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Lack of Belonging Predicts Depressive Symptomatology in College Students

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Abstract

Feeling a sense of belonging is a central human motivation that has consequences for mental health and well-being, yet surprisingly little research has examined how belonging shapes mental health among young adults. In three data sets from two universities (exploratory study: $N = 157$; Confirmatory Study 1: $N = 121$; Confirmatory Study 2: $n = 188$ in winter term, $n = 172$ in spring term), we found that lower levels of daily-assessed feelings of belonging early and across the academic term predicted higher depressive symptoms at the end of the term. Furthermore, these relationships held when models controlled for baseline depressive symptoms, sense of social fit, and other social factors (loneliness and frequency of social interactions). These results highlight the relationship between feelings of belonging and depressive symptoms over and above other social factors. This work underscores the importance of daily-assessed feelings of belonging in predicting subsequent depressive symptoms and has implications for early detection and mental health interventions among young adults.

Keywords

depression, social behavior, preregistered

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> I long, as does every human being, to be at home wherever I find myself.
>
> —Maya Angelou (2015)

Theorists have long agreed with writer Maya Angelou—a sense of belonging and connection with other people is a central human motivation (Baumeister & Leary, 1995). Whereas individuals can belong to diverse types of groups in their lifetime, including friendships, schools, clubs or teams, communities or neighborhoods, political causes, and religious or spiritual organizations, it is the perception of feeling that they belong to these groups that has been theorized to be an important driver of health and well-being (Berkman & Syme, 1979; Young et al., 2004). Belonging is important throughout the life span, but feeling like one belongs is particularly important during life transitions, such as the first year of college (Walton & Cohen, 2007). Here, we provide the first longitudinal prospective assessment of whether daily perceptions of belonging predict increased depressive symptomatology among first-year college students across multiple universities and explore whether belonging is a unique predictor of depressive symptoms among other social factors, including loneliness and social interactions.

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The Need to Belong and Mental Health Among Young Adults in College

Over the past 10 years, there has been a significant increase in the prevalence of depression, anxiety, and suicide in young adults (Duffy et al., 2019; Twenge et al., 2019). Indeed, nearly 19% of first-year college students globally are diagnosed with depression each year (Auerbach et al., 2018), and research suggests that rates are rising more for younger birth cohorts (Kessler et al., 2005; Twenge, 2015). From the early 2000s to now, rates of major depressive episodes have nearly doubled in young adults between the ages of 18 and 25 years (Twenge et al., 2019). It is well known that stressful life events and health behaviors (e.g., sleep) play an important role in predicting increases in depressive symptomatology and psychological distress among young adults (Breslau et al., 1996; Kendler et al., 1999; Monroe et al., 1999). Adolescence and young adulthood are also a critical time for developing and maintaining social connections, particularly among first-year university students as they build their social networks and adjust to a new lifestyle away from home. Greater feelings of social connectedness are associated with greater well-being in this age group (Jose et al., 2012).

One social factor that is quite important to young adults is belonging. Belonging is a feeling that one has a sufficient number of social relationships and connections to a community or social context (Allen et al., 2018). For first-year college students, much of their social life is their university community. This connection to the university community is often referred to as "school belonging," which is thought to be the extent to which students feel personally accepted, respected, included, and supported by others in the school social environment (Goodenow & Grady, 1993). Indeed, initial research into feelings of belonging in adolescents and young adults has begun to examine school belonging and the consequences of low feelings of belonging. This work has found that lack of belonging is both increasing in this population and associated with greater negative affect (Twenge et al., 2021) and worse self-reported mental health (Gopalan & Brady, 2020). On the other hand, higher levels of school belonging are also linked to better academic outcomes (Pittman & Richmond, 2007) and greater persistence in engineering (Marra et al., 2012), which has influenced our understanding of the important role that feelings of belonging have in the success and wellness of adolescents and young adults.

Research has begun to investigate the role that social factors play in the development of depression. Previous research has identified social stressors (e.g., relationship breakup) as risk factors for depression (Kendler et al., 1999, 2003; Monroe et al., 1999). Similarly, loneliness is associated with higher rates of depression, particularly in young adults (Cacioppo et al., 2006, 2010; Matthews et al., 2016). Initial cross-sectional work has also identified lack of belonging as a predictor of depressive symptoms (Parr et al., 2020). Many self-report assessments of depressive symptoms include questions that assess social functioning; for example, the Center for Epidemiological Studies-Depression (CES-D) scale asks participants to rate social-functioning statements such as "I talked less than usual," "People were unfriendly," "I felt that people dislike me," and "I felt lonely" (Lewinsohn et al., 1997), suggesting that depressive symptoms overlap with social *experiences* as well. The relationship between social factors and depression in young adults specifically has important implications as well. College students often have access to mental health treatment on campus, but the majority with mood disorders do not seek treatment (Blanco et al., 2008). When left untreated, depression in university students can have serious negative consequences on academic performance (Hysenbegasi et al., 2005) and physical health (Dalton & Hammen, 2018) and can lead to suicidal ideation (Beck et al., 1993; Garlow et al., 2008). Universities, however, may be a unique environment for helping improve student wellness because campuses offer health and support services as well as

Statement of Relevance

Humans have a need to feel as if they belong in their social world. Although the social factors that influence depressive symptoms are well documented, less work has explored the unique contributions of various social factors. Furthermore, depressive symptoms often co-occur with social disconnection, presenting a need for more prospective investigations to identify whether social factors are related to subsequent mental health. We explored whether feelings of belonging, assessed daily, predicted end-of-term depressive symptoms in first-year college students. In two studies, we found that a lack of belonging, even early in an academic term, was associated with greater depressive symptoms at the end of the term. Importantly, feelings of belonging predicted depressive symptoms even when models controlled for feelings of loneliness and the number of social interactions a student had during the day. This points to opportunities to improve feelings of belonging for more effective interventions for young adults during life transitions.

opportunities for socialization and growth. Understanding the factors that lead to depression in students would help identify targets of intervention. Furthermore, using experience sampling in daily life allows for earlier detection of risk and thus could lead to earlier implementation of interventions to help students thrive on campus.

Social factors emerge as a possible target of intervention because of their relationship with a variety of mental health and success outcomes. However, greater work needs to be done to determine whether loneliness interventions are effective or that interventions can increase social contact among young adults (Masi et al., 2011). However, there are effective interventions for belonging in this developmental context (Brady et al., 2020; Murphy et al., 2020; Walton & Cohen, 2007, 2011), suggesting that probing the relationship between feelings of belonging and depression could yield insight for effective future interventions. Importantly, belonging is not the same as feeling like one is socially connected or supported by other people. Theories on belonging note that belonging is about not just having close relationships but rather whether someone feels as if they belong in a certain social context (Walton & Brady, 2017). Although close relationships can be a source of belonging in a context (Shook & Clay, 2012), individuals' subjective feelings of belonging may not always overlap with their feelings of social connection. Because belonging appears to be a unique facet of social life, it is important to examine the unique contributions that feelings of belonging have to mental health beyond social connection (or lack thereof—loneliness); thus, in the present work, we examined these effects while controlling for other measures of social behavior.

A Novel Methodology for Examining Belonging Effects

A recent study highlighted that much of our understanding of mental health disorders is based on cross-sectional work, whereas influences on mental health outcomes likely vary over time (Nelson et al., 2017). Thus, measuring predictors of mental health through means of ecological momentary assessment (EMA) and longitudinal analysis may offer better insight into the dynamic nature of psychopathology (Nelson et al., 2017). Additionally, EMAs avoid attendant bias and inaccurate recall (Stone et al., 2007); such avoidance is critical for investigating depressive symptomatology because depression can produce a host of negative cognitive biases (Gotlib et al., 2004). Here, we report three studies exploring how daily sense of belonging at college early in the academic term predicts end-of-term depressive symptoms. By exploring the relationship between feelings of belonging across different weeks in an academic term, we predicted that we would be able to determine whether early-term associations offer insight that can lead to early intervention in future translational work. Specifically, we first used daily EMA reports of how much one feels like they belong in an exploratory data set of first-year college students ($N = 157$) and then explored the reliability and robustness of this predictive association in two separate data sets of first-year college students ($N = 121$ and $N = 188$). On the basis of this initial discovery work, we preregistered our subsequent hypotheses to be tested on the two similar confirmatory data sets, after collecting but before analyzing the data (https://osf.io/pwfm4/). We hypothesized that higher average feelings of belonging at the student's school in a given week would be predictive of lower end-of-term depressive symptoms, controlling for depressive symptoms at the beginning of the term. We also hypothesized that this relationship would hold when models controlled for a global measure of social and academic fit assessed at the beginning of the term, suggesting that momentary feelings of belonging might have additional predictive power over a general feeling of social and academic fit at the university. Finally, we included loneliness and social-interaction frequency in the models because we hypothesized that feelings of belonging would predict depressive symptoms over and above the effects of other social factors known to impact depressive symptomatology.

Method

Participants

Participants were first-year university students at two different university campuses in the United States. The participants were recruited via advertisements on student mailing lists and Facebook groups. Participants were eligible if they were full-time first-year students between the ages of 18 and 25 years, had a data-enabled smartphone, and were available for participation throughout the academic term. For their participation, participants received a Fitbit and up to $205, with greater compensation for more completed assessments. All procedures were approved by the host institution's institutional review board. Sample size was determined by how many students responded to recruitment materials prior to the first day of classes for the academic term. Although we did not preregister an a priori sample size, G*Power (Version 3.1.9.7; Faul et al., 2007) sample-size calculations indicated that a sample size of 77 would be required to achieve 80% power to detect a medium effect size in multiple linear regression. Participants from the exploratory study and Confirmatory Study 1 attended university A, and participants from Confirmatory Study 2 attended

