Psychometric Evaluation of a Visual Interpersonal Analogue Scale

William C. Woods[1], Elizabeth A. Edershile[1], Whitney R. Ringwald[1], Brinkley M. Sharpe[1], Philip H. Himmelstein[1], Michelle G. Newman[2], Stephen J. Wilson[2], William D. Ellison[3], Kenneth N. Levy[2], Aaron L. Pincus[2], J. David Creswell[4], Aidan G. C. Wright[1]

[1]University of Pittsburgh

[2]The Pennsylvania State University

[3]Trinity University

[4]Carnegie Mellon University

Abstract

Interpersonal Theory organizes social behavior along dominant (vs. submissive) and warm (vs. cold) dimensions. There is a growing interest in assessing these behaviors in naturalistic settings to maximize ecological validity and to study dynamic social processes. Studies that have assessed interpersonal behavior in daily life have primarily relied on behavioral checklists. Although checklists have advantages, they are discrepant with techniques used to capture constructs typically assessed alongside warmth and dominance, such as affect, which typically rely on adjective descriptors. Further, these checklists are distinct from the methodologies used at the dispositional level, such as personality inventories, which rarely rely on behavioral checklists. The current study evaluates the psychometric performance of interpersonal adjectives presented on a visual analogue scale in five different samples. Validity of the visual interpersonal analogue scale (VIAS) approach to momentary assessment was evaluated by comparing its performance with an interpersonal behavior checklist and by examining associations among the VIAS warmth and dominance scales and other momentary and dispositional constructs. Results were generally consistent with an existing interpersonal behavior checklist at the within-person level but diverged somewhat at the dispositional level. Across the five samples, the VIAS generally performed as hypothesized at both the within- and between-person levels.

Researchers are increasingly interested in measuring psychological constructs intensively and repeatedly in individuals' natural environments. Intensive longitudinal designs rely on ambulatory assessment methods such as ecological momentary assessment (EMA; Shiffman et al., 2008) and can range in frequency of observations from milliseconds (e.g., passive sensing techniques) to days (e.g., daily diaries). The proliferation of mobile computing devices has led to a large number of studies adopting such methods (e.g., Hamaker & Wichers, 2017).

Two general approaches to self-report assessment are used for intensive longitudinal research in naturalistic settings. One frequent choice is to adopt measures that were developed to be used in cross-sectional designs. This is problematic because measures used to assess between-person differences (such as personality constructs) in a cross-sectional design may perform differently in an intensive longitudinal design assessing within-person differences (Ringwald et al., in press; Voelkle et al., 2014). For example, positive and negative affect have been shown to be associated at the within-person level, but not at the between-person level (Rush & Hofer, 2014). In EMA studies, due to the intensive and repeated nature of the design, brevity is at a premium due to concerns about participant burden. Consequently, existing measures developed for cross-sectional studies may be too lengthy, forcing a choice between the higher internal reliability of lengthier questionnaires and participant burden. Thus, measures must be abbreviated, and consequently, this may have a marked impact on the psychometrics and nomological network of the scales. Alternatively, researchers develop their own measures with little psychometric testing, which raises questions of validity (cf. Tomko et al., 2014). Thus, although enthusiasm to dive into content-focused ambulatory assessment research is understandable, one issue that has been largely overlooked in the drive to measure behavior in vivo is the validity of measures used in these studies (Wright & Zimmermann, 2019). The lack of consideration for validity and other outstanding issues illustrates the need for more psychometrically focused development of measures for use in intensive longitudinal designs.

Measuring Interpersonal Behavior

As a social species, interpersonal behavior is of vital importance in understanding human affect, thought, and action. Interpersonal Theory (Kiesler, 1983; Pincus & Ansell, 2013; Wright et al., in press) organizes social behavior along two bipolar orthogonal dimensions, dominance (dominant to submissive) and warmth (warm to cold). This structure has been fruitfully applied to model interpersonal functioning from the momentary (i.e., within-person) to dispositional (i.e., between-person) levels of analysis (Pincus et al., 2014; Wright et al., in press). For example, just as an individual can be described as behaving in a cold and submissive manner in a given moment, one could be described as having a dispositionally cold and submissive interpersonal style. Consequently, it is advantageous for measures of

interpersonal warmth and dominance to be able to capture both momentary behaviors as well as dispositional manifestations.

Two prior notable efforts have developed measures of interpersonal behavior for EMA studies: behavior checklists and the interpersonal grid. Perhaps the most popular behavior checklist is the Social Behavior Inventory (SBI; Moskowitz, 1994). The SBI asks participants to indicate discrete behaviors they engaged in during an interaction from a list. The SBI has a pool of behavioral items for each of the four poles of the two dimensions (i.e., warm, cold, dominant, and submissive). In EMA studies, participants typically are given a random subset (e.g., 12; Moskowitz & Zuroff, 2004) of these items to complete on each occasion because the full scale of 46 would prove too burdensome. A sum of endorsed items provides the intensity of each pole. A dimensional score (i.e., warmth dimension) can be generated by taking the difference between the relevant two poles. One strength of the SBI is the relatively concrete and discrete nature of its items. The items were designed to be clear and intuitive descriptors of common behaviors that reflect the underlying dimensions of dominance and warmth.

However, a notable limitation of the behavioral checklist approach is that it is challenging for these measures to comprehensively assess broad constructs like dominance and warmth. Behavioral checklists must be sufficiently inclusive to capture the variety of idiosyncratic expressions of the underlying construct for the individual being assessed (e.g., Waller, 1989). In other words, it is difficult for a checklist for interpersonal warmth to comprehensively assess all the discrete verbal and non-verbal behaviors that are relevant to each individual's idiosyncratic expression of warmth. It is possible to improve coverage by assessing more behaviors, but at the risk of being cumbersome to administer repeatedly in an intensive longitudinal design. This makes behavioral checklists less desirable for EMA studies in which brevity is necessary.

The Interpersonal Grid (Moskowitz & Zuroff, 2005) effectively overcomes these issues. The Interpersonal Grid is an 11x11 square that has anchors for warmth and dominance and their opposites on the sides and top, respectively, and adjectival blends of the dimensions in each corner. Typically, researchers have used the Interpersonal Grid to ask participants to rate other people's behavior by placing a mark in the square that best matches the intensity and blend of warmth and dominance of the other person (e.g., Sadikaj et al., 2010). As a single item, the Interpersonal Grid readily meets the criteria of being short enough for EMA deployment. In addition, by using adjectives as anchors, the Interpersonal Grid allows participants to be more inclusive of the behaviors corresponding to each provided adjective, rather than assuming every person engages in the same behavioral expressions pertaining to a given construct.

Nevertheless, the Interpersonal Grid suffers from its unique presentation. The non-standard grid structure requires that it either be presented via a paper format, or custom-coded into software. Each of these potentially undercut many of the advantages of EMA (Trull & Ebner-Priemer, 2013). Paper-based diaries, once the mainstay of this area, have now fallen out of favor because they lack adequate timestamps to verify when they were completed and can easily be lost or misplaced. Further, much of the rapid rise in EMA work is the result of

ready-made, modular, and easy-to-use software solutions for smartphones that can be loaded onto participants own devices. Although it is possible to code a grid-like question format, the need to develop custom software to do so undermines many benefits of ready-made software solutions.

