

# Depression, Negative Emotionality, and Self-Referential Language: A Multi-Lab, Multi-Measure, and Multi-Language-Task Research Synthesis

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Depressive symptomatology is manifested in greater first-person singular pronoun use (i.e., I-talk), but when and for whom this effect is most apparent, and the extent to which it is specific to depression or part of a broader association between negative emotionality and I-talk, remains unclear. Using pooled data from  $N = 4,754$  participants from 6 labs across 2 countries, we examined, in a preregistered analysis, how the depression–I-talk effect varied by (a) first-person singular pronoun type (i.e., subjective, objective, and possessive), (b) the communication context in which language was generated (i.e., personal, momentary thought, identity-related, and impersonal), and (c) gender. Overall, there was a small but reliable positive correlation between depression and I-talk ( $r = .10$ , 95% CI [.07, .13]). The effect was present for all first-person singular pronouns except the possessive type, in all communication contexts except the impersonal one, and for both females and males with little evidence of gender differences. Importantly, a similar pattern of results emerged for negative emotionality. Further, the depression–I-talk effect was substantially reduced when controlled for negative emotionality but this was not the case when the negative emotionality–I-talk effect was controlled for depression. These results suggest that the robust empirical link between depression and I-talk largely reflects a broader association between negative emotionality and I-talk. Self-referential language using first-person singular pronouns may therefore be better construed as a linguistic marker of general distress proneness or negative emotionality rather than as a specific marker of depression.

*Keywords:* depression, language, LIWC, negative emotionality, personality

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The idea that language use reveals information about personality has long circulated in the social and medical sciences (Pennebaker, Mehl, & Niederhoffer, 2003). Only over the last two decades, though, spurred by the increasing digitization of verbal behavior and significant advances in computerized text analysis (Boyd & Pennebaker, 2016; Iliev, Deghani, & Sagi, 2015; Schwartz & Ungar, 2015), has it become possible to subject this idea to rigorous empirical investigation. By now, a flourishing literature points to associations between various personal characteristics and

subtle yet traceable idiosyncrasies in word use (Tausczik & Pennebaker, 2010). Of the linguistic variables studied in this regard, personal pronouns have proven particularly psychologically revealing (Chung & Pennebaker, 2007; Pennebaker, 2011). Motivated by theory arguing that excessive self-focus after the experience of negative life events or failure to meet important goals is associated with negative affect (Carver & Scheier, 1981; Duval & Wicklund, 1972) and depression in particular (Pyszczynski & Greenberg, 1987), research has identified first-person singular

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pronoun use (i.e., I-talk) as a marker of psychopathology traits characterized by self-focused attention (Ireland & Mehl, 2014). In this context, the association between depression<sup>1</sup> and I-talk has received by far the most empirical attention (Edwards & Holtzman, 2017; Guntuku, Yaden, Kern, Ungar, & Eichstaedt, 2017).

Although the basic connection between depression and I-talk is documented in the literature, there are critical empirical and theoretical questions remaining. Accordingly, the aims of this project were to “zoom in” on this association by analyzing how it varies by pronoun subtypes, communication contexts, and gender, and to test whether the effect is unique to depression or perhaps reflects a broader association between negative emotionality and I-talk, given that negative emotionality is a robust dispositional predictor of depression (Kotov, Gamez, Schmidt, & Watson, 2010). In addition to advancing the empirical literature on psychological aspects of language use, understanding the specific conditions under which I-talk is a marker of depression is critical considering attempts to use I-talk as a possible screening tool for depression (Edwards & Holtzman, 2017). To accomplish the aims of the current study, we pooled data from  $N = 4,754$  participants from 11 samples from 6 labs across 2 countries, the United States and Germany. All samples administered validated measures of both depression and negative emotionality, and first-person singular pronoun use was assessed via one or more language tasks. In addition, the hypotheses, methods, and analytic plan were preregistered.

### Prior Research on Depression and Self-Referential Language Use

A sizable literature has examined the association between depression and I-talk using a variety of methods to measure language, including manual pronoun counts by humans (i.e., Buccu & Freedman, 1981; Weintraub, 1981), dictionary-based computerized text analysis (e.g., Fast & Funder, 2010; Mehl, 2006; Rude, Gortner, & Pennebaker, 2004; Zimmermann, Wolf, Bock, Peham, & Benecke, 2013), and open-vocabulary text analysis approaches that can isolate effects for single words and word phrases (e.g., Schwartz et al., 2014; Yarkoni, 2010). Although the majority of studies find that I-talk is used more frequently by individuals with depression, the magnitude of the effect varies substantially across studies. For example, the effect size ranges from a small negative correlation ( $r = -.10$ , Rodriguez, Holleran, & Mehl, 2010) to a large positive one ( $r = .58$ , Brockmeyer et al., 2015). Studies that report a mean difference between currently depressed and never depressed (or control) participants sometimes find differences in the expected direction (e.g.,  $d = .52$ , Rude et al., 2004), and other times do not find reliable differences at all (e.g.,  $d = -.28$ , Baddeley, Pennebaker, & Beevers, 2013). Finally, using an open vocabulary approach, Schwartz et al. (2014) found that the depression facet of neuroticism was positively associated with some first-person singular pronouns (e.g., I'm, me) and phrases containing first-person singular pronouns (e.g., I do not, my head), however the correlations were small (ranged from  $r = .05$  to  $r = .10$ ).

The variability in the magnitude of the depression–I-talk association may be explained, in part, by two reasons. First, past research overwhelmingly used small samples which yield notoriously unstable effects that can fluctuate dramatically from study to study (Lakens & Evers, 2014; Schönbrodt & Perugini, 2013) and

often provide imprecise estimates of the true effect size (Fraleigh & Vazire, 2014; Ioannidis, 2005). None of the 17 samples from a total of 13 studies that tested for correlational effects had a sample of at least  $N = 1,417$ , the size required to obtain a sample correlation coefficient that is within  $\pm .05$  of a population correlation coefficient of typical size in social and personality psychology ( $r = \sim .20$ ; Richard, Bond, & Stokes-Zoota, 2003), with probability of .95 (Algina & Olejnik, 2003). Second, past research was often unable to test for moderators. Studies vary considerably by (a) whether results are reported separately for the three first-person singular pronouns or collapsed across them, (b) the communication context in which language is generated, and (c) the gender composition.

In an effort to clarify the inconsistencies in the depression and I-talk literature, a recent meta-analysis that analyzed sample-based estimates from correlational studies using the Linguistic Inquiry and Word Count computer program (LIWC, Pennebaker, Boyd, Jordan, & Blackburn, 2015) found a small positive correlation between depression and total first-person singular pronoun use ( $r = .13$ , 95% CI [.10, .16]; Edwards & Holtzman, 2017). We sought to complement this meta-analysis by estimating the overall effect in a single large-scale collaborative study that relied on pooled participant-level data. Moreover, Edwards and Holtzman (2017) found significant variation in the effect sizes thereby supporting the presence of moderators. We therefore also sought to extend their meta-analysis by conducting the most comprehensive investigation of moderators to date.

### Does the Depression–I-Talk Effect Vary by First-Person Singular Pronoun Type?

Although most studies report results collapsed across the three first-person singular pronoun types (i.e., subjective, objective, and possessive first-person singular pronouns), some researchers have taken a finer grained approach. A study that reported results separately for the three pronoun types found that depressed participants used more subjective first-person singular pronouns (i.e., “I”) than never depressed participants, but that the two groups did not differ in their use of objective (e.g., “me”) or possessive (e.g., “my”) first-person singular pronouns (Rude et al., 2004). In research that reported results for combinations of the three pronoun types, one study found that the association was larger for subjective than objective/possessive first-person singular pronouns (i.e.,  $r = .29$  for subjective vs.  $r = .05$  for objective/possessive; Dunning & Park, 2009) whereas another study found the opposite pattern (i.e.,  $r = .04$  for subjective vs.  $r = .18$  for objective/possessive; Zimmermann, Brockmeyer, Hunn, Schauenburg, & Wolf, 2017).

In short, some of the variability in the depression–I-talk effect might be explained by whether researchers examine the effect separately for the three types of first-person singular pronouns. This is consistent with research showing that the three pronoun types do not always load on the same statistical dimension (Campbell & Pennebaker, 2003). In contrast to possessive first-person

<sup>1</sup> In line with a dimensional view of depression, we use the term depression throughout this paper not specifically for clinically diagnosed depression but, rather, broadly to include subclinical depression and depressive symptoms.

singular pronouns which capture a form of self-referential language that focuses on the self in relation to something else, subjective and objective first-person singular pronouns both capture a form of self-referential language that focuses on the self in isolation. Moreover, there are important psychological differences between subjective and objective first-person singular pronouns with subjective capturing a more active or self-as-actor form of self-focus and objective capturing a more passive or self-as-target form of self-focus (James, 1890). Based on both empirical and theoretical grounds then, it is important to evaluate whether and how the association between depression and I-talk varies as a function of first-person singular pronoun type.

### Does the Depression–I-Talk Effect Vary by Communication Context?

Past research often ignores the communication context in which language is produced. This is problematic to the extent that certain communication contexts afford a greater or lesser expression of personality (e.g., Mehl, Robbins, & Holleran, 2012). Rodriguez and colleagues (2010), for example, observed the positive association between depression and I-talk when participants wrote an essay describing their personality to themselves (as they would in a personal diary), but not when they did so describing their personality to others (as they would in an online blog). Although, consistent with this finding, Edwards and Holtzman's (2017) meta-analysis found that the correlation between depression and I-talk was slightly larger in private than in public contexts, the effect difference was not statistically significant.

Beyond the private-public dimension, there are other theoretically important properties of the communication context that can affect the validity of I-talk as a marker of depression. One such property is whether the context affords the expression of individual differences in self-referential language use. In impersonal contexts (e.g., descriptions of an object or a picture), first-person singular pronouns are rarely used, and because of limited between-person variability, the depression–I-talk effect may be attenuated. In personal contexts, on the other hand, writing or talking about a topic of personal relevance may maximize between-person variability in first-person singular pronoun use, and thereby accentuate the effect. However, in contexts where the topic revolves specifically around a person's identity, self-referential language use may effectively become the norm, which could reduce between-person variability in first-person singular pronoun use and, in turn, weaken the depression–I-talk effect.

Another psychological property of the communication context that might alter the magnitude of the depression and I-talk effect is the degree to which it allows for controlled (in the sense of planful/considered) verbal expression. Because of the negative stigma around mental illness, depressed individuals may try to alter aspects of their language use to conceal their depression from others. In contexts that afford little controllability then, such as stream-of-consciousness tasks that call for maximally automatic language, depressed individuals may have more difficulty censoring their word use, which could accentuate the depression–I-talk association. To the extent that function words are generally difficult to control (Pennebaker, 2011), however, the depression–I-talk effect may be quite consistent across different levels of (still overall low) controllability.

### Does the Depression–I-Talk Effect Differ by Gender?

Ever since Nolen-Hoeksema's (1987) seminal work on response styles theory as an explanation of gender differences in depression, research shows that women report that they are more likely to ruminatively self-focus in response to a depressed mood than are men (Johnson & Whisman, 2013). This suggests that the positive relationship between depression and I-talk may be larger for women than men. Therefore, a final reason why there is large variability in the magnitude of the depression–I-talk effect may be because past studies vary in their gender composition. For example, some past research examined (a) only one gender (e.g., Jarrold et al., 2011), (b) both genders but heavily skewed toward women (e.g., Rodriguez et al., 2010; Van der Zanden et al., 2014; and Zimmermann et al., 2013), and (c) approximately equal numbers of men and women (e.g., Mehl, 2006; Weintraub, 1981). The one study that has examined gender differences directly did not find strong support that gender moderated the depression–I-talk association (Fast & Funder, 2010). Although the effect was more positive for women than men for clinician-rated depression, it did not reliably differ by gender for participant-rated depression (Fast & Funder, 2010). The Edwards and Holtzman (2017) meta-analysis found no evidence of moderation but this test was limited because most published research omitted separate estimates by gender. Therefore, a large-scale study that can generate precise estimates of the depression–I-talk effect separately for men and women is needed.

### Is the Depression–I-Talk Effect Specific and Unique or Part of a Broader Association Between Negative Emotionality and I-Talk?