Table 1. Participant Characteristics for Each Study

Variable	Exploratory study (N = 157)	Confirmatory Study 1 (N = 121)	Confirmatory Study 2: winter (N = 188)	Confirmatory Study 2: spring (N = 172)
Gender				
Male	63 (40.1%)	52 (43.0%)	66 (35.1%)	61 (35.5%)
Female	93 (59.2%)	68 (56.2%)	122 (64.9%)	111 (64.5%)
Nonbinary	1 (0.6%)	1 (0.8%)	0 (0%)	0 (0%)
Age (years)				
M (*SD*)	18.2 (0.396)	18.2 (0.687)	18.4 (0.568)	18.4 (0.577)
Race				
White	42 (26.8%)	33 (27.3%)	58 (30.9%)	54 (31.4%)
Black	6 (3.8%)	6 (5.0%)	5 (2.7%)	5 (2.9%)
Latinx	4 (2.5%)	9 (7.4%)	11 (5.9%)	9 (5.2%)
East Asian	58 (36.9%)	47 (38.8%)	64 (34.0%)	61 (35.5%)
South Asian	21 (13.4%)	18 (14.9%)	20 (10.6%)	15 (8.7%)
Other	0 (0%)	1 (0.8%)	2 (1.1%)	2 (1.2%)
Mixed race	26 (16.6%)	7 (5.8%)	28 (14.9%)	26 (15.1%)
Baseline depressive symptoms				
M (*SD*)	13.3 (9.47)	10.5 (7.88)	15.3 (9.44)	15.9 (10.90)
Mdn (range)	11.0 (0–42.0)	9.0 (0–38.0)	14.0 (0–56.0)	13.0 (1.0–55.0)
End-of-term depressive symptoms				
M (*SD*)	18.6 (10.1)	15.2 (9.21)	16.2 (11.1)	17.8 (10.1)
Mdn (range)	18.0 (0–53.0)	13.0 (0–41.0)	13.0 (0–55.0)	16.5 (1.0–53.0)
Baseline sense of social fit				
M (*SD*)	5.00 (0.811)	5.10 (0.775)	4.84 (0.827)	4.69 (0.876)
Mdn (range)	5.06 (1.82–6.71)	5.12 (2.18–6.53)	4.88 (2.12–7.00)	4.76 (1.76–6.47)
End-of-term sense of social fit				
M (*SD*)	4.83 (0.957)	4.87 (0.903)	4.70 (0.896)	4.76 (0.818)
Mdn (range)	4.91 (1.53–6.94)	4.88 (2.53–6.71)	4.76 (1.76–6.47)	4.82 (2.29–6.82)

Note: For gender and race, values outside parentheses are *n*s and inside parentheses are percentages of the sample. Depressive symptoms were assessed using the Center for Epidemiological Studies-Depression (CES-D) scale. Sense of social fit was assessed using the Sense of Social and Academic Fit Scale (SAFS).

university B. University A is a highly selective, medium-size private institution in the mid-Atlantic region of the United States. University B is a selective, large public institution on the West Coast of the United States. Demographic information for participants in each study can be found in Table 1.

Study design

Data were obtained from three studies aimed at assessing students' health and well-being across two campuses: an exploratory study, Confirmatory Study 1, and Confirmatory Study 2. All studies collected passive-sensing data from participants' phones and Fitbits, EMA survey data during multiple weeks throughout the term, and self-reported psychological-assessment data at the beginning and end of the term. Here, we focus on EMA and self-reported psychological assessment data. The exploratory study was conducted in the spring semester of 2017, Confirmatory Study 1 was conducted in the spring semester of 2018 at the same institution, and Confirmatory Study 2 was conducted in the winter and spring quarters in 2018 at a separate institution.

Procedure

Participants completed a baseline appointment at the end of the fall term to determine eligibility, learn the procedure for the study, and complete demographic information. A second baseline session occurred during the first week of classes in the term, in which participants completed a battery of questionnaires (described below in the Measures section) and were given instructions for completing the EMAs. An end-of-term assessment was completed during the final week of classes in the term. Participants were then compensated and debriefed.

For the exploratory study and Confirmatory Study 1, EMAs occurred across 3 different weeks in the term. Participants received questions four times per day: once in the morning at 11 a.m., twice in the afternoon, and once

in the evening at 10 p.m. The afternoon questions were sent at varying intervals between 12:30 p.m. and 8:30 p.m. The gap between surveys was always at least 90 min. Participants had 90 min to respond or their responses were recorded as missing. Feelings of belonging were assessed only at the end-of-day time point. In the exploratory study, EMAs occurred in Week 1 (early term), Week 6 (midterm), and Week 15 (end of term). Data collection began on a Wednesday and concluded the following Tuesday. In Confirmatory Study 1, EMAs occurred in Week 2 (early term), Week 7 (midterm), and Week 15 (end of term). Each week of data collection began on a Monday and concluded the following Sunday.

In Confirmatory Study 2, EMAs occurred across 4 different weeks in the winter and spring terms. Data for the first 2 weeks were collected during the winter term, and data for the second 2 weeks were from the spring term. EMAs occurred in Week 5 (winter midterm) and Week 9 (winter end of term). Then in the spring term, EMAs occurred in Week 5 (spring midterm) and Week 8 (spring end of term). Each week of data collection began on a Wednesday and concluded the following Tuesday. Participants received questions four times per day: once in the morning at 10 a.m., twice in the afternoon, and once in the evening at 9 p.m. The first afternoon link was sent randomly during the window between 1 p.m. and 4 p.m., and the second afternoon link randomly during a window between 4 p.m. and 7 p.m. The gap between surveys was always at least 90 min. Participants had 90 min until the next survey to respond or their responses were recorded as missing. Feelings of belonging were assessed only at the end-of-day time point.

Measures

Several standard psychosocial surveys were administered at the beginning and end of each term. This article focuses on depressive symptoms, sense of social fit, and EMA-assessed feelings of belonging (for a full list of measures assessed, see the Supplemental Material available online).

Demographics. At baseline, we assessed demographics such as gender, race, and age (for demographic information for each study, see Table 1).

Feelings of belonging. Feelings of belonging were assessed in end-of-day EMAs. The feelings-of-belonging question ("Today, I feel like I belong at [school name]") was answered on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*); higher scores reflect greater feelings of belonging. Scores were averaged across each day for each of the 3 EMA weeks. To ensure data quality, we included in the analysis for a given week only those participants with at least three feelings-of-belonging responses in that week. With this threshold, we maintained at least 90% of participants every week.

Depressive symptoms. The CES-D was used to assess depressive symptoms (Radloff, 1977). This 20-item scale (αs > .879 for all studies) asked participants to report on their depressive symptoms over the past week (e.g., "I felt that everything I did was an effort"). Items were answered on a scale ranging from 0 (*rarely*) to 3 (*most or all of the time*) and summed to create a total CES-D score (range = 0–60); higher scores indicate greater depressive symptoms. Summary statistics for baseline and end-of-term CES-D scores for participants in all studies can be found in Table 1.

Sense of social fit. The Sense of Social and Academic Fit Scale (SAFS) was used to assess student perceptions of their overall social and academic fit at their university (Walton & Cohen, 2007). The SAFS scale (αs > .905 for all studies) includes 17 items that ask participants to report on their social and academic fit at their university (e.g., "I fit in well at [school name]," "People at [school name] like me," and "I am similar to the kind of people who succeed at [school name]"). Items were answered on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) and averaged to create a total SAFS score (range = 1–7); a higher score indicates greater social and academic fit. Summary statistics for baseline and end-of-term SAFS scores for participants in all studies can be found in Table 1.

Loneliness. Loneliness was assessed in all four EMAs for each day of EMA data collection. The loneliness question ("How lonely do you feel right now") was answered on a scale ranging from 0 (*not at all*) to 4 (*extremely*); higher scores reflect greater feelings of loneliness. Scores were averaged across all time points for each day for each of the 3 EMA weeks. To ensure data quality, we included in the analysis for a given week only those participants with at least three loneliness responses in that week. With this threshold, we maintained at least 90% of participants every week.

Social interactions. Number of social interactions was assessed in all four EMAs for each day of EMA data collection in the exploratory study and Confirmatory Study 2. Participants answered the question ("Since the last survey, how many social interactions have you had? An interaction is talking to someone or a group of people face-to-face, by phone or online for at least 3 minutes.") using ranges listed as answer options ("0," "1–2," "3–5," "6–10," "11–20," "21+"); higher numbers reflect a larger number of social interactions. Scores were averaged across

each day for each of the 3 EMA weeks. To ensure data quality, we included in the analysis for a given week only those participants with at least three social-interaction responses in that week. With this threshold, we maintained at least 90% of participants every week.

Statistical approach

The exploratory study was used to discover patterns between different EMA items and depressive symptoms. On the basis of results from the initial exploratory study, we preregistered hypotheses for two confirmatory studies: Confirmatory Study 1 and Confirmatory Study 2. Because Confirmatory Study 2 was assessed over two terms, the winter and spring terms were analyzed separately using different baseline and end-of-term measures for each term.

Preliminary results assessed whether CES-D and SAFS scores changed over the course of the academic term using paired-samples *t* tests. We used ordinary least squares regression models to assess whether average feelings of belonging from different weeks during an academic term were a significant predictor of end-of-term depressive symptomatology. First, we included baseline CES-D scores and average feelings of belonging in a given week as predictors of postterm CES-D scores. Then we added baseline SAFS scores as an additional covariate to determine the effects of EMA feelings of belonging over and above the effects of a global sense of fit measure. Sensitivity analyses investigated whether feelings of belonging predicted end-of-term depressive symptomatology after controlling for two other social factors: loneliness and number of social interactions. Further, an additional sensitivity analysis included all covariates in one model such that baseline CES-D scores, baseline SAFS scores, average feelings of belonging, average feelings of loneliness, and average number of social interactions predicted end-of-term depressive symptoms.

Some data cleaning was performed in *Python* (Version 3.8; Van Rossum & Drake, 1995), including aggregation of daily EMA variables into weekly variables and excluding participants with insufficient data. Analyses were conducted in the R programming environment (Version 4.0.1; R Core Team, 2020) using the *tidyverse* (Version 1.3; Wickham et al., 2019) and *sjPlot* (Version 2.4.0; Lüdecke, 2018) packages.

Results

Preliminary analyses

Consistent with the expectation that depressive symptomatology rises over the course of a college term (Shim et al., 2019), depressive symptoms (CES-D scores) increased from the beginning to the end of the term in the exploratory study, $t(120) = -6.13$, $p < .001$, Cohen's $d = -0.55$, 95% confidence interval (CI) = [−0.73, −0.26], as well as in both Confirmatory Study 1, $t(156) = -6.74$, $p < .001$, and the Confirmatory Study 2 spring term, $t(171) = -2.62$, $p = .010$, Cohen's $d = -0.55$, 95% CI = [−0.72, −0.38]. This same increase in depressive symptoms over the term was not observed in the Confirmatory Study 2 winter term, $t(187) = -1.26$, $p = .210$, Cohen's $d = -0.18$, 95% CI = [−0.32, −0.04], although in this sample, there was a significant increase in depressive symptomatology from the beginning of the winter term to the end of the spring term (i.e., combining two consecutive terms), $t(172) = -3.38$, $p < .001$, Cohen's $d = -0.24$, 95% CI = [−0.38, −0.10]. In the exploratory study and both terms of Confirmatory Study 2, average end-of-term CES-D scores were greater than 16, indicating risk for major depressive disorder (Lewinsohn et al., 1997). Average CES-D scores in Confirmatory Study 1 neared this threshold.