An alternative approach to measuring interpersonal behavior that circumvents the limitations of both lengthy checklists and difficult-to-implement Interpersonal Grids are visual analogue scales. In this method, a slider bar is depicted with opposing adjectival labels at both ends (e.g., cold and warm, distant and friendly) and is used by participants to choose a point on the bar that best reflects perceptions of their or another person's behavior. These adjectives allow participants to interpret items using their idiosyncratic understandings of the verbal and non-verbal behaviors that constitute each interpersonal construct. This may allow for capturing greater breadth of the construct than checklists with specific behaviors. One early study (Horowitz et al., 1991) found no differences in the psychometrics between self-reported ratings of dispositional dominance and warmth using single dimension visual analogue scales anchored by adjectives (warm-cold, dominant-submissive) and self-reported ratings of trait dominance and warmth using ratings made with a 2-dimensional visual analogue graph.

Visual analogue scales typically provide a numerical reference point (0–100) and can be anchored by indicators of intensity or frequency (e.g., "0 = Not at all," "100 = Extremely"). Psychometric research has shown that single-item visual analogue scales can show strong validity and reliability (e.g., Abend et al., 2014; Davey et al., 2007; Newman et al., 2019), recommending this format when brevity is a concern. Further, some research suggests that visual analogue scales may be psychometrically superior to traditional Likert scales for measurement of dimensional constructs (Reips & Funke, 2008), though other work suggests little to no increment in performance (Kuhlmann et al., 2017, Simms et al., 2019). In theory, more response options should allow for greater precision of responses. At the same time, if individuals are not able to differentiate between small gradations of experience, if they default to a binning strategy, or engage in other idiosyncratic response sets, this will generate unsystematic variance (i.e., error). Nevertheless, visual analogue scales may have advantageous properties in some practical scenarios, such as when observed variance is likely to be low with a coarse measurement scale but a more differentiated scale would allow for model estimation and convergence.

Current Study

The purpose of this study was to psychometrically evaluate the performance of Visual Interpersonal Analogue Scales (VIAS) in intensive longitudinal designs used across five independent samples, including undergraduates, community members, and psychiatric outpatients. The VIAS, as we describe it, refers to the assessment of interpersonal warmth and dominance as separate dimensions, presented on visual analogue scales. The specific presentation of the VIAS differed somewhat across the five samples (Table 1).

VIAS performance was evaluated in several ways. First, correlations between the VIAS and relevant momentary (e.g., affect and stress) and dispositional (e.g., personality and

interpersonal problems) constructs were compared with the widely used SBI (Moskowitz, 1994). These momentary constructs were chosen because affect is commonly measured in association with interpersonal behaviors and perceptions (e.g., Ringwald et al., 2021; Roche et al., 2014; Sadikaj et al., 2010; Vize et al., 2022). Second, we tested the orthogonality of the two dimensions assumed by Interpersonal Theory at both the momentary and dispositional levels across all five samples. Third, we present correlations between different instantiations of the VIAS and a wide variety of momentary and dispositional measures across the five samples. Finally, we report momentary correlations between VIAS items and single-item measures of mental health functioning used in an outpatient sample. This final set of analyses are exploratory and designed to augment the understanding of the VIAS performance in applied settings.

Given that there are well-established measures of interpersonal behavior such as the SBI, we had some expectations of how our VIAS items would perform. Our expected correlations between the VIAS and other momentary and dispositional constructs are shown in Table 2. At the momentary level, we expected that other measures of momentary warmth and dominance would be associated with VIAS momentary warmth and dominance items. We also expected that warmth would be strongly correlated with positive affect and negatively with negative affect and stress. We predicted a less consistent pattern for dominance given that some prior studies have reported associations between dominance and positive affect, other studies found associations of dominance with negative affect and stress, and still others found no association at all (Côté & Moskowitz, 1998; Wright et al., 2017; Zuroff et al., 2007).

At the dispositional level, we expected averaged momentary VIAS warmth to be associated with dispositional measures of warmth, warm interpersonal problems, and warm values (e.g., Zuroff et al., 2007). The same prior work led us to anticipate association between averaged VIAS momentary dominance and dispositional dominance, dominant interpersonal problems, and dominant values. We expected agreeableness and extraversion to be associated with VIAS warmth (Gurtman, 1995; McCrae & Costa, 1989; Pincus, 2002), and extraversion with VIAS dominance (Barford et al., 2015; DeYoung et al., 2013). In relation to mental health, we expected that dispositional measures of perceived stress, loneliness, depressivity, anxiety, and borderline personality disorder would not have significant correlations with either of the interpersonal dimensions (e.g., Girard et al., 2017). We expected both narcissistic vulnerability and narcissistic grandiosity to be associated with less VIAS warmth, and narcissistic grandiosity was also expected to be associated with more VIAS dominance (e.g., Bradlee & Emmons, 1992; Johnson et al., 2012; Rodebaugh et al., 2010). Finally, we expected that women would tend to report more VIAS warmth than men (e.g., Gurtman & Lee, 2009; Hopwood et al., 2020).

In considering the magnitude of correlations at the dispositional level, we expected to find smaller effect sizes than have been reported in previous work relying on mono-method approaches. Our study leveraged cross-method correlations between averaged momentary measures and dispositional scales which necessarily attenuates their correlations relative to mono-method associations (Achenbach et al., 2005; Fleeson & Gallagher, 2009).

Method

The University of Pittsburgh Institutional Review Board (IRB) approved all procedures for Undergraduate Sample 1 (#PRO16080767), Undergraduate Sample 2 (#PRO16080767), and Community Sample 3 (#PRO17120303). Study procedures for Community Sample 4 were approved by the IRB at Carnegie Mellon University (#IRBSTUDY2015_00000207). Study procedures for Outpatient Sample 5 were approved by the IRB at the Pennsylvania State University (#38490).

Procedures and psychometric information for each study is available in the Supplemental Material. In all samples, cross-sectional data were collected prior to EMA protocol completion. This study was not pre-registered. Data and syntax for Undergraduate Samples 1 and 2 as well as Community Samples 3 and 4 are available on OSF (https://osf.io/cz968/?view_only=0ee0464cef3744ad9c2c84c2f60542d1). Code for Outpatient Sample 5 is also available on OSF. Contact K. N. Levy (klevy@psu.edu) for materials and data for Community Sample 5.

Sample Demographics

Sample 1

Undergraduate Sample 1[1] (US1; $N = 288$) self-identified as mostly White (70.83%) and female (38.54%). The mean age of this sample was 19.22 ($SD = 1.74$).

Sample 2

Undergraduate Sample 2 (US2) was a sub-sample of participants who chose to complete an optional EMA protocol ($n = 396$) drawn from a larger sample ($N = 836$). The sub-sample used in this study was 57.10% female and mostly White (83.30%). The mean age was 18.74 ($SD = 1.36$).

Sample 3

Community Sample 3 (CS3; $N = 342$) was mostly female (51.75%) and predominantly White (87.43%). The mean age was 27.66 years ($SD = 5.01$). Community members were oversampled for traits consistent with narcissism (see Supplement for more details).

Sample 4

Community Sample 4 (CS4) was comprised of 148 community adults (67.15% female; 66.2% White). The mean age was 37.67 years ($SD = 13.42$). Community participants were recruited as part of a parent randomized controlled trial of stress management training (clinical trials identifier: NCT02502227). While only baseline data were analyzed from this community for this report, all trial details and study criteria can be found in Chin et al., 2019).

