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Electronic Bridge to Mental Health for College Students: A Randomized Controlled Intervention Trial

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Abstract

Objective: Suicide is the second leading cause of death among college students in the United States, and the percentage of students reporting suicidal thoughts is increasing. Nevertheless, many students at risk do not seek mental health (MH) services. This randomized controlled trial (RCT) examined the efficacy of Electronic Bridge to Mental Health for College Students (*e*Bridge) for increasing at-risk students' linkage to MH services.

Method: Students from four universities were recruited via email; 40,347 (22.6%) completed the online suicide risk screen; and 3,363 (8.3%) met criteria for randomization based on suicide risk factors and lack of current treatment (62.2% female, 35.0% male, 2.8% transgender/non-binary; 73.2% white, 7.0% Black, 19.9% Asian, 11.7% other; 12.4% Hispanic, 76.2% undergraduate). These students were randomized to *e*Bridge (personalized feedback [PF] with option of online counseling) or Control (PF). The primary outcome was linkage to MH services within six months.

Results: Among students assigned to *e*Bridge, 355 students (21.0%) posted ≥1 message and 168 (10.0%) posted ≥2 messages to the counselor. In intent-to-treat analyses, there was no *e*Bridge effect on obtaining MH services. However, within the *e*Bridge group, students who posted ≥1 message were significantly more likely to link to MH services.

Conclusions: *e*Bridge shows promise for reaching a relatively small subset of college students at risk for suicide; however, engagement in *e*Bridge was low. This study underscores the urgent need for more effective strategies to engage young adults in online mental health interventions.

Keywords

Suicide is second only to unintentional injuries as a cause of death among college students ages 18 to 24 in the United States; the suicide rate increased 40% in this age group during the past decade (Centers for Disease Control and Prevention, 2020). This disturbing statistic is closely paralleled with an increase in suicidal ideation among college students. Based on population surveys of over 155,000 students from 196 campuses, Lipson, Lattie and Eisenberg (2019) found that suicidal ideation among students increased from 5.8% in 2007 to 10.8% in 2016–2017 (Lipson et al., 2019). Moreover, recent American College Health Association (ACHA) data indicate that approximately 13% of college students have seriously considered suicide and 2% of college students have attempted suicide in the past 12 months (American College Health Association, 2019). Suicide risk and suicide among college students are substantial and growing public health concerns.

Converging evidence from college counseling center surveys (Xiao et al., 2017) and broader population level surveys (Lipson et al., 2019) indicate that utilization of mental health (MH) services among college students has also increased during the past decade. Nevertheless, many students with elevated suicide risk do not share their suicidal thoughts with others or seek professional help. In one study, 41% of the college students who reported having seriously considered suicide also reported that they had not shared their suicidal thoughts with anyone (Becker et al., 2018). Similarly, in the Healthy Minds Study, only 50% of students with past-year suicidal ideation received MH services (Eisenberg et al., 2011); and a survey of college counseling center directors indicated that only 17% of students who died by suicide were current or former clients (Gallagher, 2006). This lack of professional help-seeking may be due to barriers such as a lack of insurance coverage, a belief that treatment is unneeded or may not be helpful, a lack of time, or a preference to solve one's own problems (Czyz et al., 2013; Eisenberg et al., 2007). It may also be due to perceived cultural barriers or cultural sensitivity concerns among students who identify with sexual minority, gender minority, or racial/ethnic minority subgroups (Horwitz et al., 2020).

Research on population-level interventions designed to address the relative lack of professional help-seeking among college students at risk for suicide has been limited. Nevertheless, the National Strategy for Suicide Prevention recommended online screening and referral programs as one promising strategy (Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012), and initiatives spearheaded by national organizations, including the American Foundation for Suicide Prevention (AFSP) and the Jed Foundation, have resulted in the use of voluntary, web-based screening programs at many colleges and universities in the United States (American Foundation for Suicide Prevention, 2020; The Jed Foundation, 2020). College populations are well-suited for such interventions as they are in an age range that is often associated with the first onset of

mental disorders (Kessler et al., 2005) and are savvy with Internet-based communication technologies. They also have a prevalence of mental disorders similar to same-aged non-college students (Blanco et al., 2008).

Perhaps the most widely disseminated population-level MH intervention for college students is the Interactive Screening Program (ISP), which was developed by the AFSP and, to our knowledge, was the first such intervention for college students (Haas et al., 2008). ISP is an interactive web-based intervention that offers confidential MH screening to identify students with elevated suicide risk. It provides students with information about counseling services and an opportunity to dialog with counselors via an online portal (American Foundation for Suicide Prevention, 2020). In a 3-year naturalistic study of ISP conducted at two universities from 2003–2005, 8% of those invited to participate submitted the screening survey, 91% of initial respondents viewed their personalized assessments, 35% engaged in online counseling dialogues, and 20% came for in-person evaluations (Garlow et al., 2008; Haas et al., 2008). While this study was not a randomized trial with a control group, enabling us to infer effectiveness, it provided valuable insight related to the promise and further development of this type of online approach.

