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Social behavior, interaction appraisals, and suicidal ideation in schizophrenia: The dangers of being alone

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Abstract

Despite the increasing attention to social appraisals in suicide risk, the interpersonal correlates of suicidal thoughts and behavior in schizophrenia are not well understood. Ecological momentary assessment could reveal whether dysfunctional social appraisals and behavior are evident in people with schizophrenia with suicidal ideation. A total of 93 outpatients with diagnoses of schizophrenia with ($n = 18$, 19%) and without ($N = 75$; 81%) suicidal ideation participated in one week of intensive daily monitoring via mobile devices, generating real-time reports on the quantity of social interactions and appraisals about them, as well as information concerning concurrent affect and symptoms. The presence of suicidal ideation was not associated with the quantity of social interactions or time spent alone, but it was associated with the anticipation of being alone as well as greater negative and lower positive affect when alone. Despite this aversive experience of being alone, people with suicidal ideation reported negative appraisals about the value of recent and potential social interactions. These findings suggest that suicidal ideation in schizophrenia may not be associated with the quantity of social interactions, but with negative expectations about the quality of social interactions coupled with an aversive experience of being alone. Cognitive therapy interventions that address negative expectations and pleasure about social interactions, especially when alone, may reduce suicidal ideation.

Keywords

Suicide; Self-Harm; Psychosis; Mobile technology; Ecological momentary assessment; Depression

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Contributors

All of the authors contributed to the interpretation of results and production of the manuscript. EG, JS and JH developed the measures and implemented data collection and measures. CD led development of the hypotheses and conducted statistical analyses. RM and DP contributed to the production of results and interpretation.

Conflicts of interest

Dr. Granholm reported consulting fees from Otsuka America Pharmaceutical, Inc. None of the authors has any conflicts of interest to report.

1. Introduction

Approximately 5–10% of people with schizophrenia die by suicide and 40–60% attempt suicide (Chapman et al., 2015; Fialko et al., 2006; Hawton et al., 2005; Radomsky et al., 1999). Risk factors for suicidal ideation and behavior in people with schizophrenia include demographic (e.g. younger age, higher level of education) and symptoms (e.g., active psychotic symptoms, depressive symptoms; Palmier-Claus et al., 2014; Popovic et al., 2014), and suicidal ideation has been observed to be a strong predictor of suicidal behavior (Skodlar et al., 2008). Unfortunately, as noted by multiple authors (Laursen et al., 2014; Nock et al., 2008), these risk factors provide limited understanding of the mechanisms of suicidal thoughts in schizophrenia.

In the broader literature, interpersonal stressors (compared to non-social stressors) appear to be more associated with risk for suicide (Liu and Miller, 2014) and social appraisals are central to emerging theories of suicide. For example, theories of suicidal behavior feature perceived alienation from other people (e.g., “thwarted belongingness” (Van Orden et al., 2010), perceived lack of availability of others to provide rescue from distress (Taylor et al., 2010), and perception of others as a source of threat (Selten and Cantor-Graae, 2005). Psychological models of suicide specifically adapted for schizophrenia (e.g., the Schematic Appraisal Model of Suicide) implicate perceptions of low social standing and alienation from others (Johnson et al., 2008). It is not fully clear why social factors are particularly associated with suicide compared to non-social factors, although translational research indicates that perceived lack of close relationships violates fundamental drives across species and produces a cascade of neurobiological changes (Cacioppo et al., 2015).

Social appraisals in schizophrenia, including aberrant beliefs regarding the intentions of others (Savla et al., 2013) might intersect with suicidal thoughts in ways unique from people without schizophrenia. The negative effects of social isolation appear to be explained by diminished reward from social interactions and perceived threat (Cacioppo et al., 2015). Some prior work has indicated that more severe paranoia, including perceptions of potential threat from others, is associated with higher likelihood of subsequent suicidal thoughts (Palmier-Claus et al., 2014). On the other hand, negative symptoms, which include social disinterest and withdrawal, have been found to be unrelated or perhaps even protective against suicidal ideation and behavior (Fenton, 2000; Hawton et al., 2005). The distinction between reward systems pertaining to “wanting” and “liking” (Berridge et al., 2009) can be applied to understanding the experience of social interactions or being alone. People with the diagnosis of schizophrenia experience diminished “wanting” or anticipation of social interactions, despite relatively intact “liking” or consummatory pleasure from social interactions (Gard et al., 2007). On the one hand, theories of suicide, including in schizophrenia, generally posit distress related to disconnection from others. On the other hand, people with social anhedonia (although not necessarily people with schizophrenia (Gard et al., 2014)) experience greater positive affect and lower negative affect when alone (Brown et al., 2007; Kwapil et al., 2009). Thus, the experience of being alone versus with others may vary in schizophrenia depending upon whether suicidal ideation is present.