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[1]Note: To aid the reader in tracking which findings apply to each sample, we have chosen to use a comprehensive labeling technique that includes both the type of participants and the sample number. For example, the first sample is labeled "Undergraduate Sample 1" throughout and the third sample "Community Sample 3."

Sample 5

Outpatient Sample 5 (OS5) consisted of 54 outpatients with a diagnosis of either borderline personality disorder (BPD; $n = 36$) or any anxiety disorder without comorbid BPD ($n = 18$) as a part of a larger study. Participants self-identified as mostly female (87.04%) and White (87.04%). The mean age was 31.61 years ($SD = 11.56$). Participants were recruited from a community mental health center associated with a large university. Further demographic and diagnostic details are reported in the Supplemental Materials and elsewhere (Scala et al., 2018).

Measures[2]

Table 2 lists the constructs measured in each study. Response scales and anchors for each measure can be found in the Supplemental Material Table A1.

Momentary (EMA) Measures

Momentary interpersonal warmth and dominance.—In each sample, interpersonal warmth and dominance were rated using the VIAS; however, the adjective anchors and scale ranges differed somewhat between samples as shown in Table 1.

Participants in Undergraduate Sample 1 also rated momentary warmth and dominance using the SBI (Moskowitz, 1994). As described above, the SBI is a behavioral checklist that uses a dichotomous (yes/no) response scale. The 46 SBI items were divided into four subsets of 12 (two items, "I went along with the other(s)" and "I criticized the other(s)" count towards the warm and submissive and the cold and dominant poles, respectively), with three items measuring each pole. One of these four subsets were randomly presented at each assessment. Items representing marking the poles (warm, cold, dominant, and submissive) of the interpersonal dimensions were summed, then dominance (dominant – submissive) and warmth (warm – cold) dimensions were scored.[3]

Momentary positive and negative affect was measured in all samples. Each sample used slightly different anchors and scales. In US1 and 2 and CS3, 10 items from the Positive and Negative Affect Schedule (Watson & Clark, 1999) were rated on visual analogue slider bars. The positive affect items were "Happy; Proud; Content; Excited; Relaxed;" and the negative affect items were "Sad; Ashamed; Nervous; Hostile; Angry." In CS4, participants rated how "Positive" and "Negative" their mood was during each reported social interaction. In OS5, affect was rated on visual analogue slider bars using the positive affect items "Active; Calm; Happy; Pleasant" and the negative affect items were "Angry; Frightened; Irritable; Sad."

Momentary stress was assessed in US1, CS 3, and OS 5 using a single item rated on visual analogue slider bar. In US1 and CS3, participants rated "How stressful was [the] social interaction when it occurred." In OS5, stress at the time the survey was reported.

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[2]Descriptive data for listed measures can be found in the supplemental materials.
[3]Note that this subtraction method is equivalent to ipsatizing the SBI (Moskowitz & Zuroff, 2004).

Other momentary items.—OS5 featured several single item scales which were administered contemporaneously with ratings of interpersonal behavior and affect. Each of these were presented on a visual analogue slider bar. The items included in the current study were: "Ability to perform important tasks; Ability to relate to others; Anxiety; Depression How well do you know this person? [Current feelings of] 'Pleasantness;' Mental health symptoms; Physical health symptoms; and Self-esteem." All items, except familiarity with the interaction partner item, asked about present experience (e.g., "Rate how 'calm' you feel"). Additional administration details can be found in Supplemental Materials Table A2.

Dispositional (Baseline) Measures

Trait dominance and warmth were assessed in US1 using the 32-item International Personality Item Pool-Interpersonal Circumplex (IPIP-IPC; Markey & Markey, 2009). For the IPIP-IPC, participants rated the accuracy of self-descriptive phrases for themselves, such as "love large parties" and "think of others first."

Interpersonal problems were assessed in US2 and CS3. The 32-item Inventory of Interpersonal Problems—Short Circumplex (IIP-SC; Soldz et al., 1995) was used in US2. A 32-item version of the Circumplex Scales of Interpersonal Problems (Boudreaux et al., 2018) was used in CS3.

Dominant and warm interpersonal values were assessed in US2 using the Circumplex Scale of Interpersonal Values—Short Form (CSIV-32; Locke et al., 2012). For the CSIV-32, participants indicated the extent to which it was important for them to act or appear in accordance with a set of descriptors. An example item is "When I am around [other people], it is [ANSWER CHOICE] that I appear confident."

The Big-5 Personality Traits were assessed in US1 and CS3 using the Big-Five Inventory—2 (BFI-2; Soto & John, 2017), a 60-item measure of extraversion, agreeableness, negative emotionality, conscientiousness, and open-mindedness.

Narcissism was measured in US1 and 2 and CS3. The 52-item Pathological Narcissism Inventory (PNI; Pincus et al., 2009) was used to measure narcissistic grandiosity and vulnerability in US1 and 2. The PNI presents participants with statements reflecting trait narcissism and asks participants to rate the extent to which the statements are true of them. The Brief PNI (B-PNI; Schoenleber et al., 2015) was used in US2 and CS3. The B-PNI is a 28-item version constructed using item response theory and includes all scales and dimensions of PNI.

The 60-item Five Factor Narcissism Inventory – Short Form (FFNI-SF; Sherman et al., 2015) was also used in US2 and CS3. Participants rated the extent to which statements were reflective of their beliefs and behaviors.

Perceived stress was measured in CS4 using the 10-item Perceived Stress Scale (Cohen et al., 1983). Participants rated the how often they experience certain thoughts or affects associated with stress.

Loneliness was assessed in CS4 using the UCLA Loneliness Scale (Russell, 1996), a 20-item measure of perceived integration into one's social community.

Borderline personality disorder symptoms were assessed in OS5 using the 10-item McLean Screening Instrument for Borderline Personality Disorder (Zanarini et al., 2003).

Anxiety traits/symptoms were assessed in US2, CS3, and OS5. The anxiousness subscale of the Comprehensive Assessment of Traits Relevant to Personality Disorder (CAT-PD-SF; Wright & Simms, 2014) was used to measure trait anxiety in Undergraduate Sample 2. Dispositional anxiety was measured in CS3 using the Beck Anxiety Inventory (BAI; Beck & Steer, 1990), a 21-item scale measuring experiences of anxiety in the past month." Dispositional anxiety was also measured in OS5 using the Generalized Anxiety Disorder Questionnaire-4 (GAD-Q-IV; Newman et al., 2002). The GAD-Q-IV features a continuous scoring system devised to reflect the Diagnostic and Statistical Manual-IV diagnostic system for generalized anxiety disorder.

Depression traits/symptoms were assessed in US2, CS3 and 4, and OS5. The depressiveness scale of the CAT-PD was used to measure trait depression in Undergraduate Sample 2. The 21-item Beck Depression Inventory-2 (BDI-2; Beck et al., 1996) was used in the community and outpatient samples to assess depression symptoms in the past two weeks.

Analytic Strategy

All analyses were completed in Mplus 8.4 (Muthén & Muthén, 2019). We used multi-level models to estimate correlations between the VIAS momentary interpersonal warmth and dominance measures and other momentary and dispositional measures. Multi-level analyses of momentary variables allowed us to separate these measures into two distinct sources of variance: person-level-averages (i.e., between-person, dispositional, individual differences, level 2) and deviations at a given time point from the person's average (i.e., within-person, momentary, level 1). This person-mean-centering was estimated by Mplus as part of the model, which allows for better estimation of the between-person effects as Mplus considers factors such as number of contributed responses per participant when creating level 2 estimates (Muthén & Muthén, 2019).

