 5 (the three exceptions—sighing, complaining, worrying—were low reliability and/or low base rate behaviors in this sample). Conversely, self- and stranger-rated Neuroticism failed to significantly predict any relevant behavior. More specifically, effect sizes were strongest for informants (mean absolute $r = .18$), followed by self-ratings (mean absolute $r = .09$) and stranger-ratings (mean absolute $r = .06$). Aside from these relations, self- and informant-rated Neuroticism predicted self-talk ($r_{\text{self}} = -.21, p < .10$; $r_{\text{informant}} = -.20, p < .10$). However, these relations are difficult to interpret—perhaps because self-talk yielded fairly low inter-coder reliability in the training files, indicating inconsistent application of the coding scheme. Informant-rated Neuroticism also correlated with time spent on a computer ($r = .28, p < .05$), which may indicate a solitary form of entertainment. Also interesting were some relations between stranger-rated Neuroticism and the Extraversion-relevant behavior of laughing ($r = -.27, p < .05$) and happiness ($r = -.21, p < .10$). After controlling for stranger-rated Extraversion, the happiness correlation drops precipitously ($r = -.02$), but the laughter relation remains significant ($r = -.18, p < .10$). So, it is possible that unacquainted perceivers are conflating Neuroticism and Extraversion to some degree (cf. Paulhus & Bruce, 1992), but not entirely.

Conscientiousness. Given the conceptual definition of conscientiousness, we expected trait ratings to predict goal-oriented behavior (e.g., attending class, studying, exercising; time on computer and watching television), organization and preparation (e.g., cleaning and hygienic behavior), norm adherence (e.g., low substance use, low swearing, refraining from gossip), and responsibility. Given that conscientiousness could be described as moderately observable and evaluative, the SOKA model does not make a clear prediction regarding which perspective should be most valid. However, since it is not *highly* evaluative and conscientiousness is a trait that typically generates stronger convergence even in lower acquaintance situations (e.g., Borkenau & Liebler, 1992), we expected that all three sources would have some validity, with self- and informant-ratings more strongly predicting relevant behavior due to greater access to information. We would also perhaps expect a slight advantage for informant-judgments (relative to self-judgments) due to the impact of its moderate evaluativeness.

Table 7 provides the correlations between self-, informant-, and stranger-ratings of Conscientiousness and conscientiousness-relevant behavior, as captured by the EAR. These data are less interpretable than those for Extraversion and Neuroticism. At first glance, stranger-rated Conscientiousness shows strong evidence of criterion validity, predicting time spent in class ($r = .31, p < .05$), sleeping ($r = -.27, p < .10$), and swearing ($r = -.41, p < .01$). Indeed, one would expect highly conscientious individuals to be in class, not swear, and be awake more often between the hours of 7:30 am and 11:30 pm (this effect likely driven by differences in the early part of the day). However, stranger-rated Conscientiousness significantly predicted exercise, but in the opposite direction of the anticipated relation ($r = -.41, p < .01$). This is difficult to explain, but it is possible that exercise as observed in this study was utilized as a diversion more than a goal-directed behavior. There is other evidence suggesting that conscientiousness predicted less

engagement in behaviors that could be considered diversions, such as talking with friends ($r_{\text{self}} = -.20, p < .10$). Then again, it is also likely that the EAR did not adequately capture exercise, given that participants were asked to remove the device during exercise activities. Thus, observations of exercise could be at least partially due to non-compliance with the suggested protocol.

On the other hand, self-ratings of Conscientiousness predicted less time spent on the computer ($r = -.26, p < .05$), less time engaged in gossip ($r = -.20, p < .10$), and swearing less often ($r = -.25, p < .10$) and had no highly unusual or unexpected relations within the set of theoretically relevant behaviors. At first glance, the inverse relation with time spent on the computer would seem puzzling, but in our sample, coders reported that computers were typically used as a distraction (e.g., video games, viral videos) rather than for the ostensible completion of work-related tasks.

Informants generally fared the worst in terms of criterion validity in this category, predicting only sleeping ($r = -.23, p < .10$) at a greater-than-chance level. This is not entirely surprising, given the relatively weak convergent/discriminant pattern displayed by informant-rated Conscientiousness (see Table 4) in this study. Interestingly, informant-rated Conscientiousness also predicted self-talk ($r = .27, p < .05$), sadness ($r = -.23, p < .10$), anger ($r = .25, p < .05$), affection ($r = .24, p < .10$), and concern for others ($r = .20, p < .10$). Controlling for informant-rated Neuroticism depresses the relations for sadness ($r = -.16$), and self-talk ($r = .19$), but actually inflates the relation with anger ($r = .39, p < .01$). Although curious, none of this lends credence to informant-ratings of Conscientiousness in this sample. Thus, the hypotheses for this trait were largely unsupported.

Agreeableness. Given the conceptual definition of agreeableness, we expected trait ratings in this domain to predict behaviors that indicated investment in relationships and concern for others (e.g., talking to significant others or family, engaging in personal conversations, sympathy, affection, concern for others) and the avoidance of confrontation (e.g., less anger). Given that Agreeableness is moderately evaluative and not easily visible at low acquaintance (Ames & Bianchi, 2008), we expected that informant-ratings would better predict relevant behaviors than would self-ratings, and that stranger-ratings would show very little criterion validity.