Ecological momentary assessment (EMA), or the repeated naturalistic sampling of daily experiences, offers a potentially useful method for examining social behavior and appraisals in relation to suicidal thoughts. The differential impact of social context on affect and symptoms has been examined with EMA; for example, people higher in social anhedonia spend more time alone and report greater positive affect and less negative affect when alone (Brown et al., 2007; Kwapil et al., 2009). Although prior studies have examined affective predictors of moment-by-moment suicidal ideation in schizophrenia (Palmier-Claus et al., 2014), to our knowledge, studies have not yet employed EMA in contrasting quantity and appraisals of social interactions among people with and without suicidal thoughts.

We examined the social behavior and social interaction appraisals of outpatients with diagnosed schizophrenia who were experiencing suicidal ideation compared to people not endorsing suicidal thoughts using EMA. We predicted that people with suicidal ideation would experience lower positive affect and greater negative affect when alone and in the absence of recent social interactions, consistent with the role of perceived social disconnection in recent theories of suicidal thoughts (Taylor et al., 2010; Van Orden et al., 2010). Additionally, we predicted that people with suicidal ideation would experience greater perceived social threat (paranoia, suspiciousness) during social interactions and greater negative appraisals of social interactions in general. Lastly, we explored the quantity of social interactions and we examined the role of current depressive symptoms (excluding measurement of suicidal ideation) and delusional ideation in order to determine the specificity of effects of suicidal ideation versus more general depressive and psychotic symptoms.

2. Materials and methods

2.1. Sample

The data from this study derived from baseline evaluation of participants ($N = 126$) in an ongoing parent study that focuses on implementation of Cognitive Behavioral Social Skills Training (CBSST) in Assertive Community Treatment (ACT) teams (Granholt et al., 2015). All participants were enrolled in ACT teams in the San Diego County Adult and Older Adult Mental Health System. To enroll in ACT programs, participants must have a severe and persistent mental illness and be at risk for hospitalization, homelessness or incarceration. Minimal inclusion criteria were used: 1) voluntary informed consent, 2) age 18 or older, 3) DSM-IV-TR diagnosis of schizophrenia or schizoaffective disorder, 4) receiving ACT services for at least 3 months, 5) no prior Social Skills Training or Cognitive Behavioral Therapy in the past 3 years, and 6) living in the community for at least the past month. Baseline EMA data were available for a total of 126 participants, but participants with less than 6 samples were excluded ($N = 32$; 25%), resulting in a final sample for analysis of 93.

2.2. Assessments

2.2.1. Clinical and demographic data—All participants were diagnosed with schizophrenia or schizoaffective disorder based on a structured clinical interview (SCID-IV) and available record review and final diagnoses were confirmed in consensus meetings.

2.2.2. Psychiatric symptom severity—The Expanded Brief Psychiatric Rating Scale (BPRS; 24-item version) was used to assess the severity of current psychopathology (Faustman and Overall, 1999). Participants also completed the Beck Depression Inventory (Version 2; BDI-2) to assess self-reported depressive symptoms (Beck et al., 1996).

2.2.3. Suicidal ideation—The presence of current suicidal ideation was assessed with a composite variable composed of the BPRS Suicide Item (Clinician-Rated) and the BDI-2 suicidal ideation Item (Self-Reported). Prior work indicates that single item measures of suicidal ideation are consistent with validated scales for suicidal ideation (Desseilles et al., 2012) and are predictive of suicide mortality and attempt (Green et al., 2015). Given that self-assessment in schizophrenia is more often inaccurate than in people without schizophrenia (Bowie et al., 2007), and there were instances of non-overlap between BPRS and BDI-2 indicators of suicidal ideation, we opted to combine the BPRS and BDI-2 items into a single measure, requiring positive endorsement of ideation on *both* the BDI-2 (score > 0) and BPRS (score > 0) to identify people with suicidal ideation. We grouped participants into none or minimal ideation (N = 75) and present suicidal ideation (N = 18) groups accordingly.