In the present study, we examined the efficacy of a theoretically driven intervention, *Electronic Bridge to Mental Health for College Students (e*Bridge), in a large-scale, multi-university randomized trial. The primary aim of *e*Bridge is to facilitate the linkage of students with elevated suicide risk to professional mental health (MH) services following web-based screening. Although the development of eBridge was informed by the ISP, eBridge is theoretically based in health behavior theories and more explicitly incorporates principles of motivational interviewing (MI), which emphasize personal choice and a nonjudgmental communication style to elicit and strengthen intrinsic motivation for behavior change (Burke et al., 2003; W. R. Miller & Rollnick, 2012). These MI principles are incorporated in the *e*Bridge presentation of personalized screening feedback, its offer of optional online counseling, and its use of online counselors who are trained in MI. eBridge also differs from ISP in its suicide risk screening questions and extended baseline evaluation, and in the eBridge platform's inclusion of several unique tools for students and online counselors (e.g., decision ruler for students, multiple student counseling request options, screening item scores readily available for counselors to review).

The design of *e*Bridge was specifically informed by two health behavior promotion models, the Health Belief Model (HBM; Henshaw & Freedman-Doan, 2009; Janz et al., 2002; Rosenstock, 1966; Strecher et al., 1997) and Self-Determination Theory (SDT; Deci & Ryan, 1985). The HBM, which emphasizes the individual's values regarding possible behavior change (e.g., the value of seeking treatment or improving mental health) and the individual's expectancies regarding the effects of taking action (e.g., expectancy regarding the helpfulness of treatment), has gained impressive support in hundreds of empirical studies (e.g. Janz et al., 2002). SDT posits that intrinsic motivation is important to behavior change and can be enhanced by supporting individuals' autonomy (Deci & Ryan, 1985). Several researchers have described the integration of SDT with MI and have suggested that SDT provides a framework to explain how MI works (Markland et al., 2005; W. R. Miller & Rollnick, 2012; Patrick & Williams, 2012).

We previously developed and iteratively refined *e*Bridge (including its web-based interface and interaction modality), and then conducted a pilot randomized controlled trial (RCT) to examine the range and variability of outcomes associated with *e*Bridge and the control condition (King et al., 2015). Although students in both conditions were provided online personalized feedback (PF), they received PF in different formats and only students in eBridge were offered the option of online counseling. After completing the suicide risk screen, students in the control group were automatically taken to a webpage with PF in graphic form. In keeping with a MI framework, students in eBridge had the option of viewing their PF that was provided using MI-adherent language. We found that students assigned to *e*Bridge, relative to students in the control condition, reported significantly higher levels of readiness to seek MH services, lower levels of stigma regarding MH services, and a greater likelihood of linking to MH services. This was a relatively small RCT and findings were considered preliminary.

The primary aim of this large, multi-site randomized controlled intervention trial was to examine the efficacy of *e*Bridge in increasing the likelihood that students at elevated risk for suicide link to MH services. As suicide risk factors are multifactorial and vary across individuals (Ginley & Bagge, 2017), we defined suicide risk as any two of the following: lifetime history of suicide attempt, past-year suicidal thoughts, positive screen for depression (past 2 weeks), positive screen for heavy alcohol use (past 2 months). The choice to use multiple positive suicide risk screen criteria was based on conceptual models of suicide, such as the biopsychosocial model for suicide (Turecki & Brent, 2016), which recognize suicide risk as multi-factorial, representing a complex interplay between predisposing and proximal factors (Turecki et al., 2019). In eBridge, we focused on empirically based clinical risk factors. A history of one or more suicide attempts is relatively common among those who die by suicide and frequent thoughts of suicide are a leading predictor of suicide attempts (e.g. Fergusson et al., 2005; Moskos et al., 2005). Depression is a leading predictor of suicide and suicide attempts (e.g. Hawton et al., 2013) and the risk of depression is heightened in the transition to adulthood (Richards, 2011). Similarly, alcohol use disorders are associated with elevated risk of suicide (Flensborg-Madsen et al., 2009), and in a national US sample, acute alcohol use co-occurred with approximately one-third of suicide deaths involving common methods (Conner et al., 2014).

We compared *e*Bridge to the control condition (as described above for pilot RCT), and our primary outcome, measured at six months, was linkage to MH services (psychotherapy, psychoactive medication, combination). We hypothesized that *e*Bridge would result in significantly greater MH services utilization. As secondary outcomes, we also examined *e*Bridge effects on readiness to seek MH services, perceived stigma in relation to MH services, and reductions in levels of suicide risk factors (suicidal ideation, depression, heavy alcohol use). We hypothesized that *e*Bridge would result in significantly greater readiness to seek MH services, lower perceived stigma regarding MH services, and better MH outcomes. Finally, we examined three moderators of *e*Bridge effectiveness – readiness for treatment, gender, and history of multiple suicide attempts. We focused on these possible moderators due to their theoretical importance to treatment seeking based on HBM and SDT models (readiness for treatment), and previous research indicating that problem severity and female

gender are related to a greater likelihood of seeking MH services (Bruffaerts et al., 2019; Sontag-Padilla et al., 2016).