SAFS scores decreased from the beginning of the term to the end of the term in the exploratory study, $t(121) = 3.68$, $p < .001$, Cohen's $d = 0.27$, 95% CI = [0.12, 0.42], as well as in both Confirmatory Study 1, $t(156) = 3.32$, $p = .001$, Cohen's $d = 0.20$, 95% CI = [0.08, 0.32], and the Confirmatory Study 2 winter term, $t(188) = 3.04$, $p = .003$, Cohen's $d = 0.16$, 95% CI = [0.05, 0.26]. This same decrease in social fit over the term was not observed in the Confirmatory Study 2 spring term, $t(171) = -1.79$, $p = .075$, Cohen's $d = -0.08$, 95% CI = [−0.17, 0.01], and was also not observed from the beginning of the winter term to the end of the spring term (i.e., combining two consecutive terms), $t(173) = 1.34$, $p = .183$, Cohen's $d = 0.09$, 95% CI = [−0.04, 0.21].

EMA feelings of belonging were evaluated over time using analyses of variance with weekly averages as repeated measures (see Fig. 1). In the exploratory study, feelings of belonging decreased over time, $F(2, 303) = 16.57$, $p < .001$, $\eta_p^2 = .10$, 90% CI = [.05, .10]. Similar results were found in Confirmatory Study 1, $F(2, 493) = 21.62$, $p < .001$, $\eta_p^2 = .08$, 90% CI = [.04, .12], and the winter term of Confirmatory Study 2, $F(1, 167) = 25.91$, $p < .001$, $\eta_p^2 = .13$, 90% CI = [.06, .22]. However, decreases in feelings of belonging were not observed in the Confirmatory Study 2 spring term.

SAFS scores were generally correlated with EMA feelings of belonging across time points and studies (for correlations among all variables in the present studies, see the Supplemental Material). In the exploratory study, baseline SAFS scores were correlated with weekly measures of feelings of belonging (*r*s = .46–.71, all *p*s < .001), and end-of-term SAFS scores were correlated with weekly measures of feelings of

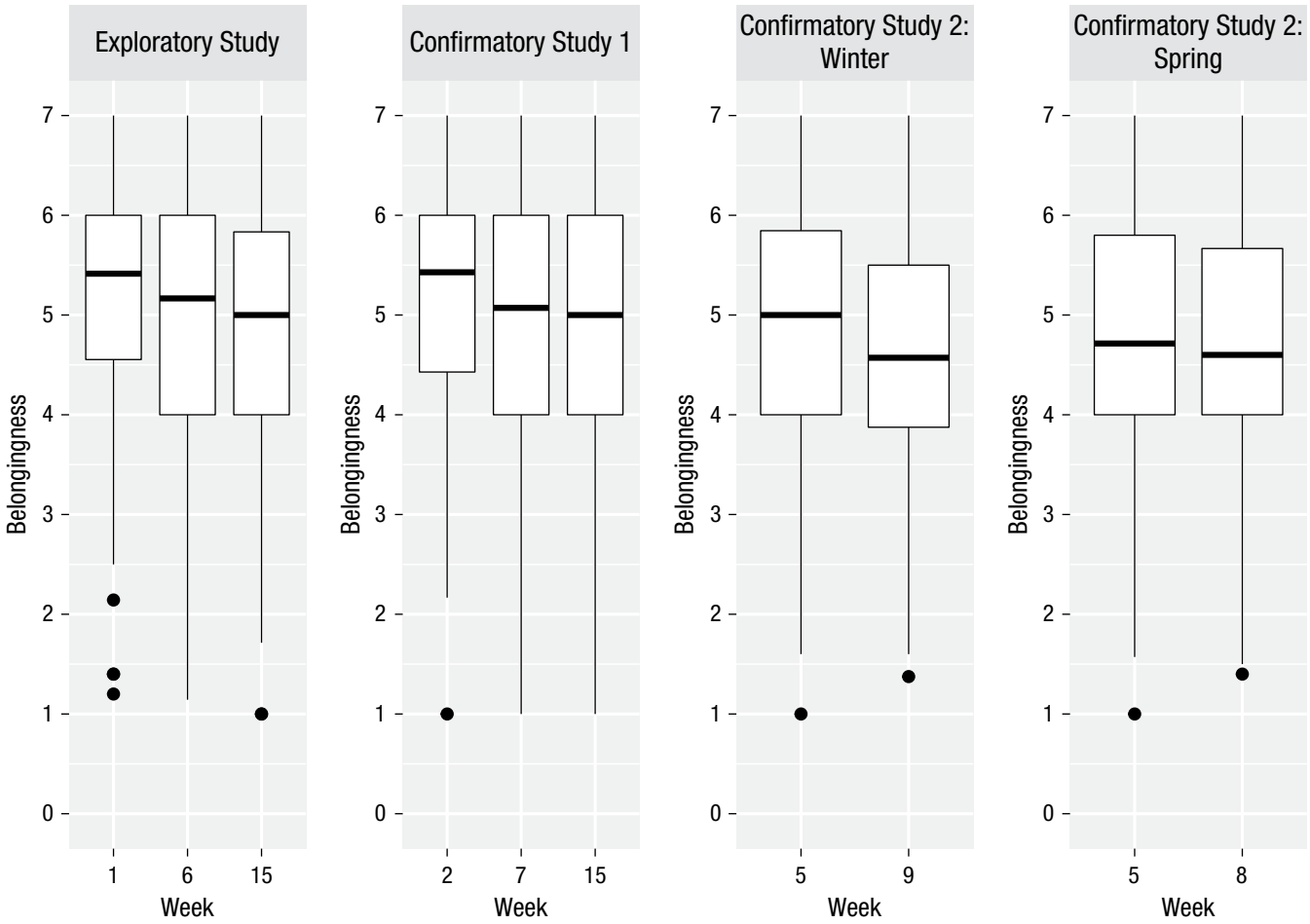

Fig. 1. Feelings of belonging in each week and term of the three studies. Belongingness was measured by ecological momentary assessment. Each box indicates the interquartile range (IQR) of the data, the horizontal line indicates the mean, and the whiskers extend 1.5 times the IQR. Dots represent outliers.

belonging as well (*r*s = .68–.78, all *p*s < .001). In Confirmatory Study 1, baseline SAFS scores were correlated with weekly measures of feelings of belonging (*r*s = .60–.65, all *p*s < .001), and end-of-term SAFS scores were correlated with weekly measures of feelings of belonging as well (*r*s = .66–.69, all *p*s < .001). In the Confirmatory Study 2 winter quarter, baseline SAFS scores were correlated with weekly measures of feelings of belonging (*r*s = .53–.56, all *p*s < .001), and end-of-term SAFS scores were correlated with weekly measures of feelings of belonging as well (*r*s = .67–.68, all *p*s < .001). In the Confirmatory Study 2 spring quarter, baseline SAFS scores were correlated with weekly measures of feelings of belonging (*r*s = .68–.69, all *p*s < .001), and end-of-term SAFS scores were correlated with weekly measures of feelings of belonging as well (*r*s = .68–.73, all *p*s < .001). This suggests that sense of social fit is significantly correlated with EMA measures of feelings of belonging, but these measures do not demonstrate a perfect overlap and, rather, are separate constructs.

Primary analysis: early-term feelings of belonging predict depressive symptoms

Exploratory results. In the exploratory study, initial analyses showed that lower levels of daily belonging at the beginning, middle, or end of the term predicted higher end-of-term depressive symptomatology, controlling for baseline depressive symptoms (see Table 2). We found that feelings of belonging early in the term (Week 1: $\beta = -0.36$, $p < .001$), midway through the term (Week 6: $\beta = -0.37$, $p < .001$), and at the end of the term (Week 15: $\beta = -0.41$, $p < .001$) predicted end-of-term depressive symptoms. These effects persisted even after we controlled for a sense of social fit (see Table 3), suggesting that it is the daily perception of belonging at the institution (as

Table 2. Results of Linear Regression Models Predicting End-of-Term Depressive Symptoms From Average Belongingness in Each Week in Each Study, Controlling for Baseline Depressive Symptoms

Predictor	*b*	β	95% CI (*b*)	95% CI (β)	*p*
Exploratory study: Week 1 (observations = 152, R^2 = .347, adjusted R^2 = .338)					
Intercept	30.239	0.000	[22.434, 38.044]	[–0.130, 0.130]	< .001
Belongingness	–3.155	–0.360	[–4.417, –1.893]	[–0.503, –0.216]	< .001
Baseline CES-D	0.367	0.340	[0.212, 0.522]	[0.196, 0.484]	< .001
Exploratory study: Week 6 (observations = 151, R^2 = .372, adjusted R^2 = .364)					
Intercept	27.782	–0.000	[21.223, 34.341]	[–0.128, 0.128]	< .001
Belongingness	–2.940	–0.372	[–4.031, –1.848]	[–0.510, –0.234]	< .001
Baseline CES-D	0.393	0.367	[0.245, 0.541]	[0.229, 0.505]	< .001
Exploratory study: Week 15 (observations = 148, R^2 = .355, adjusted R^2 = .346)					
Intercept	29.469	–0.000	[23.285, 35.653]	[–0.131, 0.131]	< .001
Belongingness	–3.241	–0.414	[–4.313, –2.169]	[–0.552, –0.277]	< .001
Baseline CES-D	0.356	0.329	[0.207, 0.504]	[0.192, 0.466]	< .001
Confirmatory Study 1: Week 2 (observations = 118, R^2 = .336, adjusted R^2 = .324)					
Intercept	21.757	0.000	[13.948, 29.567]	[–0.150, 0.150]	< .001
Belongingness	–2.227	–0.287	[–3.505, –0.949]	[–0.452, –0.122]	.001
Baseline CES-D	0.468	0.400	[0.275, 0.660]	[0.235, 0.565]	< .001
Confirmatory Study 1: Week 7 (observations = 120, R^2 = .389, adjusted R^2 = .379)					
Intercept	18.766	0.000	[12.045, 25.487]	[–0.142, 0.142]	< .001
Belongingness	–1.976	–0.275	[–3.104, –0.848]	[–0.431, –0.118]	.001
Baseline CES-D	0.571	0.459	[0.376, 0.766]	[0.302, 0.616]	< .001
Confirmatory Study 1: Week 15 (observations = 118, R^2 = .397, adjusted R^2 = .386)					
Intercept	19.287	–0.000	[12.317, 26.257]	[–0.143, 0.143]	< .001
Belongingness	–2.074	–0.280	[–3.249, –0.900]	[–0.438, –0.121]	.001
Baseline CES-D	0.565	0.459	[0.370, 0.760]	[0.300, 0.617]	< .001
Confirmatory Study 2: Winter Week 5 (observations = 171, R^2 = .348, adjusted R^2 = .340)					
Intercept	16.674	–0.000	[9.813, 23.535]	[–0.123, 0.123]	< .001
Belongingness	–1.927	–0.216	[–3.086, –0.768]	[–0.346, –0.086]	.001
Baseline CES-D	0.560	0.484	[0.410, 0.710]	[0.354, 0.614]	< .001
Confirmatory Study 2: Winter Week 9 (observations = 169, R^2 = .376, adjusted R^2 = .369)					
Intercept	21.003	–0.000	[14.147, 27.860]	[–0.121, 0.121]	< .001
Belongingness	–2.854	–0.303	[–4.069, –1.640]	[–0.432, –0.174]	< .001
Baseline CES-D	0.517	0.438	[0.365, 0.669]	[0.309, 0.567]	< .001
Confirmatory Study 2: Spring Week 5 (observations = 165, R^2 = .367, adjusted R^2 = .359)					
Intercept	15.201	–0.000	[8.667, 21.735]	[–0.123, 0.123]	< .001
Belongingness	–1.139	–0.143	[–2.242, –0.036]	[–0.281, –0.005]	.043
Baseline CES-D	0.507	0.528	[0.374, 0.640]	[0.390, 0.666]	< .001
Confirmatory Study 2: Spring Week 8 (observations = 157, R^2 = .408, adjusted R^2 = .401)					
Intercept	20.168	0.000	[13.330, 27.005]	[–0.122, 0.122]	< .001
Belongingness	–2.093	–0.243	[–3.272, –0.914]	[–0.380, –0.106]	.001
Baseline CES-D	0.478	0.493	[0.345, 0.611]	[0.356, 0.629]	< .001

Note: Depressive symptoms were assessed using the Center for Epidemiological Studies-Depression (CES-D) scale. CI = confidence interval.