2.2.4. EMA procedures—Personal digital assistants (PDAs) were programmed to administer 10 electronic interviews per day for seven days. Each survey required approximately 3 min to complete. A modified version of the Purdue Momentary Assessment Tool version 2.1.2 (Weiss et al., 2004) was to deliver the EMA. This tool provides time stamps for all data entries and permits responses only within a 15-minute period following an alarm signal. Alarm signals occurred within 75-minute windows from approximately 9:00 AM to 9:00 PM. Participants could adjust the time of first and last survey but otherwise could not control the timing of surveys. Each participant was provided 30 minutes of training in the use of the PDA to answer questionnaires and participants completed questionnaires with guidance until they could do so without assistance. Written information about sampling procedures and battery charging, a carrying pack, and a phone number to call in case of questions or to troubleshoot technical problems were also provided.

2.2.5. EMA questions—For the current analyses, 8 items were selected from a larger questionnaire (see Supplemental material). These items assessed whether participants were alone at the time of the alarm, whether or not a recent interaction had occurred and a once daily summary of the number of interactions (options of from 0, 1, 2, 3, or 4 or more). These items yielded information on the proportion of time sampled in an interaction and the total amount of interaction within each day. Four appraisals of these interactions were rated, based on items from the Defeatist Performance Attitude Subscale of the Dysfunctional Attitude Scale (Cane et al., 1986), with items rated on analog scales asking whether interactions were worth the effort or enjoyable, and whether the respondent felt confident and other person viewed the respondent positively (see (Granholt et al., 2013). Items from the EMA protocol were previously piloted and social indices corresponded with lab-based measures of social function (Granholt et al., 2008, 2013). Participants reported current happiness and sadness and as well as whether they experienced being spied upon or whether their thoughts were read since the last alarm on a 1–7 scale. If participants reported recent

social interactions since the last alarm, they were asked for their appraisals of those interactions, and if they did not report any recent social interactions, they were asked similar questions regarding their beliefs about social interactions in general. Participants were also asked about anticipated activities between the present time and the subsequent alarm, which included being “alone”.

2.3. Statistical analyses

Data were analyzed using IBM SPSS version 23 (SPSS, 2010). We first compared groups based on suicidal ideation using t-tests for continuous and chi-squared for categorical variables. We next calculated for each person the proportion of time spent in social interactions, alone, and predicted time alone across the 1 week period, and we then contrasted these values across groups. We next tested four linear mixed models with fixed effects for baseline suicidal ideation, being alone vs. in social interaction, and their interaction predicting concurrent positive and negative affect and delusional ideation as dependent variables. These models tested whether emotional experience and psychotic symptoms varied across social context, the presence of suicidal ideation, and their interaction. We also tested models with the suicidal ideation grouping variable predicting appraisals of social interactions. In all models, subjects were entered as a random effect, maximum likelihood estimation was used, and the p-value was set at 0.05. Estimated marginal means were contrasted via least significant difference (LSD), and we calculated Cohen's d to examine the effect sizes of these comparisons. As the hypotheses focused on assessing aggregated average responses in different contexts over the one-week sampling period (alone vs. not alone), we did not incorporate time in models or conduct lagged models.

3. Results

3.1. Sample characteristics (Table 1)

Participants were on average, middle-aged, mostly male, unmarried and with a high school level of education. There were no sociodemographic differences between the group with suicidal ideation (n = 18) compared to the group without (n = 75). The group with suicidal ideation had more severe depressive symptoms on the BDI-2 (sans the suicide item) and more severe psychiatric symptoms on the BPRS. The rates of endorsement of BDI suicide items for the entire sample were as follows (no ideation: 71%, ideation but no intent: 27.7%; would like to kill self 2.2%; would kill self if had the chance: 2.2%); rates on the BPRS were 69.9% no ideation; 20.4% “mild” ideation without plan; 9.7% “moderate” ideation with preoccupation and occasional plan).