Table 8 provides the correlations between self-, informant-, and stranger-ratings of Agreeableness and conscientiousness-relevant behavior, as captured by the EAR. The most obvious feature of this table is the lack of significant relations between ratings of Agreeableness and relevant behavior. Only one relation reaches statistical significance: the relation between the single-(but not the aggregated) informant rating and talking with other family (family members other than children or spouses; $r = .22, p < .10$), which is puzzling due to the unusual deleterious impact of aggregation, and thus is likely spurious. Still, to the extent that ratings of Agreeableness predicted any relevant behaviors, informant-ratings were the most valid. Self- and stranger-ratings of Agreeableness predicted concern for others ($r_{\text{self}} = .17, p = .12$; $r_{\text{stranger}} = .17, p = .11$) at levels approaching statistical significance, and all other relations were fairly small in magnitude.

On the other hand, ratings of Agreeableness did predict some interesting unanticipated behaviors. For example, the negative relation with deep conversation ($r = -.20, p < .10$) may seem counterintuitive on its face, but the coding instructions specifically indicated that such conversations were not to be emotional in content. Thus, individuals that were seen as agreeable

by knowledgeable others did not tend to have political or philosophical discussions with others. Informant-rated Agreeableness also predicted self-talk ($r = .26, p < .05$), which represents the third informant-rated trait (Neuroticism, Conscientiousness) predicting this behavioral measure. Once again, self-talk was a somewhat problematic coding category and proved unreliable in the inter-coder analysis, and the fact that these three moderately correlated (see the informant monomethod triangle in Table 4) trait measures predicted the same outcome is not surprising. Still, the fact that this fairly evaluative cluster of ratings from close others associated with this single behavioral outcome is curious. In addition, like self-ratings of Conscientiousness, self-ratings of Agreeableness predicted less time spent on the computer ($r = -.35, p < .01$). Controlling for self-rated Conscientiousness did not greatly impact this relation ($r = -.30, p < .01$), so it seems that spending time on the computer may be related to conscientiousness (perhaps because it is often not goal-directed activity) and agreeableness (perhaps because it is generally solitary) independently. Self-ratings of Agreeableness also predicted responsibility ($r = .23, p < .05$), a class of behavior we expected to be related to Conscientiousness. This cross-prediction between Agreeableness and Conscientiousness and their hypothesized behavioral correlates (measures of Conscientiousness from different sources predicted displays of interpersonal affection and concern for others) is a recurrent theme in these data, and is consistent with structural models of personality that propose a higher-order factor composed largely of Agreeableness and Conscientiousness (i.e., Digman's (1997) "Alpha" or DeYoung's (2006) "stability" super-factors).

Finally, Agreeableness ratings (particularly stranger ratings) predicted three extraversion-relevant outcomes: gossip ($r_{\text{stranger}} = .19, p < .10$), laughing ($r_{\text{stranger}} = .20, p < .10$), and time spent in transit ($r_{\text{stranger}} = .23, p < .05$; $r_{\text{self}} = .20, p < .10$). Controlling the three significant

stranger relations for stranger-rated Extraversion only slightly decreases these relations (laughing $r = .15$, gossip $r = .18$, time spent in transit $r = .19$).

The lack of predicted correlations, in combination with these unexpected findings, suggest that the EAR (or the coding system employed) did not adequately capture Agreeableness-related behavior, so with respect to the hypotheses tested, we would consider the results inconclusive.

Openness to Experience. Given the conceptual definition of Openness to Experience, we expected trait ratings to predict creativity, unconventionality, and engagement in philosophical discussion (deep conversations) and exploratory behavior (substance use). Given the high evaluativeness of Openness (as assessed by the BFI) and its low observability, particularly to strangers, we expected that self- and informant-ratings would better predict Openness-relevant behavior, with a slight advantage to informant-ratings.

Table 9 provides the correlations between self-, informant-, and stranger-ratings of Openness and openness-relevant behavior, as captured by the EAR. With one exception (substance use), stranger-ratings of Openness generally failed to predict relevant behavior. Also with one exception (engaging in deep conversations), informant-ratings of Openness tended to predict relevant behavior. Specifically, aggregated informant ratings predicted substance use ($r = .22, p < .10$), and the single informant estimate predicted unconventionality ($r = -.26, p < .10$). Self-ratings predicted only EAR-coded creativity ($r = .22, p < .10$). The relations between self- and informant-rated Openness and creativity and unconventionality, in particular, are noteworthy due to the extremely low base rates for each of these behavioral categories.

As with other categories, ratings of Openness had a few interesting relations beyond those hypothesized. Specifically, informant ratings of Openness predicted swearing ($r = .40, p < .05$) and listening to music ($r = .22, p < .10$). To the extent that swearing is an unconventional use of language and listening to music could be considered appreciation of artistic endeavors, these relations may make some sense.

Overall, it would seem that the EAR (or, again, the coding system employed in the current study) generally fails to capture Openness-relevant behavior. However, to the extent that it does, informant ratings seemed to be the most valid of the three sources.