Whereas some researchers argue that self-focused attention is specific to depression (Pyszczynski & Greenberg, 1987), others argue that it is a general marker of psychopathology that is characterized by negative affect (Ingram, 1990). Consistent with the latter suggestion, past research reveals that self-focused attention, regardless of whether it is assessed with subjective self-reports or objectively measured first-person singular pronoun use, is positively associated with symptoms of anxiety in addition to symptoms of depression (Brockmeyer et al., 2015; Mor & Winquist, 2002). Further, research consistently finds that first-person singular pronoun use is positively related to the Big Five domain of neuroticism (Kern et al., 2014; Mehl, Gosling, & Pennebaker, 2006; Pennebaker & King, 1999; Qiu, Lin, Ramsay, & Yang, 2012; Yarkoni, 2010; Yee, Harris, Jabon, & Bailenson, 2011). Neuroticism, also referred to as negative emotionality, is the tendency to become easily distressed and to experience negative feelings such as sadness or nervousness (John, Naumann, & Soto, 2008), and is the Big Five domain that has the strongest associations with depressive and anxiety disorders (Kotov et al., 2010). The theoretically important question that is yet unanswered, however, is the extent to which the depression–I-talk effect is specific to depression or reflective of the broader association between negative emotionality and I-talk. In other words, is depression related to self-focused attention solely because of its shared variance with negative emotionality? This is important to examine in the context of attempts to use I-talk as a potential screening tool for depression (Edwards & Holtzman, 2017). A large-scale study that

includes individual participant data on all three variables is required to address this topic. Because all of the 11 samples in the current study measured (a) depression, (b) trait negative emotionality, and (c) first-person singular pronoun use, our study is the first to examine whether self-focused attention is a marker of depressive symptoms when controlling for negative emotionality.

### Overview of the Study and Research Questions

The purpose of this large-scale preregistered study was to (a) obtain a more precise estimate of the depression–I-talk effect using pooled data from multiple labs and language tasks and (b) examine the specificity of the effect according to theoretically important dimensions (i.e., pronoun type, communication context, gender, and trait domain). Unlike traditional meta-analyses that pool data at the sample level, our analysis pooled data at the level of the participant, which is a particularly powerful way of synthesizing research for building a cumulative knowledge base (Cooper & Patall, 2009; Glass, 2015; van Elk et al., 2015). Compared with meta-analyses with sample-level data, analyses with participant-level data (a) have more power and flexibility to examine moderators (Cooper & Patall, 2009), such as how the depression–I-talk effect varies by first-person singular pronoun type, communication context, and gender, and (b) are better suited to address more complex questions related to process (Glass, 2015), such as the extent to which the depression–I-talk effect is specific to depression or reflective of a broader underlying association between negative emotionality and I-talk. For these reasons (and others), we collaborated with 6 labs to obtain raw data on more than 4,000 participants' levels of depression, negative emotionality, and first-person singular pronoun use. A further advantage of this approach is that study authors (as a collective) were involved in the design and collection of all of the underlying data. This is usually not the case in a traditional meta-analysis. The research questions (and hypotheses), methods, and the data analysis plan were preregistered on the Open Science Framework (OSF) at <https://osf.io/rz387/>.

#### Research Question 1 (RQ1): To What Extent Is Depression Related to I-Talk?

On both theoretical and empirical grounds, we hypothesized that depression would be positively associated with total first-person singular pronoun use, and we expected that the correlation would be small in magnitude, similar to the meta-analytic finding. We had this expectation about the size of the depression–I-talk relationship because (a) large-sample studies on personality and language tend to find small correlations (Kern et al., 2014; Pennebaker & King, 1999; Yarkoni, 2010) and (b) correlations between self-reported personality and objectively measured behaviors tend to be small because of the absence of shared method variance.

**Research question 1a (RQ1a): To what extent does the relationship between depression and I-talk vary by first-person singular pronoun type?** Most past research reports results for overall first-person singular pronoun use; but among research that has examined the results separately for the three pronoun types, it appears that the positive association between depression and I-talk is largest for subjective first-person singular pronouns (Dunnack & Park, 2009; Rude et al., 2004). However,

because of the limited number of studies that have examined this issue, this research question is exploratory and we do not have specific hypotheses.

**Research question 1b (RQ1b): To what extent does the relationship between depression and I-talk vary by communication context?** Four communication contexts will be examined in the current study: (a) impersonal (i.e., participants write about a topic that is not related to themselves), (b) personal (i.e., participants write or talk about a topic that is related to themselves), (c) identity (i.e., participants write or talk about aspects of their identity), and (d) momentary thought (i.e., participants write about what they are thinking in the moment in a stream-of-consciousness manner). Because personal communication contexts (identity and momentary thought contexts are also personal in nature) afford the expression of individual differences more so than impersonal contexts, we hypothesized that the magnitude of the positive association between depression and I-talk would be greater in the personal, identity, and momentary thought contexts than in the impersonal context; however, we do not have specific hypotheses for how the magnitude will differ among the three former contexts.

**Research question 1c (RQ1c): To what extent does the relationship between depression and I-talk vary by gender?** Research on gender differences in responses to depression suggests that the positive association between depression and I-talk may be larger for women than men. However, because (a) limited past research has examined this, and (b) the one study that has did not find conclusive support for gender differences (Fast & Funder, 2010), this research question is exploratory and we do not have a specific hypothesis.

#### Research Question 2 (RQ2), RQ2a, RQ2b, and RQ2c

Although the primary purpose of including negative emotionality in this study was to examine the extent to which first-person singular pronouns are a unique linguistic marker of depression, it made sense to first replicate the negative emotionality–I-talk effect observed in the literature. In addition to examining the extent to which negative emotionality is related to I-talk (RQ2), we also estimated the negative emotionality–I-talk effect for the three first-person singular pronoun types (RQ2a), the four communication contexts (RQ2b), and for women and men separately (RQ2c). Empirical research mostly reveals a small to moderate positive association between negative emotionality and I-talk (e.g., Kern et al., 2014; Mehl et al., 2006; Pennebaker & King, 1999; Qiu et al., 2012; Yarkoni, 2010; Yee et al., 2011). Therefore, for RQ2, we hypothesized that negative emotionality would be positively, although modestly, related to I-talk. The remaining research questions were exploratory and we had no specific hypotheses.

#### Research Question 3 (RQ3): To What Extent Is the Association Between Depression and I-Talk Unique to Depression or Reflective of a Broader Association Between Negative Emotionality and I-Talk?

Although we had no specific hypothesis, our exploratory analyses were guided by the idea that depression shares substantial variance with the broader trait domain of negative emotionality (Kotov et al., 2010) and that, therefore, it is possible that at least part of the depression–I-talk effect may be subsumed under the broader negative emotionality–I-talk association.

## Method

The Institutional Review Board at the University of Arizona declared this study exempt from human subjects review (Protocol Number: 1711034279, Protocol Title: Depression, Negative Emotionality, and Self-Referential Language: A Multi-Lab, Multi-Measure, and Multi-Language-Task Research Synthesis). This study was declared exempt because all analyses were performed on archival, de-identified data and Allison M. Tackman, who performed all analyses, had no interaction with any of the study participants.

## Samples and Procedure

This study included  $N = 4,754$  participants from a total of 11 samples<sup>2</sup> from 6 labs across the United States and Germany. Participants were included in the study if their data could be used in at least one analysis (e.g., correlation between depression and I-talk). Therefore, all of the participants completed at least one language task and the majority of the participants (88.28%) completed both a depression and negative emotionality measure (2.57% of participants had scores on depression but were missing scores on negative emotionality, and 9.15% of participants had scores on negative emotionality but were missing scores on depression).

The 11 samples were included in this study so the overall sample would represent a more heterogeneous group of participants with regards to depressive symptomatology, enhancing the generalizability of our study findings. More specifically, seven samples included participants who ranged from having no symptoms of depression to mostly subclinical levels of depression, three samples consisted of participants who were at risk for clinical depression due to recently experiencing a stressful life event, and one sample consisted of participants who were clinically diagnosed with depression. Below is a brief description of each sample and the language task(s) used (also see Table 1 which summarizes important information about the 11 samples).

**Sample 1.** As part of a larger study, 253 college students from the University of Arizona (60.1% female;  $M_{\text{age}} = 19.05$ ) completed a series of self-report questionnaires and wrote for 15 min about how happy or satisfied they were with their life.

**Sample 2.** As part of a larger study, 133 adults living in Tucson, AZ who recently separated from their marital partners (63.6% female;  $M_{\text{age}} = 40.57$ ) completed a series of self-report questionnaires and continuously spoke into a voice recorder for four minutes about their strongest thoughts and feelings regarding their relationship separation experience.

**Sample 3.** This sample also consisted of 133 adults living in Tucson, AZ who recently separated from their marital partners (70.7% female;  $M_{\text{age}} = 43.13$ ). The procedure was the same as that used in Sample 2.

**Sample 4.** As part of a larger study, 161 young adults from the University of Arizona or living in the nearby community who recently experienced a romantic breakup (73.1% female;  $M_{\text{age}} = 19.49$ ) completed a series of self-report questionnaires and verbally responded to four questions about their breakup experience during a 4-min audio-recorded session. The four questions, each of which was displayed on a computer screen for one minute, were as follows: (a) When did you first realize you and your partner were headed toward breaking up? (b) What do you remember about the

separation itself, the actual time when you and your former partner separated? (c) How much contact have you had with your former partner? What kind/s of contact? and (d) How has the breakup affected your thoughts and feelings regarding romantic relationships?

**Sample 5.** As part of a larger study, 305 adults (57% female;  $M_{\text{age}} = 28.62$ ) completed a series of self-report questionnaires and participated in a modified expressive writing task about their deepest thoughts and feelings regarding their relationship. This was an online couple study in German language recruited mainly via social media. They were asked to write at least 850 words (as signaled with a counter on the web page).

**Sample 6.** As part of a larger study, 55 depressed patients (69.1% female;  $M_{\text{age}} = 46.04$ ) completed a series of self-report questionnaires and were then randomly assigned to either an expressive writing trial (treatment group) or a time management writing trial (control group). Participants wrote for 20 min and were patients at a psychosomatic rehabilitation clinic in Southern Germany (Bad Buchau, Baden-Württemberg).

**Sample 7.** As part of a larger study, 110 college students from Georgia Southern University (57.3% female;  $M_{\text{age}} = 19.96$ ) completed a series of self-report questionnaires and participated in part of the Life Story Interview. During the audio-recorded session that lasted one hour or less, participants described what the main chapters would be in a story about their life and described three key scenes in their life story: a high point, a low point, and a turning point.

**Sample 8.** As part of a class assignment, 937 introductory psychology students from the University of Texas at Austin (61% female) completed a series of questionnaires and participated in a stream-of-consciousness writing task (similar to the task described in Holleran & Mehl, 2008) as well as a task that required them to write short essays in response to a picture from the Thematic Apperception Test (Murray, 1943).

**Sample 9.** As part of a class assignment, 948 introductory psychology students from the University of Texas at Austin (61.3% female;  $M_{\text{age}} = 19.03$ ) completed a series of questionnaires and a stream-of-consciousness writing task. (The task was identical to that used for Sample 8.)

**Sample 10.** As part of a class assignment, 1,269 introductory psychology students from the University of Texas at Austin (65.8% female) completed a series of questionnaires and a stream-of-consciousness writing task (identical to Samples 8 and 9), a

<sup>2</sup> The entirety of Sample 3 and part of Sample 7 in the current study were used in the Edwards and Holtzman (2017) meta-analysis on depression and total first-person singular pronoun use (these samples correspond to the Tackman et al. and Holtzman samples in the meta-analysis). Four of the 11 samples in the current study were used in one of our previous papers examining narcissism and the use of first-person singular pronouns (Carey et al., 2015). Samples 8, 9, 10, and 11 in the current study correspond to Samples 12, 13, 14, and 9 in the Carey et al. (2015) study. One sample from the Carey et al. (2015) study that met the inclusion criteria for the current study (i.e., administered a measure of depression and negative emotionality) was not included in the current study because it was the only sample that would have been categorized as having a public communication context, and with such a small sample size, would have produced imprecise effect estimates for the public communication context. The remaining 10 of 15 samples used in the Carey et al. (2015) study were not included in the current study because they did not include a measure of depression and negative emotionality.

