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### Publication Date

2021-08-01

### DOI

10.1016/j.jpsychires.2021.06.022

Peer reviewed



Published in final edited form as:

*J Psychiatr Res.* 2021 August ; 140: 496–503. doi:10.1016/j.jpsychires.2021.06.022.

## Ecological momentary assessment of interpersonal theory of suicide constructs in people experiencing psychotic symptoms

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### Abstract

**Background:** People with psychotic disorders are at an increased risk of suicide, but there is little understanding of suicidal ideation (SI) in this population. The Interpersonal Psychological Theory of Suicide posits that perceived burdensomeness (PB) and thwarted belongingness (TB) contribute to SI. To our knowledge there are no studies using ecological momentary assessment (EMA) to assess these interpersonal risk factors in a sample of individuals with psychotic disorders. This study investigated the validity and variability of PB and TB, and whether SI, EMA-measured psychotic symptoms, mood, and social context relate to PB and TB.

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Author statement

Below are details of the contributions to this manuscript made by each author:

Emma M. Parrish conducted the literature review, performed data analysis, and took primary responsibility for writing this manuscript. Samantha A. Chalker helped with the literature review, data analysis, interpretation of results, and contributed to drafts of the manuscript.

Mayra Cano developed the methods section, collected data, and contributed to drafts of the manuscript.

Dr. Raeanne C. Moore helped with the literature review, data analysis, interpretation of results, and contributed to drafts of the manuscript.

Dr. Amy E. Pinkham helped with the literature review, data analysis, interpretation of results, and contributed to drafts of the manuscript.

Dr. Philip D. Harvey helped with the literature review, data analysis, interpretation of results, and contributed to drafts of the manuscript.

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Amy Lieberman helped with the literature review, data analysis, interpretation of results, and contributed to drafts of the manuscript.

Dr. Eric Granholm helped with the literature review, data analysis, interpretation of results, and contributed to drafts of the manuscript.

Dr. Colin Depp helped develop the analysis plan, helped with interpretation of results, provided feedback throughout the process, and contributed to drafts of the manuscript.

Declaration of competing interest

Dr. Harvey has received consulting fees or travel reimbursements from Alkermes, Bio Excel, Boehringer Ingelheim, Karuna Pharma, Minerva Pharma, and Sunovion Pharma during the past year. He receives royalties from the Brief Assessment of Cognition in Schizophrenia (Owned by Verasci, Inc). He is chief scientific officer of i-Function, Inc.

**Method:** Ninety-six participants with a psychotic disorder, including mood disorders with psychosis completed in-lab assessments of current SI, and then EMA surveys on a smartphone 3×/day for 10 days, answering questions about burdensomeness, belongingness, symptoms (i.e., hearing voices, experiencing suspiciousness), mood (i.e., happy, sad), and social context.

**Results:** Burdensomeness varied within-participants less than belongingness ( $t(95) = -3.74, p < .001$ ). Participants with SI had higher mean burdensomeness ratings ( $t(94) = -2.70, p < .01$ ) and lower mean belongingness ratings ( $t(94) = 3.68, p < .001$ ) than did participants without SI. Being with others, greater psychotic experiences, less happiness, and greater sadness related to greater burdensomeness. SI status, being alone, greater psychotic experiences, less happiness, and greater sadness related to less belongingness.

**Conclusions:** This study examined the real-time influences of SI and psychotic symptoms on burdensomeness and belongingness. Hearing voices, suspiciousness, mood, and SI are related to interpersonal suicide-related risk factors. In this sample, social context had a differential effect on burdensomeness and belongingness.

### Keywords

Schizophrenia; Schizoaffective disorder; Bipolar disorder; Ecological momentary assessment (EMA); Suicide; Psychosis

## 1. Introduction

People with psychotic disorders are at an increased risk of suicide compared to the general population (Osborn et al., 2008). 1 in 20 people with a psychotic disorder die by suicide (Hor and Taylor, 2010) and approximately 23–50% of people with psychotic disorders have attempted suicide in their lifetime (Aslan et al., 2020; Aydin et al., 2019; Radomsky et al., 1999). In addition, among people with schizophrenia, there may be a higher likelihood and more rapid rate of conversion from suicidal ideation (SI) to suicide behavior (Clapham et al., 2019), and means used for attempts may be more lethal (Lopez-Morinigo et al., 2016; Radomsky et al., 1999). Despite these striking statistics, the phenomenology of SI and behavior in psychotic disorders is poorly understood (Aleman and Denys, 2014; Donker et al., 2013; Villa et al., 2019). Thus, it is unclear if and how existing theories of the psychological determinants of suicide in the general population apply to people with psychosis.

Among the more empirically supported theories of suicide is the Interpersonal Psychological Theory of Suicide (IPT, but see Ribeiro et al., in press), which posits a four-part risk cascade, beginning with passive suicidal ideation. This desire emerges when perceived burdensomeness (when an individual feels like a burden to others) and thwarted belongingness (when an individual feels they do not belong with others) converge. Inclusion of a third variable, hopelessness surrounding these interpersonal states improving, leads to a desire to die. Suicidal thoughts transition to behavior, however, only once capability for suicidal behavior (e.g., less fear of death) is also apparent (Van Orden et al., 2010). This theory has been supported by a large meta-analysis (Chu et al., 2017) and has been validated in a number of clinical populations including mood disorders, autism spectrum disorder,

and people experiencing chronic pain (Dow et al., 2019; Kleiman et al., 2014; Taylor et al., 2016; Wilson et al., 2017). People with psychotic disorders have higher levels of perceived burdensomeness and thwarted belongingness than do people with other psychiatric disorders (Silva et al., 2015), and perceived burdensomeness and thwarted belongingness are associated with SI in schizophrenia and first episode psychosis (Villa et al., 2018; Wastler et al., 2020). The presence of others may also play a role in feelings of perceived burdensomeness and thwarted belongingness, as negative emotional experiences while alone have been linked to SI in schizophrenia (Depp et al., 2016). To our knowledge, there are no studies linking IPTS constructs to prospective suicidal behavior in psychotic disorders. Thus, the application of IPTS to people with psychotic disorders, and how the constructs of this theory may predict the transition from ideation to behavior, is still relatively unknown.