Multivariate Analyses: Unique Predictive Validity

As Table 4 demonstrates, these three sources of personality information contain unique variance, but to what extent is the unique information provided by each perspective valid? Vazire and Mehl (2008) demonstrated that self- and informant-rated behavioral predictions were indeed generally complementary, with 15 of the 20 behaviors assessed showing significant unique predictive validity for each source independently (see their Table 4). Personality trait judgments, however, may or may not conform to this pattern. Table 10 presents the results of multiple regression analyses³ involving the principal variables of interest in this study (i.e., Big Five measures from three sources predicting theoretically relevant behavioral manifestations), organized by trait and magnitude of multiple correlation. The first three data columns contain the standardized beta weights for each source, and the final column contains the multiple correlation when all three predictors are included in the model. In general, there is very little—if any—evidence of predictive complementarity in these data. Rather, as the bivariate analyses

suggested, for any given trait-behavior relation, it seems that one source is clearly preferable to another.

Perhaps surprisingly, for 8 of the 16 extraversion-relevant behaviors assessed in this study, aggregated stranger ratings were the sole significant predictor (compared to just 1 each for self- and informant-rated Extraversion). For Neuroticism, however, informant-ratings showed the largest standardized betas for 7 of the 11 relevant behaviors (3 of these reaching statistical significance). The other three trait categories showed relatively unclear patterns, which is unsurprising considering the results of the bivariate analyses.

Discussion

We obtained personality measures from three sources (self, knowledgeable informants, and strangers) in an attempt to evaluate the predictive validity of each with respect to a naturalistic behavioral criterion. At the outset, we made five general predictions. First, we predicted that self-ratings of personality would predict relevant acoustically-encoded behavior in the domains of Extraversion, Agreeableness, Conscientiousness, and Neuroticism. In fact, self-reports only predicted behavior to an acceptable degree in the domain of Extraversion. Looming large over this general predictive failure, however, is the fact that informant and/or stranger perspectives are likely more similar to those of the coders than those of the self. In other words, it is likely that informant and stranger personality ratings are derived from behavioral observation to a greater extent than are self-ratings of general personality traits.

We also predicted that informant ratings would predict behavior in Extraversion, Agreeableness, and Conscientiousness, whereas in actuality, these ratings predicted relevant behaviors for Extraversion, Neuroticism and Openness. In addition, we predicted that self and

informant judgments would demonstrate incremental validity in some cases, but we observed little such synergy. Perhaps some of these shortfalls are related to the bandwidth discrepancy between the criteria and predictors in this study that likely created a ceiling on the predictive power of each perspective. However, our final general prediction—that stranger ratings of Extraversion would predict relevant target behavior as well as self or informant ratings—was strongly supported.

Limitations

To our knowledge, this is the only study to date that has examined the validity of trait judgments from the self, informants, and strangers with respect to a naturalistic behavior criterion. This key advantage, however, is offset by a few limitations. First and foremost, in a current scientific culture keenly (and appropriately) interested in power and replicability, the central analyses included in this paper are based on a fairly small sample size. In our opinion, the incorporation of real-life behavior—and the methodological and analytic difficulties that such incorporation poses—justifies the value of this study despite its small sample size, but this does not change the fact that our confidence intervals are large and our results imprecise. Future endeavors should aim to (a) gather similar data from more people, (b) employ longer (than two days) observation periods, (c) employ multiple (non-contiguous) observation periods, and (d) include measures for increasing the reliability of the behavioral coding (i.e., multiple coders for all files, refinement of coding system). Although accomplishing these goals simultaneously is a somewhat daunting task, we believe that this would provide a clearer picture of the validity of these judgments and allow for some more sophisticated data analysis aimed at more detailed research questions. In the interim, researchers without access to the resources to conduct such a

study should continue to collect behavioral data which can be later synthesized via meta-analytic review.

Secondly, although a chief advantage of this particular study, the prediction of behavior in natural settings is only one method of criterion validation. In the end, the general concept of a personality trait includes consistency in affective experience, cognition, and motivation in addition to consistent patterns in behavior. Self reports, for example, did not grade out well in our analyses, but this may not be an entirely fair test. Due to the self's unique perspective, perhaps one would expect that self-judgments might fail to predict some behavior. On the other hand, for outside observers, the adage "behavior engulfs the field" takes on particular importance in this instance. Principally in the case of the strangers, these trait judgments are formed solely on small snippets of behavior. Thus, it would follow that predicting other behavior would be simpler for them than, say, predicting emotional responses to events or understanding the reasons for these actions. That said, we do not feel that this simple fact makes the validity of stranger ratings tautological. The strangers in this study only had access to a few statements made by each target and about a minute's worth of nonverbal behavior in a laboratory setting. The fact that this information could be utilized to make summary personality judgments that in turn predicted behavior in real-world settings is still fairly substantial. Furthermore, the behavioral outcome most strongly predicted by the stranger ratings was happiness, an affective response.

Nevertheless, our criterion measure was restricted to observable (i.e., behavioral) manifestations of traits, and thus likely favored observer- (i.e., informant- and stranger-) reports over self-reports. To the extent that readers agree that behavioral manifestations of traits are the most central, this is not necessarily a weakness of our criterion measure. However, future

research should try to incorporate criterion measures that also capture less overt manifestations of the Big Five (e.g., subtle linguistic cues, behavioral residue, life outcomes).

Future Directions

The work discussed here represents only a small step toward understanding the utility and validity of trait judgments from various sources. At its heart, this is among the most basic of research programs in personality. However, seventy-plus years into the investigation of personality traits, our sense of how actual behaviors tend to cluster together in individuals is still somewhat limited. The SOKA model can be used as an orienting principle for elaborating on this network.