Table 3. Results of Linear Regression Models Predicting End-of-Term Depressive Symptoms From Average Belongingness in Each Week in Each Study, Controlling for Baseline Depressive Symptoms and Sense of Social Fit

Predictor	*b*	β	95% CI (*b*)	95% CI (β)	*p*
Exploratory study: Week 1 (observations = 151, R^2 = .361, adjusted R^2 = .348)					
Intercept	34.170	−0.000	[24.250, 44.091]	[−0.130, 0.130]	< .001
Belongingness	−2.814	−0.325	[−4.463, −1.166]	[−0.515, −0.134]	.001
Baseline CES-D	0.335	0.314	[0.180, 0.490]	[0.169, 0.460]	< .001
Baseline SAFS	−0.064	−0.088	[−0.200, 0.072]	[−0.276, 0.100]	.355
Exploratory study: Week 6 (observations = 150, R^2 = .416, adjusted R^2 = .404)					
Intercept	38.405	0.000	[28.631, 48.180]	[−0.125, 0.125]	< .001
Belongingness	−2.642	−0.336	[−3.798, −1.485]	[−0.483, −0.189]	< .001
Baseline CES-D	0.319	0.301	[0.171, 0.467]	[0.162, 0.441]	< .001
Baseline SAFS	−0.133	−0.182	[−0.241, −0.024]	[−0.330, −0.033]	.017
Exploratory study: Week 15 (observations = 147, R^2 = .392, adjusted R^2 = .379)					
Intercept	37.900	0.000	[28.277, 47.524]	[−0.128, 0.128]	< .001
Belongingness	−3.066	−0.395	[−4.205, −1.927]	[−0.542, −0.248]	< .001
Baseline CES-D	0.289	0.271	[0.139, 0.439]	[0.130, 0.411]	< .001
Baseline SAFS	−0.101	−0.142	[−0.208, 0.007]	[−0.294, 0.010]	.066
Confirmatory Study 1: Week 2 (observations = 118, R^2 = .339, adjusted R^2 = .322)					
Intercept	18.413	0.000	[7.087, 29.739]	[−0.150, 0.150]	.002
Belongingness	−2.541	−0.328	[−4.035, −1.048]	[−0.520, −0.135]	.001
Baseline CES-D	0.484	0.414	[0.287, 0.682]	[0.245, 0.583]	< .001
Baseline SAFS	0.055	0.078	[−0.080, 0.190]	[−0.113, 0.269]	.420
Confirmatory Study 1: Week 7 (observations = 120, R^2 = .394, adjusted R^2 = .379)					
Intercept	22.232	0.000	[12.618, 31.847]	[−0.143, 0.143]	< .001
Belongingness	−1.568	−0.218	[−2.957, −0.179]	[−0.411, −0.025]	.027
Baseline CES-D	0.535	0.430	[0.327, 0.742]	[0.263, 0.597]	< .001
Baseline SAFS	−0.059	−0.103	[−0.175, 0.058]	[−0.307, 0.101]	.320
Confirmatory Study 1: Week 15 (observations = 118, R^2 = .407, adjusted R^2 = .392)					
Intercept	24.318	−0.000	[14.488, 34.147]	[−0.142, 0.142]	< .001
Belongingness	−1.579	−0.213	[−2.934, −0.224]	[−0.395, −0.030]	.023
Baseline CES-D	0.512	0.415	[0.304, 0.719]	[0.247, 0.584]	< .001
Baseline SAFS	−0.080	−0.139	[−0.190, 0.031]	[−0.332, 0.053]	.155
Confirmatory Study 2: Winter Week 5 (observations = 171, R^2 = .349, adjusted R^2 = .337)					
Intercept	18.760	−0.000	[7.999, 29.521]	[−0.123, 0.123]	.001
Belongingness	−1.764	−0.198	[−3.094, −0.434]	[−0.347, −0.049]	.010
Baseline CES-D	0.546	0.472	[0.386, 0.707]	[0.333, 0.610]	< .001
Baseline SAFS	−0.032	−0.040	[−0.161, 0.096]	[−0.197, 0.118]	.619
Confirmatory Study 2: Winter Week 9 (observations = 169, R^2 = .376, adjusted R^2 = .365)					
Intercept	21.243	−0.000	[10.641, 31.846]	[−0.121, 0.121]	< .001
Belongingness	−2.836	−0.301	[−4.200, −1.472]	[−0.446, −0.156]	< .001
Baseline CES-D	0.515	0.437	[0.354, 0.677]	[0.300, 0.574]	< .001
Baseline SAFS	−0.004	−0.005	[−0.126, 0.119]	[−0.156, 0.147]	.953

(continued)

Table 3. *(continued)*

Predictor	*b*	β	95% CI (*b*)	95% CI (β)	*p*
Confirmatory Study 2: Spring Week 5 (observations = 164, R^2 = .367, adjusted R^2 = .356)					
Intercept	16.319	0.000	[6.881, 25.757]	[−0.124, 0.124]	.001
Belongingness	−1.034	−0.130	[−2.407, 0.338]	[−0.302, 0.042]	.139
Baseline CES-D	0.498	0.519	[0.356, 0.641]	[0.371, 0.667]	< .001
Baseline SAFS	−0.018	−0.027	[−0.141, 0.105]	[−0.208, 0.154]	.770
Confirmatory Study 2: Spring Week 8 (observations = 156, R^2 = .415, adjusted R^2 = .404)					
Intercept	15.807	−0.000	[6.291, 25.324]	[−0.122, 0.122]	.001
Belongingness	−2.722	−0.316	[−4.199, −1.245]	[−0.487, −0.144]	< .001
Baseline CES-D	0.509	0.524	[0.367, 0.650]	[0.379, 0.670]	< .001
Baseline SAFS	0.085	0.124	[−0.039, 0.210]	[−0.057, 0.305]	.177

Note: Depressive symptoms were assessed using the Center for Epidemiological Studies-Depression (CES-D) scale. Sense of social fit was assessed using the Sense of Social and Academic Fit Scale (SAFS). CI = confidence interval.

opposed to a general sense of social fit) that is a critical risk factor for depressive symptomatology. Of note, even feelings of belonging early in the term predicted end-of-term depressive symptoms (approximately 4 months later). We preregistered these hypotheses to test them in Confirmatory Study 1 and Confirmatory Study 2.

Confirmatory results. We then examined whether average feelings of belonging during EMA weeks in the term predicted postterm depressive symptoms in Confirmatory Study 1 and Confirmatory Study 2, controlling for baseline depressive symptoms. As predicted, in Confirmatory Study 1, we found that feelings of belonging early in the term (Week 2: β = −0.28, $p < .001$), midway through the term (Week 7: β = −0.27, $p < .001$), and at the end of the term (Week 15: β = −0.28, $p < .001$) predicted end-of-term depressive symptoms (see Table 2 and Fig. 2). Results also held when baseline SAFS score was added as a covariate (see Table 3).

Confirmatory Study 2 was split into two academic terms: winter and spring. As predicted, in the winter term, analyses revealed that feelings of belonging predicted depressive symptoms midway through the term (Week 5: β = −0.22, $p = .001$) and at the end of the term (Week 9: β = −0.30, $p < .001$), controlling for baseline depressive symptoms. In the spring term, feelings of belonging midway through the term (Week 5: β = −0.14, $p = .043$) and at the end of the term (Week 9: β = −0.24, $p < .001$) were also predictive of end-of-term depressive symptoms. Moreover, average feelings of belonging continued to predict end-of-term depressive symptoms when models controlled for baseline sense of social fit in addition to baseline depressive symptoms in 3 of the 4 weeks in Confirmatory Study 2 (see Table 3 and Fig. 2). Feelings of belonging did not significantly predict end-of-term depressive symptoms when models controlled for sense of social fit in Week 5 of the spring quarter. Figure 2 depicts the relationship between feelings of belonging in the early-term week of data (chosen at random for display purposes) from each study in an unadjusted model.

Controlling for other daily social experiences. As a further exploratory test (hypotheses were not preregistered), we examined whether the effects of feelings of belonging on end-of-term depressive symptoms would hold when models controlled for EMA measures of loneliness and number of self-reported social interactions. Indeed, in the exploratory study, feelings of belonging remained a significant predictor of end-of-term depressive symptoms across all 3 weeks (all ps < .014) when average feelings of loneliness were included in the model (see Table 4). This pattern of results was shown again in Confirmatory Study 1 across all 3 weeks (all ps < .013), both weeks in the Confirmatory Study 2 winter term (ps < .005), and the end-of-term week in the Confirmatory Study 2 spring term ($p = .006$). In the Confirmatory Study 2 spring term, feelings of belonging at midterm were not a significant predictor of end-of-term depressive symptoms (β = −0.09, $p = .189$) when models controlled for average feelings of loneliness. Note, however, that loneliness itself was also a significant predictor of end-of-term depressive symptoms in many (but not all—see Confirmatory Study 1, all 3 weeks) of the weeks across studies.