Psychotic symptoms, especially hallucinations, are related to SI and behavior (Comparelli et al., 2018; DeVlyder et al., 2015; Harkavy-Friedman et al., 2003; Heelis et al., 2016; Hor and Taylor, 2010; Huang et al., 2018; Kjelby et al., 2015). However, it is unclear if psychotic symptoms are related to perceived burdensomeness and thwarted belongingness. Methods such as ecological momentary assessment (EMA), are ideal for understanding the complex associations between psychotic symptoms, social context, interpersonal factors (i.e., burdensomeness and belongingness), SI, and past suicidal behavior. EMA can be used to administer frequent assessments of symptoms and experiences using smartphones in order to elucidate how symptoms and constructs change within individuals. Several studies have utilized EMA among participants with serious mental illness (e.g., Granholm et al., 2013; 2019; Mote and Fulford, 2020), and EMA has been used to assess both perceived burdensomeness and thwarted belongingness in a sample of inpatients with unipolar depression (Forkmann et al., 2018; Hallensleben et al., 2019; Rath et al., 2019). One study in these participants found that EMA measures of burdensomeness and belongingness had significant within-person variability, were reliable, and demonstrated good convergent validity with a lab-based version of the Interpersonal Needs Questionnaire (INQ; Forkmann et al., 2018). The same group showed that momentary measures of perceived burdensomeness and thwarted belongingness related to passive and active SI (Hallensleben et al., 2019) and were lower when participants were with others (Hallensleben et al., 2020). In a network analysis, perceived burdensomeness and thwarted belongingness had contemporaneous and lagged associations with SI (Rath et al., 2019). We are unaware of studies that have related momentary measures of perceived burdensomeness and thwarted belongingness to psychotic symptoms.

The aims of this study were to, in a sample of people experiencing psychotic symptoms, 1) evaluate convergence of EMA-measured perceived burdensomeness and thwarted belongingness as well as psychosis with in-lab measures of these constructs and psychosis; 2) examine the variability of these constructs and how this variability relates to in-lab measures of SI and behavior; 3) investigate whether EMA-measured burdensomeness and belongingness relate to in-lab measures of SI and behavior, in-lab measured symptoms, EMA-measured psychotic symptoms, mood, and social context. We hypothesized that EMA-measured burdensomeness and belongingness would have good convergent validity, would be related to the presence of SI, and would be related to psychotic symptoms, mood, and social context.

## 2. Method

### Participants.

Data from this study included 96 participants from an ongoing EMA study evaluating the relationship between social cognition and suicidality in psychotic disorders. All data were collected prior to the COVID-19 pandemic across three sites: The University of California San Diego (n = 35), The University of Texas at Dallas (n = 37), and The University of Miami Miller School of Medicine (n = 24). Participants at UM were recruited at the Miami VA Medical Center and local outpatient clinics. UTD recruited from local outpatient clinics and Metrocare Services, a non-profit mental health service provider organization located in Dallas County. UCSD recruited participants from received clinician referrals from San Diego County Behavioral services. Community advertisements were also used to recruit participants at all sites. Eligibility criteria included: 1) aged 18–65; 2) current diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder with psychotic features, or major depressive disorder with psychotic features, confirmed by the Mini International Neuropsychiatric Inventory (MINI; Sheehan et al., 1998) and the Structured Clinical Interview for the DSM-5 (SCID 5; First et al., 2015); 3) available informant with whom the participant was regularly in contact; 4) in outpatient, partial hospitalization, or residential care; 5) proficient in English; and 6) able to provide informed consent.

### Exclusion Criteria.

Exclusion criteria were: 1) history of a head trauma with loss of consciousness >15 min; 2) diagnosed with neurological or neurodegenerative disorder; 3) vision or hearing problems that would interfere with data collection; 4) estimated IQ < 70, as determined by the Wide Range Achievement Test-4 (WRAT-4; Wilkinson and Robertson, 2006); 5) DSM-5 diagnosis of a substance use disorder in the past three months, excluding cannabis and tobacco, and confirmed by the SCID-5. This study was approved by each site's Institutional Review Board, and participants completed an assessment of capacity to consent prior to written informed consent.

In-lab diagnostic and symptom assessments were conducted by raters trained in administering interview-based measures. Raters were trained to achieve a 0.80 inter-rater reliability kappa with gold-standard raters. Baseline data were available for a total of 104 participants; seven participants (6.7%) withdrew or discontinued before completing the EMA period, resulting in a final sample of 96.

### 2.1. In-lab measures

**Clinical Symptoms Assessment.**—Symptom severity was assessed using the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987). Trained raters administered a semi-structured interview examining participants' positive, negative, and general psychopathology symptoms. The severity of depressive and manic symptoms was evaluated using the Montgomery-Asberg Depression Rating Scale (MADRS; Montgomery and Åsberg, 1979) and the Young Mania Rating Scale (YMRS; Young et al., 1978). Total scores for both the MADRS and YMRS range from zero to 60, with higher scores representing higher levels of depression and mania, respectively.

**Assessment of Cognition.**—The Cognitive function was measured according to three domains of the MATRICS Consensus Cognitive Battery (MCCB; Nuechterlein et al., 2008) derived from scores on seven cognitive measures: speed of processing (Trail Making Test Part A; Symbol coding; Animal naming), working memory (Letter Number Span test), and verbal learning (Hopkins Verbal Learning Test (HVLN)-Revised, immediate recall, delayed recall, and recognition).

**Columbia-Suicide Severity Rating Scale (C-SSRS).**—Lifetime SI/behavior and current ideation were assessed using the interview-rated C-SSRS (Posner et al., 2011). Raters gathered information about past (lifetime) and current (past month) SI. The C-SSRS also assesses lifetime and recent suicidal behavior, including suicide attempts. We grouped participants into either no current SI (SI−) or current SI (SI+), as defined by a rated score of two (i.e., non-specific active suicidal thoughts) or higher (e.g., active thoughts with plan) on SI within the last month.

**Modified Scale for Suicidal Ideation (MSSI).**—The MSSI is an 18-item measure of suicide severity in the past 48 h (Miller et al., 1986). Domains include intensity of attitudes, competence to attempt, and ruminating about death; total scores range from zero to 54. Higher scores indicate greater SI severity (coefficient alpha = .94).

**The Interpersonal Needs Questionnaire (INQ-15).**—The INQ-15 is a 15-item self-report measure assessing interpersonal beliefs underlying the desire for suicide (Van Orden et al., 2012). The perceived burdensomeness subscale consists of items measuring participants' view of themselves as a burden to those in their lives (e.g., "These days, I feel like a burden on the people in my life"; *coefficient alpha* = .89), and the thwarted belongingness subscale consists of items measuring participants' sense of belonging (e.g., "These days, other people care about me", reverse coded; *coefficient alpha* = .85). Higher scores reflect higher levels of perceived burdensomeness and thwarted belongingness.