Table 1  
*Overview of the Study Samples, Language Tasks, Measures, and Categorization of Language Tasks Into Communication Contexts*

Sample <sup>a</sup>	Language task(s)	N	% F	M <sub>age</sub>	College students or community members	Depression		Negative emotionality		Communication context		
						Measure	α	Measure	α	Personal	Moment. Th.	Identity
1	Quality of life essay	253	60.1	19.05	College	CES-D 20	.91	BFI	.83	x		x
2	Talk about marital separation experience	133	63.6	40.57	Community	BDI-II	.92	BFI	.85	x		
3	Talk about marital separation experience	133	70.7	43.13	Community	CES-D 10	.87	BFI	.81	x		
4	Talk about romantic breakup experience	161	73.1	19.49	Mixed	BDI-II	.88	BFI	.81	x		
5	Write about romantic relationship	305	57.0	28.62	Community	CES-D 20	.88	TIP1	.64	x		
6	1. Expressive writing essay 2. Time management essay	55	69.1	46.04	Community	BDI-II	.90	NEO-FFI	.78	x		x
7	1. Chapters in life story 2. High point in life story 3. Low point in life story 4. Turning point in life story	110	57.3	19.96	College	CES-D 10	.76	BFAS	.90	x		x
8	1. Stream-of-consciousness task 2. Thematic apperception test	937	61.0	—	College	CES-D 10	.81	TIP1	.66	x		x
9	Stream-of-consciousness task	948	61.3	19.03	College	CES-D 10	— <sup>b</sup>	BFI	— <sup>b</sup>	x		x
10	1. Stream-of-consciousness task 2. Thematic apperception test	1269	65.8	—	College	CES-D 10	.81	BFI	.82	x		
11	3. Who am I? writing task 1. Important memory or life episode 2. Like most about yourself 3. Like least about yourself 4. Important moment in romantic life 5. Person you care most about 6. Recent problem	450	72.4	19.82	College	CES-D 10	.79	Big Five factor markers	.88	x		x

*Note.* Moment. Th. = Momentary Thought; CES-D = Center for Epidemiologic Studies Depression Scale (Sample 1 used Radloff (1977) 20-item version, Sample 5 used Meyer & Hautzinger (2001) 20-item German version, Samples 3, 8, 9, and 10 used Andresen et al. (1994) 10-item version, and Samples 7 and 11 used Cole et al. (2004) 10-item version); BDI-II = Beck Depression Inventory-II (Samples 2 and 4 used Beck et al. (1996) version and Sample 6 used Hautzinger et al. (2003) German version); BFI = 8-item neuroticism scale from the Big Five Inventory (John et al., 2008); TIP1 = 2-item neuroticism scale from the Ten-Item Personality Inventory (Sample 8 used Gosling et al. (2003) version and Sample 5 used Muck et al. (2007) German version); NEO-FFI = 12-item neuroticism scale from the Borkenau & Ostendorf (1993) German version of the NEO Five-Factor Inventory; BFAS = 20-item neuroticism scale from the Big Five Aspect Scales (DeYoung et al., 2007); Big Five factor markers = 10-item neuroticism scale from the International Personality Item Pool (IPIP) representation of Goldberg's (1992) Big Five factor markers (<http://ipip.ori.org/newBigFive5broadKey.htm>).

<sup>a</sup> All samples are English except for Samples 5 and 6, which are German. <sup>b</sup> We could not compute Cronbach's Alpha because we did not have item-level information.

Thematic Apperception Test essay (identical to Sample 8), and an essay to the prompt “write about who you are.”

**Sample 11.** Four hundred fifty psychology students from Michigan State University (72.4% female;  $M_{\text{age}} = 19.82$ ) wrote short essays in response to six different prompts modeled after the Life Story Interview. These prompts asked them to (a) describe an important scene, episode, or moment in life that stands out as either especially positive or especially negative (i.e., high or low point in life story), (b) describe an episode or moment that stands out as a significant event in their romantic life, love life, or sexual life, (c) describe the person they care most about in life, (d) describe a recent problem or trouble that they had to face and tell how they overcame it, (e) write about what they like most about themselves, and (f) write about what they like least about themselves (Donnellan & Holtzman, unpublished data, 2013).

## Measures

Supplement 1 lists the items and response scales for all of the depression and negative emotionality measures used in the current study. Participants were instructed to indicate the extent to which a series of statements or items were characteristic of themselves in the past one or two weeks (for the depression measures) or in general (for the negative emotionality measures).

**Depression.** The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) was administered in Samples 2 and 4, and the German version of the BDI-II was administered in Sample 6 (Hautzinger, Keller, Kühner, & Bürger, 2003). The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) was administered in Sample 1, and the German version of the CES-D was administered in Sample 5 (Meyer & Hautzinger, 2001). The remaining samples used a shortened version of the CES-D: Samples 3, 8, 9, and 10 used the 10-item shortened version by Andresen, Malmgren, Carter, and Patrick (1994) and Samples 7 and 11 used the 10-item shortened version by Cole, Rabin, Smith, and Kaufman (2004). Internal consistencies for these measures were acceptable: Cronbach’s alphas ranged from .88 to .92 for the BDI-II, .88 to .91 for the CES-D, .81 to .87 for the Andresen et al. (1994) 10-item CES-D, and .76 to .79 for the Cole et al. (2004) 10-item CES-D.

**Negative emotionality.** The 8-item neuroticism scale from the Big Five Inventory (BFI-44; John et al., 2008) was administered in Samples 1, 2, 3, 4, 9, and 10. The 20-item neuroticism scale from the Big Five Aspect Scales (BFAS; DeYoung, Quilty, & Peterson, 2007) was administered in Sample 7. The 12-item neuroticism scale from the German version of the NEO Five-Factor Inventory (NEO-FFI; Borkenau & Ostendorf, 1993) was administered in Sample 6. The 10-item emotional stability scale from the 50-item International Personality Item Pool (IPIP) representation of the Goldberg (1992) markers from the Big Five factor structure (<http://ipip.ori.org/newBigFive5broadKey.htm>) was administered in Sample 11 (scored to reflect neuroticism in the current study). Finally, the 2-item emotional stability scale from the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003; scored to reflect neuroticism in the current study) was administered in Sample 8, and the German version of this scale was administered in Sample 5 (TIPI-G; Muck, Hell, & Gosling, 2007; scored to reflect neuroticism in the current study). Internal consistencies for these measures were acceptable: Cronbach’s alphas

were .90 for the 20-item neuroticism scale from the BFAS, .78 for the 12-item neuroticism scale from the NEO-FFI, .88 for the 10-item neuroticism scale from the Big Five factor markers, ranged from .81 to .85 for the 8-item neuroticism scale from the BFI, and ranged from .64 to .66 for the 2-item neuroticism scale from the TIPI.

**First-person singular pronoun use.** All language tasks that were audio-recorded were transcribed and saved as text documents; all written essays were saved as text documents. The text documents from the English samples were submitted to the English version of the Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2015), and the text documents from the German samples were submitted to the German LIWC dictionary (Wolf et al., 2008). For each text document, we obtained the percentage of words (out of the total number of words) that were (a) subjective first-person singular pronouns (English: “I,” “I’m,” “I’ve,” “I’ll,” and “I’d”; German: “Ich”), (b) objective first-person singular pronouns (English: “me” and “myself”; German: “mich” and “mir” – the genitive pronoun “meiner” is hardly used in spoken German and was omitted here for its overlap with the routinely used possessive pronoun “meiner”), and (c) possessive first-person singular pronouns (English: “my” and “mine”; German: “mein,” “meine,” “meinem,” “meinen,” “meiner,” “meines,” and “meins”). The sum of the number of words that are subjective, objective, and possessive first-person singular pronouns out of the total number of words make up total first-person singular pronoun use.

## Communication Contexts

Table 1 summarizes the categorization of the language tasks into the four communication contexts (i.e., personal, momentary thought, identity, and impersonal). Two of the authors (Allison M. Tackman and Matthias R. Mehl) categorized each task and discussed their solutions until agreement was reached.

**Impersonal.** Language tasks that were categorized as impersonal ( $N = 2,129$ ) were those in which participants wrote about a topic that was not related to themselves. The only task that was categorized as impersonal was the Thematic Apperception Test essay (i.e., Task 2 from Sample 8 and Task 2 from Sample 10).

**Personal.** Language tasks that were categorized as personal ( $N = 4,739$ ), on the other hand, were those in which participants wrote or talked about a topic that was related to themselves. All remaining language tasks were categorized as personal.

**Identity.** Language tasks that were categorized as identity-relevant ( $N = 2,070$ ) were those in which participants wrote or talked about aspects of their identity, such as who they are as a person (e.g., Task 3 from Sample 10), their specific attributes (e.g., Task 2 and 3 from Sample 11), and their life story (e.g., Sample 7).

**Momentary thought.** Finally, language tasks that were categorized as producing momentary thoughts ( $N = 3,117$ ) were those in which participants wrote about what they were thinking in the moment without any prompts for what to write about. The only task that was categorized as momentary thought was the stream-of-consciousness task (i.e., Sample 9 and Task 1 from Samples 8 and 10).

All language tasks categorized as identity or momentary thought were also categorized as personal, but not all personal tasks were categorized as identity or momentary thought (i.e., Samples 2–5, Task 2 from Sample 6, and Tasks 4–6 from Sample 11).

## Combining Data and Analysis Plan

The data were analyzed at the level of the participant (rather than at the level of the sample), so all measures were standardized within sample to account for differences among the 11 samples in terms of measurement (e.g., 4 depression and 5 negative emotionality questionnaires were used across the 11 samples) and administrative differences (e.g., where and when the 11 samples were collected varied). Left uncontrolled, these differences might bias correlations. More specifically, scores for depression, negative emotionality, and first-person singular pronouns (i.e., total, subjective, objective, and possessive) were  $z$  scored within sample. When samples had more than one language task however, first-person singular pronoun scores were  $z$  scored at the language task level within sample to account for differences among the tasks (e.g., content and instructions).<sup>3</sup> In other words, for participants who completed one language task (i.e., participants from Samples 1, 2, 3, 4, 5, 6, and 9), they had four first-person singular pronoun  $z$ -scores (i.e., FPSsubj\_z, FPSobj\_z, FPSposs\_z, and FPStotal\_z), and for participants who completed more than one language task (i.e., participants from Samples 7, 8, 10, and 11), they had four first-person singular pronoun  $z$  scores per each language task completed.

To analyze the research questions, we had to create four context data sets and an overall (or all context) dataset. These five data sets (which can be used to reproduce all inferential statistics reported in this paper) are posted on the Open Science Framework at <https://osf.io/zsx8n/>. To create the four context data sets, we averaged  $z$  scores across language tasks when participants from a sample completed more than one task that shared the same communication context (e.g., from Sample 10, the stream-of-consciousness (soc) task and the who am I (wai) task are both personal in nature, so FPSsubj\_z in the personal context dataset for Sample 10 is the average of FPSsubj\_z\_soc and FPSsubj\_z\_wai, and the same logic applies for FPSobj\_z, FPSposs\_z, and FPStotal\_z). To create the overall dataset, we averaged  $z$  scores across all language tasks when participants from a sample completed more than one task, regardless of whether the tasks shared the same communication context (e.g., participants in Sample 10 completed three language tasks, so FPSsubj\_z in the overall dataset for Sample 10 is the average of FPSsubj\_z\_soc, FPSsubj\_z\_wai, and FPSsubj\_z\_tat, and the same logic applies for the other three first-person singular pronoun  $z$  scores).

The detailed analysis plan was preregistered on the OSF at <https://osf.io/rz387/>. We computed Pearson correlations for RQ1 and parts a, b, and c. We did the same for RQ2 and its three parts. Following recommendations to decrease reliance on binary thinking of null-hypothesis significance testing (Cumming, 2014), we report two statistics for each analysis: a standardized effect size ( $r$ ) and a bootstrapped 95% confidence interval (CI) of  $r$ . Because of the large sample sizes for each analysis, we used  $r \geq |.10|$  as a guideline for what might be considered a nontrivial effect size (Meehl, 1997). In other words, we interpret correlations between depression (or negative emotionality) and first-person singular pronoun use as meaningful if they are at least small in magnitude (Gignac & Szodorai, 2016; where  $r = .10$  is considered small,  $r = .20$  is considered moderate or typical, and  $r = .30$  is considered large).

To answer RQ3, we computed partial correlations. The number of partial correlations we ran was dependent on the results from the two previous research questions. Again, we report two statistics for each analysis: a standardized effect size ( $r_{xy.z}$ ) and a bootstrapped 95% confidence interval (CI) of  $r_{xy.z}$ .

## Results

### Descriptives

The means and standard deviations for depression, negative emotionality, and first-person singular pronoun use are shown in Table 2. Consistent with previous research on gender differences in depression (Nolen-Hoeksema, 1987) and negative emotionality (Schmitt, Realo, Voracek, & Allik, 2008), women reported more depressive symptoms and higher levels of negative emotionality than men.

Regarding the descriptive statistics for first-person singular pronoun use, several observations are worth noting. First, consistent with past research showing that “I” is used more often than either “me” or “my” (Chung & Pennebaker, 2007), subjective first-person singular pronouns were used substantially more often than either objective or possessive first-person singular pronouns. More specifically, collapsed across communication context and gender, participants used subjective first-person singular pronouns more than four times as much as objective first-person singular pronouns and more than three times as much as possessive first-person singular pronouns. Second, and as expected, participants used substantially more first-person singular pronouns in the personal, momentary thought, and identity contexts than in the impersonal context, regardless of pronoun type and gender. Also as expected, the identity context produced the greatest frequency of first-person singular pronouns, again regardless of pronoun type and gender. Third and finally, consistent with past research on gender differences in first-person singular pronoun use (Newman, Groom, Handelman, & Pennebaker, 2008), women used more first-person singular pronouns than men, regardless of pronoun type and communication context.