Exploring the effect of feelings of belonging on end-of-term depressive symptoms when controlling for

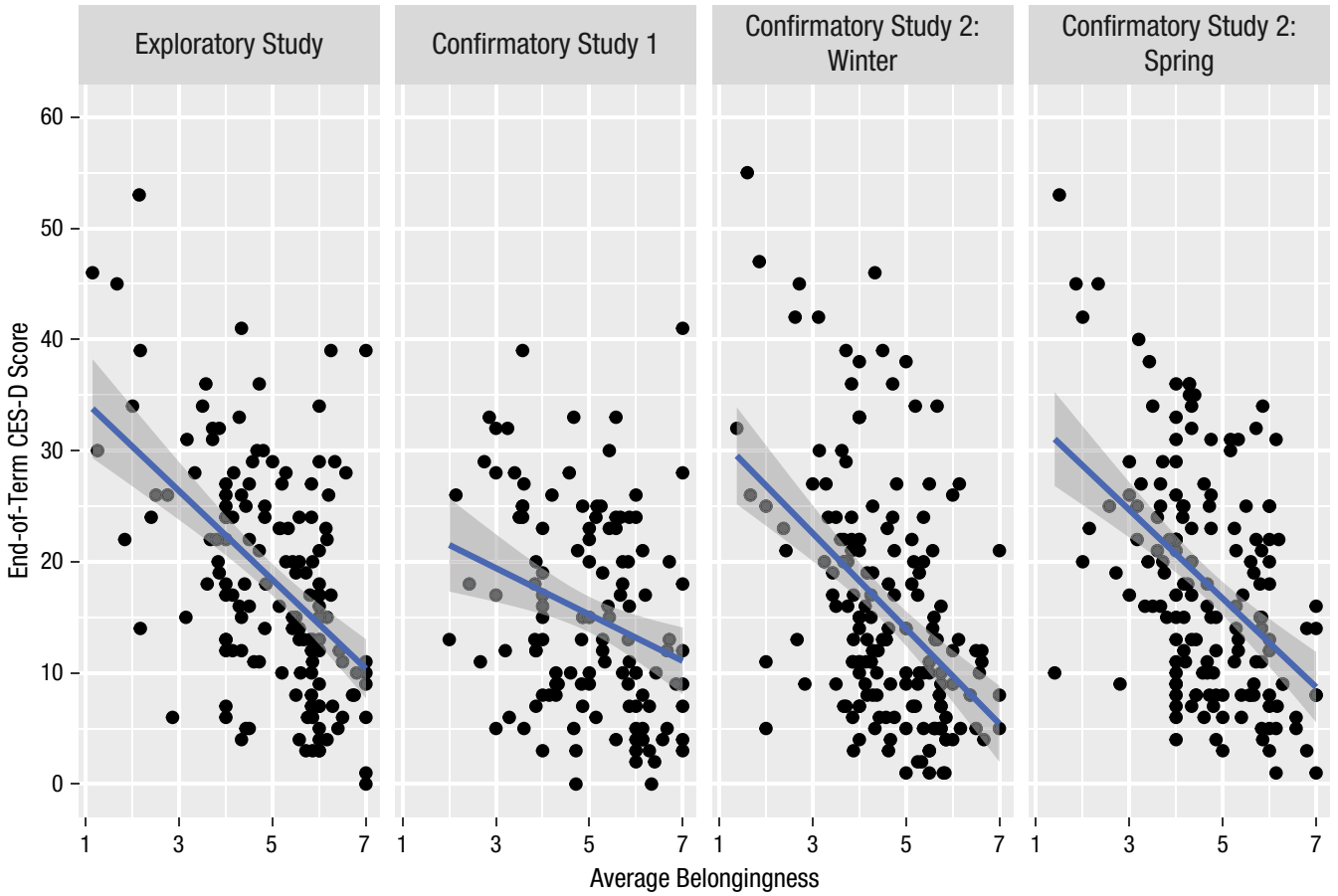

Fig. 2. Scatterplots displaying the association between average feelings-of-belonging scores early in the term and end-of-term depressive symptoms scores (assessed on the Center for Epidemiological Studies-Depression [CES-D] scale), separately for each study and term. Slopes are regression lines from unadjusted models. Error bands show 95% confidence intervals. The early-term time point for feelings-of-belonging scores was chosen at random for display purposes.

social-interaction frequency followed much of the same pattern. In the exploratory study, feelings of belonging remained a significant predictor of end-of-term depressive symptoms across all 3 weeks (all *p*s < .001) when average number of social interactions was included in the model (see Table 5). This pattern of results was shown again in both weeks in the Confirmatory Study 2 winter term (*p*s < .004) and the end-of-term week in the Confirmatory Study 2 spring term ($p < .001$). In the Confirmatory Study 2 spring term, feelings of belonging at midterm were a marginal predictor of end-of-term depressive symptoms ($\beta = -0.14$, $p = .056$), but the pattern was consistent across all studies, generally. Of note, average number of social interactions was not a significant predictor of end-of-term depressive symptoms across most of the weeks in all studies.

Finally, we ran a model in each study that included all covariates: baseline depressive symptoms, baseline social and academic fit, EMA loneliness, and EMA social interactions (see Table 6). In the exploratory study, feelings of belonging remained a significant predictor of end-of-term depressive symptoms across all 3 weeks (all *p*s < .009). This pattern of results held for Confirmatory Study 1 in early and midterm weeks (*p*s < .046) and was marginal for the end-of-term week ($p = .069$). Similarly, feelings of belonging were a significant predictor of end-of-term depressive symptoms across 3 of the 4 weeks in Confirmatory Study 2 (*p*s < .026), other than midterm of the spring term ($p = .327$). These results followed those of the simplified models above; midterm week in the spring term was the weakest predictor of end-of-term depressive symptoms.

Discussion

Across three separate studies, we found that lower feelings of belonging served as a significant predictor of greater postterm depressive symptoms in first-year

Table 4. Results of Linear Regression Models Predicting End-of-Term Depressive Symptoms From Average Belongingness in Each Week in Each Study, Controlling for Baseline Depressive Symptoms and Average Loneliness in Each Week

Predictor	*b*	β	95% CI (*b*)	95% CI (β)	*p*
Exploratory study: Week 1 (observations = 152, R^2 = .382, adjusted R^2 = .370)					
Intercept	25.449	0.000	[17.164, 33.734]	[−0.127, 0.127]	< .001
Belongingness	−2.522	−0.287	[−3.827, −1.217]	[−0.436, −0.139]	< .001
Baseline CES-D	0.321	0.298	[0.167, 0.476]	[0.155, 0.441]	< .001
Loneliness	3.988	0.212	[1.275, 6.700]	[0.068, 0.356]	.004
Exploratory study: Week 6 (observations = 151, R^2 = .398, adjusted R^2 = .385)					
Intercept	23.768	−0.000	[16.573, 30.964]	[−0.126, 0.126]	< .001
Belongingness	−2.408	−0.305	[−3.561, −1.255]	[−0.451, −0.159]	< .001
Baseline CES-D	0.339	0.317	[0.188, 0.491]	[0.175, 0.458]	< .001
Loneliness	2.960	0.186	[0.605, 5.316]	[0.038, 0.335]	.014
Exploratory study: Week 15 (observations = 148, R^2 = .403, adjusted R^2 = .391)					
Intercept	23.464	−0.000	[16.565, 30.363]	[−0.127, 0.127]	< .001
Belongingness	−2.489	−0.318	[−3.611, −1.368]	[−0.462, −0.175]	< .001
Baseline CES-D	0.311	0.287	[0.165, 0.456]	[0.153, 0.422]	< .001
Loneliness	3.582	0.249	[1.517, 5.648]	[0.105, 0.392]	.001
Confirmatory Study 1: Week 2 (observations = 118, R^2 = .340, adjusted R^2 = .323)					
Intercept	22.249	0.000	[14.348, 30.149]	[−0.150, 0.150]	< .001
Belongingness	−1.960	−0.253	[−3.380, −0.540]	[−0.436, −0.070]	.007
Baseline CES-D	0.453	0.387	[0.257, 0.649]	[0.219, 0.555]	< .001
Loneliness	−0.932	−0.077	[−3.083, 1.218]	[−0.256, 0.101]	.392
Confirmatory Study 1: Week 7 (observations = 120, R^2 = .393, adjusted R^2 = .377)					
Intercept	19.450	0.000	[12.509, 26.391]	[−0.143, 0.143]	< .001
Belongingness	−1.788	−0.249	[−3.010, −0.567]	[−0.418, −0.079]	.004
Baseline CES-D	0.561	0.451	[0.364, 0.757]	[0.293, 0.609]	< .001
Loneliness	−0.862	−0.065	[−2.991, 1.268]	[−0.227, 0.096]	.425
Confirmatory Study 1: Week 15 (observations = 118, R^2 = .413, adjusted R^2 = .398)					
Intercept	20.757	−0.000	[13.659, 27.856]	[−0.142, 0.142]	< .001
Belongingness	−1.620	−0.218	[−2.890, −0.351]	[−0.389, −0.047]	.013
Baseline CES-D	0.543	0.441	[0.348, 0.738]	[0.283, 0.599]	< .001
Loneliness	−2.056	−0.146	[−4.350, 0.238]	[−0.308, 0.017]	.079
Confirmatory Study 2: Winter Week 5 (observations = 171, R^2 = .376, adjusted R^2 = .365)					
Intercept	14.969	−0.000	[8.131, 21.807]	[−0.120, 0.120]	< .001
Belongingness	−1.653	−0.185	[−2.806, −0.500]	[−0.315, −0.056]	.005
Baseline CES-D	0.462	0.399	[0.299, 0.625]	[0.258, 0.540]	< .001
Loneliness	3.418	0.196	[0.980, 5.855]	[0.056, 0.336]	.006
Confirmatory Study 2: Winter Week 9 (observations = 169, R^2 = .410, adjusted R^2 = .399)					
Intercept	17.873	−0.000	[10.886, 24.860]	[−0.118, 0.118]	< .001
Belongingness	−2.330	−0.248	[−3.562, −1.097]	[−0.379, −0.117]	< .001
Baseline CES-D	0.421	0.357	[0.260, 0.582]	[0.220, 0.493]	< .001
Loneliness	3.295	0.216	[1.173, 5.417]	[0.077, 0.355]	.003

(continued)

Table 4. *(continued)*

Predictor	*b*	β	95% CI (*b*)	95% CI (β)	*p*
Confirmatory Study 2: Spring Week 5 (observations = 165, R^2 = .438, adjusted R^2 = .428)					
Intercept	11.742	−0.000	[5.383, 18.102]	[−0.116, 0.116]	< .001
Belongingness	−0.708	−0.089	[−1.768, 0.351]	[−0.222, 0.044]	.189
Baseline CES-D	0.414	0.431	[0.282, 0.546]	[0.293, 0.568]	< .001
Loneliness	4.212	0.297	[2.367, 6.057]	[0.167, 0.427]	< .001
Confirmatory Study 2: Spring Week 8 (observations = 157, R^2 = .477, adjusted R^2 = .467)					
Intercept	16.065	0.000	[9.372, 22.759]	[−0.115, 0.115]	< .001
Belongingness	−1.589	−0.184	[−2.722, −0.455]	[−0.316, −0.053]	.006
Baseline CES-D	0.398	0.410	[0.268, 0.528]	[0.276, 0.544]	< .001
Loneliness	3.936	0.289	[2.209, 5.663]	[0.162, 0.416]	< .001

Note: Depressive symptoms were assessed using the Center for Epidemiological Studies-Depression (CES-D) scale. CI = confidence interval.

undergraduate students after controlling for baseline depressive symptomatology. In particular, lower feelings of belonging predicted higher end-of-term depression up to 4 months in advance. Importantly, these results demonstrate a robust relationship between depressive symptoms and feelings of belonging across different weeks of the term and different universities. Moreover, these results held when models controlled for general feelings of social and academic fit at the beginning of the term, suggesting that these daily feelings of belonging provide an important signal for changes in depressive symptomatology over and above the effect of a general sense of fit at college. This could have important implications for interventions to mitigate depressive symptoms in first-year university students because early detection of risk can allow for both earlier intervention and more proactive preventative strategies.