**Smartphone EMA Surveys.**—Participants were given the choice to use their own smartphones or use a lab-provided Samsung A50 smartphone. They were trained in phone usage and EMA procedures, and they completed an in-lab EMA survey to practice the future 10-day protocol. Participants received \$1.66 for each survey completed, for a maximum of \$50. Participants chose three daily sampling windows in the morning, afternoon, and evening. Participants were instructed to carry their smartphones with them throughout the 10-day protocol to answer the EMA surveys within 1 h of receiving them. To encourage adherence, participants were also contacted by telephone on the first day of EMA to troubleshoot and contacted again if they missed more than three consecutive surveys.

**Ten Day EMA Procedure.**—Surveys occurred 3×/day for 10 days, for a total of 30 possible EMA samples. On a one to seven scale, participants rated the current intensity of experiences of voices, suspicious thoughts, and mood states (happy, sad). To assess social context, participants also noted who they were with, categorized as "alone" or "with others." Participants responded to two items derived from the INQ-15: burdensomeness, "Since the past alarm, how much have you felt that you were a burden on others?" (higher scores indicate more perceived burdensomeness) and belongingness, "Since the past alarm, how

much have you been feeling like you belong or fit with others in your life?” (higher scores indicate less thwarted belongingness). To coincide with the INQ, a composite score of burdensomeness and belongingness was computed.

**Statistical analysis.**—We analyzed SI and behavior in three levels: lifetime past attempt (C-SSRS), ideation in the past month (C-SSRS; SI+, SI–), and ideation severity in the last 48 h (MSSI). We aggregated burdensomeness and belongingness scores across all 30 EMA samples for aim 1, and used the full variability of the data for the other aims. For aim 1, due to non-normal distribution of the EMA variables, we computed Spearman correlations between the aggregated means of EMA variables and the INQ. We created a burdensomeness and belongingness composite score by reverse-coding the belongingness variable and adding the two variables together, such that higher composite scores represented higher perceived burdensomeness and thwarted belongingness. To investigate aim 2, we first calculated an intraclass correlation coefficient for EMA burdensomeness and belongingness. Mean squared successive differences (MSSDs) were calculated for each of the EMA variables in order to examine within-person variability. A paired *t*-test was used to see how variability of burdensomeness and belongingness EMA variables compared to variability of other EMA variables (e.g., mood states). To investigate aim 3, independent *t*-tests were used to understand how aggregated EMA burdensomeness and belongingness scores differed between those who did and did not endorse current SI. Spearman correlations were used to see how aggregated means correlated with an in-lab measure of SI severity (MSSI). We ran a hybrid mixed effects linear model (Twisk, 2019) to understand how EMA-measured psychotic symptoms were related to burdensomeness and belongingness, controlling for mood. Mixed effects linear models incorporate all data and therefore are robust to missing data. Predictors in these models included a random effect for each participant, SI status, social context (alone vs. with others), a mean EMA value over time for each participant, and each participant’s momentary deviation from the mean at each EMA reporting epoch. Thus, if the voices momentary estimate is positive, the participant reported experiencing hearing more voices at that particular survey than their mean across the full EMA period. Then, we employed time-lagged mixed effects models, including SI status, momentary lagged social context (T-1), the momentary lagged value (T-1) of each EMA variable, and each participant’s mean value for each EMA variable. Alternatively, we ran these models incorporating “Day” as a repeated measure, using non-centered EMA values, but the former models were more informative and thus included in this paper. The *p* value was set to 0.01 for all analyses.

### 3. Results

#### Demographics.

Demographic and clinical characteristics are provided in Table 1. Overall, participants had a mean age of 43.9, were relatively evenly divided between men and women, were primarily Black or African American, and non-Hispanic. Most participants had a diagnosis of schizoaffective disorder, followed by bipolar disorder with psychotic features, schizophrenia, and major depressive disorder with psychotic features. There were 48 SI+ and 48 SI– participants, and no participants changed SI status from pre-to post-EMA data collection.



MCCB group means in both participants with and without SI were approximately 1 SD below average, and cognition in these domains did not significantly differ between the two groups. Of the SI + participants, 83.3% had attempted suicide in their lifetime, whereas 22.9% of SI- participants had attempted suicide in their lifetime. There was a wide range of SI severity in the SI + participants (MSSI range 0–30), but SI- participants had very low SI severity (MSSI range 0–2). Furthermore, SI + participants had higher scores on the INQ than SI- participants,  $t(85.7) = -3.773, p < .001$ . Participants responded to an average of 80.8% of surveys during the 1-h window. Adherence was not related to age, years of education, gender, or diagnosis (all  $p > .05$ ). Adherence percentage negatively correlated with the YMRS ( $\rho = -0.275, p = .008$ ), and did not correlate with any other symptom or cognitive measures (PANSS positive symptoms, PANSS negative symptoms, MADRS, MCCB, all  $p > .05$ ).

### **Averaged EMA Burdensomeness and Belongingness Correlations with in-lab measures.**

See Table 2 for descriptive statistics of all averaged EMA items. Higher MADRS scores correlated with higher EMA burdensomeness ( $\rho = 0.431, p < .001$ ) and lower EMA belongingness ( $\rho = -0.595, p < .001$ ). Burdensomeness and belongingness did not correlate with the YMRS, PANSS positive symptoms, or PANSS negative symptoms. Belongingness and burdensomeness collected with EMA were highly negatively correlated with each other ( $\rho = -0.504, p < .001$ ), as were the INQ burdensomeness and belongingness subscales measured in person ( $\rho = 0.681, p < .001$ ). EMA belongingness was negatively correlated with the INQ total ( $\rho = -0.607, p < .001$ ), and EMA burdensomeness was positively correlated with the INQ total ( $\rho = 0.493, p < .001$ ). When EMA burdensomeness and belongingness were combined into a composite score, it was strongly correlated with the INQ total score ( $\rho = 0.667, p < .001$ ). Therefore, EMA burdensomeness and belongingness show good convergent validity with the in-lab measure of the same constructs.

### **Within-Person Variability in EMA measures.**

The ICC for burdensomeness was 0.69 and the ICC for belongingness was 0.59. A paired samples  $t$ -test of MSSDs revealed that burdensomeness varied within participants less than belongingness ( $t(95) = -3.74, p < .001$ ). Additionally, the belongingness MSSD significantly varied more than sadness ( $t(95) = 2.66, p = .009$ ), happiness ( $t(95) = 3.28, p = .001$ ), and voices ( $t(95) = 5.76, p < .001$ ), whereas variability of burdensomeness and sadness, happiness, and suspiciousness were not significantly different. Therefore, burdensomeness was more stable within people than belongingness.