3.2. Adherence to EMA protocol

A total of 5854 surveys were administered to participants who contributed data to these analyses, and responses were obtained for 3661 surveys. The average adherence rate (total number of responses/total number possible) was 61.4% (SD = 24.3). The mean number of surveys per person was 37.7 (SD = 17.4).

3.3. Frequency of engagement and anticipated social behavior (Table 2)

People with suicidal ideation engaged in a similar frequency of social interactions per day, did not differ in terms of the average proportion of samples spent alone, and were as likely to report a recent social interaction (although this latter variable was at trend) than those without ideation. Despite few differences between groups in the frequency of social interaction, consistent with hypotheses, people in the present ideation group were more likely to predict that they would be alone in subsequent survey epochs. They also reported significantly more time interacting with “strangers”.

3.4. Affect and delusional ideation during recent social interactions and when alone (Table 3)

Estimated mean values of concurrent affective ratings and delusional ideation derived from mixed models, subdivided across social contexts and suicidal ideation status, are presented in Table 3. Consistent with hypotheses about affect, there was a significant interaction between suicidal ideation and currently being alone, such that people experiencing suicidal ideation experienced more sadness and less happiness compared to control participants when alone. The interaction between suicidal ideation and recent social behavior on affect, however, was not significant. Main effects were found for recent social behavior and being with others, whereby participation in recent social interactions and being with others were associated with greater happiness and less negative affect regardless of suicidal ideation status. No significant effects emerged in regard to delusional symptoms.

3.5. Social interaction appraisals (Table 4)

Consistent with hypotheses, people experiencing suicidal ideation endorsed more negative appraisals toward recent social interactions as not enjoyable or “worth the effort,” regardless of whether they had recent social interactions or not.

3.6. Disentanglement from depressive symptoms

We repeated the above analyses with depressive symptoms (baseline BDI scores excluding the suicide item) to examine the specificity of the effects of suicidal ideation. The pattern of results for depressive symptoms was somewhat unique. As with suicidal ideation, BDI scores were not significantly correlated with average proportion of time spent alone ($r = 0.011$, $p = 0.916$), nor were they related to average daily frequency of social interactions ($r = -0.197$, $p = 0.066$). However, unlike suicidal ideation, BDI scores were not significantly correlated with predictions about being alone in subsequent surveys ($r = 0.153$, $p = 0.142$), but were significantly negatively correlated with likelihood of recent social interaction ($r = -0.215$, $p = 0.023$). In regard to mixed models predicting positive and negative affect, main effects for baseline depression were observed (positive affect: est. = -0.05 , S.E. = 0.01 , $t = 3.9$, $p < 0.001$; negative affect: est. = 0.06 , S.E. = 0.01 , $t = 5.8$, $p < 0.001$). However, unlike suicidal ideation status, there were no interaction effects with being alone (positive affect $\times$ alone: est. = -0.01 , S.E. = 0.004 , $t = 1.4$, $p = 0.156$; negative affect $\times$ alone: est. = 0.002 , S.E. = 0.004 , $t = 0.6$, $p = 0.556$). Finally, baseline depressive symptoms were predictive of more negative values of all social interaction appraisals, regardless of recent social interaction (p -value ranged 0.001 to 0.044).

4. Discussion

This is the first study, to our knowledge, to employ EMA to investigate the frequency, social appraisals, and concurrent affective experience in social interactions among people with schizophrenia recently experiencing suicidal thoughts. Our findings suggest two potentially important misperceptions about social interactions. First, people with suicidal ideation were approximately 50% more likely to predict being alone in the near future, yet they spent an equivalent amount of time with others compared to people without suicidal ideation. Second, people with suicidal ideation endorsed appraisals of social interactions consistent with diminished anticipatory enjoyment of relationships (e.g., “other people are not worth the effort”), yet they experienced less positive and more negative affect when alone. Thus, suicidal ideation in schizophrenia might involve both diminished “wanting” of social relationships and yet also decreased “liking” of being alone. These findings differed from the effect of general depressive symptoms, which did not vary by social context or relate to participants’ likelihood of prediction of being alone.