### Depression and First-Person Singular Pronouns

Table 3 gives the zero-order correlations between depression and first-person singular pronoun use, by pronoun type, communication context, and gender.

**RQ1: To what extent is depression related to I-talk?** We hypothesized that depression would be positively, although modestly, related to total first-person singular pronoun use. This hypothesis was supported,  $r = .10$ , 95% CI [.07, .13]. According to effect size guidelines for correlation coefficients (Gignac & Szodorai, 2016), this effect is considered small in magnitude.

**RQ1a: To what extent does the relationship between depression and I-talk vary by first-person singular pronoun type?** As shown in the all contexts portion of Figure 1, depression was positively related to subjective ( $r = .10$ , 95% CI [.07, .13]) and

<sup>3</sup> The analysis plan was modeled after the one used in our previous paper on I-talk and narcissism which had the same multisample and multi-language-task data structure (i.e., Carey et al., 2015).

**Table 2**  
*Overall Means (With Standard Deviations in Parentheses) for the Study Measures*

Context	Depression <sup>a</sup>					Negative emotionality <sup>b</sup>					First-person singular pronouns <sup>c</sup>							
	All		F		M		All		F		M		Subjective (I)		Objective (me/myself)		Possessive (my/mine)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	All	F	M	All	F	M
Personal	30.11 (18.12)	30.83 (18.45)	28.61 (17.50)	46.50 (21.76)	49.87 (21.24)	40.34 (21.45)	8.75 (3.09)	9.07 (2.97)	8.21 (3.26)	5.73 (2.10)	5.93 (2.01)	5.40 (2.23)	1.20 (.94)	1.27 (.95)	1.09 (.94)	1.81 (1.16)	1.87 (1.17)	1.72 (1.16)
Moment. Th.	10.82 (2.46)	11.23 (2.29)	10.12 (2.59)	10.12 (2.59)	7.72 (1.96)	7.99 (1.88)	7.23 (2.03)	1.41 (.94)	1.49 (.94)	1.27 (.93)	1.41 (.94)	1.41 (.94)	1.41 (.94)	1.49 (.94)	1.27 (.93)	2.20 (1.16)	2.26 (1.17)	2.08 (1.16)
Identity	12.65 (2.74)	13.04 (2.58)	11.90 (2.91)	7.83 (2.24)	8.06 (2.12)	7.36 (2.41)	2.01 (.98)	2.09 (.95)	1.85 (1.03)	2.81 (1.48)	2.89 (1.56)	2.68 (1.35)	.70 (1.84)	.76 (1.98)	.60 (1.60)	.49 (1.23)	.52 (1.29)	.43 (1.12)
Impersonal																		

*Note.* To aid in interpretation, the depression and negative emotionality measures were rescaled with a linear transformation to percent of maximum possible (POMP) scores, giving them a theoretical range of 0–100 (P. Cohen, Cohen, Aiken, & West, 1999). Means and standard deviations for the depression and negative emotionality measures for each of the 11 samples are given in Supplement 2 (see Table S2.9). Numbers for first-person singular pronouns reflect percentage of total words. For example, in the personal context, 7.09% of all words spoken or written are subjective first-person singular pronouns (i.e., I, I'm, I've, I'll, I'd). Means and standard deviations for the first-person singular pronouns for each of the 11 samples (and for each language task for samples that have multiple language tasks) are given in Supplement 2 (see Table S2.2). All = All participants; F = Female participants; M = Male participants; Moment. Th. = Momentary Thought.  
<sup>a</sup> Sample size for depression:  $N_{All} = 4,319$ ,  $N_F = 2,745$ , and  $N_M = 1,496$ . <sup>b</sup> Sample size for negative emotionality:  $N_{All} = 4,632$ ,  $N_F = 2,917$ , and  $N_M = 1,634$ . <sup>c</sup> Sample size for first-person singular pronouns in (1) all contexts:  $N_{All} = 4,754$ ,  $N_F = 2,979$ , and  $N_M = 1,687$ ; (2) personal context:  $N_{All} = 4,739$ ,  $N_F = 2,974$ , and  $N_M = 1,678$ ; (3) momentary thought context:  $N_{All} = 3,117$ ,  $N_F = 1,914$ , and  $N_M = 1,118$ ; (4) identity context:  $N_{All} = 2,070$ ,  $N_F = 1,318$ , and  $N_M = 672$ ; and (5) impersonal context:  $N_{All} = 2,129$ ,  $N_F = 1,316$ , and  $N_M = 730$ .

**Table 3**  
*Zero-Order Correlations for Depression and First-Person Singular Pronoun Use, by Pronoun Type, Context, and Gender*

Context	Depression					Negative emotionality					First-person singular pronouns							
	All		F		M		All		F		M		Subjective (I)		Objective (me/myself)		Possessive (my/mine)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	All	F	M	All	F	M
All <sup>a</sup>	<b>.10 [.07, .13]</b>	.07 [.03, .11]	<b>.13 [.08, .18]</b>	<b>.10 [.07, .13]</b>	<b>.10 [.07, .13]</b>	.08 [.04, .12]	<b>.12 [.07, .17]</b>	.08 [.04, .11]	.06 [.02, .11]	.07 [.02, .13]	.07 [.02, .13]	.07 [.02, .13]	.01 [-.02, .04]	.01 [-.02, .04]	.01 [-.02, .04]	-.02 [-.06, .02]	-.02 [-.06, .02]	.06 [0.00, .11]
Personal <sup>b</sup>	<b>.10 [.07, .13]</b>	.07 [.03, .11]	<b>.12 [.07, .17]</b>	<b>.10 [.07, .13]</b>	<b>.10 [.07, .13]</b>	.08 [.04, .12]	<b>.11 [.06, .16]</b>	.08 [.04, .11]	.07 [.03, .11]	.07 [.03, .11]	.07 [.03, .11]	.07 [.03, .11]	.00 [-.03, .03]	.00 [-.03, .03]	.00 [-.03, .03]	-.03 [-.07, .01]	-.03 [-.07, .01]	.06 [0.01, .11]
Moment. Th. <sup>c</sup>	<b>.10 [.06, .14]</b>	.09 [.04, .14]	<b>.10 [.03, .16]</b>	<b>.10 [.05, .13]</b>	<b>.10 [.05, .13]</b>	.09 [.05, .13]	<b>.10 [.03, .16]</b>	.09 [.05, .13]	.09 [.04, .14]	.09 [.04, .14]	.09 [.04, .14]	.09 [.04, .14]	.01 [-.03, .05]	.01 [-.03, .05]	.01 [-.03, .05]	-.04 [-.09, .01]	-.04 [-.09, .01]	.08 [0.02, .15]
Identity <sup>d</sup>	.08 [.03, .12]	.04 [-.01, .09]	<b>.11 [.02, .19]</b>	<b>.10 [.06, .14]</b>	<b>.10 [.06, .14]</b>	.07 [.02, .13]	<b>.11 [.03, .19]</b>	.03 [-.01, .08]	.02 [-.04, .07]	.02 [-.04, .07]	.02 [-.04, .07]	.02 [-.04, .07]	-.04 [-.08, .01]	-.04 [-.08, .01]	-.04 [-.08, .01]	-.06 [-.11, .00]	-.06 [-.11, .00]	.02 [-.07, .10]
Impersonal <sup>e</sup>	.04 [-.01, .09]	.05 [-.01, .11]	.03 [-.05, .11]	.04 [-.01, .09]	.04 [-.02, .10]	.04 [-.02, .10]	.02 [-.06, .11]	.04 [-.01, .08]	.03 [-.03, .10]	.03 [-.03, .10]	.04 [-.05, .14]	.04 [-.05, .14]	.04 [-.01, .08]	.04 [-.01, .08]	.04 [-.01, .08]	.05 [-.01, .10]	.05 [-.01, .10]	.01 [-.06, .08]

*Note.* Pearson's  $r$  and 95% confidence interval of Pearson's  $r$  is shown. Correlations in bold are  $|.10|$  or greater. Zero-order correlations between depression and first-person singular pronoun use in the 11 samples are given in Supplement 2 (see Table S2.3). Moment. Th. = Momentary Thought; All = All participants; F = Female participants; M = Male participants.  
<sup>a</sup> Sample size for analyses in all contexts:  $N_{All} = 4,319$ ,  $N_F = 2,745$ , and  $N_M = 1,496$ . <sup>b</sup> Sample size for analyses in personal context:  $N_{All} = 4,307$ ,  $N_F = 2,741$ , and  $N_M = 1,488$ . <sup>c</sup> Sample size for analyses in momentary thought context:  $N_{All} = 2,693$ ,  $N_F = 1,684$ , and  $N_M = 932$ . <sup>d</sup> Sample size for analyses in identity context:  $N_{All} = 1,995$ ,  $N_F = 1,286$ , and  $N_M = 634$ . <sup>e</sup> Sample size for analyses in impersonal context:  $N_{All} = 1,840$ ,  $N_F = 1,158$ , and  $N_M = 606$ .

objective ( $r = .08$ , 95% CI [.04, .11]) first-person singular pronoun use, but was unrelated to possessive first-person singular pronoun use ( $r = .01$ , 95% CI [-.02, .04]).

**RQ1b: To what extent does the relationship between depression and I-talk vary by communication context?** We hypothesized that the association between depression and first-person singular pronoun use would be smaller in the impersonal context than in the personal, momentary thought, and identity contexts; but we made no hypotheses for how the magnitude of the relationship would differ among the three latter contexts. The results were consistent with the hypothesis: As shown in Figure 1, depression was positively associated with total first-person singular pronoun use in the personal ( $r = .10$ , 95% CI [.07, .13]), momentary thought ( $r = .10$ , 95% CI [.06, .14]), and identity ( $r = .08$ , 95% CI [.03, .12]) contexts; in the impersonal context, the estimated correlation was positive but the 95% confidence interval was consistent with effects in either direction ( $r = .04$ , 95% CI [-.01, .09]).

Next, we investigated whether the pattern of results found for RQ1a (i.e., depression was positively related to subjective and objective first-person singular pronoun use but unrelated to possessive first-person singular pronoun use, also see Figure 1) was observed in the personal, momentary thought, and identity contexts. As shown in Figure 1, this pattern of results was observed in the personal and momentary thought contexts: The correlations for subjective and objective first-person singular

pronoun use were positive and the 95% confidence intervals were consistent with effects in only one direction (for subjective:  $r = .10$ , 95% CI [.07, .13] in the personal context and  $r = .09$ , 95% CI [.05, .13] in the momentary thought context; for objective:  $r = .08$ , 95% CI [.05, .11] in the personal context and  $r = .09$ , 95% CI [.05, .13] in the momentary thought context), and the correlations for possessive first-person singular pronoun use were not reliably different from zero, with the point estimates being zero or very close to zero ( $r = .00$ , 95% CI [-.03, .03] in the personal context and  $r = .01$ , 95% CI [-.03, .05] in the momentary thought context). In the identity context, a nonzero positive correlation was only apparent for subjective first-person singular pronoun use ( $r = .10$ , 95% CI [.06, .14]); the 95% confidence intervals for the correlations with objective and possessive first-person singular pronoun use were consistent with effects in either direction (for objective:  $r = .03$ , 95% CI [-.01, .08]; for possessive:  $r = -.04$ , 95% CI [-.08, .01]).

Consistent with the finding for total first-person singular pronoun use in the impersonal context, the point estimates of the correlations for the three pronoun types in the impersonal context were all positive, but the 95% confidence intervals were consistent with effects in either direction (see Figure 1; for subjective:  $r = .04$ , 95% CI [-.01, .09]; for objective:  $r = .04$ , 95% CI [-.01, .08]; for possessive:  $r = .04$ , 95% CI [-.01, .08]).

**RQ1c: To what extent does the relationship between depression and I-talk vary by gender?** Collapsed across pronoun type and context, the positive correlation between depression and total first-person singular pronoun use was slightly smaller for women ( $r = .07$ , 95% CI [.03, .11]) than men ( $r = .13$ , 95% CI [.08, .18]). To examine whether this difference was statistically meaningful, we calculated the 95% confidence interval for a difference between two independent simple correlations using Equation 15 from Zou (2007).<sup>4</sup> The result was  $r = -.06$ , 95% CI [-.12, .00]. The 95% confidence interval of the difference was consistent with effects ranging from a small negative difference in favor of a smaller positive effect for women than men to no difference. For completeness, we examined all possible gender differences (see Table 3 for the zero-order correlations separately for women and men and Table S2.5 of Supplement 2 for tests of the differences). Of 20 possible gender differences, only 3 differences had confidence intervals that excluded zero. We therefore concluded there was little evidence that the association between depression and first-person singular pronoun use varied by gender.