### **EMA burdensomeness and belongingness related to SI and past behavior.**

SI + participants had significantly lower mean belongingness ratings and higher mean burdensomeness ratings than SI- participants (see Table 2). Similarly, SI + participants had a higher burdensomeness/belongingness composite rating ( $t(94) = -3.74, p < .001$ , *Cohen's*  $d = 0.76; M = 7.42, SD = 2.42$ ) than SI- participants ( $M = 5.52, SD = 2.56$ ). Belongingness significantly negatively correlated with SI severity in the past 48 h ( $\rho = -0.374, p < .001$ ), while burdensomeness significantly positively correlated with SI severity in the past 48 h ( $\rho = 0.300, p < .001$ ). The burdensomeness/belongingness composite also significantly positively correlated with SI severity in the past 48 h ( $\rho = 0.411, p < .001$ ). Burdensomeness



and belongingness were not significantly related to lifetime suicide attempts ( $ps > .01$ ). Furthermore, variability of burdensomeness and belongingness did not significantly differ between participants based on current SI, lifetime suicide attempt, or MSSSI total ( $ps > .01$ ).

#### **Concurrent EMA burdensomeness model**

See Table 3a for full statistics. Each model included a random effect for participant, SI  $\pm$ status, a mean EMA value for each participant, a momentary deviation from the mean for each participant, and momentary social context. Interactions between SI status and EMA variables were not included in the final model. SI status was not significantly related to burdensomeness ( $p = .022$ ). Mean levels of all EMA variables were significantly related to burdensomeness. Variability in all EMA variables (voices, suspiciousness, happiness, and sadness) was significantly related to burdensomeness ( $ps < .001$ ). If participants were alone, they reported significantly lower levels of burdensomeness than when they were with others ( $b = -0.28$ ,  $S.E. = 0.03$ ,  $t = -4.95$ ,  $p < .001$ ).

#### **Concurrent EMA belongingness model.**

See Table 3b for full statistics. Each model included a random effect for participant, SI  $\pm$ status, a mean EMA value for each participant, a momentary deviation from the mean for each participant, and momentary social context. As with burdensomeness, interactions between SI status and EMA variables were not included in the final model. SI + participants reported significantly less belongingness than SI- participants ( $b = -0.42$ ,  $S.E. = 0.06$ ,  $t = -6.86$ ,  $p < .001$ ). Mean levels of EMA voices and happiness were related to belongingness, but not suspiciousness and sadness. Variability in all EMA variables (voices, suspiciousness, happiness, and sadness) was significantly related to belongingness ( $ps < .01$ ). Furthermore, when participants were alone, they reported significantly less belongingness than when they were with others ( $b = -0.23$ ,  $S.E. = 0.06$ ,  $t = -3.93$ ,  $p < .001$ ).

#### **Lagged EMA burdensomeness and belongingness models.**

Additional mixed models were performed using the same four EMA variables from the previous analysis, including a lagged momentary deviation from the mean for each participant and the participant's mean EMA value, as well as a lagged social context variable (see supplementary Tables 1a and 1b for full data). For burdensomeness, mean levels of all EMA variables except happiness were significantly related to burdensomeness. If participants were alone in the previous survey, they endorsed significantly less burdensomeness than if they were with others ( $b = -0.25$ ,  $S.E. = 0.06$ ,  $t = -3.88$ ,  $p < .001$ ). There were no other lagged variables significantly related to burdensomeness ( $p$ 's  $> 0.01$ ). For belongingness, mean levels of voices and happiness were significantly related to belongingness, but suspiciousness or sadness were not. There were no lagged variables (social context, psychotic symptoms, or mood) that significantly related to belongingness ( $ps > .01$ ).

## **4. Discussion**

This study sought to evaluate the validity of EMA-measured constructs of burdensomeness and belongingness, examine variability of these constructs over time, and understand how

these constructs relate to SI, behavior, and EMA-measured psychotic symptoms, mood, and social context in a sample of people experiencing psychotic symptoms. This study builds on prior research examining burdensomeness and belongingness through EMA by investigating these variables in a sample of people with psychotic symptoms. We found that EMA measures of burdensomeness and belongingness were highly correlated with the INQ, similar to EMA measurements of these constructs in unipolar depression (Forkmann et al., 2018). We also found that participants with current SI had higher scores on burdensomeness and lower scores on belongingness, consistent with some previous research utilizing in-lab assessments of perceived burdensomeness and thwarted belongingness in people experiencing psychotic symptoms (Villa et al., 2018; Wastler et al., 2020). However, we did not find that EMA-measured burdensomeness and belongingness differed between participants based on past suicide attempts. Within participants, we found that belongingness significantly varied across time more than burdensomeness, which is consistent with previous literature (Forkmann et al., 2018) and suggests that burdensomeness is a more stable construct than belongingness.

The results of the mixed models suggest that contemporaneous psychotic symptoms and mood have a greater relationship with interpersonal constructs related to suicide than did lagged psychotic symptoms and mood, suggesting that these constructs are transitory and momentary experiences. We found that momentary concurrent increases in voices and suspiciousness were related to burdensomeness and belongingness, suggesting that psychotic symptoms, like mood, are relevant to perceived burdensomeness and thwarted belongingness. Psychotic symptoms may have a particular additive relevance to thwarted belongingness when SI is present, as SI+ participants experienced greater thwarted belongingness than SI- participants. This finding is compatible with previous research suggesting a link between psychotic symptoms, SI, and suicidal behavior (Comparelli et al., 2018; DeVylder et al., 2015; Harkavy-Friedman et al., 2003; Heelis et al., 2016; Hor and Taylor, 2010; Huang et al., 2018; Kjelby et al., 2015). However, our results were not specific to the presence of recent SI, as there was an effect of voices and suspiciousness on perceived burdensomeness and thwarted belongingness for all participants. We also found that sadness and happiness were related to both burdensomeness and belongingness in our sample, consistent with Rath et al. (2019), who found a relationship between depressive symptoms and these constructs in a sample of inpatients with unipolar depression. Also like Rath et al. who found in a sample of inpatients with unipolar depression that positive mood was negatively related to both perceived burdensomeness and thwarted belongingness, we found that happiness was negatively related to both interpersonal risk factors. Notably, the Rath et al. study did not examine the impact of psychotic symptoms on burdensomeness and belongingness and did not include a sample of people with psychotic disorders.

Our participants reported more thwarted belongingness when they were alone than when they were with others. This is consistent with the findings of Hallensleben et al. (2020), who found that participants with unipolar depression and current or lifetime SI reported less thwarted belongingness when in the company of others. In our sample, the presence of psychotic symptoms while alone may have had an additive effect of negatively influencing thwarted belongingness. In contrast, our participants felt greater perceived burdensomeness when they were around other people.