More practically, at the very least, these data, in conjunction with recent findings (Vazire, 2010; Vazire & Mehl, 2008) indicate that there may be key differences in the validity of trait ratings by source, meaning that in practical application, we should rely on different predictor variables depending upon the circumstance and focal dimension. For example, the potential of a prospective sales representative might best be evaluated by a panel of strangers, whereas clinicians might choose to seek informant reports of personality when considering a client's propensity for melancholy in the future (but see Carlson & Oltmanns, 2013). For researchers investigating accurate personality perception, perhaps the same accuracy criterion should not be utilized across traits. For example, self-other agreement may prove an appropriate index of accuracy for say, Conscientiousness, but for Openness, one might compare novel estimates to judgments made by knowledgeable informants.

Future research should also continue to improve upon our current methods of naturalistically measuring behavior. Specifically, the rather coarse coding categories for acoustic

behavior probably underestimate the predictive validity of trait judgments. Aside from drastically altering the method of data acquisition (e.g., using a video analog to the EAR, which has important ethical constraints), there may be some ways to adjust coding methods that could prove illuminating. For example, rather than employing pure counting methods, coders might be instructed to listen to small segments of recordings and then rate the personality state (Fleeson, 2007) of the individual at various time points. Furthermore, methods such as this could be jointly employed with attempts to measure context or situation type (Rauthmann et al., 2014), allowing for a slightly more objective evaluation of person-situation interactive effects (Sherman, Nave, & Funder, 2010).

Conclusion

Our findings bolster the emerging conclusion that different perspectives – the self versus others – have complementary strengths and weaknesses when it comes to accurately judging a person's personality. We also provided the first head-to-head comparison of these different perspectives against a naturalistic, objective behavioral criterion measure. One lesson from this study is that the EAR may be an ideal method for collecting behavioral measures of personality for some domains (e.g., extraversion, agreeableness) but not others (e.g., emotions, openness). For those domains for which the EAR provides reliable data (e.g., extraversion and agreeableness), one intriguing possibility is that the EAR could potentially pick up on some trait-relevant behavior that neither the self nor close others can judge very accurately (e.g., agreeableness). Behavioral measures, when reliable, could also help adjudicate differences between the self and close others. These applications could be extended to other domains where self- and other-reports may be untrustworthy or may disagree (e.g., relationship behaviors, workplace behaviors, parent-child interactions). Although our findings are not conclusive, we

hope this approach will be used to address questions about self- and other-knowledge in a wide range of contexts, questions that may have been intractable without the ability to unobtrusively and objectively observe people's naturalistic behavior.

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Footnotes

¹One exception to this practice was sleep. Because sleep instances were excluded from the total usable file count, the denominator for the time-use percentage in this case was the total number of files (as opposed to usable files).

²Fear and disgust occurred so infrequently in this sample (present in 1 and 4 files, respectively) that we excluded them from analysis.

³We chose to use the aggregated estimates for these analyses for two primary reasons. First, informant and stranger ratings are most often collected in aggregated form, and thus the best way to evaluate the practical utility of each perspective would be to examine each in its most commonly used form. Second, the myriad combinations of self, single-stranger, and single-informant estimates would make analyzing and interpreting these data unduly laborious.

Table 1

Trait-Specific Hypotheses

Variable	Observability	Evaluativeness	Prediction
Neuroticism	Low	Low	Self > Informant > Stranger
Extraversion	High	Low	Self = Informant = Stranger
Openness	Low	High	Informant > Self > Stranger
Agreeableness	Moderate	Moderate	Informant > Self > Stranger
Conscientiousness	Moderate	Moderate	Informant > Self > Stranger

Table 2

EAR Descriptive Statistics

Behavior	Inter-coder	At Least	Base Rate			
	Reliability	Once	Minimum	Maximum	Mean	SD
<u>Talking</u>						
Overall	.94	87	6.2	59.1	30.0	12.1
With 1 person	.81	87	0.8	45.2	16.7	9.7
With group	.85	81	0.0	21.8	6.7	5.6
On phone	.96	78	0.0	32.2	4.3	4.6
Alone	.39	44	0.0	15.4	1.1	2.2
With significant other	.24	31	0.0	36.5	3.6	7.6
With child	.90	17	0.0	26.5	1.3	4.1
With other family	.10	39	0.0	22.7	2.3	4.5
With friend	.91	86	0.0	42.6	17.0	11.0
With stranger	.86	37	0.0	29.4	1.2	3.7
To pet	--	12	0.0	4.0	0.2	0.7
<u>Activities</u>						
Socializing	.89	63	0.0	54.6	12.2	14.4
In class	.96	86	0.0	31.9	15.5	5.9
On computer	.75	54	0.0	24.5	2.6	4.6
Working	.96	29	0.0	49.7	6.3	11.1
Eating	.41	53	0.0	8.6	1.5	1.8