Five sets of results are presented—the samples used in each set of analyses are indicated at the beginning of each section and in the relevant tables. First, we compare within-person and between-person-level correlations among the VIAS items and the well-established SBI. Second, we estimated the orthogonality of warmth and dominance at the within- and between-person levels of the VIAS items in each sample, as well as in a meta-dataset combining all samples. Third, we report correlations between VIAS items with momentary measures (e.g., affect) from each sample at both the within-person and between-person levels. Fourth, we report correlations between the VIAS items with dispositional measures (e.g., personality) collected in each sample. These correlations were estimated at the between-person level, with interpersonal warmth and dominance allowed to correlate at the within-person level. Finally, we report within-person correlations between the VIAS items and single item indicators of functioning and perception that were available from OS5.

Results

Results are summarized in-text and full results can be found in corresponding tables. Note that although theorists have used terms other than warm/cold and dominance/submissive for the two primary interpersonal dimensions, we have standardized the language for clarity.

Throughout this section, the term "between-person" will be used to discuss individual differences (i.e., level 2) derived from EMA measures. In contrast, "dispositional" will be used for constructs that are assessed using cross-sectional measures.

Comparison with the SBI in US1

First, we examined correlations between the SBI and the VIAS dimensions (Table 3). Momentary VIAS dominance correlated modestly with both SBI dominance and SBI warmth. Momentary VIAS warmth correlated modestly with SBI dominance and moderately with the SBI warmth. At the between-person level, the VIAS dominance showed modest, positive correlations with the SBI dominance. The VIAS warmth dimension was strongly and positively associated with SBI warmth.

Both measures showed mixed evidence for orthogonality between dominance and warmth dimensions at the within- and between-person levels (Table 4). The concept of orthogonality from Interpersonal Theory (Kiesler, 1983; Pincus & Ansell, 2013) would suggest that the dimensions should be uncorrelated. The relatively modest associations do at least approximate the predicted magnitude. There was a significant modest negative correlation between dominance and warmth at the between-person level for the VIAS in this sample, though see below for results across samples.

Next, we compared the nomological networks of the SBI and the VIAS with other momentary variables as well as with the dispositional measures (Table 4). At the within-person level, dominance was modestly, positively correlated with positive affect in both the VIAS and SBI. Modest correlations emerged between negative affect and dominance, but in the opposite direction for the VIAS (positive) and SBI (negative). Warmth was strongly positively associated with positive affect for the VIAS whereas warmth was modestly positively associated with positive affect for the SBI. Modest negative correlations emerged between warmth and negative affect for both the VIAS and SBI. At the between-person level, there were moderate positive correlations between warmth and positive affect. Strong negative correlations emerged between warmth and negative affect for both the VIAS and SBI. A modest negative correlation was found between dominance and negative affect for the SBI. At the between-person level, stress was associated with lower dominance and warmth for the SBI but only lower warmth for the VIAS.

Turning to dispositional measures (Table 4), SBI dominance showed a moderate, negative correlation with neuroticism, whereas SBI warmth had a moderate, positive correlation with agreeableness and neuroticism. On the other hand, VIAS dominance was found to have a modest, positive correlation with extraversion; VIAS warmth had a moderate, positive correlation with agreeableness and conscientiousness.

Lastly, women tended to report more VIAS and SBI warmth than males, whereas age was not associated with either the VIAS or the SBI (Table 4).

Tests of Orthogonality Across All Samples

There were significant, albeit small, negative correlations between VIAS warmth and dominance at the within-person level in four of the five samples (Table 5). When data across all samples were pooled, the within-person correlation remained modest and negative. Findings at the between-person level were less consistent, as a modest, negative correlation between warmth and dominance found in only two of the five samples (US1 and 2). There were no significant between-person correlations in CS3 and 4, nor OS5. When the five samples were pooled, the between-person correlation between warmth and dominance was small and negative, but significant.

Within-Person Correlations Across All Samples

As hypothesized, momentary VIAS warmth was moderately to strongly associated with greater positive affect and lower negative affect in all five samples (Table 6). The correlation between momentary VIAS warmth and affect were similarly strong when pooling the samples. Within-person correlations between VIAS dominance and affect were less consistent. Undergraduate Samples 1 and 2 showed modest significant, positive relationships between VIAS dominance and positive affect, whereas the other three samples showed no significant correlation. At the same time, 3 of the 5 samples (US2, CS3, and OS5) evidenced small but significant positive correlations between within-person VIAS dominance and negative affect. When pooling the samples, VIAS dominance evidenced a modest, positive correlation with both positive and negative affect.

VIAS warmth was correlated with lower stress in all the samples; the pooled results were similar (Table 6). Correlations between momentary VIAS dominance and stress were small and inconsistent: stress showed a small correlation with greater VIAS dominance in two samples (CS3, OS5), less dominance in another (US1), and showed no relationship (US2). The pooled estimate of the correlation between momentary stress and VIAS dominance was also modest. Finally, we examined correlations between the participants' interpersonal behavior and their social ties to their interaction partners (e.g., parent, boss, etc.) in US1 and US2 as well as CS3 (Table 7). Although effects were generally modest, some notable patterns replicated across the three samples. For instance, there was a tendency toward less warm and less dominant behavior when interacting with a boss but more dominance with an employee. There were no dominance effects for coworkers, who presumably have relatively equal power relative to bosses and employees. Participants also did not report more or less dominance when interacting with romantic partners, but they did report modestly more warmth with romantic partners. Interactions with strangers were characterized by slightly less warmth.

Between-Person Correlations Across All Samples

We next examined the between-person correlation between the aggregated VIAS and affect and stress (Table 6). Individuals who tended to report higher VIAS warmth also tended to report greater positive affect in all five samples at a moderate to strong effect. Pooling the

samples yielded a moderate positive correlation between VIAS warmth and positive affect. Average VIAS dominance was not significantly correlated with positive affect in four of the five samples, nor in the pooled estimate. Average VIAS warmth was, however, modestly to strongly negatively associated with negative affect. Results of average VIAS dominance and negative affect were mixed. Most samples yielded non-significant results except for CS3. Finally, average VIAS warmth was moderately to strongly negatively correlated with stress in all five samples and in the pooled estimate. The correlation between average levels of VIAS dominance and stress was significant only in OS5.

Correlations Between VIAS Dimensions and Dispositional Measures

Turning to dispositional measures (i.e., cross-sectional global self-report), first we examined correlations between personality traits and average VIAS warmth and dominance (Table 8). In the two samples with personality trait data (US1, CS3) greater levels of extraversion were positively associated with VIAS dominance. Similarly, and consistent with previous work (e.g., Gurtman, 1995; McCrae & Costa, 1989; Pincus, 2002), dispositional agreeableness and conscientiousness were associated wither greater average VIAS warmth across interactions. In one of the two samples, negative associations were found between neuroticism and VIAS dominance as well as between VIAS warmth and openness. Examining interpersonal constructs using dispositional scales, US1 participants who reported more dominant traits tended to report more VIAS dominance. Similarly, those who reported more dispositional warmth tended to report more VIAS warmth.