The robust link between psychotic symptoms and perceived burdensomeness and thwarted belongingness is a novel finding to our knowledge, and the mechanisms underlying this relationship are unclear. First, it is possible that hallucinations and suspiciousness may directly and dynamically lead to perceived burdensomeness and thwarted belongingness, as we found that momentary increases above individual level averages in psychotic symptoms was associated with increases in perceived burdensomeness and thwarted belongingness. Second, it is also possible that having a psychotic disorder may increase perceived burdensomeness and thwarted belongingness, as evidenced by the link between average levels of these symptoms, perceived burdensomeness, and thwarted belongingness. Burdensomeness in our study increased when people were in the presence of others, and more severe symptoms may lead to negative perceptions of burden care by others (Awad and Voruganti, 2008; Silva et al., 2015). Third, psychotic symptoms may interfere with adaptive coping responses that might mitigate perceived burdensomeness and thwarted belongingness. An emerging model of suicide based on the IPTS, the Automatic and Controlled Antecedents of Suicidal Ideation and Action (ACASIA; Olson et al., in press) posits that opportunity to respond against one's automatic response moderates whether automatic attitudes affect the severity of perceived burdensomeness, thwarted belongingness, suicidal thoughts, and actions taken based on those thoughts. Psychotic symptoms may interfere with or subvert adaptive coping strategies, leading to increases in perceived burdensomeness and thwarted belongingness. Mechanistic understanding of how psychotic symptoms lead to interpersonal factors connected to suicide, which may vary between and within people, may be an important research direction.

Our results show that interpersonally mediated theories of suicide are applicable to this population and that psychotic symptoms influence interpersonal factors related to suicide, and may contribute to increased rates of suicide in this population (Aydin et al., 2019; Hor and Taylor, 2010). Cognitive behavioral therapy (CBT) for psychosis, an effective treatment for reducing positive symptoms in schizophrenia (Hagen, 2011; Rector and Beck, 2001), may also have downstream effects on reducing experiences of burdensomeness and increasing belongingness. Furthermore, suicide-specific treatments, such as cognitive behavioral prevention of suicide in psychosis (CBSPP; Tarrrier et al., 2014), may have the potential to impact these constructs. Additionally, as perceived burdensomeness and thwarted belongingness are momentary experiences, perhaps mobile, context-driven "just in time" interventions may be particularly valuable.

This study is limited by the short testing window (10 days) that does not allow examination of the variation of these constructs over the period of multiple weeks. The study sample was limited in terms of breadth of persons with psychotic features, with enrollment primarily consisting of interested and eligible people with schizophrenia or schizoaffective disorder as compared to participants diagnosed with mood disorders with psychotic features. Thus, diagnostic differences in the relationship between psychotic symptoms, mood symptoms, context, and interpersonal constructs related to suicide would be an important question for future research. At this time, we cannot speak to the variation of these constructs over longer periods of time weeks or months apart, and cannot link burdensomeness and belongingness prospectively to suicidal ideation or behavior. Unlike previous research studies examining these constructs using EMA, we did not ask participants about momentary SI or behavior

specifically. Previous studies have assessed SI in EMA surveys (e.g., Kleiman et al., 2017; Rath et al., 2019), but not in a population of people with psychotic disorders. We were concerned about the durability of informed consent within the population related to clinical management of SI reported on smartphones, which has been addressed in people without psychosis (Husky et al., 2014; Kleiman et al., 2017) but not to our knowledge in people with psychosis. Therefore, our study does not predict momentary or future suicidal ideation or behavior, a direction for future research. Social cognition may impact SI (Comparelli et al., 2018), thus it would be important to understand how social cognition may impact interpersonal suicide risk factors in this population. Furthermore, hallucination content, trauma, stigma, functioning, environmental influences, and day-to-day activities may influence burdensomeness and belongingness, questions for further research.

In sum, despite the limitations of this study, momentary psychotic symptoms are related to feelings of perceived burdensomeness and thwarted belongingness, which are additionally modified by social context. Interpersonal mechanisms of suicide in psychosis deserve further study.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgements

This work was supported by the National Institute of Mental Health (grant number: NIMH R01 MH116902-01A1; and T32 MH019934 to E. M.P.).

We would like to thank Katelyn Barone, Bianca Tercero, Cassi Springfield, Linlin Fan, Ian Kilpatrick, Snigdha Kamarsu, Tess Filip, and Maxine Hernandez for their involvement in data collection and recruitment.

## References

- Aleman A, Denys D, 2014. Mental health: a road map for suicide research and prevention. *Nature* 509, 421–423. [PubMed: 24860882]
- Aslan M, Radhakrishnan K, Rajeevan N, Sueiro M, Goulet JL, Li Y, Depp C, Concato J, Harvey PD, 2020. Suicidal ideation, behavior, and mortality in male and female US veterans with severe mental illness. *J. Affect. Disord* 267, 144–152. 10.1016/j.jad.2020.02.022. [PubMed: 32063566]
- Awad AG, Voruganti LNP, 2008. The burden of schizophrenia on caregivers. *Pharmacoeconomics* 26, 149–162. 10.2165/00019053-200826020-00005. [PubMed: 18198934]
- Aydın M, Ihan BÇ, Tekdemir R, Çökünlü Y, Erbasan V, Altunba K, 2019. Suicide attempts and related factors in schizophrenia patients. *Saudi Med. J* 40, 475–482. 10.15537/smj.2019.5.24153. [PubMed: 31056625]
- Chu C, Buchman-Schmitt JM, Stanley IH, Hom MA, Tucker RP, Hagan CR, Rogers ML, Podlogar MC, Chiurliza B, Ringer FB, 2017. The interpersonal theory of suicide: a systematic review and meta-analysis of a decade of cross-national research. *Psychol. Bull* 143, 1313. 10.1037/bul0000123. [PubMed: 29072480]
- Clapham E, Bodén R, Brandt L, Jönsson EG, Bahmanyar S, Ekblom A, Ösby U, Reutfors J, 2019. Suicide ideation and behavior as risk factors for subsequent suicide in schizophrenia: a nested case–control study. *Suicide Life-Threatening Behav.* 49, 996–1005. 10.1111/sltb.12499.
- Comparelli A, Corigliano V, Lamis DA, De Carolis A, Stampatore L, De Pisa E, Girardi P, Pompili M, 2018. Positive symptoms and social cognition impairment affect severity of suicidal ideation in schizophrenia. *Schizophr. Res* 193, 470–471. 10.1016/j.schres.2017.07.027. [PubMed: 28712966]