TV on	.95	87	0.7	72.7	28.6	15.5
Sleeping	.75	69	0.0	33.3	8.4	8.1
Studying	.54	53	0.0	35.9	4.5	6.9
Exercising	.96	18	0.0	20.9	1.5	3.8
Music on	.96	86	0.0	41.8	14.8	9.2
Arguing	.71	17	0.0	5.6	0.3	0.1
Swearing	.80	26	0.0	5.7	1.1	1.5
Substance use	.62	14	0.0	7.9	0.3	1.2
Laughing	.87	81	0.0	19.9	5.2	3.8
Singing	.93	62	0.0	10.7	1.7	2.0
Crying	--	4	0.0	1.6	0.0	0.2
Sighing	.44	49	0.0	3.6	0.7	0.9
Coughing	.80	45	0.0	9.4	0.9	1.4

Location

Apartment	.89	87	0.7	77.1	46.7	15.8
Outdoors	.72	62	0.0	26.5	3.2	4.5
In public	.91	87	13.2	67.2	38.7	13.8
In transit	.91	87	3.5	43.5	14.3	7.1

Type of Conversation

Small talk	.57	83	0.0	25.5	6.4	6.2
Deep conversation	--	40	0.0	19.6	1.0	2.4
Personal	.70	60	0.0	13.5	2.1	2.8
Gossip	.61	72	0.0	13.8	3.1	3.0

Practical	.88	86	0.0	43.5	15.6	9.7
<u>Emotions</u>						
Happiness	.58	49	0.0	13.5	2.6	3.7
Anger	.59	31	0.0	11.6	0.7	1.6
Fear	--	1	0.0	1.4	0.0	0.1
Surprise	.00	17	0.0	2.3	0.2	0.4
Disgust	--	4	0.0	1.5	0.0	0.2
<u>Big Five Behaviors</u>						
Dominance	.60	30	0.0	6.1	0.6	1.1
Affiliation	--	3	0.0	6.6	0.1	0.7
Energy	.16	22	0.0	14.0	0.6	1.8
Sympathy	.96	12	0.0	1.6	0.1	0.3
Concern for others	.72	30	0.0	3.1	0.4	0.7
Affection	--	17	0.0	6.5	0.3	1.0
Complaining	.45	49	0.0	5.2	1.0	1.0
Worrying	.35	14	0.0	2.7	0.2	0.5
Sadness	.87	8	0.0	1.0	0.1	0.2
Cleaning	--	39	0.0	20.6	1.3	2.9
Hygiene	.87	55	0.0	5.0	1.0	1.2
Responsibility	--	26	0.0	4.8	0.4	0.9
Spirituality	--	10	0.0	2.9	0.1	0.4
Creativity	--	5	0.0	3.6	0.1	0.6
Unconventionality	--	5	0.0	1.4	0.1	0.2

Note. $N = 83$. Reliability = ICC (2, k). If at least three raters had zero occurrences logged in the training files, we did not calculate reliability (--).

Table 3

Target (Self-Reported) and Informant Descriptive Statistics

	Self		Informant		Stranger	
	Mean	SD	Mean	SD	Mean	SD
Neuroticism	21.32	6.90	22.04	7.04	21.11	2.98
Extraversion	27.99	7.30	30.37	5.99	26.10	4.57
Openness	36.31	6.36	37.94	5.83	33.75	3.81
Agreeableness	36.27	5.11	35.82	5.66	35.92	3.40
Conscientiousness	34.56	5.08	35.53	5.65	34.45	3.32

Note. $N = 110$ (Self), 86 (Informant), 109 (Stranger).

Table 4

Multitrait-Multimethod Matrix of Personality Judgments

	<u>Self</u>					<u>Informant</u>					<u>Stranger</u>				
	N	E	O	A	C	N	E	O	A	C	N	E	O	A	C
<u>Self</u>															
N	(.87)														
E	-.30	(.91)													
O	-.17	.25	(.81)												
A	-.49	.21	.00	(.77)											
C	-.27	.14	-.01	.27	(.75)										
<u>Informant</u>															
N	.50	-.04	-.05	-.33	-.16	(.90)									
E	-.17	.67	.03	.15	.09	-.02	(.86)								
O	-.05	.20	.51	-.08	-.09	-.23	.23	(.83)							
A	-.30	-.03	-.23	.34	-.02	-.59	.11	.16	(.83)						
C	-.11	-.15	-.23	.03	.32	-.48	-.02	.27	.41	(.84)					
<u>Stranger</u>															
N	.22	-.11	-.13	-.17	-.03	.19	-.11	-.09	-.07	.06	(.87)				
E	-.17	.29	.11	.24	.10	-.06	.34	.17	.00	-.02	-.55	(.94)			
O	.08	-.02	.29	-.02	-.09	.08	-.03	.15	-.15	-.20	-.31	.19	(.87)		
A	-.06	-.02	.01	.21	-.15	.04	.19	.00	.13	-.13	-.49	.31	.30	(.91)	
C	-.06	-.13	.05	.06	.07	-.01	.00	-.05	.02	.02	-.30	.11	.24	.36	(.90)

Note. Ns vary depending upon sources. For Self, Informant, and Stranger intercorrelations, Ns are 110, 86, and 109, respectively. Self-Informant N was 85; Self-Stranger N was 107; Informant-Stranger N was 88. Bolded correlations are significant at $p < .05$; convergent relations are underlined. Coefficient Alpha appears in parentheses. At Least Once = number of cases in which this behavior was coded at least one time during the observation period.