Next, we examined correlations between preferred interpersonal values and problems with reported momentary interpersonal behavior. US2 showed that, on average, VIAS dominance was modestly positively associated with valuing interpersonally dominant traits. Further, VIAS warmth was moderately associated with valuing interpersonal warmth. Examining interpersonal problems assessed in US2, demonstrated that, on average, higher VIAS warmth was associated with distress over being too warm.

We next looked at correlations with several dispositional narcissism constructs. Note that some results from both US1 and 2 have been reported elsewhere (Edershile et al., 2019); we repeat them here for completeness. The VIAS showed no correlations with narcissism in US1. In US2 and CS3, however, VIAS warmth was associated with less narcissistic grandiosity and vulnerability in the FFNI and PNI. Correlations between VIAS dominance and grandiosity ranged from non-significant to modestly positively significant across the multiple in the three samples. VIAS warmth and narcissistic vulnerability associations ranged from non-significant to modestly negatively significant across the same samples and measures.

We next examined associations between the VIAS and various dispositional measures of mental health (Table 8). Dispositional perceived stress was not correlated with the VIAS in CS4, but dispositional loneliness was associated with greater VIAS dominance in the same sample. Depressivity was correlated with less VIAS warmth in three of the four samples that included it. Similarly, depressivity was negatively associated with VIAS dominance in three of the four samples. Anxiousness was not correlated with VIAS warmth or dominance in

two measures across three samples. Likewise, there was no correlation between borderline personality pathology and VIAS warmth or dominance in OS5.

Finally, there was no significant correlation between the VIAS and age in four of the five individual samples. In CS4, older individuals were more likely to endorse greater VIAS dominance. However, the pooled estimation across all samples showed a modest positive correlation between age and VIAS warmth. Turning to self-identified gender: womens tended to show greater VIAS warmth than men in three of the five samples. There was no association between VIAS dominance and gender in four of the five samples and the pooled estimate.

Exploratory Momentary Items

In the final set of analyses, we examined the correlations between single-item mental health related items and the VIAS within OS5 (Table 9). In the moment, greater VIAS warmth was associated with increased subjective performance, more interpersonal experiences, less mental and physical health symptoms, and higher self-esteem. Momentary VIAS dominance was modestly correlated with anxiety and familiarity with the other person.

Discussion

The present study tested the psychometric properties of visual analogue scales of interpersonal behavior. The VIAS joins the SBI and Interpersonal Grid as a method for assessing momentary interpersonal warmth and dominance. Both the SBI and the Interpersonal Grid have notable strengths, but also limitations (e.g., large number of highly specific behavioral items, difficulty implementing in widely available software) that the VIAS approach addresses. Here we enlisted five samples, spanning student, community, and psychiatric outpatient participants. Within- and between-person correlations were examined with several constructs that are known to have convergent and divergent correlations with interpersonal behavior. We first summarize the findings comparing the VIAS to the SBI. Second, we examine the VIAS' correlations with other constructs across the five samples, including those for which we had a priori predictions.

Consistent with comparisons of cross-sectional interpersonal trait ratings using single-dimension and two-dimensional visual analogue scales (Horowitz et al., 1991), the VIAS dimensions performed comparably to the standard SBI in intensive repeated assessments of interpersonal behavior. The VIAS and SBI showed similar patterns of orthogonality, particularly at the within-person level; although, note that modest associations between VIAS warmth and dominance were found in most samples. When comparing patterns of associations at the within-person level, the VIAS and SBI showed similar correlations with both measures of affect and stress. At the between-person level, there were some notable differences. For example, both the VIAS and SBI showed expected same-dimension correlations with dispositional interpersonal domains. However, whereas the VIAS exhibited no cross-dimension correlations with dispositionally assessed interpersonal domains—in line with Interpersonal Theory—the SBI dominance and dispositional warmth were negatively correlated. Further, the VIAS, but not the SBI, evinced the hypothesized positive correlation between dispositional dominance and extraversion. Thus, although the VIAS

and SBI evinced mostly similar patterns of correlation, the VIAS demonstrated incremental improvement toward matching a priori predictions.

We found several promising trends when examining the results across the five samples despite differing sample demographics and varying presentations of the VIAS. First, regarding orthogonality, dominance and warmth exhibited only modest associations at the within-person and between-person levels in most samples. Although orthogonality implies no correlation (Kiesler, 1983; Pincus & Ansell, 2013), the associations across the samples were relatively modest. The VIAS did show a significant association between the dimensions at the between-person level, whereas the SBI within the same sample did not. Nevertheless, some level of association between dimensions at the within-person level is commonly found using other interpersonal assessment measures (e.g., Fournier et al., 2009; Meehan et al., 2018; Roche et al., 2013), and thus is not necessarily indicative of a problem with the VIAS. Second, momentary VIAS warmth showed relatively strong correlations with affect and stress whereas dominance showed smaller and less consistent correlations with these constructs, in line with our predictions. Third, the pattern of the VIAS associations with dispositional measures also provided promising indications of the approach's validity. Akin to the within-person level, there were relatively strong correlations between average momentary warmth and better affect (i.e., higher positive affect and lower negative affect), but no clear pattern of correlations between average momentary dominance and affect. The VIAS also showed expected correlations with interpersonal dispositions and five-factor personality traits. As expected, average momentary dominance measured by the VIAS was associated with dispositional measures of dominance and extraversion and higher average warmth was associated with dispositional measures of warmth and agreeableness. In addition, although not predicted a priori, we did find a consistent association between warmth and conscientiousness in two samples.

We did not expect most measures of clinical and subclinical mental health to be associated with the VIAS scales. In line with expectations, we did not find any consistent correlations between perceived stress, anxiety traits and symptoms, or BPD symptoms with average dominance or warmth. However, depressive traits and symptoms were correlated with both lower average momentary dominance and warmth, whereas loneliness was associated with more dominance. We did anticipate significant correlations between the VIAS scales and narcissism. In line with prior work using same-method scales, dominance was positively correlated with grandiosity, but this was only found in US2. More consistent correlations were observed across samples between low VIAS warmth and narcissistic vulnerability.

Despite clear patterns of association that conformed to expectations, the correlations between cross-sectional dispositional measures and averages of momentary ratings on the VIAS were generally of modest to moderate effect size, even when assessing the putatively same construct (e.g., average momentary dominance and dispositional dominance). Although these may appear to fall short of what might be expected from convergent correlation, it is important to recognize that these are different scales (i.e., the dispositional measure and the momentary measure used different items) across different modalities/methods of assessment (i.e., cross-sectional vs. momentary). Different measures of the same construct using the same method often correlate highly, but far from perfectly,

and as noted previously, cross-method correlation in multi-modal data have long been known to lead to lower values (Achenbach et al., 2005; Fleeson & Gallagher, 2009). As a point of comparison, we note that BFI-2 extraversion (a construct closely aligned with positive emotionality; Lucas et al., 2008) correlated modestly to moderately with momentary averages of positive affect (US1 $r = .22$; CS3 $r = .38$), on par with correlations between dispositional measures of interpersonal behavior and the VIAS. This similarity is further noteworthy given the difference in assessment modalities between affect (i.e., momentary measure) and extraversion (i.e., dispositional measure).