- Depp CA, Moore RC, Perivoliotis D, Holden JL, Swendsen J, Granholm EL, 2016. Social behavior, interaction appraisals, and suicidal ideation in schizophrenia: the dangers of being alone. *Schizophr. Res* 172, 195–200. 10.1016/j.schres.2016.02.028. [PubMed: 26948502]
- DeVylder JE, Lukens EP, Link BG, Lieberman JA, 2015. Suicidal ideation and suicide attempts among adults with psychotic experiences: data from the collaborative psychiatric epidemiology surveys. *JAMA psychiatry* 72, 219–225. 10.1001/jamapsychiatry.2014.2663. [PubMed: 25715312]
- Donker T, Caelear A, Grant JB, Van Spijker B, Fenton K, Hehir KK, Cuijpers P, Christensen H, 2013. Suicide prevention in schizophrenia spectrum disorders and psychosis: a systematic review. *BMC psychology* 1, 6. 10.1186/2050-7283-1-6. [PubMed: 25566358]
- Dow D, Morgan L, Hooker JL, Michaels MS, Joiner TE, Woods J, Wetherby AM, 2019. Anxiety, depression, and the interpersonal theory of suicide in a community sample of adults with autism spectrum disorder. *Arch. Suicide Res* 1–18. 10.1080/13811118.2019.1678537, 0.
- First MB, Williams JBW, Karg RS, Spitzer RL, 2015. Structured Clinical Interview for DSM-5—Research Version (SCID-5 for DSM-5, Research Version; SCID-5-RV). American Psychiatric Association, Arlington VA.
- Forkmann T, Spangenberg L, Rath D, Hallensleben N, Hegerl U, Kersting A, Glaesmer H, 2018. Assessing suicidality in real time: a psychometric evaluation of self-report items for the assessment of suicidal ideation and its proximal risk factors using ecological momentary assessments. *J. Abnorm. Psychol* 127, 758–769. 10.1037/abn0000381. [PubMed: 30299116]
- Granholm E, Ben-Zeev D, Fulford D, Swendsen J, 2013. Ecological Momentary Assessment of social functioning in schizophrenia: impact of performance appraisals and affect on social interactions. *Schizophr. Res* 145, 120–124. 10.1016/j.schres.2013.01.005. [PubMed: 23402693]
- Granholm E, Holden JL, Mikhael T, Link PC, Swendsen J, Depp C, Moore RC, Harvey PD, 2019. What do people with schizophrenia do all day? Ecological momentary assessment of real-world functioning in schizophrenia. *Schizophr. Bull* 46, 242–251. 10.1093/schbul/sbz070.
- Hagen R, 2011. *CBT for Psychosis: A Symptom-Based Approach*. Routledge.
- Hallensleben N, Glaesmer H, Forkmann T, Rath D, Strauss M, Kersting A, Spangenberg L, 2020. How is the presence of company related to thwarted belongingness in real time? Taking a closer look at the conceptualization of the construct of the interpersonal theory of suicide. *Int. J. Environ. Res. Publ. Health* 17, 4873. 10.3390/ijerph17134873.
- Hallensleben N, Glaesmer H, Forkmann T, Rath D, Strauss M, Kersting A, Spangenberg L, 2019. Predicting suicidal ideation by interpersonal variables, hopelessness and depression in real-time. An ecological momentary assessment study in psychiatric inpatients with depression. *Eur. Psychiatr* 56, 43–50. 10.1016/j.eurpsy.2018.11.003.
- Harkavy-Friedman JM, Kimhy D, Nelson EA, Venarde DF, Malaspina D, Mann JJ, 2003. Suicide attempts in schizophrenia: the role of command auditory hallucinations for suicide. *J. Clin. Psychiatr* 64, 871–874.
- Heelis R, Graham H, Jackson C, 2016. A preliminary test of the interpersonal psychological theory of suicidal behavior in young people with a first episode of psychosis. *J. Clin. Psychol* 72, 79–87. 10.1002/jclp.22233. [PubMed: 26768800]
- Hor K, Taylor M, 2010. Suicide and schizophrenia: a systematic review of rates and risk factors. *J. Psychopharmacol* 24, 81–90. 10.1177/1359786810385490. [PubMed: 20923923]
- Huang X, Fox K, Ribeiro J, Franklin J, 2018. Psychosis as a risk factor for suicidal thoughts and behaviors: a meta-analysis of longitudinal studies. *Psychol. Med* 48, 765–776. 10.1017/S0033291717002136. [PubMed: 28805179]
- Husky M, Olié E, Guillaume S, Genty C, Swendsen J, Courtet P, 2014. Feasibility and validity of ecological momentary assessment in the investigation of suicide risk. *Psychiatr. Res* 220, 564–570. 10.1016/j.psychres.2014.08.019.
- Kay SR, Fiszbein A, Opler LA, 1987. The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophr. Bull* 13, 261–276. 10.1093/schbul/13.2.261. [PubMed: 3616518]
- Kjelby E, Sinkeviciute I, Gjestad R, Kroken RA, Løberg E-M, Jørgensen HA, Hugdahl K, Johnsen E, 2015. Suicidality in schizophrenia spectrum disorders: the relationship to hallucinations and persecutory delusions. *Eur. Psychiatr* 30, 830–836. 10.1016/j.eurpsy.2015.07.003.