Whereas great work has established the importance of social factors in depression, our findings highlight how much feelings of belonging in particular are related to long-term depressive symptoms. Specifically, lower feelings of belonging across days in a week early in the academic term were predictive of higher end-of-term depressive symptoms, months later. Moreover, these findings hold when models controlled for loneliness and social interactions, suggesting that feelings of belonging are an important predictor of mental health over and above other social experiences. Whereas much of the scientific literature has found that perceptions of loneliness or the loss of relationships are leading social factors for mental health risk (Barnett & Gotlib, 1988; Coyne & Downey, 1991; Matthews et al., 2016; Monroe et al., 1999; Russell et al., 1984), we show here that daily perceptions of belonging independently and robustly predict depressive symptomatology. Critically, much of the literature on risk for depression identifies social experiences, but little focuses on the relative value of feelings of belonging. Work in this area has been primarily cross-sectional in nature (Hagerty & Williams, 1999; Parr et al., 2020) or not focused on depressive symptoms (Gopalan & Brady, 2020), and the work described here demonstrates the temporal predictive power of assessing feelings of belonging. Additionally, the results presented here emphasize that feelings of belonging are a unique predictor of depressive symptoms. Whereas loneliness additionally predicted depressive symptoms at the end of the term, an objective measure of social interaction (frequency of social interactions) did not, suggesting that subjective social experiences are stronger predictors of depression. Identifying that feelings of belonging assessed throughout the academic term were a unique predictor of depressive symptoms above and beyond loneliness has implications for both early diagnosis and intervention. Furthermore, we cannot demonstrate a causal direction of effects with these analyses (for baseline depression scores predicting EMA-measured feelings of belonging, see Table S7 in the Supplemental Material). Thus, interventions that focus on either feelings of belonging or depression could be improved with elements of treatment for the other factor. For example, an intervention designed to help this population with their depressive symptoms could integrate greater emphasis on finding sources of belonging, a component missing from most depression treatments.

Although the results were replicated across multiple time points in the academic term in multiple data sets

Table 5. Results of Linear Regression Models Predicting End-of-Term Depressive Symptoms From Average Belongingness in Each Week in Each Study, Controlling for Baseline Depressive Symptoms and Average Number of Social Interactions

Predictor	*b*	β	95% CI (*b*)	95% CI (β)	*p*
Exploratory study: Week 1 (observations = 152, R^2 = .348, adjusted R^2 = .335)					
Intercept	29.389	0.000	[21.034, 37.745]	[−0.131, 0.131]	< .001
Belongingness	−3.217	−0.367	[−4.500, −1.934]	[−0.513, −0.220]	< .001
Baseline CES-D	0.372	0.345	[0.215, 0.528]	[0.200, 0.490]	< .001
Social interactions	0.568	0.039	[−1.394, 2.529]	[−0.096, 0.175]	.568
Exploratory study: Week 6 (observations = 151, R^2 = .373, adjusted R^2 = .360)					
Intercept	27.095	−0.000	[19.378, 34.812]	[−0.129, 0.129]	< .001
Belongingness	−2.942	−0.372	[−4.037, −1.847]	[−0.511, −0.234]	< .001
Baseline CES-D	0.396	0.370	[0.247, 0.545]	[0.230, 0.509]	< .001
Social interactions	0.352	0.022	[−1.713, 2.417]	[−0.108, 0.152]	.737
Exploratory study: Week 15 (observations = 148, R^2 = .355, adjusted R^2 = .341)					
Intercept	29.198	−0.000	[21.980, 36.416]	[−0.132, 0.132]	< .001
Belongingness	−3.249	−0.415	[−4.331, −2.167]	[−0.554, −0.277]	< .001
Baseline CES-D	0.357	0.330	[0.207, 0.506]	[0.192, 0.468]	< .001
Social interactions	0.156	0.010	[−1.970, 2.283]	[−0.124, 0.144]	.885
Confirmatory Study 2: Winter Week 5 (observations = 171, R^2 = .351, adjusted R^2 = .340)					
Intercept	18.514	−0.000	[10.668, 26.359]	[−0.123, 0.123]	< .001
Belongingness	−1.773	−0.199	[−2.975, −0.571]	[−0.334, −0.064]	.004
Baseline CES-D	0.562	0.485	[0.411, 0.712]	[0.355, 0.615]	< .001
Social interactions	−0.988	−0.062	[−3.029, 1.054]	[−0.190, 0.066]	.341
Confirmatory Study 2: Winter Week 9 (observations = 169, R^2 = .377, adjusted R^2 = .365)					
Intercept	21.465	−0.000	[13.843, 29.087]	[−0.121, 0.121]	< .001
Belongingness	−2.786	−0.296	[−4.098, −1.474]	[−0.435, −0.157]	< .001
Baseline CES-D	0.517	0.438	[0.365, 0.670]	[0.309, 0.568]	< .001
Social interactions	−0.298	−0.019	[−2.419, 1.823]	[−0.150, 0.113]	.782
Confirmatory Study 2: Spring Week 5 (observations = 165, R^2 = .367, adjusted R^2 = .355)					
Intercept	15.374	−0.000	[7.816, 22.932]	[−0.123, 0.123]	< .001
Belongingness	−1.124	−0.141	[−2.276, 0.027]	[−0.285, 0.003]	.056
Baseline CES-D	0.507	0.527	[0.373, 0.640]	[0.388, 0.667]	< .001
Social interactions	−0.087	−0.006	[−1.972, 1.799]	[−0.138, 0.126]	.928
Confirmatory Study 2: Spring Week 8 (observations = 157, R^2 = .408, adjusted R^2 = .397)					
Intercept	20.195	0.000	[12.644, 27.746]	[−0.122, 0.122]	< .001
Belongingness	−2.089	−0.242	[−3.331, −0.848]	[−0.387, −0.098]	.001
Baseline CES-D	0.478	0.493	[0.345, 0.611]	[0.355, 0.630]	< .001
Social interactions	−0.016	−0.001	[−1.793, 1.762]	[−0.132, 0.130]	.986

Note: Depressive symptoms were assessed using the Center for Epidemiological Studies-Depression (CES-D) scale. CI = confidence interval.

for our primary hypothesis—the relationship between feelings of belonging and end-of-term depressive symptoms—some findings did not replicate in every week. Specifically, there was no significant relationship between average feelings of belonging at midterm in Confirmatory Study 2 in the spring term when models controlled for average feelings of loneliness. Similarly, we did not observe the same decrease in social fit for

Table 6. Results of Linear Regression Models Predicting End-of-Term Depressive Symptoms From Average Belongingness in Each Week in Each Study, Controlling for Baseline Depressive Symptoms, Sense of Social Fit, Loneliness, and Number of Social Interactions in Each Week

Predictor	*b*	β	95% CI (*b*)	95% CI (β)	*p*
Exploratory study: Week 1 (observations = 151, R^2 = .396, adjusted R^2 = .376)					
Intercept	28.369	−0.000	[17.868, 38.870]	[−0.127, 0.127]	< .001
Belongingness	−2.248	−0.259	[−3.919, −0.578]	[−0.452, −0.067]	.009
Baseline CES-D	0.300	0.282	[0.146, 0.455]	[0.137, 0.427]	< .001
Presemester SAFS	−1.222	−0.099	[−3.502, 1.058]	[−0.284, 0.086]	.291
Loneliness	3.802	0.204	[1.116, 6.489]	[0.060, 0.348]	.006
Social interactions	1.028	0.072	[−0.875, 2.931]	[−0.061, 0.205]	.288
Exploratory study: Week 6 (observations = 150, R^2 = .455, adjusted R^2 = .436)					
Intercept	34.884	0.000	[24.832, 44.936]	[−0.121, 0.121]	< .001
Belongingness	−1.823	−0.232	[−3.059, −0.588]	[−0.389, −0.075]	.004
Baseline CES-D	0.246	0.232	[0.093, 0.398]	[0.088, 0.376]	.002
Presemester SAFS	−2.934	−0.236	[−4.780, −1.087]	[−0.385, −0.088]	.002
Loneliness	3.604	0.230	[1.321, 5.888]	[0.084, 0.376]	.002
Social interactions	0.678	0.043	[−1.257, 2.613]	[−0.080, 0.167]	.490
Exploratory study: Week 15 (observations = 147, R^2 = .452, adjusted R^2 = .433)					
Intercept	33.629	0.000	[23.937, 43.321]	[−0.123, 0.123]	< .001
Belongingness	−2.064	−0.266	[−3.270, −0.858]	[−0.421, −0.111]	.001
Baseline CES-D	0.225	0.211	[0.078, 0.373]	[0.073, 0.349]	.003
Presemester SAFS	−2.409	−0.200	[−4.202, −0.616]	[−0.349, −0.051]	.009
Loneliness	3.964	0.279	[1.951, 5.977]	[0.137, 0.421]	< .001
Social interactions	0.250	0.016	[−1.724, 2.225]	[−0.110, 0.142]	.802
Confirmatory Study 1: Week 2 (observations = 118, R^2 = .344, adjusted R^2 = .321)					
Intercept	18.849	0.000	[7.467, 30.231]	[−0.150, 0.150]	.001
Belongingness	−2.276	−0.293	[−3.888, −0.663]	[−0.501, −0.086]	.006
Baseline CES-D	0.469	0.401	[0.269, 0.670]	[0.230, 0.573]	< .001
Presemester SAFS	0.955	0.080	[−1.344, 3.255]	[−0.112, 0.271]	.412
Loneliness	−0.948	−0.079	[−3.102, 1.206]	[−0.257, 0.100]	.385
Confirmatory Study 1: Week 7 (observations = 120, R^2 = .397, adjusted R^2 = .376)					
Intercept	22.423	−0.000	[12.766, 32.080]	[−0.143, 0.143]	< .001
Belongingness	−1.457	−0.203	[−2.890, −0.024]	[−0.402, −0.003]	.046
Baseline CES-D	0.530	0.426	[0.322, 0.739]	[0.259, 0.594]	< .001
Presemester SAFS	−0.892	−0.092	[−2.905, 1.120]	[−0.300, 0.116]	.382
Loneliness	−0.706	−0.054	[−2.867, 1.454]	[−0.218, 0.110]	.519
Confirmatory Study 1: Week 15 (observations = 118, R^2 = .419, adjusted R^2 = .399)					
Intercept	24.468	−0.000	[14.690, 34.246]	[−0.141, 0.141]	< .001
Belongingness	−1.296	−0.175	[−2.694, 0.103]	[−0.363, 0.014]	.069
Baseline CES-D	0.505	0.410	[0.298, 0.711]	[0.242, 0.577]	< .001
Presemester SAFS	−1.051	−0.108	[−2.956, 0.855]	[−0.304, 0.088]	.277
Loneliness	−1.786	−0.126	[−4.130, 0.558]	[−0.292, 0.040]	.134