We note that although the VIAS generally demonstrated expected patterns of association, VIAS dominance appeared to show weaker associations compared with VIAS warmth. For example, VIAS warmth's association with SBI warmth was .28 at the within-person level and .53 at the between-person level, whereas VIAS dominance's association to SBI dominance was .19 at the within-person level and .17 at the between-person level. It is unclear whether this reflects differences in the conceptual burden of asking participants to assess interpersonal dominance, or whether the adjectives used on each pole were less evocative of consistent responses than our warmth adjectives. It may well be that dominance is more difficult to rate consistently across methods. Although speculative, this could be because motivations to control and assert one's needs are not always overtly expressed in behavioral dominance. Global dispositional measures may better reflect motivations whereas behavior ratings in the moment may not. Regardless of the reason, this is an area ripe for future refinement.

As a practical matter, we tested several different anchors for the VIAS across samples. Researchers interested in using the VIAS may naturally wonder which set of anchors is best. We invite readers to peruse the tables for possible differences, though we do not see notable ones across operationalizations of interpersonal adjectives. The different anchors appear to function roughly equivalently. Therefore, we believe researchers likely have latitude to choose among these various anchors. Practical matters, such as how more than one anchor renders on a smartphone screen might push investigators to fewer anchors. We see these as reasonable considerations for the applied researcher.

Though this study was a broad evaluation of the VIAS method, there are several limitations worth noting. First, our comparison with the SBI was in a student sample. Tests of the VIAS' psychometric functioning could be enhanced in a community sample whose participants may have a less homogenous social experience than a sample of students. Second, although we were able to compare the VIAS with the SBI, we did not have a comparison with the Interpersonal Grid. Third, we had relatively few momentary measures. Assessing the VIAS' pattern of momentary correlations across a greater number of constructs would improve understanding of how the scale performs. At the same time, relatively few validated momentary scales are available for use as external criteria. Indeed, this is a major motivation for evaluating these scales. Fourth, many of the dispositional measures were featured in only one or two samples. Ideally, we would have been able to see patterns across more samples; this was not possible due to our use of archival datasets. Finally, it is worth noting that our single item measures of VIAS warmth and dominance did not readily allow for traditional estimation of reliability.

Despite these limitations, we have demonstrated that the VIAS compares favorably to one of the gold-standard momentary measures of interpersonal behavior, the SBI. Indeed, with respect to orthogonality and external validity correlations, the VIAS results aligned more closely with theory and the existing literature than those of the SBI. Further, across five samples, the VIAS' nomological network was broadly consistent with expectations based upon previous findings, and generally consistent despite differences in the populations the samples were drawn from and the format of the VIAS items themselves. The flexibility of this format as a dimensional, adjective-based, brief set of items is an asset to investigations of interpersonal process employing intensive repeated assessments.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Public Significance Statement:

The current study reports on the development of a new method for measuring social behavior in ambulatory assessments. We find that the method performs as would be hypothesized based upon theory and existing empirical research on links between interpersonal behaviors and a variety of emotional and behavioral processes.

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Table 1

Presentation of VIAS items across the five samples

Sample	Dominance	Warmth	Scale Range
Undergraduate Sample 1 Undergraduate Sample 2 Community Sample 3	"Assertive/Dominant/Controlling" to "Accommodating/Submissive/Timid"	"Warm/Friendly/Caring" to "Cold/Distant/Hostile"	−50 to 50
Community Sample 4	"Dominant/Forceful" to "Submissive/Meek"	"Warm/Friendly" to "Cold/Hostile"	0 to 100
Outpatient Sample 5	"Dominant" to "Submissive"	"Distant" to "Friendly"	0 to 100

Note. Anchors are presented from adjectives reflecting high values on the dimension to low values on the dimension.

Table 2

List of constructs assessed in each sample and their expected correlations with the VIAS dimensions

	Sample					Expected Correlations	
	1	2	3	4	5	**VIAS Warmth**	**VIAS Dominance**
Momentary measures							
Interpersonal behavior (checklist)	X					(+) warmth	(+) dominance
Positive Affect	X	X	X	X	X	(+)	*nh*
Negative Affect	X	X	X	X	X	(−)	*nh*
Stress	X		X		X	(−)	*nh*
Dispositional/baseline measures							
Interpersonal traits	X					(+) trait warmth	(+) trait dominance
Interpersonal problems		X	X			(+) warm problems	(+) dominant problems
Interpersonal values		X				(+) warm values	(+) dominant values
Big 5 personality traits	X		X			(+) agreeableness (+) extraversion	(+) extraversion
Narcissism		X	X			(−) vulnerability (−) grandiosity	(+) grandiosity
Perceived Stress				X		*nh*	*nh*
Loneliness				X		*nh*	*nh*
BPD symptoms					X	*nh*	*nh*
Anxiety traits/symptoms		X	X		X	*nh*	*nh*
Depression traits/symptoms		X	X	X	X	*nh*	*nh*
Gender	X	X	X	X	X	(+) Female	*nh*

Note. Constructs measured in a sample indicated by "X." Expected correlations with the VIAS dimensions are positive (+) or (−), *nh* (no hypothesis) indicates we did not expect a consistent correlation. Sample 1,2 = Undergraduates, Samples 3,4 = Community members, Sample 5 = Outpatients; VIAS = Visual Interpersonal Adjective Scale.

Table 3

Within- and between-person correlations with 95% confidence intervals among the Visual Interpersonal Analogue Scale dimensions and the Social Behavior Inventory dimensions in Sample 1

Social Behavior Inventory	VIAS	
	Dominance	**Warmth**
Within-person		
Dominance (Dimension)	**.19** (.14 – .18)	**.11** (.09 – .13)
Warmth (Dimension)	−**.05** (−.08 – −.03)	**.28** (.26 – .31)
Between-Person		
Dominance (Dimension)	**.17** (.01 – .33)	.08 (−.07 – .22)
Warmth (Dimension)	−.11 (-.23 – .02)	**.53** (.43 – .64)

Note. Bolding indicates that this estimate's 95% confidence interval did not contain zero. VIAS = Visual Interpersonal Adjective Scale.

Table 4

Psychometric comparison of the Visual Interpersonal Adjectives and the Social Behavior Inventory in Sample 1 using correlations with corresponding 95% confidence intervals