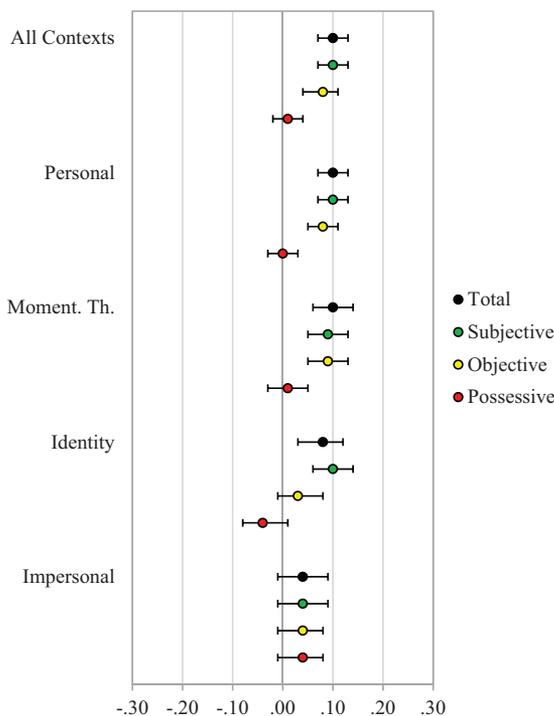


Figure 1. Zero-order correlations for depression and first-person singular pronoun use, by pronoun type and context. The point estimate and the 95% confidence interval of the point estimate for the correlations is plotted. Subjective fps pronouns include I and all contractions with I, objective fps pronouns include me and myself, and possessive fps pronouns include my and mine. Moment. Th. = Momentary Thought.

4

$$L = r_1 - r_2 - \sqrt{(r_1 - l_1)^2 + (u_2 - r_2)^2}$$

$$U = r_1 - r_2 + \sqrt{(u_1 - r_1)^2 + (r_2 - l_2)^2}$$

where 1 = female, 2 = male,  $r$  = zero-order correlation for females or males,  $l$  &  $u$  = lower and upper limits of the 95% confidence interval for female or male's correlations, and  $L$  &  $U$  = lower and upper limits of the 95% confidence interval of the difference between female and male's correlations.

**Negative Emotionality and First-Person Singular Pronouns**

Table 4 displays the zero-order correlations between negative emotionality and first-person singular pronoun use, by pronoun type, communication context, and gender.

**RQ2: To what extent is negative emotionality related to I-talk?** We hypothesized that negative emotionality would be positively related to first-person singular pronoun use. This hypothesis was supported,  $r = .13$ , 95% CI [.11, .16]. Like the depression–I-talk effect found for RQ1, this effect is considered small in magnitude.

**RQ2a: To what extent does the relationship between negative emotionality and I-talk vary by first-person singular pronoun type?** As shown in the all contexts portion of Figure 2, negative emotionality was positively associated with all three types of first-person singular pronouns (for subjective:  $r = .12$ , 95% CI [.09, .15]; for objective:  $r = .09$ , 95% CI [.06, .12]; and for possessive:  $r = .05$ , 95% CI [.02, .08]).

**RQ2b: To what extent does the relationship between negative emotionality and I-talk vary by communication context?** As shown in Figure 2, negative emotionality was positively associated with total first-person singular pronoun use in all four contexts (for personal:  $r = .14$ , 95% CI [.11, .17]; for momentary thought:  $r = .14$ , 95% CI [.10, .17]; for identity:  $r = .12$ , 95% CI [.08, .16]; and for impersonal:  $r = .05$ , 95% CI [.01, .09]).

Do these results differ by pronoun type? In the personal context, the correlations were positive (and the 95% confidence intervals consistent with effects in a single direction) for all three pronoun types:  $r = .12$ , 95% CI [.09, .15] for subjective,  $r = .09$ , 95% CI [.07, .12] for objective, and  $r = .04$ , 95% CI [.01, .07] for possessive first-person singular pronoun use. In the momentary thought and identity contexts, the correlations were positive for all three pronoun types, but the confidence intervals were consistent with effects in a single direction only for subjective and objective first-person singular pronoun use (for subjective:  $r = .12$ , 95% CI [.09, .16] in momentary thought context and  $r = .11$ , 95% CI [.07, .15] in identity context; and for objective:  $r = .11$ , 95% CI [.07, .14] in momentary thought context and  $r = .05$ , 95% CI [.01, .09] in identity context). The results for possessive first-person singular pronoun use in these contexts were consistent with effects ranging from a tiny negative or zero correlation to a small positive correlation ( $r = .04$ , 95% CI [.00, .08] in the momentary thought context and  $r = .02$ , 95% CI [−.02, .07] in the identity context). Finally, in the impersonal context, there was a very small positive correlation for all three pronoun types, but only for possessive first-person singular pronoun use did the confidence interval exclude zero ( $r = .04$ , 95% CI [.00, .09] for subjective,  $r = .04$ , 95% CI [.00, .09] for objective, and  $r = .06$ , 95% CI [.02, .10] for possessive first-person singular pronoun use).

**RQ2c: To what extent does the relationship between negative emotionality and I-talk vary by gender?** Collapsed across pronoun type and context, there was a positive association between negative emotionality and first-person singular pronoun use for women ( $r = .10$ , 95% CI [.06, .13]) and for men ( $r = .11$ , 95% CI [.07, .16]). The gender difference was not reliably different from zero,  $r = -.01$ , 95% CI [−.07, .05], see Table S2.5 in Supplement

**Table 4**  
*Zero-Order Correlations for Negative Emotionality and First-Person Singular Pronoun Use, by Pronoun Type, Context, and Gender*

Context	First-person singular pronouns											
	Subjective (I)				Objective (me/myself)				Possessive (my/mine)			
	All	M	F	All	M	F	All	M	F	All	M	F
All <sup>a</sup>	<b>.13</b> [.11, .16]	<b>.11</b> [.07, .16]	<b>.12</b> [.09, .15]	<b>.12</b> [.09, .15]	<b>.12</b> [.07, .16]	.09 [.06, .12]	.09 [.06, .12]	.09 [.06, .12]	.03 [−.02, .08]	.05 [.02, .08]	.04 [−.01, .09]	.02 [−.01, .06]
Personal <sup>b</sup>	<b>.14</b> [.11, .17]	<b>.13</b> [.08, .17]	<b>.12</b> [.09, .15]	<b>.12</b> [.09, .15]	<b>.14</b> [.09, .18]	.09 [.07, .12]	.09 [.07, .12]	.08 [.05, .12]	.04 [−.01, .09]	.04 [.01, .07]	.04 [−.01, .08]	.01 [−.03, .05]
Moment. Th. <sup>c</sup>	<b>.14</b> [.10, .17]	<b>.12</b> [.06, .18]	<b>.12</b> [.09, .16]	<b>.12</b> [.09, .16]	<b>.11</b> [.06, .17]	<b>.11</b> [.07, .14]	.09 [.05, .14]	.09 [.05, .14]	.07 [.02, .13]	.04 [.00, .08]	.05 [−.01, .11]	−.01 [−.05, .04]
Identity <sup>d</sup>	<b>.12</b> [.08, .16]	<b>.17</b> [.10, .24]	<b>.11</b> [.07, .15]	<b>.11</b> [.07, .15]	<b>.17</b> [.11, .24]	.05 [.01, .09]	.03 [−.02, .08]	.03 [−.02, .08]	.01 [−.07, .08]	.02 [−.02, .07]	.04 [−.04, .11]	−.01 [−.07, .04]
Impersonal <sup>e</sup>	.05 [.01, .09]	−.01 [−.08, .07]	.04 [.00, .09]	.04 [.00, .09]	−.01 [−.08, .06]	.04 [.00, .09]	.08 [.02, .13]	.08 [.02, .13]	−.01 [−.08, .07]	.06 [.02, .10]	.01 [−.07, .09]	.08 [.03, .12]

Note. Pearson's  $r$  and 95% confidence interval of Pearson's  $r$  is shown. Correlations in bold are  $|.10|$  or greater. Zero-order correlations between negative emotionality and first-person singular pronoun use in the 11 samples are given in Supplement 2 (see Table S2.4). Moment. Th. = Momentary Thought; All = All participants; F = Female participants; M = Male participants.  
<sup>a</sup> Sample size for analyses in all contexts:  $N_{All} = 4,632$ ,  $N_F = 2,917$ , and  $N_M = 1,634$ .  
<sup>b</sup> Sample size for analyses in personal context:  $N_{All} = 4,617$ ,  $N_F = 2,912$ , and  $N_M = 1,625$ .  
<sup>c</sup> Sample size for analyses in momentary thought context:  $N_{All} = 3,050$ ,  $N_F = 1,883$ , and  $N_M = 1,089$ .  
<sup>d</sup> Sample size for analyses in identity context:  $N_{All} = 2,038$ ,  $N_F = 1,307$ , and  $N_M = 657$ .  
<sup>e</sup> Sample size for analyses in impersonal context:  $N_{All} = 2,090$ ,  $N_F = 1,302$ , and  $N_M = 712$ .

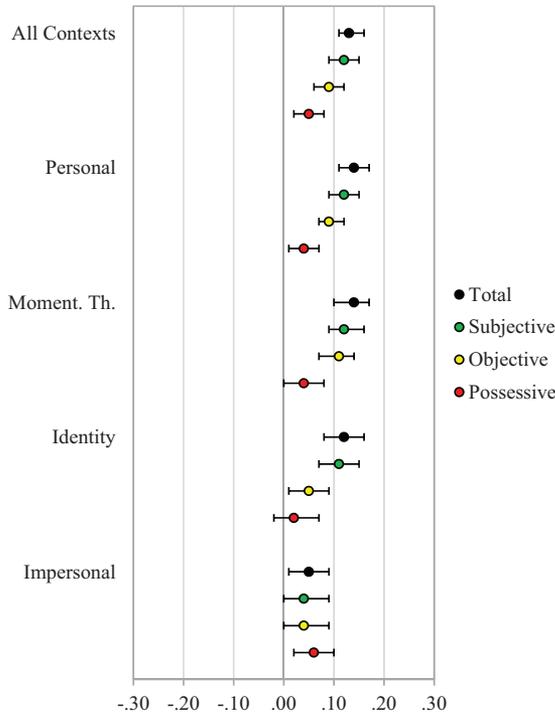


Figure 2. Zero-order correlations for negative emotionality and first-person singular pronoun use, by pronoun type and context. The point estimate and the 95% confidence interval of the point estimate for the correlations is plotted. Subjective fps pronouns include I and all contractions with I, objective fps pronouns include me and myself, and possessive fps pronouns include my and mine. Moment. Th. = Momentary Thought.

2. Of 20 possible gender differences, only 3 differences had confidence intervals that excluded zero.<sup>5</sup> Like the conclusion for depression, we did not find compelling evidence for gender differences in the relationship between negative emotionality and first-person singular pronoun use.

### Depression, Negative Emotionality, and First-Person Singular Pronouns

Aside from the observation that the magnitude of the correlations was slightly larger for negative emotionality than for depression, examination of Figures 1 and 2 shows that the pattern of results was similar for the two constructs. Based on the results from the two previous research questions showing that the effects varied as a function of first-person singular pronoun type and communication context, we examined the degree to which the depression–I-talk effect was unique to depression by computing a partial correlation for depression and subjective first-person singular pronoun use in the personal context for all participants, controlling for negative emotionality. We focused on subjective first-person singular pronouns because this pronoun type produced the most robust effects, and we focused on the personal context because the impersonal context produced mostly equivocal results and the language tasks that characterize momentary thought and identity contexts are personal in nature.

**RQ3: To what extent is the association between depression and I-talk unique to depression or reflective of a broader association between negative emotionality and I-talk?** What happens to the correlation between depression and subjective first-person singular pronoun use in the personal context when controlling for negative emotionality? As shown in Figure 3, although the positive association remained, it was reduced by 60% ( $r_{\text{DepSubj.Ne}} = .04$ , 95% CI [.01, .08]). As a comparison, we examined how the correlation for negative emotionality was affected when controlling for depression. As shown in Figure 3, when controlling for depression, the positive association between negative emotionality and subjective first-person singular pronoun use in the personal context remained and was only reduced by 25% ( $r_{\text{NeSubj.Dep}} = .09$ , 95% CI [.06, .12]).<sup>6</sup>

In supplementary analyses, we examined how the correlation patterns differed by gender.<sup>7</sup> For women, the depression effect controlling for negative emotionality was reduced less than the negative emotionality effect controlling for depression, 25% versus 43% (for depression: zero-order  $r = .08$ , 95% CI [.04, .12] and partial  $r = .06$ , 95% CI [.02, .10]; for negative emotionality: zero-order  $r = .07$ , 95% CI [.03, .11] and partial  $r = .04$ , 95% CI [.00, .07]). For men, an opposite pattern emerged. The depression effect controlling for negative emotionality was reduced more than the negative emotionality effect controlling for depression, 64% versus 29% (for depression: zero-order  $r = .11$ , 95% CI [.06, .16] and partial  $r = .04$ , 95% CI [–.02, .09]; for negative emotionality: zero-order  $r = .14$ , 95% CI [.09, .18] and partial  $r = .10$ , 95% CI [.05, .15]).