The strengths of this study were the comparatively large sample of community-dwelling people with schizophrenia and micro-level assessment of social experiences. Nonetheless, there are several limitations. We assessed suicidal ideation at a single time point (baseline), with a single binary grouping variable assessed prior to other measures, and we lacked longitudinal data on history of suicide attempts, duration of present ideation, or other beliefs (e.g., hopelessness) that covary with suicidal thoughts. We did not include a question about current ideation in the EMA survey to assess whether momentary ideation covaried with social appraisals. EMA has been used to provide real-time assessment of suicidal thoughts with no indication that repeated assessment of these cognitions increases their frequency (Husky et al., 2014). Our groups were imbalanced in psychiatry symptom severity and so we cannot rule out that group differences were the result of more general differences in psychopathology, although our sensitivity analysis with depression indicated somewhat different patterns of associations between affect and social appraisals/activity. Suicidal thoughts are a non-specific predictor of suicidal behavior. The sample was restricted to assertive community treatment participants who are by definition at greater risk for hospitalization, and so these data may not apply to less acutely ill people. Compared to other EMA studies, the rate of adherence was diminished, which might have been due to the severity of illness in the population and/or the frequent number of assessments.

Notwithstanding these limitations, because social behavior (time alone, quantity of social interactions) was quite similar between those with and without suicidal ideation, interventions purely targeted toward increasing the quantity of social interaction might not be effective in diminishing social risks associated with suicidal thoughts. This is consistent with a larger body of work on social isolation in which perceptions of isolation rather than quantity of social interactions appear to drive negative outcomes (Cacioppo et al., 2015). Although people with suicidal ideation endorsed appraisals of social interactions that were consistent with social anhedonia (e.g., interactions are not enjoyable or worth the effort), their affective experience when alone was in contrast with what would be predicted by social anhedonia — they experienced less happiness and more sadness when alone. Taken together, a combination of low perceived reinforcement value of socialization coupled with an

aversive experience of being alone is consistent with constructs that have been proposed in recent theories of suicide, in particular distress related to perceived lack of close social relationships which may be most acutely experienced when alone (Taylor et al., 2010, 2011; Van Orden et al., 2010). A next step would be in understanding which factors contribute to the development of these seemingly maladaptive appraisals of social interactions and time alone, such as negative beliefs about the illness and negative social experiences surrounding the diagnosis of schizophrenia (e.g., stigma).

Schizophrenia may exacerbate such potentially maladaptive cognitions by interfering with anticipation of enjoyment in the future (Gard et al., 2007) and/or recollection of recent positive experiences. Indeed, it was apparent that negative and positive affect were disproportionately impacted in people with suicidal ideation when alone, but this effect was not evident when considering temporally distal social interactions. Interestingly, no differences between people with suicidal ideation were found in terms of appraisals regarding their ability to successfully communicate in social interactions and beliefs of how others perceive them, highlighting the potential specificity of certain appraisals on suicidal ideation. In contrast to hypotheses, paranoid ideation was not associated with social appraisals, differing from a prior study (Palmier-Claus et al., 2014), although the items we employed (e.g., fear of being spied upon) may have reflected more specific perceptions of threat from others.

Given that social appraisals can be modified through psychosocial intervention, EMA could provide a platform to target maladaptive beliefs tailored to real-time social contexts (e.g., when patients are alone; Granholm et al., 2012). In particular, interventions aimed at sustaining positive recollection of recent social interactions (e.g., “savoring”; Strauss, 2013) may be able to diminish negative appraisals of social interactions when alone. Such interventions focused on reducing perceived social isolation could have a variety of salutary effects beyond thoughts of self-harm.

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Table 1

Sample characteristics.

Variable	No suicidal ideation (n = 75) M(SD) or %	Suicidal ideation (n = 18) M(SD) or %	t ratio or χ^2	p-Value
Age	44.5 (10.4)	47.0 (10.8)	.8	.372
Gender (% male)	56.6%	66.7%	.7	.410
Ethnicity			7.8	.186
% White	48.0%	50.0%		
% African-American	29.3%	22.2%		
% Hispanic/Latino	17.3%	5.6%		
% other	5.4%	22.2%		
Married (% married)	9.6%	5.6%	.3	.588
Education	12.4 (2.0)	12.6 (1.8)	.2	.854
BPRS 24 total	53.0 (12.5)	63.2 (13.3)	3.0	.003
BDI II total (without Suicide Item)	11.9 (9.0)	26.1 (10.7)	5.7	<0.001

BPRS: Brief Psychiatric Rating Scale; BDI II: Beck Depression Inventory.