	VIAS		SBI	
Orthogonality				
Within-person correlation	.02 (.00 – .05)		**−.03** (−.06 – −.01)	
Between-person correlation	**−.15** (−28 – −.02)		.11 (−.07 – .29)	
Momentary Measures	**Dominance**	**Warmth**	**Dominance**	**Warmth**
Within-person level				
Positive Affect	**.15** (.12 – .17)	**.42** (.40 – .44)	**.10** (.08 – .13)	**.19** (.17 – .22)
Negative Affect	**.06** (.03 – .08)	**-.20** (−.22 – −.17)	**−.06** (−.09 – −.04)	**−.18** (−.20 – −.15)
Stress	**−.04** (−.06 – −.01)	**−.35** (−.37 – −.01)	**−.08** (−.10 – −.06)	**−.21** (−.23 – −.19)
Between-person level				
<u>Affect</u>				
Positive Affect	.03 (−.10 – .17)	**.37** (.28 – .47)	.13 (−.03 – .29)	**.29** (.17 – .42)
Negative Affect	.09 (−.04 – .22)	**−.58** (−.66 – −.50)	**−.20** (−.54 – .31)	**−.43** (−.54 – −.31)
Stress	.12 (−.02 – .25)	**−.51** (−.61 – −.41)	**−.21** (−.23 – −.19)	**−.39** (−.52 – −.27)
Dispositional Measures	**Dominance**	**Warmth**	**Dominance**	**Warmth**
<u>Personality</u>				
Extraversion	**.14** (.02 – .27)	.05 (−.07 – .18)	.15 (−.02 – .32)	−.10 (−.25 – .04)
Agreeableness	−.12 (−.24 – .01)	**.32** (.21 – .43)	−.12 (−.28 – .04)	**.20** (.07 – .34)
Conscientiousness	.00 (−.13 – .13)	**.21** (.09 – .33)	.07 (−.09 – .24)	.10 (−.04 – .24)
Neuroticism	−.07 (−.20 – .05)	.05 (−.08 – .18)	**−.24** (−.41 – −.07)	**.16** (.01 – .30)
Openness	.02 (−.11 – .15)	.06 (−.06 – .19)	.15 (−.01 – .31)	.11 (−.03 – .24)
<u>Interpersonal Traits</u>				
Interpersonal Dominance	**.17** (.04 – .29)	−.06 (−.19 – .06)	**.21** (.06 – .36)	**−.29** (−.41 – .17)
Interpersonal Warmth	−.06 (−.19 – .07)	**.36** (.25 – .47)	−.04 (−.20 – .12)	**.22** (.10 – .35)
<u>Demographics</u>				
Age	.01 (−.12 – .14)	−.09 (−.22 – .03)	.01 (−.14 – .17)	−.06 (−.20 – 07)
Gender (Female = 0; Male = 1)	.09 (−.04 – .22)	**−40** (−.51 – −.30)	.08 (−.08 – .21)	**−.34** (−.46 – −.22)

Note. Bolding indicates that this estimate's 95% confidence interval did not contain zero. VIAS = Visual Interpersonal Analogue Scale; SBI = Social Behavior Inventory; Personality = Big Five Inventory; Interpersonal Traits = International Personality Item Pool: Interpersonal Circumplex.

Table 5

Correlations and associated 95% confidence intervals between self-warmth and self-dominance using the VIAS

	Undergraduate Sample 1	Undergraduate Sample 2	Community Sample 3	Community Sample 4	Outpatient Sample 5	Combined
Within-person	.02 (.00 − .05)	**−.07** (−.10 − −.04)	**−.13** (−.15 − −.11)	**−.09** (−.14 − −.04)	**−.08** (−.11 − .05)	**−.07** (−.09 − −.06)
Between-person	**−.15** (−.28 − −.02)	**−.18** (−.30 − −.06)	−.02 (−.14 − .10)	.12 (−.10 − .34)	.04 (−.24 − .32)	**−.09** (−.15 − −.02)

Note. Bolding indicates that this estimate's 95% confidence interval did not contain zero. Average was calculated after Z-transformations of each sample's coefficient.

Table 6

Within-person and between-person correlations and respective 95% confidence intervals for momentary measures across the five samples

Dominance	Undergraduate Sample 1		Undergraduate Sample 2		Community Sample 3		Community Sample 4		Outpatient Sample 5		Combined Sample	
	Warmth	**Dominance**	**Warmth**	**Dominance**	**Warmth**	**Dominance**	**Warmth**	**Dominance**	**Warmth**	**Dominance**	**Warmth**	**Dominance**
Within-Person												
Positive affect	**.12** (.10 – .15)	**.49** (.47 – .50)	**.04** (.02 – .07)	**.49** (.47 – .52)	**−.01** (−.03 – −.01)	**.54** (.53 – .55)	−.01 (−.06 – .04)	**.38** (.34 – .43)	.04 (−.00 – .08)	**.33** (.30 – .37)	**.03** (.02 – .04)	**.50** (.49 – .51)
Negative affect	−.00 (−.03 – −.02)	**−.36** (−.38 – −.34)	**.04** (.01 – .07)	**−.45** (−.47 – −.42)	**.05** (.03 – .06)	**−.43** (−.44 – −.41)	.03 (−.02 – .09)	**−.35** (−.39 – −.30)	**.06** (.02 – −.10)	**−.21** (−.24 – −.17)	**.03** (.02 – .04)	**−.40** (−.41 – −.39)
Stress	**−.03** (−.06 – −.01)	**−.35** (−.37 – −.33)	.01 (−.02 – .04)	**−.42** (−.45 – −.40)	**.04** (.03 – .06)	**−.45** (−.46 – −.43)	−.02 (−.08 – −.04)	**−.33** (−.39 – −.27)	**.06** (.02 – .09)	**−.26** (−.29 – −.23)	**.02** (.01 – .03)	**−.38** (−.39 – −.37)
Between-Person												
Positive affect	.04 (−.10 – .17)	**.34** (.23 – .46)	.04 (−.08 – .16)	**.49** (.47 – .52)	**.16** (.05 – .28)	**.46** (.37 – .55)	.06 (−.16 – .29)	**.31** (.12 – .50)	.04 (−.27 – .21)	**.56** (.36 – .77)	−.06 (−.13 – −.00)	**.28** (.23 – .34)
Negative affect	.10 (−.03 – .23)	**−.56** (−.65 – −.47)	.05 (−.07 – .17)	**−.45** (−.47 – −.42)	−.10 (−.21 – −.02)	**−.33** (−.44 – −.23)	−.23 (−.46 – −.01)	**−.30** (−.51 – −.08)	**.37** (.11 – .62)	−.19 (−.42 – .05)	−.01 (−.08 – .05)	**−.41** (−.47 – −.36)
Stress	.12 (−.02 – .25)	**.35** (−.37 – −.33)	.01 (−.02 – .04)	**−.42** (−.45 – −.40)	−.02 (−.14 – −.06)	**−.45** (−.46 – −.43)	.01 (−.06 – .08)	**−.33** (−.38 – −.27)	**.32** (.07 – .57)	**−.31** (−.56 – −.06)	.04 (−.03 – .10)	**−.34** (−.40 – −.28)

Note. Bolding indicates that this estimate's 95% confidence interval did not contain zero.

Table 7

Influence of social roles at the within-person level

Relationship	Undergraduate Sample 1		Undergraduate Sample 2		Community Sample 3	
	Dominance	Warmth	Dominance	Warmth	Dominance	Warmth
Boss	**−.19** (−.22 − −.17)	**−.07** (−.09 − −.04)	**−.08** (−.11 − −.05)	**−.07** (−.10 − −.04)	**−.14** (−.16 − −.12)	**−.05** (−.07 − −.04)
Child					**.09** (.07 − .11)	**.04** (.03 − .06)
Coworker	.02 (−.00 − .04)	**.06** (.04 − .08)	.01 (−.02 − .04)	**−.06** (−.09 − −.03)	−.00 (−.02 − .02)	**−.08** (−.10 − −.06)
Employee					**.11** (.10 − .13)	−.02 (−.04 − .00)
Family	**.05** (.02 − .07)	−.01 (.04 − .02)	−.00 (−.03 − .03)	−.01 (−.04 − .02)		
"Other family"					−.01 (−.03 − .01)	.02 (.00 − .04)
Friend	.01 (−.02 − .03)	−.00 (−.03 − .02)	.02 (−.01 − .05)	**.08** (.06 − .11)	.02 (−.00 − .04)	**.07** (.06 − .09)
Parent					−.01 (−.02 − .01)	.01 (−.01 − .03)
Partner	.03 (.00 − .05)	**.10** (.07 − .13)	.02 (−.01 − .05)	**.04** (.02 − .07)	**−.03** (−.05 − −.02)	**.05** (.03 −.07)
Roommate	.01 (−.02 − .03)	**−.07** (−.10 − −.05)	**.04** (.01 − .07)	**−.04** (−.07 − −.01)		
Stranger	.02 (−.01 − .04)	**−.04** (−.07 − .−03)	**−.05** (−.08 − −.03)	**−.06** (−.08 − −.03)	**.04** (.02 − .05)	**−.09** (−.11 − −.07)

Note. Bolding indicates that this estimate's 95% confidence interval did not contain zero.