Table 5

Extraversion

Predictor	Self N = 83	Informant N = 69	Stranger N = 83
Talking			
With 1 Other	.06	.29* (.27)	-.10 (-.08)
With Group	.01	-.05 (-.06)	.24** (.18)
With Friend	.24**	.30** (.28**)	.27** (.20)
With Significant Other	-.19*	-.15 (-.12)	-.23** (-.17)
Location			
In Transit	.14	.30** (.28**)	.21* (.15)
In Public	-.03	-.06 (-.09)	.14 (.11)
Activities			
Socializing	-.04	.04 (.04)	.17 (.12)
Music	.09	.18 (.12)	.28** (.20)
Laughing	.22**	.16 (.14)	.23** (.17)
Singing	.21*	.13 (.08)	.11 (.08)
Exercising	.10	.17 (.16)	.14 (.10)
Type of Conversation			
Gossip	.20*	.21* (.19)	.05 (.04)
Practical	.21*	.23* (.22*)	-.02 (-.02)
Emotion			
Happiness	.17	.08 (.08)	.39** (.28)

FFM Aspects

Affiliation	.15	.19 (.21*)	.24** (.17)
Energy	.21*	.23* (.20)	.22** (.16)

Note. The relations in parentheses are single-informant and single-stranger estimates.

* $p < .10$

** $p < .05$

Table 6

Neuroticism

Predictor	Self N = 83	Informant N = 69	Stranger N = 84
Location			
Apartment	.06	.23* (.19)	.07 (.05)
In Public	-.03	-.22* (-.22*)	-.07 (-.05)
Activities			
Working	-.14	-.27* (-.21*)	.00 (.00)
Sleeping	.13	.22* (.22*)	-.02 (-.01)
Crying	.14	.19 (.20)	-.05 (-.05)
Coughing	.15	.20* (.15)	.05 (.05)
Sighing	.09	.11 (.19)	.02 (.02)
Emotion			
Sadness	.06	.18 (.22*)	-.13 (-.09)
Anger	-.06	.19 (.13)	.17 (.12)
FFM Aspects			
Worrying	.10	.18 (.17)	-.09 (-.07)
Complaining	-.02	.15 (.12)	.00 (-.01)

Note.

* $p < .10$ ** $p < .05$

Table 7

Conscientiousness

Predictor	Self N = 83	Informant N = 69	Stranger N = 84
Activities			
In Class	.10	-.02 (-.05)	.31** (.21)
Computer	-.26**	-.11 (-.10)	-.09 (-.07)
Sleeping	-.02	-.23* (-.20)	-.27** (-.18)
Studying	.21*	.09 (.06)	.04 (.03)
Swearing	-.25	.13 (.20)	-.41** (-.31)
Working	-.01	.05 (.08)	.07 (.04)
Exercising	.08	-.06 (-.05)	-.41** (-.28)
Type of Conversation			
Gossip	-.20*	-.08 (-.06)	-.07 (-.04)
FFM Measurement Model			
Cleaning	-.06	.01 (.02)	-.16 (-.11)
Hygiene	.12	.14 (.07)	.03 (.01)
Responsibility	.15	.02 (.07)	.03 (.02)

Note. N for Swearing is only 50 (for self- and stranger-ratings) and 42 (for informant-ratings) because two coders failed to register the category.

* $p < .10$

* * $p < .05$

Table 8

Agreeableness

Predictor	Self N = 84	Informant N = 69	Stranger N = 84
Talking			
With Significant Other	-.09	-.14 (.02)	-.06 (-.03)
With Other Family	.07	.17 (.22*)	.16 (.12)
Emotions			
Anger	.11	.02 (.02)	-.06 (-.04)
FFM Measurement Model			
Sympathy	.03	-.03 (-.08)	.02 (.02)
Concern for Others	.17	.11 (.16)	.17 (.13)
Affection	-.07	.02 (.05)	-.03 (-.01)

Note.

* $p < .10$ ** $p < .05$

Table 9

Openness to Experience

Predictor	Self N = 83	Informant N = 65	Stranger N = 84
Activities			
Substance Use	.06	.22* (.21*)	.21* (.15)
Type of Conversation			
Deep	.11	-.12 (-.16)	.12 (.08)
FFM Measurement Model			
Creativity	.22**	.17 (.11)	-.04 (-.03)
Unconventionality	.03	.18 (.26**)	.05 (.03)

Notes:

* $p < .10$ ** $p < .05$

Table 10

Unique Predictive Validity of Trait Ratings by Source

Variable	Standardized Betas			
	Self	Informant	Stranger	R
<u>Extraversion</u>				
Laughing	.17	-.02	.17	.46
Music	-.08	.12	.41*	.43
Talk w/Friend	-.02	.23	.30*	.42
In Transit	.02	.19	.30*	.41
Talk w/Group	.06	-.23	.39*	.38
Talk w/1	-.23	.50*	-.13	.36
Happiness	.04	-.06	.33*	.33
In Public	.17	-.28	.29*	.32
Talk w/Significant Other	-.20	.06	-.23	.31
Affiliation	.00	.11	.26*	.31
Energy	.07	.11	.18	.29
Socializing	-.13	.03	.29*	.28
Exercising	.14	.01	.19	.28
Gossip	.22	.05	.00	.26
Practical	.15	.15	-.09	.26
Singing	.15	.05	.01	.20
<u>Neuroticism</u>				
Sadness	.03	.25	-.32*	.36