- Kleiman EM, Liu RT, Riskind JH, 2014. Integrating the interpersonal psychological theory of suicide into the depression/suicidal ideation relationship: a short-term prospective study. *Behav. Ther* 45, 212–221. 10.1016/j.beth.2013.10.007. [PubMed: 24491196]
- Kleiman EM, Turner BJ, Fedor S, Beale EE, Huffman JC, Nock MK, 2017. Examination of real-time fluctuations in suicidal ideation and its risk factors: results from two ecological momentary assessment studies. *J. Abnorm. Psychol* 126, 726. 10.1037/abn0000273. [PubMed: 28481571]
- Lopez-Morinigo J-D, Ayesa-Arriola R, Torres-Romano B, Fernandes AC, Shetty H, Broadbent M, Dominguez-Ballesteros M-E, Stewart R, David AS, Dutta R, 2016. Risk assessment and suicide by patients with schizophrenia in secondary mental healthcare: a case–control study. *BMJ Open* 6, e011929. 10.1136/bmjopen-2016-011929.
- Miller IW, Norman WH, Bishop SB, Dow MG, 1986. The modified scale for suicidal ideation: reliability and validity. *J. Consult. Clin. Psychol* 54, 724. 10.1037/0022-006X.54.5.724. [PubMed: 3771893]
- Montgomery SA, Åsberg M, 1979. A new depression scale designed to be sensitive to change. *Br. J. Psychiatr* 134, 382–389. 10.1192/bjp.134.4.382.
- Mote J, Fulford D, 2020. Ecological momentary assessment of everyday social experiences of people with schizophrenia: a systematic review. *Schizophr. Res* 216, 56–68. 10.1016/j.schres.2019.10.021. [PubMed: 31874743]
- Nuechterlein KH, Green MF, Kern RS, Baade LE, Barch DM, Cohen JD, Essock S, Fenton WS, Frese FJ 3rd, Gold JM, Goldberg T, Heaton RK, Keefe RS, Kraemer H, Mesholam-Gately R, Seidman LJ, Stover E, Weinberger DR, Young AS, Zalcman S, Marder SR, 2008. The MATRICS Consensus Cognitive Battery, part 1: test selection, reliability, and validity. *Am. J. Psychiatr* 165, 203–213. 10.1176/appi.ajp.2007.07010042. [PubMed: 18172019]
- Olson MA, McNulty JK, March DS, Joiner TE, Rogers ML, Hicks LL, (in press). Automatic and Controlled Antecedents of Suicidal Ideation and Action: A Dual-Process Conceptualization of Suicidality. *Psychological Review*..
- Osborn D, Levy G, Nazareth I, King M, 2008. Suicide and severe mental illnesses. Cohort study within the UK general practice research database. *Schizophr. Res* 99, 134–138. 10.1016/j.schres.2007.11.025. [PubMed: 18155881]
- Posner K, Brown GK, Stanley B, Brent DA, Yershova KV, Oquendo MA, Currier GW, Melvin GA, Greenhill L, Shen S, 2011. The Columbia–Suicide Severity Rating Scale: initial validity and internal consistency findings from three multisite studies with adolescents and adults. *Am. J. Psychiatr* 168, 1266–1277. 10.1176/appi.ajp.2011.10111704. [PubMed: 22193671]
- Radomsky ED, Haas GL, Mann JJ, Sweeney JA, 1999. Suicidal behavior in patients with schizophrenia and other psychotic disorders. *Aust. J. Pharm* 156, 1590–1595. 10.1176/ajp.156.10.1590.
- Rath D, De Beurs D, Hallensleben N, Spangenberg L, Glaesmer H, Forkmann T, 2019. Modelling suicide ideation from beep to beep: application of network analysis to ecological momentary assessment data. *Internet Interventions* 18, 100292. 10.1016/j.invent.2019.100292. [PubMed: 31828015]
- Rector NA, Beck AT, 2001. Cognitive behavioral therapy for schizophrenia: an empirical review. *J. Nerv. Ment. Dis* 189, 278–287. 10.1097/NMD.0b013e31826dd9af. [PubMed: 11379970]
- Ribeiro J, Linthicum K, Joiner T, Huang X, Harris L, Bryen C, (in press). Do suicidal desire and facets of capability for suicide predict future suicidal behavior? A longitudinal test of the desire-capability hypothesis. *J. Abnorm. Psychol*..
- Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, Hergueta T, Baker R, Dunbar GC, 1998. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *J. Clin. Psychiatr* 59 (Suppl. 20), 22–33 quiz 34-57.
- Silva C, Ribeiro JD, Joiner TE, 2015. Mental disorders and thwarted belongingness, perceived burdensomeness, and acquired capability for suicide. *Psychiatr. Res* 226, 316–327. 10.1016/j.psychres.2015.01.008.



- Tarrier N, Kelly J, Maqsood S, Snelson N, Maxwell J, Law H, Dunn G, Gooding P, 2014. The cognitive behavioural prevention of suicide in psychosis: a clinical trial. *Schizophr. Res* 156, 204–210. 10.1016/j.schres.2014.04.029. [PubMed: 24853059]
- Taylor NJ, Mitchell SM, Roush JF, Brown SL, Jahn DR, Cukrowicz KC, 2016. Thwarted interpersonal needs and suicide ideation: comparing psychiatric inpatients with bipolar and non-bipolar mood disorders. *Psychiatr. Res* 246, 161–165. 10.1016/j.psychres.2016.09.025.
- Twisk JWR, 2019. Mixed model analysis in longitudinal studies. In: *Applied Mixed Model Analysis: A Practical Guide, Practical Guides to Biostatistics and Epidemiology*. Cambridge University Press, Cambridge, pp. 131–150. 10.1017/9781108635660.010.
- Van Orden KA, Cukrowicz KC, Witte TK, Joiner TE, 2012. Thwarted belongingness and perceived burdensomeness: construct validity and psychometric properties of the Interpersonal Needs Questionnaire. *Psychol. Assess* 24, 197. 10.1037/a0025358. [PubMed: 21928908]
- Van Orden KA, Witte TK, Cukrowicz KC, Braithwaite SR, Selby EA, Joiner TE Jr., 2010. The interpersonal theory of suicide. *Psychol. Rev* 117, 575. 10.1037/a0018697. [PubMed: 20438238]
- Villa J, Ehret BC, Depp CA, 2019. Systematic review of the inclusion of people with psychosis in suicide-specific clinical trials. *Crisis J. Crisis Interv. Suicide Prev* 41, 233–236. 10.1027/0227-5910/a000628.
- Villa J, Pinkham AE, Kaufmann CN, Granholm E, Harvey PD, Depp CA, 2018. Interpersonal beliefs related to suicide and facial emotion processing in psychotic disorders. *J. Psychiatr. Res* 100, 107–112. 10.1016/j.jpsychires.2018.02.016. [PubMed: 29514121]
- Wastler HM, Moe AM, Pine JG, Breitborde NJK, 2020. Perceived burdensomeness, thwarted belongingness and suicidal ideation among individuals with first-episode psychosis. *Early Intervention in Psychiatry* 1–5. 10.1111/eip.13023.
- Wilkinson GS, Robertson GJ, 2006. *Wide Range Achievement Test 4 Professional Manual*. Psychological Assessment Resources, Lutz, FL.
- Wilson KG, Heenan A, Kowal J, Henderson PR, McWilliams LA, Castillo D, 2017. Testing the interpersonal theory of suicide in chronic pain. *Clin. J. Pain* 33, 699–706. 10.1097/AJP.0000000000000451. [PubMed: 27768608]
- Young RC, Biggs JT, Ziegler VE, Meyer DA, 1978. A rating scale for mania: reliability, validity and sensitivity. *Br. J. Psychiatry* 133, 429–435. 10.1192/bjp.133.5.429. [PubMed: 728692]