(continued)

Table 6. *(continued)*

Predictor	*b*	β	95% CI (*b*)	95% CI (β)	*p*
Confirmatory Study 2: Winter Week 5 (observations = 171, R^2 = .377, adjusted R^2 = .358)					
Intercept	16.822	−0.000	[5.686, 27.959]	[−0.121, 0.121]	.003
Belongingness	−1.518	−0.170	[−2.849, −0.187]	[−0.319, −0.021]	.026
Baseline CES-D	0.458	0.395	[0.284, 0.631]	[0.245, 0.545]	< .001
Presemester SAFS	−0.327	−0.024	[−2.507, 1.852]	[−0.181, 0.134]	.767
Loneliness	3.309	0.190	[0.786, 5.831]	[0.045, 0.334]	.010
Social interactions	−0.301	−0.019	[−2.394, 1.792]	[−0.150, 0.112]	.777
Confirmatory Study 2: Winter Week 9 (observations = 169, R^2 = .410, adjusted R^2 = .392)					
Intercept	17.764	−0.000	[6.920, 28.609]	[−0.118, 0.118]	.001
Belongingness	−2.359	−0.251	[−3.776, −0.942]	[−0.401, −0.100]	.001
Baseline CES-D	0.416	0.353	[0.245, 0.587]	[0.207, 0.498]	< .001
Presemester SAFS	−0.108	−0.008	[−2.172, 1.956]	[−0.158, 0.142]	.918
Loneliness	3.352	0.219	[1.180, 5.523]	[0.077, 0.361]	.003
Social interactions	0.306	0.019	[−1.832, 2.443]	[−0.114, 0.152]	.778
Confirmatory Study 2: Spring Week 5 (observations = 164, R^2 = .441, adjusted R^2 = .423)					
Intercept	12.148	0.000	[2.726, 21.571]	[−0.117, 0.117]	.012
Belongingness	−0.656	−0.082	[−1.973, 0.661]	[−0.247, 0.083]	.327
Baseline CES-D	0.403	0.419	[0.262, 0.543]	[0.272, 0.566]	< .001
Presemester SAFS	−0.381	−0.033	[−2.402, 1.640]	[−0.208, 0.142]	.710
Loneliness	4.332	0.305	[2.454, 6.210]	[0.172, 0.437]	< .001
Social interactions	0.469	0.033	[−1.376, 2.313]	[−0.096, 0.162]	.616
Confirmatory Study 2: Spring Week 8 (observations = 156, R^2 = .487, adjusted R^2 = .470)					
Intercept	11.249	0.000	[1.905, 20.592]	[−0.115, 0.115]	.019
Belongingness	−2.275	−0.264	[−3.687, −0.864]	[−0.428, −0.100]	.002
Baseline CES-D	0.430	0.443	[0.291, 0.568]	[0.300, 0.586]	< .001
Presemester SAFS	1.587	0.135	[−0.478, 3.652]	[−0.041, 0.312]	.131
Loneliness	4.007	0.295	[2.268, 5.746]	[0.167, 0.422]	< .001
Social interactions	0.015	0.001	[−1.726, 1.755]	[−0.127, 0.129]	.987

Note: Depressive symptoms were assessed using the Center for Epidemiological Studies-Depression (CES-D) scale. Sense of social fit was assessed using the Sense of Social and Academic Fit Scale (SAFS). CI = confidence interval.

Confirmatory Study 2 in the spring term, in contrast to the findings across other time points in the other studies. Although the present results demonstrate a great deal of replication, it is worth noting these null effects. However, it is possible that because global sense of social and academic fit did not significantly decrease during that term period, EMA-measured belonging might not be as powerful a predictor of depressive symptoms when models control for loneliness, and future research can explore what might weaken the relationship between daily feelings of belonging and depressive symptoms.

The findings here suggest that feelings of belonging early in the academic term could be an important signal for helping at-risk students. Therefore, universities interested in reducing rates of depression in their first-year students could assess feelings of belonging early in the term and offer just-in-time interventions to help students find their fit at the university. If these interventions can enhance feelings of belonging, they could have important effects on end-of-term mental health as well as other academic performance outcomes (O'Keeffe, 2013). Indeed, research on belonging interventions has found that they can enhance the performance and well-being for students who might not feel that they belong (Brady et al., 2020; Murphy et al., 2020; Walton & Cohen, 2011), and future work could explore whether interventions such as these can help students struggling with low feelings of belonging and high depressive symptoms.

Whereas initial research has found that a global measure of belonging is predictive of depressive symptoms in some samples (Shochet & Smith, 2014), these results suggest that EMA or daily assessments of belonging yield greater sensitivity—even when models control for a global measure of social and academic fit. This has important implications for future work examining the social factors involved in depressive symptom and depression etiology. Global measures of social experience might be subject to recall bias and low sensitivity because of the context in which participants complete the measure. EMAs have the unique ability to tap in to an individual's present moment experience. However, the measure of global social and academic fit that we used assesses how much the individual feels they will thrive socially and academically in their school, which may differ from feeling as if they belong. Although correlations were robust between the SAFS scale and EMA belonging, they were not a perfect overlap, which could contribute to the difference in predictive power. We demonstrate that patterns in EMA responses early in an academic term are predictive of mental health outcomes months later—offering both greater sensitivity and earlier detection of risk factors for poor mental health outcomes.

One of the strengths of this work is that we used an exploratory data set to examine the relationship between belonging and end-of-term depressive symptoms in students and then replicated these findings across different data sets from different universities. This method creates confidence in the strength of these relationships. However, there are also a few limitations to this work. First, our findings are limited to first-year college students at two institutions. Whereas previous work has linked global feelings of belonging to depressive symptoms in older adults (McLaren et al., 2007) and military personnel (Bryan & Heron, 2015), our results suggest that future work could consider daily assessments of belonging in other demographic samples to explore the generalizability of this work. Another limitation is that because our EMA measure of belonging was a single item, we do not know why an individual might not feel like they belong at their university. Thus, although our results establish a clear prospective link between feelings of belonging and later depressive symptoms, further research is needed to explore the sources of low levels of belonging to target via intervention.

Because the study procedures required some time to enroll participants and offer instructions for completing all components of the parent study, data were collected during winter and spring terms. It is possible that the relationship between belonging and depressive symptoms depends on the season of the academic term. For example, it is possible that first-year students beginning their first term of university demonstrate an even stronger relationship between belonging and depressive symptoms as they adapt to a new social context. However, it is also possible that the developmental context of college and young adulthood might yield similar results regardless of semester or year in school because feeling as if one belongs in an institution might be critical throughout their participation in that social setting. Other timing effects could also be observed within the level of the day. We assessed feelings of belonging only at the end of the day, but feelings of belonging might fluctuate across a day, and future work should examine the within-day context of feelings of belonging.

Similarly, future work can explore when feelings of belonging within an academic term are the strongest predictor of end-of-term depressive symptoms or explore trajectories of feelings of belonging and their relationship with depressive symptoms. Finally, students self-selected into the study, which could mean that students experiencing the lowest feelings of belonging would not be compelled to join the study. Students also completed self-report measures, which likely do a good job of tapping into the subjective feeling of belonging but might not give a comprehensive snapshot of *how* a student fits into their school community. Thus, the sources of lack of belonging that contribute to this increase in depressive symptoms are as yet unclear.

Conclusion

Greater feelings of belonging, even early in an academic term, were associated with fewer depressive symptoms at the end of the academic term. Feelings of belonging predicted depressive symptoms over and above other social factors and baseline levels of depressive symptoms, and this effect was replicated across multiple data sets. The implications of this work support theory and offer insight into potential ways to detect risk for depression in college students earlier. Furthermore, the strong link between feelings of belonging on a daily level and future depressive symptoms suggests important future work that could explore whether intervening on day-to-day belonging could have benefits for mental health.

Transparency

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Creswell conceptualized and designed the methodology for the study. J. M. Dutcher, D. K. Villalba, M. J. Tumminia, A. Doryab, Y. Sefdigar, and W. Seo managed the project and oversaw data collection. J. M. Dutcher, J. Lederman, M. Jain, S. Price, and A. Kumar analyzed the data. J. M. Dutcher, J. Lederman, M. Jain, S. Price, A. Kumar, and J. D. Creswell wrote the manuscript, and all the authors approved the final manuscript for submission.

Declaration of Conflicting Interests

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Open Practices

The design and analysis plans for Confirmatory Studies 1 and 2 were preregistered on OSF at https://osf.io/pwfm4/. Data and materials for these studies have not been made publicly available. This article has received the badge for Preregistration. More information about the Open Practices badges can be found at http://www.psychologicalscience.org/publications/badges.

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Supplemental Material

Additional supporting information can be found at http://journals.sagepub.com/doi/suppl/10.1177/09567976211073135

References

Allen, K., Kern, M. L., Vella-Brodrick, D., Hattie, J., & Waters, L. (2018). What schools need to know about fostering school belonging: A meta-analysis. *Educational Psychology Review*, *30*(1), 1–34.

Angelou, M. [@DrMayaAngelou]. (2015, July 13). *I long, as does every human being, to be at home wherever I find myself. - Maya Angelou - The Angelou Johnson Family* [Tweet]. Twitter. https://twitter.com/drmayaangelou/status/620654782273880064

Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., Cuijpers, P., Demyttenaere, K., Ebert, D. D., Green, J. G., Hasking, P., Murray, E., Nock, M. K., Pinder-Amaker, S., Sampson, N. A., Stein, D. J., Vilagut, G., Zaslavsky, A. M., & Kessler, R. C., & WHO WMH-ICS Collaborators. (2018). WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *Journal of Abnormal Psychology*, *127*(7), 623–638.