Bold numbers indicate significance at $p < 0.05$.

Table 2

Quantity of social interactions by suicidal ideation.

Variable	No or minimal suicidal ideation (n = 75) M(SD)	Suicidal ideation (n = 18) M(SD)	t ratio	p-Value	Cohen's d
Mean frequency of social interactions per day	3.8 (1.2)	3.4 (1.2)	-1.1	0.255	0.33
Mean % of samples spent alone	55.5 (28.8)	54.9 (32.4)	-0.3	0.980	0.02
Mean % of samples with recent social interaction(s)	45.4 (25.2)	34.8 (23.4)	-1.5	0.120	0.43
Mean % of samples predicting being alone in the future	40.4 (28.0)	59.1 (33.6)	2.4	0.017	0.60
Mean % of time interacting with:					
– Family or fellow residents		18.9 (23.0)	0.1	0.940	0.016
– Friends or acquaintances		12.1 (15.3)	0.6	0.547	0.158
– Strangers		4.5 (7.1)	2.4	0.018	0.518

Bold numbers indicate significance at $p < 0.05$.

Table 3

Suicidal ideation level by recent social interaction and being alone predicting affect and delusions.

Variable	No or minimal suicidal ideation (n = 75)		Suicidal ideation (n = 18)		Suicidal ideation main effect		Social interaction main effect		Interaction	
	No recent social behavior M(S.E.)	Recent social behavior M(S.E.)	No recent social behavior M(S.E.)	Recent social behavior M(S.E.)	p-Value		p-Value		p-Value	
Happiness	4.7 (.14)	4.9 (.15)	3.8 (.30)	4.1 (.31)	0.014		< 0.001		0.576	
Sadness	2.4 (.14)	2.3 (.15)	2.9 (.30)	2.5 (.31)	0.300		< 0.001		0.067	
Spied on	2.3 (.18)	2.2 (.18)	2.7 (.37)	2.8 (.37)	0.236		0.883		0.272	
Thoughts read	2.2 (.18)	2.2 (.18)	2.5 (.37)	2.5 (.37)	0.469		0.630		0.469	
Variable	No or minimal suicidal ideation (n = 75)		Suicidal ideation (n = 18)		Suicidal ideation main effect		Alone main effect		Interaction	
	With others M(S.E.)	Alone M(S.E.)	With Others M(S.E.)	Alone M(S.E.)	p-Value		p-Value		p-Value	
Happiness	4.8 (.15)	4.7 (.14)	4.1 (.30)	3.7 (.3)	0.011		< 0.001		0.034	
Sadness	2.3 (.15)	2.4 (.15)	2.6 (.30)	2.9 (.30)	0.259		0.001		0.048	
Spied on	2.3 (.18)	2.3 (.18)	2.8 (.37)	2.7 (.37)	0.253		0.037		0.354	
Thoughts read	2.2 (.18)	2.2 (.18)	2.5 (.40)	2.4 (.37)	0.477		0.347		0.159	

Estimated marginal means in linear mixed effects model.

Bold numbers indicate significance at $p < 0.05$.

Table 4

Appraisals about social interactions by suicidal ideation status.

Variable	No or minimal suicidal ideation (n = 75) M(S.E.)	Suicidal ideation (n = 18) M(S.E.)	F (df)	p-Value	Cohen's d
<i>No recent social interaction</i>					
Interactions are worth the effort	4.7 (.17)	3.5 (.33)	10.1	0.002	.843
Feel confident in communicating well	4.7 (.16)	4.1 (.32)	3.2	0.076	.475
Others think well of respondent	4.7 (.16)	3.9 (.34)	3.8	0.055	.517
Want to interact with others	4.5 (.19)	3.7 (.38)	3.8	0.055	.517
<i>Recent social interaction</i>					
Enjoyed the interaction	5.0 (.14)	4.2 (.29)	7.2	.009	.712
Interaction was worth the effort	5.1 (.14)	4.2 (.30)	7.0	.009	.702
Communicated well	5.1 (.14)	4.8 (.31)	0.9	.339	.252
Interaction partner thought well of respondent	4.9 (.15)	4.7 (.32)	0.6	.417	.206

Estimated marginal means in linear mixed effects model.

Bold numbers indicate significance at $p < 0.05$.