**Table 1**

## Sample characteristics.

Characteristic	SI+ (N = 48)	SI- (N = 48)	Total Sample (N = 96)	<i>t</i> or $\chi^2$ , <i>p</i>
Age, M(SD), Range	43.8 (11.6), 19-61	44.2 (10.9) 22-65	43.9 (11.2), 19-65)	0.30, .765dsa,
Sex (female), n (%)	28 (58.3)	25 (52.1)	53 (55.2)	0.38, .538
Race, n (%)				6.99, .030
White or Caucasian	12 (25)	15 (31.3)	27 (28.1)	
Black or African American	19 (39.6)	27 (56.3)	46 (47.9)	
Other	17 (35.5)	6 (12.4)	23 (23.9)	
Ethnicity (Hispanic), n (%)	16 (33.3)	7 (14.6)	23 (23.9)	4.63, .031
Education (years), M(SD), Range	12.5 (2.8), 4-18	12.8 (1.8), 9-16	12.7 (2.4), 4-18	0.56, .586
Employment Status				0.22, .637
Employed or In School (full or part time), n (%)	13 (27.1)	11 (22.9)	24 (25.0)	
Not Employed, n (%)	35 (72.9)	37 (77.1)	72 (75.0)	
Diagnosis				3.63, .304
Schizophrenia	6 (12.5)	4 (8.3)	10 (10.4)	
Schizoaffective	24 (50)	17 (35.4)	41 (42.7)	
Bipolar disorder with psychotic features	9 (18.8)	7 (14.6)	16 (16.7)	
Major depressive disorder with psychotic features	1 (2.1)	1 (2.1)	2 (2.1)	
MCCB Age-Corrected T Scores <sup>a</sup> , M(SD), Range				
Processing Speed	41.4 (13.6), 13-67	41.9 (11.4), 12-65	41.7 (12.5), 12-67	.21, .833
Working Memory	38.2 (10.7), 13-62	40.9 (7.5), 27-56	39.5 (9.3), 13-62	1.46, .149
Verbal Learning	38.2 (8.5), 24-67	39.5 (9.5), 26-72	38.8 (9.0), 24-72	.69, .491
PANSS Positive Symptoms, M(SD), Range	18.7 (5.9), 7-34	17.3 (5.2), 7-30	18.0 (1.0), 7-34	-1.16, .250
PANSS Negative Symptoms, M(SD), Range	13.7 (4.5), 9-26	12.9 (3.8), 7-24	13.3 (0.5), 7-26	-0.89, .375
MADRS, M(SD), Range	22.2 (11.1), 0-39	9.6 (9.7), 0-31	15.7 (12.1), 0-39	-6.02, <.001*
YMRS, M(SD), Range	3.0 (4.3), 0-16	1.7 (4.3), 0-16	2.4 (4.3), 0-16	-1.47, .146
C-SSRS- Lifetime Suicide Attempt, n (%)	40 (83.3)	22 (22.9)	62 (64.6)	14.75, <.001*
MSSI – Suicidal Ideation Severity in the Past 48 Hours, M(SD), Range	4.6 (8.0), 0-30	0.1 (0.4), 0-2	2.3 (6.0), 0-30	-3.85, <.001*
INQ, M(SD), Range	49.3 (21.4), 17-93	34.9 (15.5), 32-75	42.1 (20.0), 17-93	-3.77, <.001*
EMA Survey Adherence Percentage, M(SD), Range	80.5 (19.5), 10-100	81.0 (20.8), 10-100	80.8 (19.9), 10-100	.12, .906

Note. MCCB = MATRICS Cognitive Consensus Battery; PANSS=Positive and Negative Syndrome Scale; MADRS = Montgomery-Asberg Depression Rating Scale; YMRS=Young Mania Rating Scale; C-SSRS=Columbia-Suicide Severity Rating Scale; MSSI = Modified Scale for Suicidal Ideation; INQ=Interpersonal Needs Questionnaire; EMA = Ecological Momentary Assessment.

<sup>a</sup>N = 87

\* *p* < .01 Note. SI=Suicidal Ideation.

**Table 2**

EMA average responses.

Variable	Question (Since the past alarm ...)	SI+; M (SD), Range	SI-; M (SD), Range	<i>T, p</i>	Cohen's D
Burdensomeness	How much have you felt that you were a burden on others?	3.18 (1.69), 1.0–6.9	2.32 (1.42), 1.0–6.6	$t(94) = -2.70, p < .01$	0.55
Belongingness	How much have you been feeling like you belong or fit with others in your life?	3.76 (1.34), 1.2–6.6	4.80 (1.42), 1.3–7.0	$t(94) = 3.68, p < .001$	0.75
Happiness	How much have you felt happy?	3.85 (1.47), 1.0–7.0	4.72 (1.45), 1.3–7.0	$t(94) = 2.92, p < .005$	0.60
Sadness	How much have you felt depressed?	3.47 (1.57), 1.0–6.8	2.70 (1.47), 1.0–6.7	$t(94) = -2.51, p < .015$	0.51
Voices	How much have you been bothered by voices?	2.59 (1.67), 1.0–6.9	2.14 (1.41), 1.0–5.8	$t(94) = -1.41, p = .161$	0.29
Suspiciousness	How much have you had thoughts that you really can't trust other people?	3.70 (1.65), 1.0–7.0	3.16 (1.73), 1.0–7.0	$t(94) = -1.57, p = .120$	0.32

Note. SI=Suicidal Ideation.

**Table 3a**

Person centered mixed models - burdensomeness.

Predictor Variable		Estimate	S.E.	T	P
SI+ (vs. SI-)		0.14	0.06	2.29	0.022
Voices	Momentary	0.18	0.03	5.61	<.001*
	Mean	0.27	0.02	12.49	<.001*
Suspiciousness	Momentary	0.15	0.02	6.13	<.001*
	Mean	0.11	0.02	4.95	<.001*
Happiness	Momentary	-0.11	0.03	-3.95	<.001*
	Mean	-0.07	0.02	-2.74	0.006*
Sadness	Momentary	0.25	0.03	8.85	<.001*
	Mean	0.53	0.03	19.95	<.001*
Alone (vs. with others)	Momentary	-0.28	0.06	-4.95	<.001*

\*  
 $p < .01$ *Note.* SI=Suicidal Ideation; Interactions between SI status and psychotic symptoms not shown, were not significant.

**Table 3b**

Person centered mixed models - belongingness.

Predictor Variable		Estimate	S.E.	T	P
SI+ (vs. SI-)		-0.42	0.06	-6.86	<.001*
Voices	Momentary	-0.09	0.03	-2.85	0.004*
	Mean	-0.09	0.02	-4.12	<.001*
Suspiciousness	Momentary	-0.09	0.03	-3.64	<.001*
	Mean	-0.04	0.02	-1.95	0.052
Happiness	Momentary	0.34	0.03	11.95	<.001*
	Mean	0.61	0.03	24.08	<.001*
Sadness	Momentary	-0.18	0.03	-6.11	<.001*
	Mean	-0.04	0.03	-1.64	0.101
Alone (vs. with others)	Momentary	-0.23	0.06	-3.93	<.001*

\*  
 $p < .01$ *Note.* SI=Suicidal Ideation; Interactions between SI status and psychotic symptoms not shown, were not significant.