Barnett, P. A., & Gotlib, I. H. (1988). Psychosocial functioning and depression: Distinguishing among antecedents, concomitants, and consequences. *Psychological Bulletin*, *104*(1), 97–126.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Beck, A. T., Steer, R. A., Beck, J. S., & Newman, C. F. (1993). Hopelessness, depression, suicidal ideation, and clinical diagnosis of depression. *Suicide and Life-Threatening Behavior*, *23*(2), 139–145.

Berkman, L. F., & Syme, S. L. (1979). Social networks, host resistance, and mortality: A nine-year follow-up study of Alameda County residents. *American Journal of Epidemiology*, *109*(2), 186–204.

Blanco, C., Okuda, M., Wright, C., Hasin, D. S., Grant, B. F., Liu, S.-M., & Olfson, M. (2008). Mental health of college students and their non–college-attending peers: Results from the National Epidemiologic Study on Alcohol and Related Conditions. *Archives of General Psychiatry*, *65*(12), 1429–1437.

Brady, S. T., Cohen, G. L., Jarvis, S. N., & Walton, G. M. (2020). A brief social-belonging intervention in college improves adult outcomes for Black Americans. *Science Advances*, *6*(18), Article eaay3689. https://doi.org/10.1126/sciadv.aay3689

Breslau, N., Roth, T., Rosenthal, L., & Andreski, P. (1996). Sleep disturbance and psychiatric disorders: A longitudinal epidemiological study of young adults. *Biological Psychiatry*, *39*(6), 411–418.

Bryan, C. J., & Heron, E. A. (2015). Belonging protects against postdeployment depression in military personnel. *Depression and Anxiety*, *32*(5), 349–355.

Cacioppo, J. T., Hawkley, L. C., & Thisted, R. A. (2010). Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago Health, Aging, and Social Relations Study. *Psychology and Aging*, *25*(2), 453–463.

Cacioppo, J. T., Hughes, M. E., Waite, L. J., Hawkley, L. C., & Thisted, R. A. (2006). Loneliness as a specific risk factor for depressive symptoms: Cross-sectional and longitudinal analyses. *Psychology and Aging*, *21*(1), 140–151.

Coyne, J. C., & Downey, G. (1991). Social factors and psychopathology: Stress, social support, and coping processes. *Annual Review of Psychology*, *42*(1), 401–425.

Dalton, E. D., & Hammen, C. L. (2018). Independent and relative effects of stress, depressive symptoms, and affect on college students' daily health behaviors. *Journal of Behavioral Medicine*, *41*(6), 863–874.

Duffy, M. E., Twenge, J. M., & Joiner, T. E. (2019). Trends in mood and anxiety symptoms and suicide-related outcomes among US undergraduates, 2007–2018: Evidence from two national surveys. *Journal of Adolescent Health*, *65*(5), 590–598.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175–191.

Garlow, S. J., Rosenberg, J., Moore, J. D., Haas, A. P., Koestner, B., Hendin, H., & Nemeroff, C. B. (2008). Depression, desperation, and suicidal ideation in college students: Results from the American Foundation for Suicide Prevention College Screening Project at Emory University. *Depression and Anxiety*, *25*(6), 482–488.

Goodenow, C., & Grady, K. E. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *The Journal of Experimental Education*, *62*(1), 60–71.

Gopalan, M., & Brady, S. T. (2020). College students' sense of belonging: A national perspective. *Educational Researcher*, *49*(2), 134–137.

Gotlib, I. H., Krasnoperova, E., Yue, D. N., & Joormann, J. (2004). Attentional biases for negative interpersonal stimuli in clinical depression. *Journal of Abnormal Psychology*, *113*(1), 121–135.

Hagerty, B. M., & Williams, A. (1999). The effects of sense of belonging, social support, conflict, and loneliness on depression. *Nursing Research*, *48*(4), 215–219.

Hysenbegasi, A., Hass, S. L., & Rowland, C. R. (2005). The impact of depression on the academic productivity of university students. *Journal of Mental Health Policy and Economics*, *8*(3), 145–151.

Jose, P. E., Ryan, N., & Pryor, J. (2012). Does social connectedness promote a greater sense of well-being in adolescence over time? *Journal of Research on Adolescence*, *22*(2), 235–251.

Kendler, K. S., Hettema, J. M., Butera, F., Gardner, C. O., & Prescott, C. A. (2003). Life event dimensions of loss, humiliation, entrapment, and danger in the prediction of onsets of major depression and generalized anxiety. *Archives of General Psychiatry*, *60*(8), 789–796.

Kendler, K. S., Karkowski, L. M., & Prescott, C. A. (1999). Causal relationship between stressful life events and the onset of major depression. *American Journal of Psychiatry*, *156*(6), 837–841.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 593–602.

Lewinsohn, P. M., Seeley, J. R., Roberts, R. E., & Allen, N. B. (1997). Center for Epidemiologic Studies Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults. *Psychology and Aging*, *12*(2), 277–287.

Lüdecke, D. (2018). *sjPlot: Data visualization for statistics in social science* (R package Version 2.4.0) [Computer software]. https://cran.r-project.org/web/packages/sjPlot/index.html

Marra, R. M., Rodgers, K. A., Shen, D., & Bogue, B. (2012). Leaving engineering: A multi-year single institution study. *Journal of Engineering Education*, *101*(1), 6–27.

Masi, C. M., Chen, H.-Y., Hawkley, L. C., & Cacioppo, J. T. (2011). A meta-analysis of interventions to reduce loneliness. *Personality and Social Psychology Review*, *15*(3), 219–266.

Matthews, T., Danese, A., Wertz, J., Odgers, C. L., Ambler, A., Moffitt, T. E., & Arseneault, L. (2016). Social isolation, loneliness and depression in young adulthood: A behavioural genetic analysis. *Social Psychiatry and Psychiatric Epidemiology*, *51*(3), 339–348.

McLaren, S., Gomez, R., Bailey, M., & Van Der Horst, R. K. (2007). The association of depression and sense of belonging with suicidal ideation among older adults: Applicability of resiliency models. *Suicide and Life-Threatening Behavior*, *37*(1), 89–102.

Monroe, S. M., Rohde, P., Seeley, J. R., & Lewinsohn, P. M. (1999). Life events and depression in adolescence: Relationship loss as a prospective risk factor for first onset of major depressive disorder. *Journal of Abnormal Psychology*, *108*(4), 606–614.

Murphy, M. C., Gopalan, M., Carter, E. R., Emerson, K. T., Bottoms, B. L., & Walton, G. M. (2020). A customized belonging intervention improves retention of socially disadvantaged students at a broad-access university. *Science Advances*, *6*(29), Article eaba4677. https://doi.org/10.1126/sciadv.aba4677

Nelson, B., McGorry, P. D., Wichers, M., Wigman, J. T., & Hartmann, J. A. (2017). Moving from static to dynamic models of the onset of mental disorder: A review. *JAMA Psychiatry*, *74*(5), 528–534.

O'Keeffe, P. (2013). A sense of belonging: Improving student retention. *College Student Journal*, *47*(4), 605–613.

Parr, E. J., Shochet, I. M., Cockshaw, W. D., & Kelly, R. L. (2020). General belonging is a key predictor of adolescent depressive symptoms and partially mediates school belonging. *School Mental Health*, *12*, 626–637.

Pittman, L. D., & Richmond, A. (2007). Academic and psychological functioning in late adolescence: The importance of school belonging. *The Journal of Experimental Education*, *75*(4), 270–290.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385–401.

R Core Team. (2016). *R: A language and environment for statistical computing* (Version 4) [Computer software]. https://www.R-project.org/

Russell, D., Cutrona, C. E., Rose, J., & Yurko, K. (1984). Social and emotional loneliness: An examination of Weiss's typology of loneliness. *Journal of Personality and Social Psychology*, *46*(6), 1313–1321.

Shim, E.-J., Noh, H., Yoon, J., Mun, H. S., & Hahm, B.-J. (2019). A longitudinal analysis of the relationships among daytime dysfunction, fatigue, and depression in college students. *Journal of American College Health*, *67*(1), 51–58.

Shochet, I. M., & Smith, C. L. (2014). A prospective study investigating the links among classroom environment,

school connectedness, and depressive symptoms in adolescents. *Psychology in the Schools*, *51*(5), 480–492.

Shook, N. J., & Clay, R. (2012). Interracial roommate relationships: A mechanism for promoting sense of belonging at university and academic performance. *Journal of Experimental Social Psychology*, *48*(5), 1168–1172.

Stone, A. A., Shiffman, S., Atienza, A. A., & Nebeling, L. (2007). Historical roots and rationale of ecological momentary assessment (EMA). In A. A. Stone, S. Shiffman, A. A. Atienza, & L. Nebeling (Eds.). *The science of real-time data capture: Self-reports in health research* (pp. 3–10). Oxford University Press.

Twenge, J. M. (2015). Time period and birth cohort differences in depressive symptoms in the U.S., 1982–2013. *Social Indicators Research*, *121*(2), 437–454.

Twenge, J. M., Cooper, A. B., Joiner, T. E., Duffy, M. E., & Binau, S. G. (2019). Age, period, and cohort trends in mood disorder indicators and suicide-related outcomes in a nationally representative dataset, 2005–2017. *Journal of Abnormal Psychology*, *128*(3), 185–199.

Twenge, J. M., Haidt, J., Blake, A. B., McAllister, C., Lemon, H., & Le Roy, A. (2021). Worldwide increases in adolescent loneliness. *Journal of Adolescence*, *93*, 257–269.

Van Rossum, G., & Drake, F. L., Jr. (1995). *Python reference manual*. Centrum voor Wiskunde en Informatica.

Walton, G. M., & Brady, S. T. (2017). The many questions of belonging. In A. J. Elliot, C. S. Dweck, & D. S. Yeager (Eds.), *Handbook of competence and motivation: Theory and application* (pp. 272–293). Guilford Press.

Walton, G. M., & Cohen, G. L. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology*, *92*(1), 82–96.

Walton, G. M., & Cohen, G. L. (2011). A brief social-belonging intervention improves academic and health outcomes of minority students. *Science*, *331*(6023), 1447–1451.

Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L. D., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T. L., Miller, E., Bache, S. M., Müller, K., Ooms, J., Robinson, D., Seidel, D. P., Spinu, V., . . . Yutani, H. (2019). Welcome to the tidyverse. *The Journal of Open Source Software*, *4*(43), Article 1686. https://doi.org/10.21105/joss.01686

Young, A. F., Russell, A., & Powers, J. R. (2004). The sense of belonging to a neighbourhood: Can it be measured and is it related to health and well being in older women? *Social Science & Medicine*, *59*(12), 2627–2637.