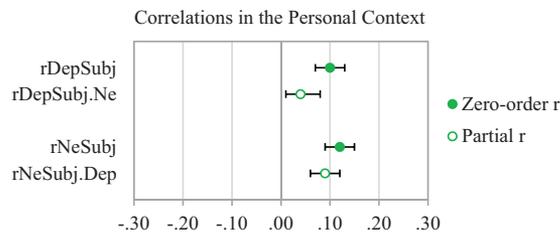
### Discussion

The purpose of this project was (a) to obtain a precise estimate of the depression–I-talk effect in a single large-scale investigation that pooled participant-level data from 11 samples and (b) to “zoom in” on this effect by examining when and for whom it is most apparent as well as the extent to which it is specific to depression or reflective of negative emotionality more broadly. Overall, there was a small positive correlation between depression and I-talk, and this effect was present for all first-person singular pronouns except the possessive type, in all communication contexts except the impersonal one, and for both women and men with little evidence of gender differences. Aside from the correlations being slightly larger for negative emotionality than for depression, the pattern of results was similar for the two constructs. Finally, and important from a theoretical perspective, our multivariate analyses revealed that the depression–I-talk effect largely reflects

<sup>5</sup> The three reliable gender differences found for negative emotionality were not the same as those found for depression (see Table S2.5 in Supplement 2).

<sup>6</sup> For completeness, we computed the partial correlations for the other combinations of contexts and pronoun types that produced reliable depression–I-talk effects (i.e., objective in the personal context, subjective in the momentary thought context, objective in the momentary thought context, and subjective in the identity context). The pattern of results was consistent with the results for subjective first-person singular pronoun use in the personal context; the correlation for depression when controlling for negative emotionality was reduced substantially more than the correlation for negative emotionality when controlling for depression.

<sup>7</sup>  $N$  for partial correlation analyses was 2,679 for females and 1,435 for males.



**Figure 3.** The partial correlation for depression and subjective first-person singular pronouns, controlling for negative emotionality ( $r_{\text{DepSubj.Ne}}$ ), and the partial correlation for negative emotionality and subjective first-person singular pronouns, controlling for depression ( $r_{\text{NeSubj.Dep}}$ ) are shown.  $N = 4,185$  for partial correlation analyses. Zero-order correlations ( $r_{\text{DepSubj}}$  and  $r_{\text{NeSubj}}$ ) are shown for comparison. All correlations are restricted to the personal context. The point estimate and the 95% confidence interval of the point estimate for the correlations are plotted. Dep = Depression; Ne = Negative emotionality; Subj = Subjective first-person singular pronouns (which include I and all contractions with I).

a broader underlying association between negative emotionality and I-talk, and therefore suggest that I-talk may, in fact, be better construed as a linguistic marker of general distress proneness or negative emotionality rather than depressive symptoms per se.

### Overall Effects and Size of Effects

At the broadest level, our study replicated the small positive correlation between depression and total first-person singular pronoun use reported in the recent meta-analysis (Edwards & Holtzman, 2017). This is important considering that our study used (a) mostly nonoverlapping data, (b) an alternative approach to data synthesis, and (c) all unpublished data. Also replicating past research (Pennebaker & King, 1999), we found a modest yet highly reliable positive correlation between negative emotionality and I-talk in the largest offline dataset to date. Although the effects are small by statistical guidelines (Gignac & Szodorai, 2016), the depression effect ( $r = .10$ ) was 10 times and the negative emotionality effect ( $r = .13$ ) was 13 times larger than the effect for narcissism ( $r = .01$ ; Carey et al., 2015), a construct with a strong intuitive link to I-talk. Further, the effects are comparable in magnitude with some of the most robust relationships observed between personality and behavior, including extraversion and positive emotion word use (e.g., Kern et al., 2014; Pennebaker & King, 1999; Yarkoni, 2010) and conscientiousness and health-related behaviors (Bogg & Roberts, 2004). Another way to evaluate the size of the I-talk correlations with depression/negative emotionality is to compare the obtained effect sizes with the effect sizes for another, face-valid, linguistic indicator of depression/negative emotionality within the same dataset. Using data from the 11 samples in the current study, the overall relationship between negative emotion word use and depression/negative emotionality was  $r = .18$  for depression and  $r = .16$  for negative emotionality, which is only modestly larger than the obtained I-talk effects (Tables S2.6–S2.7 in Supplement 2 gives the effects by context and gender for interested readers). Given the close conceptual alignment between depression/negative emotionality and negative emotion words then, these effect sizes might approximate an upper limit for linguistic markers.

Although comparing the size of the I-talk effects to the size of other, theoretically predicted effects shows that the I-talk effects are statistically meaningful, this does not necessarily imply that they are also practically meaningful. Despite the modest effect size, we believe that I-talk could be a better marker of depression/negative emotionality than other language variables such as negative and positive emotion words for at least two reasons. First, unlike content words like negative and positive emotion words (e.g., happy, nice, sad, hurt) that are easier to monitor and therefore self-censor, function words like first-person singular pronouns are produced more automatically and therefore more difficult to control (Ireland & Mehl, 2014; Mehl, Raison, Pace, Arevalo, & Cole, 2017). The finding that the size of the I-talk effects did not differ substantially across personal contexts that varied in controllability is consistent with the idea that I-talk is difficult to censor. Second, even if I-talk can be controlled to some extent, we believe that individuals will be less likely to actively restrict I-talk because it is a less obvious indicator of depression/negative emotionality compared to face-valid negative emotion words. Overall then, because I-talk is a subtle indicator that individuals might not be able to or motivated to control, it could be a more practically useful indicator of depression/negative emotionality than other linguistic indicators like negative emotion words.

### What Are the Boundary Conditions of the I-Talk Effects?

A key finding of our study is that the depression–I-talk effect (and the negative emotionality–I-talk effect) is not equally apparent for all first-person singular pronouns. Among the three types of first-person singular pronouns, we observed the smallest effect sizes for the possessive type. One explanation for this may be that the low base rate in the use of possessive pronouns reduced between-person variability in possessive pronoun use and thereby constrained a potential correlation between depression (and negative emotionality) and possessive first-person singular pronouns. However, the fact that the effects were larger and nontrivial for objective first-person singular pronouns despite their even lower base rate points to a psychological explanation. Subjective and objective first-person singular pronouns both capture a form of self-referential language where the focus is fully on the self, either from an active (self-as-actor) or passive (self-as-target) perspective (James, 1890). Possessive first-person singular pronouns, in contrast, capture a form of self-referential language where the focus is on the *relationship* between the self and something else, a person, object, or event. Depression and negative emotionality, therefore, appear to be more closely linked to self-referential language that focuses on the “self in isolation” rather than on the “self in relation.”

A second key finding of our study is that the depression–I-talk effect (and the negative emotionality–I-talk effect) was not apparent across all communication contexts. Among the four communication contexts examined, the smallest effects were observed in the impersonal context. The most likely explanation for this is that this type of context renders self-referential language non-normative and, as a result, prevents the expression of individual differences in first-person singular pronoun use. For example, compared with the approximately 11% of first-person singular pronouns used in the personal context, less than 1% of all words

written in the impersonal context were first-person singular pronouns. Although the current study was limited in that we only used one impersonal language task (i.e., the Thematic Apperception Test or TAT), we do not think our results would have differed if a variety of impersonal language tasks were used. The TAT was specifically developed to reveal personality whereas other impersonal language tasks (e.g., describing an inanimate object) were not. Base rates for other linguistic markers of depression such as negative emotion word use might be higher in response to describing TAT pictures and may therefore have more power to reveal information about a person's depression (and negative emotionality in general) in impersonal contexts. In sum, depression and negative emotionality appear to be more expressed in communication contexts in which participants express something of personal relevance to them.

### What Is I-Talk a Marker of?

Recent research has shown that spontaneous I-talk is not a useful linguistic marker of narcissism (Carey et al., 2015). On the other hand, after considerable research (Ireland & Mehl, 2014) and a recent meta-analysis (Edwards & Holtzman, 2017) on the topic, the field seems to have settled on I-talk serving as a specific marker of depressive symptomatology. In our study, I-talk did (again) emerge as reliably related to depression. However, the effect was critically reduced when participants' negative emotionality was accounted for. This suggests that the depression–I-talk link may reflect, in fact, a broader underlying association with negative emotionality. Further, because the negative emotionality–I-talk effect was not substantially altered when controlling for depression, it appears that I-talk is, at the heart, a marker of general distress proneness or negative emotionality and not something specific to depressive tendencies. This conclusion is consistent with research showing that other emotional disorders grouped together by a higher order factor of negative affectivity (Watson, 2005), such as the anxiety disorders and others, are positively associated with self-focused attention (Ingram, 1990). Because a person's use of subjective and objective first-person singular pronouns in a personal context informs us about their tendency to experience negative emotions in general and possibly their risk for mental health concerns more generally, I-talk may not be an effective assessment tool for depression in particular, especially considering that there are already well validated clinical instruments for doing so. However, incorporating I-talk into an algorithm with other linguistic markers of depression, such as negative emotion and swear words (Baddeley et al., 2013; De Choudhury, Gamon, Counts, & Horvitz, 2013; Robbins et al., 2011; Schwartz et al., 2014), to initially screen for the presence of depressive symptomatology might prove useful.

Although we did not find much evidence for gender differences in the zero-order correlations between depression and I-talk (and negative emotionality and I-talk), the post hoc partial correlation analyses run separately for women and men is consistent with the idea that I-talk may track different psychological processes in women and men (Fast & Funder, 2010).

To recap, the only reliable unique correlate of women's I-talk was their depression, but for men it was their scores on measures of negative emotionality. These findings may hint at the relationship between I-talk and general distress being driven more by

experiences of low arousal negative distress such as sadness for women and more by high arousal negative distress such as anxiety and emotional volatility for men. Future research can explicitly test this by including facet-level measures of negative emotionality, such as the negative emotionality scale from the Big Five Inventory 2, which measures the three facets of depression, anxiety, and emotional volatility (Soto & John, 2017). The preliminary finding that I-talk appears to be a better unique marker of depression among women but a better unique marker of negative emotionality (and perhaps anxiety and emotional volatility in particular) among men further supports the importance of using I-talk as one indicator among a set of indicators in an algorithm to screen for depression (and even the importance of creating separate algorithms for women and men).

### Limitations and Future Directions

One limitation of our study was that we did not examine a public communication context whereby participants write or talk about a topic with little or no expectation of privacy such as in Facebook status updates, blog posts, or tweets. Because self-presentational concerns are particularly engaged in public contexts, people high on potentially socially undesirable traits like depression or negative emotionality may attempt to mask these tendencies by censoring their language use. Such censoring might reduce between-person variability in I-talk and thereby constrain potential I-talk correlations. On the other hand, because function words such as first-person singular pronouns are produced more automatically and hence more difficult to control (Ireland & Mehl, 2014), the depression (and negative emotionality) effects may be similar in magnitude across public and private contexts. Because all of the language tasks administered in our study were private, we can compare our overall effects with what large-scale social media studies have observed. In general, these studies reveal smaller effects, both for depressive symptomatology (Schwartz et al., 2014; Yarkoni, 2010) and negative emotionality (Kern et al., 2014; Yarkoni, 2010). The potentially smaller effects in public contexts might suggest that self-presentational concerns influence individuals with socially undesirable traits to be more cautious in their speaking or writing.

Another limitation of our study was that we did not distinguish between positive and negative I-talk. Theory and empirical research shows that subjectively reported self-focus on negative self-aspects and following a negative event are associated with more negative affect, but that self-focus on positive self-aspects and following a positive event are unrelated to or associated with less negative affect (Mor & Winquist, 2002; Pyszczynski & Greenberg, 1987). It is not yet clear whether this pattern of findings holds for objectively measured self-focus or I-talk (but see Brockmeyer et al., 2015). We decided against categorizing language tasks as either positive or negative in the current study because tasks that appeared predominantly positive or negative on the surface had the potential to elicit both types of affective states. For example, talking about a positive life memory could create feelings of nostalgia whereas talking about a negative life memory could create a sense of relief or gratitude that life is currently less difficult. Further, it became clear to us after reading some of the participants' responses to "prescriptively" negative language tasks that the valence of a task depended often critically on the partic-

ipants' perspective. For example, a marital separation was a positive experience for participants who wanted the relationship to end, but a negative one for those who did not. Aside from these observations, when we examined how the language tasks differed in LIWC-analyzed positive and negative emotion words, we found only modest mean level differences across the 23 tasks for positive and negative emotion words (with instances where "prescriptively" negative tasks, such as talking about a romantic breakup experience, emerging as, on average, less negative than "prescriptively" positive tasks, such as writing a quality of life essay), providing further support against a priori categorizations of language tasks as either positive or negative.