Worry	-.16	.39*	-.13	.34
Sleep	.30*	.04	-.04	.31
Anger	-.28	.35*	.04	.31
Work	.00	-.29	.07	.28
Crying	.16	.18	-.26*	.28
Complaining	-.01	.28	-.11	.27
In Apartment	.01	.18	.13	.26
Coughing	.07	.13	.05	.20
In Public	.08	-.21	-.03	.18
Sighing	.12	.05	-.02	.15
<u>Conscientiousness</u>				
Exercising	.06	-.04	-.39*	.39
Computer	-.37*	.09	-.01	.36
Swearing	-.14	.09	-.33*	.34
Sleeping	.01	-.26	-.24	.32
In Class	.07	.01	.28	.30
Hygiene	.16	.14	.15	.28
Cleaning	-.14	.04	-.16	.22
Gossip	.01	-.15	.10	.19
Studying	.02	.14	.13	.18
Responsibility	.10	.05	.07	.14
Working	.04	.04	.08	.10
<u>Agreeableness</u>				
Talking w/Other Family	-.07	.16	.23	.27
Concern for Others	.08	-.01	.18	.23

Talking w/Significant Other	-.02	-.19	-.02	.20
Sympathy	.12	-.16	.01	.17
Anger	.12	-.02	-.06	.11
Affection	-.10	-.01	.02	.10
<u>Openness</u>				
Substance Use	-.09	.22	.27*	.34
Creativity	.20	.10	-.13	.26
Deep Conversations	.26	-.27	.06	.26
Unconventionality	.07	.14	.03	.19

Note.

* indicates significant t value for this predictor ($p < .05$)

Figure 1

Conceptual Map of FFM Dimensions

Appendix

	Upstate EAR Coding Categories
General	
EAR	1 = Subject is talking about the EAR or the study
Interesting	1 = Sound file seems interesting to you.
Noise	1 = high noise
Problem	No entry = everything ok; 1= insufficient acoustic information (silence); 2= bad recording quality;
Talking	1 = Subject is talking; includes non-fluencies. Talking to herself would be 'with others' = 0; when subj. on the phone, mark this category.
With 1 other	1 = Subject is with ONE other person; dyadic interaction;
With Group	1 = Subject is with A GROUP OF people (more than one person); Criteria: Count only the other people in the immediate environment of the participant.
On the Phone	1 = Subject is on the phone
Other Family/ relative	1 = Subject is with other family members. When in doubt mark "friend/acquaintance."
Pet	1 = Subject is with a pet or talking to a pet. You hear a meow or claws hitting the floor etc. DO mark "talk = 1" if it is pet talk. DO NOT count as "with other = 1" unless the participant is with a person.
Laughing	1 = Subject laughing; if your best guess is that it is the participant who is laughing, go ahead and mark this one.
Singing	1 = Subject is singing or whistling
Crying	1 = Subject crying
Mad / Arguing	1 = Subject is arguing with, yelling at, screaming at, shouting at, mad at another person. You detect any anger in voice. Can be frustration.
Sighing	1 = Subject is sighing; an exaggerated exhalation of breath.
Coughing/Sneezing	1 = Any sign of illness; coughing, sneezing, sniffing ... any acoustic sign of health problems NOT: complaints about or references to physical symptoms
Socializing/	1 = Subject is socializing; hanging out with others; e.g. watching a movie with other people NOT: watching a TV movie
Entertainment	
In class	1 = Subject is in class
Computer	1 = Subject is working on the computer; you hear the typing noise
Working	1 = Subject is working; e.g. in an office, retail business
Church	1 = Subject is attending a service, at a bible study group, choir practice
Eat/Drink	1 = Subject is eating or drinking.
TV	1 = TV is on; irrespective of whether it is just playing in the background or subject is engaged in watching a movie
Sleeping	1 = Subject is sleeping; also for naps; can infer if you hear nothing else, and it is at nighttime.

Exercise	1 = Subject is working out or playing sports. Most often this information will come from the accompanying diary and will be difficult to capture from the audio files.
Studying	1 = subject reports studying in the diary or is overheard studying audibly with someone else.
Radio / Music	1 = there is some Music (CD, tape, etc.) or Radio in the background; it is not important whether the subject is only listening to music or doing other things, too; DON'T MIX UP WITH TV; music at a concert or party counts. Music from a movie or TV doesn't.
Substance Use/Abuse	1=either discussion of or suspicion of substance use or abuse; includes any present party referring to drugs or alcohol or the participant behaving in a manner which suggests intoxication
Location	
Apartment / Home	1 = Subject is at home or at someone else's house
Outdoors	1 = Subject is outdoors, defined as subject is able to see the sky; driving in a car or bus would NOT be considered as outdoors
In Public	1 = Subject is in any other public place, or in transit
In Transit	1 = Subject is in transit; in a car, bus, or is walking.
Unknown	1 = Can't tell where the subject is
Conversations (mark "1" for all that apply in any given audio file)	
Name	Description
<i>Practical</i>	Participant is talking about practical everyday things. The information exchanged serves a pragmatic purpose in the participant's everyday life. Can include making plans, discussing what is for dinner, picking up kids, travel arrangements. NOT CCing people on your thoughts. e.g. "We need parmesan cheese for our dinner tonight"; "I will pick up Sally on Monday and Wednesdays at 5"
<i>Small Talk</i>	The purpose of this interaction is completely non-instrumental. No (or very trivial) information is exchanged- everything would be the same if the conversation never happened. e.g. "how's the weather?" "I stepped on something" "What are you up to?"
<i>Deep/Substantive Conversation</i>	Any conversation that has the purpose to exchange thoughts, information, values, ideas about a (NON-EMOTIONAL) topic; it could be about news of the day, about political issues, philosophical topics, theoretical ideas; information only. THE CONVERSATION DOES NOT REALLY HAVE TO BE "DEEP", ONLY NEEDS TO HAVE "SUBSTANCE" e.g., "Aren't Muslims not supposed to drink alcohol?"; "you heard that the WTC was attacked?"; "I found this book interesting."; "Guns n' Roses has a real rock n' roll sound to them"
<i>Personal / Emotional Disclosure</i>	Participant sharing of own personal feelings or emotions. Can include talking about their or a parent's divorce and their hopes and dreams for