Table 8

Between-person correlations and associated 95% confidence intervals across the five samples

	Undergraduate Sample 1		Undergraduate Sample 2		Community Sample 3		Community Sample 4		Outpatient Sample 5		Combined Sa	
	Dominance	Warmth	Dominance	Warmth	Dominance	Warmth	Dominance	Warmth	Dominance	Warmth	Warmth	Dom
Dispositional Measures												
<u>Interpersonal Traits</u>												
Dominance	**.17** (.05 – .30)	−.09 (−.21 – .03)										
Warmth	−.08 (−.20 – .05)	**.31** (.19 – .42)										
<u>Big-5 Traits</u>												
Extraversion	**.16** (.04 – .28)	.02 (−.10 – .15)			**.22** (.11 – .32)	**.20** (.19 − 31)						
Agreeableness	−.11 (−.24 – .01)	**.30** (.19 – .41)			−.01 (−.12 – .10)	**.38** (.29 – .48)						
Conscientiousness	−.00 (−.13 – .12)	**.22** (.10 – .33)			.12 (.01 – .23)	**.26** (.16 – .37)						
Neuroticism	−.09 (−.21 – .04)	.07 (−.05 – .19)			**−.16** (−.27 – −.05)	−.09 (−.20 – .02)						
Openness	.03 (−.10 – .15)	.07 (−.05 – .20)			.10 (−.01 – .21)	**.13** (.02 – .24)						
<u>Interpersonal Values</u>												
Dominance			**.16** (.05 – .27)	.02 (−.09 – .14)								
Warmth			−.04 (−.15 – .08)	**.31** (.20 – .41)								
<u>Interpersonal Problems</u>												
Dominance			.10 (−.02 – .21)	.01 (−.10 – .13)								
Warmth			.01 (−.10 – .12)	**.22** (.11 – .33)								
<u>Narcissism</u>												
Brief PNI												
Grandiosity	.12 (−.01 – .24)	−.01 (−.13 – .11)	**.17** (.06 – .28)	**−.13** (−.24 – −.02)	−.06 (−.18 – .05)	**−.20** (−.31 – −.09)						
Vulnerability	−.00 (−.13 – .12)	−.07 (−.19 – .05)	.04 (−.07 – .15)	**−.29** (−.39 – −.18)	**−.17** (−.28 – −.06)	**−.20** (−.31 – −.09)						
FFNI												
Grandiosity			**.18** (.07 – .29)	**−.23** (−.34 – −.12)	.06 (−.05 – .17)	**−.17** (−.28 – −.06)						

	Undergraduate Sample 1		Undergraduate Sample 2		Community Sample 3		Community Sample 4		Outpatient Sample 5		Combined Sa...	
	Dominance	Warmth	Dominance	Warmth	Dominance	Warmth	Dominance	Warmth	Dominance	Warmth	Warmth	Dor...
Vulnerability			.10 (−.01 − .21)	**−.28** (−.39 − −.18)	**−.18** (−.29 − −.07)	**−.13** (−.24 − −.02)						
Perceived Stress							−.19 (−.39 − .00)	−.13 (−.32 − .06)				
Loneliness							**.33** (.08 − .58)	−.02 (−.28 − .24)				
Depression traits/ symptoms (S2: CAT-PD; S3-S5: BDI)			**−.08** (−.20 − .03)	**−.22** (−.33 − −.11)	**−.13** (−.24 − −.02)	**−.15** (−.26 − −.04)	**−.22** (−.42 − −.03)	**−.25** (−.44 − −.07)	.25 (−.03 − .52)	−.08 (−.37 − .21)		
Anxiety traits/ symptoms (S2: CAT−PD; S3, S5: BAI)			−.09 (−.20 − .03)	−.06 (−.17 − .06)	−.08 (−.19 − .03)	.02 (−.09 − .13)			.15 (−.12 − .42)	.11 (−.16 − .39)		
Borderline Personality Disorder Symptoms									.19 (−.09 − .45)	−.26 (−.52 − .00)		
Demographics												
Age	.01 (−.11 − .13)	−.09 (−.28 − .03)	−.05 (−.16 − .07)	−.04 (−.15 − .08)	.05 (−06 − .17)	−.08 (−.19 − .03)	**.35** (.17 − .53)	.16 (−.03 − .35)	−.02 (−.30 − .26)	.20 (−.08 − .46)	**.16** (.10 − .23)	.07...
Gender (Female = 0; Male = 1)	.09 (−.04 − .21)	**−40** (−.50 − −.29)	.00 (−.11 − .12)	**−.28** (−.38 − −.17)	**−.13** (−.25 − −.02)	**−.40** (−.41 − −.21)	−.00 (−.21 − .20)	**.25** (.07 − .43)	−.02 (−.31 − .26)	.13 (−.16 − .41)	−.02 (−.08 − .05)	−.3...

Note. Bolding indicates that this estimate's 95% confidence interval did not contain zero. Interpersonal behavior = Social behavior inventory; Interpersonal values = Circumplex scales of interpersonal values; Interpersonal problems = Inventory of interpersonal problems (Undergraduate Sample 2), Circumplex Scales of Interpersonal Problems (Community Sample 3); Interpersonal traits = International personality item pool – Interpersonal circumplex measure; Personality = Big five inventory; Brief NPI = Brief Narcissistic Personality Inventory; FFNI = Five Factor Narcissism Inventory; NPI = Narcissistic Personality Inventory; Anxiety symptoms = Beck Anxiety Inventory; Depressive symptoms = Beck Depression Inventory – 2; Generalized anxiety symptoms = Generalized Anxiety Disorder Questionnaire – IV; Perceived stress = Perceived Stress Scale; Loneliness = UCLA Loneliness Scale.

Table 9

Exploratory analyses of single item within-person correlations and associated 95% confidence intervals from Outpatient Sample 5

	Dominance	Warmth
Ability to perform important tasks	.01 (−.03 − .04)	**.20** (.17 − .22)
Ability to relate to others	.01 (−.02 − .05)	**.34** (.31 − .37)
Anxiety	**.05** (.02 − .08)	**−.26** (−.29 − −.23)
Depression	.01 (−.02 − .04)	**−.24** (−.27 − −.22)
Familiarity with person	**.13** (.10 − .16)	**.12** (.09 − .15)
Mental health symptoms	.01 (−.02 − .04)	**−.23** (−.26 − −.20)
Physical health symptoms	.02 (−.01 − .05)	**−.12** (−.15 − −.10)
Self-esteem	−.01 (−.04 − .03)	**.33** (.30 − .36)

Note. Bolding indicates that this estimate's 95% confidence interval did not contain zero.