An alternative (and perhaps psychometrically better) approach to test whether the relationship between I-talk and depression (and negative emotionality) is more pronounced when self-focus occurs in a negative context is to examine the magnitude of the interaction between I-talk and negative emotion word use at the participant level. We examined all possible interactions (see Table S2.8 for depression results and Table S2.9 for negative emotionality results in Supplement 2), and only four of 60 interactions for depression and six of 60 interactions for negative emotionality had confidence intervals that did not include 0 (all interactions, though, were in the predicted direction such that the association was more positive at higher levels of negative emotion word use, see Figure S2.1 in Supplement 2 for an example). Further, when comparing the size of the statistically significant interactions to that of the I-talk effect from the regression analyses, the magnitude of the interaction was generally smaller than the magnitude of the I-talk effect. Taken together, although our study did not allow for a direct and conclusive test, we found little (indirect) evidence that depression or negative emotionality are characterized particularly by negative (rather than general) self-focus.

Other psychological aspects of the communication context, beyond negativity, would also have warranted investigation. For example, a question we touched on, but were unable to stringently test, is the extent to which the controllability of the communication context matters (Mehl et al., 2017). Similarly, an interesting theoretical question is to test whether I-talk might be more indicative of depression/negative emotionality when the communication context is personal than when it is interpersonal. In that regard, Rodriguez, Holleran, and Mehl (2010) introduced a flexible experimental paradigm that allows for direct tests of theoretical context moderators. Participants are randomly assigned to conditions where the task is to write a self-description. The instructions in the different conditions are identical except for one aspect, for example whether the self-descriptions are intended for the participant only or for a broader audience. With relatively straightforward modifications, the instructions could be adjusted to systematically compare, for example, self-descriptions that focus on personal versus interpersonal characteristics or "controlled" self-descriptions that participants carefully craft and edit to "automatic" self-descriptions that participants write out as they occur to them with no chance to "polish." Taking, in this way, the study of linguistic markers to the experimental realm could also ultimately help with developing better theoretical models of which psychological dimensions ultimately "matter" in the domain of trait expression through language use (Ireland & Mehl, 2014; Pennebaker et al., 2003).

A final limitation of our study was our exclusive reliance on self-report measures of depression and negative emotionality. Although the self is more accurate at rating these internal or less observable aspects of personality than are others (Vazire, 2010), self-perceptions of these traits can still be distorted for several reasons. First, because depression and negative emotionality are socially undesirable traits (Hampson, Goldberg, & John, 1987), people with a tendency to respond to self-report questionnaires in socially desirable ways may underreport their levels of these traits. Second, because of the cognitive biases associated with the emotional disorders (Mineka, Rafaeli-Mor, & Yovel, 2003), depressed individuals may have distorted self-perceptions, especially those with more severe or clinical levels of depression. For these reasons and others, it has been suggested that informant-reports from people who know the self well should be used in combination with self-reports when measuring psychopathology (Achenbach, Kruskowski, Dumenci, & Ivanova, 2005; Oltmanns & Turkheimer, 2009), and we agree that informant reports or clinician ratings would be a valuable complement to our data. For example, Fast and Funder (2010) found that the depression–I-talk correlations differed for males depending on whether the reports were self-verses clinician-rated, further supporting the importance of considering multiple perspectives when analyzing personality-behavior correlates.

A major advantage of our study over previous studies on depression and I-talk was that we included a larger and more heterogeneous sample with respect to depressive symptomatology. In addition to including college student samples, which characterizes most past research on depression and I-talk, we also included several samples of participants at risk for clinical depression and one sample of participants diagnosed with clinical depression. Therefore, although our findings do generalize to a greater range of subclinical levels of depression, because most of our samples were nonclinical or comprised participants who were not diagnosed with clinical depression, our findings are less informative about clinical levels of depression. Interestingly however, the meta-analysis did not find evidence that the depression–I-talk correlation reliably differed in nonclinical and clinical samples (Edwards & Holtzman, 2017). Consistent with this, we did not find evidence that the effect varied by depression severity in a post hoc analysis in the current study. However, the question of whether depression is more of a unique marker of I-talk in clinical than nonclinical samples remains an open question that future research should tackle.

## Conclusion

Since the early 1900s, researchers have argued that our language reveals aspects of our personalities (Allport, Walker, & Lathers, 1934; Freud, 1916/1964; Sanford, 1942). Our study replicated past research showing that depressive symptomatology is manifested in greater use of I-talk, and extended past research by demonstrating that the depression–I-talk effect is most pronounced for subjective and objective first person singular pronouns and in communication contexts in which participants write or talk about something of personal relevance to them. Importantly, however, our study revealed that the depression–I-talk effect largely reflects the broader underlying association between negative emotionality and I-talk, and as a result, self-referential language should be viewed as a

marker of general distress or negative emotionality that is common to a number of psychopathologies rather than depression in particular.

## References

- Achenbach, T. M., Krukowski, R. A., Dumenci, L., & Ivanova, M. Y. (2005). Assessment of adult psychopathology: Meta-analyses and implications of cross-informant correlations. *Psychological Bulletin*, *131*, 361–382. <http://dx.doi.org/10.1037/0033-2909.131.3.361>
- Algina, J., & Olejnik, S. (2003). Sample size tables for correlation analysis with applications in partial correlation and multiple regression analysis. *Multivariate Behavioral Research*, *38*, 309–323. [http://dx.doi.org/10.1207/S15327906MBR3803\\_02](http://dx.doi.org/10.1207/S15327906MBR3803_02)
- Allport, F., Walker, L., & Lathers, E. (1934). Written composition and characteristics of personality. *Archives of Psychology (Columbia University)*, *173*, 1–82.
- Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: Evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *American Journal of Preventive Medicine*, *10*, 77–84.
- Baddeley, J. L., Pennebaker, J. W., & Beevers, C. G. (2013). Everyday social behavior during a major depressive episode. *Social Psychological and Personality Science*, *4*, 445–452. <http://dx.doi.org/10.1177/1948550612461654>
- Beck, A. T., Steer, R. A., & Brown, G. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio, TX: The Psychological Corporation.
- Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin*, *130*, 887–919. <http://dx.doi.org/10.1037/0033-2909.130.6.887>
- Borkenau, P., & Ostendorf, F. (1993). *NEO-Fünf-Faktoren Inventar (NEO-FFI)* [NEO Five-Factor Inventory]. Göttingen, Germany: Hogrefe.
- Boyd, R. L., & Pennebaker, J. W. (2016). A way with words: Using language for psychological science in the modern era. In C. V. Dimofte, C. P. Haugtredt, & R. F. Yalch (Eds.), *Consumer psychology in a social media world* (pp. 222–236). New York, NY: Routledge.
- Brockmeyer, T., Zimmermann, J., Kulesa, D., Hautzinger, M., Bents, H., Friederich, H.-C., . . . Backenstrass, M. (2015). Me, myself, and I: Self-referent word use as an indicator of self-focused attention in relation to depression and anxiety. *Frontiers in Psychology*, *6*, 1564–1573. <http://dx.doi.org/10.3389/fpsyg.2015.01564>
- Bucci, W., & Freedman, N. (1981). The language of depression. *Bulletin of the Menninger Clinic*, *45*, 334–358.
- Campbell, R. S., & Pennebaker, J. W. (2003). The secret life of pronouns: Flexibility in writing style and physical health. *Psychological Science*, *14*, 60–65. <http://dx.doi.org/10.1111/1467-9280.01419>
- Carey, A. L., Brucks, M. S., Küfner, A. C. P., Holtzman, N. S., Große Deters, F., Back, M. D., . . . Mehl, M. R. (2015). Narcissism and the use of personal pronouns revisited. *Journal of Personality and Social Psychology*, *109*, e1–e15. <http://dx.doi.org/10.1037/pspp0000029>
- Carver, C., & Scheier, M. (1981). *Attention and self-regulation: A control theory approach to human behavior*. New York, NY: Springer-Verlag. <http://dx.doi.org/10.1007/978-1-4612-5887-2>
- Chung, C., & Pennebaker, J. (2007). The psychological function of function words. In K. Fiedler (Ed.), *Social communication* (pp. 343–359). New York, NY: Psychology Press.
- Cohen, P., Cohen, J., Aiken, L. S., & West, S. G. (1999). The problem of units and the circumstance for POMP. *Multivariate Behavioral Research*, *34*, 315–346. [http://dx.doi.org/10.1207/S15327906MBR3403\\_2](http://dx.doi.org/10.1207/S15327906MBR3403_2)
- Cole, J. C., Rabin, A. S., Smith, T. L., & Kaufman, A. S. (2004). Development and validation of a Rasch-derived CES-D short form. *Psychological Assessment*, *16*, 360–372. <http://dx.doi.org/10.1037/1040-3590.16.4.360>
- Cooper, H., & Patall, E. A. (2009). The relative benefits of meta-analysis conducted with individual participant data versus aggregated data. *Psychological Methods*, *14*, 165–176. <http://dx.doi.org/10.1037/a0015565>
- Cumming, G. (2014). The new statistics: Why and how. *Psychological Science*, *25*, 7–29. <http://dx.doi.org/10.1177/0956797613504966>
- De Choudhury, M., Gamon, M., Counts, S., & Horvitz, E. (2013). Predicting depression via social media. *Proceedings of the 7th International AAAI Conference on Weblogs and Social Media* (Vol. 13, pp. 1–10). Palo Alto, CA: Association for the Advancement of Artificial Intelligence.
- DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *Journal of Personality and Social Psychology*, *93*, 880–896. <http://dx.doi.org/10.1037/0022-3514.93.5.880>
- Dunnack, E. S., & Park, C. L. (2009). The effect of an expressive writing intervention on pronouns: The surprising case of I. *Journal of Loss and Trauma*, *14*, 436–446. <http://dx.doi.org/10.1080/15325020902925084>
- Duval, S., & Wicklund, R. (1972). *A theory of objective self-awareness*. San Diego, CA: Academic Press.
- Edwards, T., & Holtzman, N. S. (2017). A meta-analysis of correlations between depression and first person singular pronoun use. *Journal of Research in Personality*, *68*, 63–68. <http://dx.doi.org/10.1016/j.jrp.2017.02.005>
- Fast, L. A., & Funder, D. C. (2010). Gender differences in the correlates of self-referent word use: Authority, entitlement, and depressive symptoms. *Journal of Personality*, *78*, 313–338. <http://dx.doi.org/10.1111/j.1467-6494.2009.00617.x>
- Fraley, R. C., & Vazire, S. (2014). The N-pact factor: Evaluating the quality of empirical journals with respect to sample size and statistical power. *PLoS ONE*, *9*, e109019. <http://dx.doi.org/10.1371/journal.pone.0109019>
- Freud, S. (1964). Introductory lectures on psycho-analysis. In J. Strachey (Ed. & Trans.), *The standard edition of the complete psychological works of Sigmund Freud*. New York, NY: Norton. (Original work published 1916)
- Gignac, G. E., & Szodorai, E. T. (2016). Effect size guidelines for individual differences researchers. *Personality and Individual Differences*, *102*, 74–78. <http://dx.doi.org/10.1016/j.paid.2016.06.069>
- Glass, G. V. (2015). Meta-analysis at middle age: A personal history. *Research Synthesis Methods*, *6*, 221–231. <http://dx.doi.org/10.1002/jrsm.1133>
- Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment*, *4*, 26–42. <http://dx.doi.org/10.1037/1040-3590.4.1.26>
- Gosling, S. D., Rentfrow, P. J., & Swann, W. B., Jr. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*, 504–528. [http://dx.doi.org/10.1016/S0092-6566\(03\)00046-1](http://dx.doi.org/10.1016/S0092-6566(03)00046-1)
- Guntuku, S. C., Yaden, D. B., Kern, M. L., Ungar, L. H., & Eichstaedt, J. C. (2017). Detecting depression and mental illness on social media: An integrative review. *Current Opinion in Behavioral Sciences*, *18*, 43–49. <http://dx.doi.org/10.1016/j.cobeha.2017.07.005>
- Hampson, S. E., Goldberg, L. R., & John, O. P. (1987). Category-breadth and social desirability values for 573 personality terms. *European Journal of Personality*, *1*, 241–258. <http://dx.doi.org/10.1002/per.241010405>
- Hautzinger, M., Keller, F., Kühner, C., & Bürger, C. (Eds.). (2003). *Beck Depression Inventory II (BDI II)*. Bern, Switzerland: Huber Verlag.
- Holleran, S. E., & Mehl, M. R. (2008). Let me read your mind: Personality judgments based on a person's natural stream of thought. *Journal of Research in Personality*, *42*, 747–754. <http://dx.doi.org/10.1016/j.jrp.2007.07.011>