	<p>the future. The conversation passes a threshold of being trivial (for the participant).</p> <p>e.g., "I feel so shitty"; "I am scared about my grades in class"; "I have a crush on x"</p> <p>NOT accusatory statements, such as "It pisses me off when you talk with other women at parties." --> complaining</p>
<i>Gossip</i>	<p>Participant is talking (e.g., divulging personal information) about another person while they are not there. Spreading rumor / reputational information about another person in their absence. IMPORTANT: DOES NOT HAVE TO BE NEGATIVE.</p> <p>e.g. "Xxxx talked back and that's why he was fired"; "Did you hear about their break-up?"; "Frank is so silly sometimes"; "Did you hear the lead singer of Gun n' Roses is dating Xxxx?"</p>
Behaviors	
<i>Dominance</i>	Any command given to another person, any attempt to control another person's behavior, any statement about influencing others
<i>Affiliation</i>	Any statement of group membership or mention of a group to which the subject belongs
<i>Energy</i>	Excited or anticipatory speech ("let's go!" or "I'm excited/ready"), any verbal or nonverbal behavior that indicates active engagement
<i>Sympathy</i>	verbal or nonverbal behavior indicating that the subject feels with or for someone else, could be a knowing sigh or "awwhh, that's tough" type statement
<i>Concern for Others</i>	A sincere inquiry about the well-being of another person ("how's your grandmother doing?" or a non-routine "how are you?"), also any helping behavior goes here
<i>Affection (living beings)</i>	<p>Participant expresses admiration or love for living beings (NOT only for romantic partner). Can be a compliment or using pet names. NOT a backhanded compliment. Participant is being sincere beyond a social script.</p> <p>e.g. "You are beautiful"; "I love you"; "Felix is a fun cat"; "I love your cooking"</p>
<i>Complaining/ Whining</i>	<p>Participant blames someone or something, complains, whines (NOT constructive criticism).</p> <p>e.g. "I hate the wind"; "Why do I have to be here?"; "That's a dumb idea."</p>
<i>Worry/Anxiety</i>	Participant states concern of upcoming events ("I'm nervous about my Biology exam") or sounds tense or nervous when discussing an event.
<i>Sadness/Melancholy</i>	Will often coincide with the Sadness emotion category, this category may also involve discussion of past sadness.
<i>Cleaning/Organizing</i>	Subject is sweeping, picking up objects, making the bed, folding clothes, cooking, doing the dishes, house maintenance issues
<i>Hygiene</i>	Subject is brushing teeth, taking a shower, or washing hands. Any personal maintenance behavior.

<i>Tending to Responsibilities</i>	Subject is paying bills or making systematic plans to accomplish either proximal or distal goals.
<i>Spirituality</i>	Participant is talking about a spiritual or religious topic. NOT "karma's a B*****" or "Oh my god." IMPORTANT: COULD BE ANY RELIGION OR NOTION OF GOD. AND NOT CHURCH DISCUSSION--THAT IS CODED ELSEWHERE. e.g. soul, universe, afterlife, karma, God, or lack thereof.
<i>Creativity</i>	Subject is participating in creative pursuits (e.g., making music) or discussing creative pursuits (art, literature)
<i>Unconventionality</i>	Participant discusses his or her uniqueness in some domain ("I only use my left hand to eat") or desires to do something "out of the norm". Examples of the latter could range from expressing a desire to teach overseas or travel aimlessly to skydiving. The point is that the person is setting him or herself and his or her actions apart from others.
Emotions (mark "1" if subject displays any of these emotions in a given audio file)	
<i>Happiness</i>	1 = any verbal or nonverbal display of happiness. You may mark this category if you have already marked laughing, but statements of happiness also apply.
<i>Sadness</i>	1 = any verbal or nonverbal display of sadness. Mark this category if you have already marked crying, but statements of sadness also apply. <i>*ended up merging with sadness/melancholy*</i>
<i>Anger/Frustration</i>	1 = any verbal or nonverbal display of anger or frustration, e.g., angry exclamations, growl-like utterances
<i>Fear</i>	1 = any verbal or nonverbal display of fear, e.g., "I'm scared" or a shriek
<i>Surprise</i>	1 = any verbal or nonverbal display of surprise, e.g., "wow" or a sudden excited noise
<i>Disgust</i>	1 = any verbal or nonverbal display of disgust, e.g., "that's gross" or "yuck!" or "eww"