- Iliev, R., Dehghani, M., & Sagi, E. (2015). Automated text analysis in psychology: Methods, applications, and future developments. *Language and Cognition*, 7, 265–290. <http://dx.doi.org/10.1017/langcog.2014.30>
- Ingram, R. E. (1990). Self-focused attention in clinical disorders: Review and a conceptual model. *Psychological Bulletin*, 107, 156–176. <http://dx.doi.org/10.1037/0033-2909.107.2.156>
- Ioannidis, J. P. A. (2005). Why most published research findings are false. *PLoS Medicine*, 2, e124. <http://dx.doi.org/10.1371/journal.pmed.0020124>
- Ireland, M. E., & Mehl, M. R. (2014). Natural language use as a marker of personality. In T. Holtgraves (Ed.), *Oxford handbook of language and social psychology*. New York, NY: Oxford University Press.
- James, W. (1890). *The principles of psychology*. New York, NY: Holt & Co. <http://dx.doi.org/10.1037/11059-000>
- Jarrold, W., Javitz, H. S., Krasnow, R., Peintner, B., Yeh, E., Swan, G. E., & Mehl, M. (2011). Depression and self-focused language in structured interviews with older men. *Psychological Reports*, 109, 686–700. <http://dx.doi.org/10.2466/02.09.21.28.PR0.109.5.686-700>
- John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 114–158). New York, NY: Guilford Press.
- Johnson, D. P., & Whisman, M. A. (2013). Gender differences in rumination: A meta-analysis. *Personality and Individual Differences*, 55, 367–374. <http://dx.doi.org/10.1016/j.paid.2013.03.019>
- Kern, M. L., Eichstaedt, J. C., Schwartz, H. A., Dziurzynski, L., Ungar, L. H., Stillwell, D. J., . . . Seligman, M. E. P. (2014). The online social self: An open vocabulary approach to personality. *Assessment*, 21, 158–169. <http://dx.doi.org/10.1177/1073191113514104>
- Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking “big” personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, 136, 768–821. <http://dx.doi.org/10.1037/a0020327>
- Lakens, D., & Evers, E. R. K. (2014). Sailing from the seas of chaos into the corridor of stability: Practical recommendations to increase the informational value of studies. *Perspectives on Psychological Science*, 9, 278–292. <http://dx.doi.org/10.1177/1745691614528520>
- Meehl, P. E. (1997). The problem is epistemology, not statistics: Replace significance tests by confidence intervals and quantify accuracy of risky numerical predictions. In L. L. Harlow, S. A. Mulaik, & J. H. Steiger (Eds.), *What if there were no significance tests?* (pp. 393–425). Mahwah, NJ: Erlbaum.
- Mehl, M. R. (2006). The lay assessment of subclinical depression in daily life. *Psychological Assessment*, 18, 340–345. <http://dx.doi.org/10.1037/1040-3590.18.3.340>
- Mehl, M. R., Gosling, S. D., & Pennebaker, J. W. (2006). Personality in its natural habitat: Manifestations and implicit folk theories of personality in daily life. *Journal of Personality and Social Psychology*, 90, 862–877. <http://dx.doi.org/10.1037/0022-3514.90.5.862>
- Mehl, M. R., Raison, C. L., Pace, T. W. W., Arevalo, J. M. G., & Cole, S. W. (2017). Natural language indicators of differential gene regulation in the human immune system. *Proceedings of the National Academy of Sciences*, 114, 12554–12559. <http://dx.doi.org/10.1073/pnas.1707373114>
- Mehl, M. R., Robbins, M. L., & Holleran, S. E. (2012). How taking a word for a word can be problematic: Context-dependent linguistic markers of extraversion and neuroticism. *Journal of Methods and Measurement in the Social Sciences*, 3, 30–50. <http://dx.doi.org/10.2458/v3i2.16477>
- Meyer, T. D., & Hautzinger, M. (2001). Allgemeine Depressions-Skala (ADS). *Diagnostica*, 47, 208–215. <http://dx.doi.org/10.1026/0012-1924.47.4.208>
- Mineka, S., Rafeali-Mor, E., & Yovel, I. (2003). Cognitive biases in emotional disorders: Informational processing and social-cognitive perspectives. In R. Davidson, K. Sherer, & H. Goldsmith (Eds.), *Handbook of affective science* (pp. 976–1009). New York, NY: Oxford University Press.
- Mor, N., & Winquist, J. (2002). Self-focused attention and negative affect: A meta-analysis. *Psychological Bulletin*, 128, 638–662. <http://dx.doi.org/10.1037/0033-2909.128.4.638>
- Muck, P. M., Hell, B., & Gosling, S. D. (2007). Construct validation of a short five-factor model instrument: A self-peer study on the German adaptation of the Ten-Item Personality Inventory (TIPI-G). *European Journal of Psychological Assessment*, 23, 166–175. <http://dx.doi.org/10.1027/1015-5759.23.3.166>
- Murray, H. A. (1943). *Thematic Apperception Test manual*. Cambridge, MA: Harvard University Press.
- Newman, M. L., Groom, C. J., Handelman, L. D., & Pennebaker, J. W. (2008). Gender differences in language use: An analysis of 14,000 text samples. *Discourse Processes*, 45, 211–236. <http://dx.doi.org/10.1080/01638530802073712>
- Nolen-Hoeksema, S. (1987). Sex differences in unipolar depression: Evidence and theory. *Psychological Bulletin*, 101, 259–282. <http://dx.doi.org/10.1037/0033-2909.101.2.259>
- Oltmanns, T. F., & Turkheimer, E. (2009). Person perception and personality pathology. *Current Directions in Psychological Science*, 18, 32–36. <http://dx.doi.org/10.1111/j.1467-8721.2009.01601.x>
- Pennebaker, J. W. (2011). *The secret life of pronouns: What our words say about us*. New York, NY: Bloomsbury Press.
- Pennebaker, J. W., Boyd, R. L., Jordan, K., & Blackburn, K. (2015). *The development and psychometric properties of LIWC2015*. Austin, TX: University of Texas at Austin.
- Pennebaker, J. W., & King, L. A. (1999). Linguistic styles: Language use as an individual difference. *Journal of Personality and Social Psychology*, 77, 1296–1312. <http://dx.doi.org/10.1037/0022-3514.77.6.1296>
- Pennebaker, J. W., Mehl, M. R., & Niederhoffer, K. G. (2003). Psychological aspects of natural language use: Our words, our selves. *Annual Review of Psychology*, 54, 547–577. <http://dx.doi.org/10.1146/annurev.psych.54.101601.145041>
- Pyszczynski, T., & Greenberg, J. (1987). Self-regulatory perseveration and the depressive self-focusing style: A self-awareness theory of reactive depression. *Psychological Bulletin*, 102, 122–138. <http://dx.doi.org/10.1037/0033-2909.102.1.122>
- Qiu, L., Lin, H., Ramsay, J., & Yang, F. (2012). You are what you tweet: Personality expression and perception on Twitter. *Journal of Research in Personality*, 46, 710–718. <http://dx.doi.org/10.1016/j.jrp.2012.08.008>
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401. <http://dx.doi.org/10.1177/014662167700100306>
- Richard, F. D., Bond, C. F., & Stokes-Zoota, J. J. (2003). One hundred years of social psychology quantitatively described. *Review of General Psychology*, 7, 331–363. <http://dx.doi.org/10.1037/1089-2680.7.4.331>
- Robbins, M. L., Focella, E. S., Kasle, S., López, A. M., Weihs, K. L., & Mehl, M. R. (2011). Naturalistically observed swearing, emotional support, and depressive symptoms in women coping with illness. *Health Psychology*, 30, 789–792. <http://dx.doi.org/10.1037/a0023431>
- Rodriguez, A. J., Holleran, S. E., & Mehl, M. R. (2010). Reading between the lines: The lay assessment of subclinical depression from written self-descriptions. *Journal of Personality*, 78, 575–598. <http://dx.doi.org/10.1111/j.1467-6494.2010.00627.x>
- Rude, S. S., Gortner, E. M., & Pennebaker, J. W. (2004). Language use of depressed and depression-vulnerable college students. *Cognition and Emotion*, 18, 1121–1133. <http://dx.doi.org/10.1080/02699930441000030>
- Sanford, F. (1942). Speech and personality. *Psychological Bulletin*, 39, 811–845. <http://dx.doi.org/10.1037/h0060838>
- Schmitt, D. P., Realo, A., Voracek, M., & Allik, J. (2008). Why can't a man be more like a woman? Sex differences in Big Five personality

- traits across 55 cultures. *Journal of Personality and Social Psychology*, 94, 168–182. <http://dx.doi.org/10.1037/0022-3514.94.1.168>
- Schönbrodt, F. D., & Perugini, M. (2013). At what sample size do correlations stabilize? *Journal of Research in Personality*, 47, 609–612. <http://dx.doi.org/10.1016/j.jrp.2013.05.009>
- Schwartz, H. A., Eichstaedt, J., Kern, M. L., Park, G., Sap, M., Stillwell, D., . . . Ungar, L. (2014). Towards assessing changes in degree of depression through Facebook. In *Proceedings of the Workshop on Computational Linguistics and Clinical Psychology: From Linguistic Signal to Clinical Reality*, 118–125.
- Schwartz, H. A., & Ungar, L. H. (2015). Data-driven content analysis of social media: A systematic overview of automated methods. *Annals of the American Academy of Political and Social Science*, 659, 78–94. <http://dx.doi.org/10.1177/0002716215569197>
- Soto, C. J., & John, O. P. (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology*, 113, 117–143.
- Tausczik, Y. R., & Pennebaker, J. W. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, 29, 24–54. <http://dx.doi.org/10.1177/0261927X09351676>
- Van der Zanden, R., Curie, K., Van Londen, M., Kramer, J., Steen, G., & Cuijpers, P. (2014). Web-based depression treatment: Associations of clients' word use with adherence and outcome. *Journal of Affective Disorders*, 160, 10–13. <http://dx.doi.org/10.1016/j.jad.2014.01.005>
- van Elk, M., Matzke, D., Gronau, Q. F., Guan, M., Vandekerckhove, J., & Wagenmakers, E.-J. (2015). Meta-analyses are no substitute for registered replications: A skeptical perspective on religious priming. *Frontiers in Psychology*, 6, 1365. <http://dx.doi.org/10.3389/fpsyg.2015.01365>
- Vazire, S. (2010). Who knows what about a person? The self-other knowledge asymmetry (SOKA) model. *Journal of Personality and Social Psychology*, 98, 281–300. <http://dx.doi.org/10.1037/a0017908>
- Watson, D. (2005). Rethinking the mood and anxiety disorders: A quantitative hierarchical model for DSM-V. *Journal of Abnormal Psychology*, 114, 522–536. <http://dx.doi.org/10.1037/0021-843X.114.4.522>
- Weintraub, W. (1981). *Verbal behavior: Adaptation and psychopathology*. New York, NY: Springer.
- Wolf, M., Horn, A. B., Mehl, M. R., Haug, S., Pennebaker, J. W., & Kordy, H. (2008). Computergestützte quantitative textanalyse: Äquivalenz und robustheit der deutschen version des linguistic inquiry and word count [Computerized text analysis: Equivalence and reliability of the German version of Linguistic Inquiry and Word Count]. *Diagnostica*, 54, 85–98. <http://dx.doi.org/10.1026/0012-1924.54.2.85>
- Yarkoni, T. (2010). Personality in 100,000 words: A large-scale analysis of personality and word use among bloggers. *Journal of Research in Personality*, 44, 363–373. <http://dx.doi.org/10.1016/j.jrp.2010.04.001>
- Yee, N., Harris, H., Jabon, M., & Bailenson, J. N. (2011). The expression of personality in virtual worlds. *Social Psychological and Personality Science*, 2, 5–12. <http://dx.doi.org/10.1177/1948550610379056>
- Zimmermann, J., Brockmeyer, T., Hunn, M., Schauenburg, H., & Wolf, M. (2017). First-person pronoun use in spoken language as a predictor of future depressive symptoms: Preliminary evidence from a clinical sample of depressed patients. *Clinical Psychology & Psychotherapy*, 24, 384–391. <http://dx.doi.org/10.1002/cpp.2006>
- Zimmermann, J., Wolf, M., Bock, A., Peham, D., & Benecke, C. (2013). The way we refer to ourselves reflects how we relate to others: Association between first-person pronoun use and interpersonal problems. *Journal of Research in Personality*, 47, 218–225. <http://dx.doi.org/10.1016/j.jrp.2013.01.008>
- Zou, G. Y. (2007). Toward using confidence intervals to compare correlations. *Psychological Methods*, 12, 399–413. <http://dx.doi.org/10.1037/1082-989X.12.4.399>

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