Method

Participants

The study sample consisted of students from four Universities (three public, one private) in midwestern and western regions of the United States. Eligibility criteria included age 18 or above, enrollment in a degree-seeking program, residing domestically (i.e., not abroad), and being more than one semester from graduation. Across sites, a total of 178,879 students were invited to participate in the study over the course of four consecutive fall semesters (2015–2018), and 40,334 (22.5%) of these students completed the initial screening survey.

The sample of invited students was 49.5% male and 50.5% female. Among the screened sample, the majority (61.9%) identified as female, while 36.7% identified as male, and 1.4% identified as transgender or gender queer. Females were significantly more likely than males to consent to participate and complete the study screen, p < .001. The racial composition of the sample (participants were invited to check all that apply) was White (71.4%), Black (5.0%), Asian (22.5%), American Indian (1.5%), Pacific Islander (0.7%), and other (8.2%). A Hispanic or Latinx ethnicity was endorsed by 9.7% of the sample. The age distribution was age 18 (30.0%), ages 19–22 (34.0%), ages 23–30 (28.6%), and ages 31+ (7.4%). The sample was predominantly undergraduate students (60.7%); graduate students and professionals comprised 33.1% and 6.2% of the sample, respectively.

The Consolidated Standards of Reporting Trials (CONSORT) Participant Flowchart is displayed in Figure 1. Among those who completed the screening survey, 14.4% (n=5,790) were positive for suicide risk and 8.3% (n=3,363) were eligible for inclusion in the intervention trial (positive suicide risk, completed baseline survey, and not currently receiving MH services). Among this randomized sample, students' self-reported gender identities were distributed as follows: female (n = 2,088; 62.3%), male (n = 1,171; 34.9%), transgender or gender queer (n = 95; 2.8%, combined due to low frequency), missing (n = 9; 0.3%). The racial composition of this sample of eligible participants (participants were invited to check all that apply) was White (n = 2462, 73.2%), Black (n = 235, 7.0%), Asian (n = 669, 19.9%), American Indian (n = 70, 2.1%), Pacific Islander (n = 33, 1.0%), and other (n = 288, 8.6%). There were 418 (12.4%) students reporting a Hispanic or Latinx ethnicity. The age distribution was age 18 (n = 1336, 39.7%), 19–22 (n = 1231, 36.6%), 23–30 (n = 677, 20.1%), and ages 31+ (n = 119, 3.5%). The sample was predominantly undergraduate students (n = 2562, 76.2%); graduate and professional students comprised 20.2% (n = 680) and 3.6% (n = 121) of the sample, respectively.

Measures

Screen—The screen for intervention eligibility included measures of four risk factors (depression, alcohol misuse, suicidal ideation, history of suicide attempt) and an assessment of current and past MH services utilization.

Depression.: The Patient Health Questionnaire-2 (PHQ-2; Kroenke et al., 2003) was used to screen for depression over the past two weeks. The PHQ-2 has two items, one assessing feeling down, depressed, or hopeless, and one assessing anhedonia, which are each scored on a four-point Likert scale ranging from "Not at all" to "Nearly every day." The PHQ-2 has been validated as a reliable indicator of depression (Löwe et al., 2005), and the recommended cut-off score of 3 was used to indicate a positive screen.

Alcohol Misuse.: The 10-item Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) was utilized to measure frequency of alcohol use, dependency on alcohol, and alcohol-related consequences. The AUDIT has been validated as a screener (Kokotailo et al., 2004) and, given the high prevalence of drinking on college campuses, we utilized a conservative cutoff score of 8 as a positive screen for alcohol problems in the past two months. The AUDIT was also administered at 6-month follow-up assessments. Internal consistency was 0.84 in this sample.

Suicidal Ideation.: National Comorbidity Survey (Kessler et al., 2004) items were used to assess suicidal ideation at baseline and 6-month follow-up. A positive screen was defined as an affirmative response to, "In the past 12 months, has there ever been a period of 2 weeks or more when you felt like you wanted to die?" or "In the past 12 months, have you ever felt so low that you thought about committing suicide?" Individuals responding 'yes' received a follow-up assessing presence of suicidal ideation in the past month. Further, any endorsement of thoughts of being better off dead or hurting oneself in the past two weeks, as assessed by the ninth item from the PHQ-9, was also considered a positive screen for suicidal ideation.

Suicide Attempt History.: A National Comorbidity Survey (Kessler et al., 2004) item was used to screen for a positive suicide attempt history, "In your lifetime, have you ever attempted suicide?" Those who indicated a past attempt were also asked to specify lifetime number of attempts, and whether they had made an attempt in the past year and past month.

Mental Health Service Utilization.: Items from the Healthy Minds study (Eisenberg et al., 2007) were used to assess use of MH services in the past year. For medications, participants were asked, "In the past 12 months, have you taken any of the following types of medications at least several times per week with a prescription from a health professional (select all that apply): psychostimulants, antidepressants, anti-psychotics, anti-anxiety medications, mood stabilizer, sleep medications, other medication for mental or emotion health (specify); or none (of the above). Those with an affirmative response were prompted, "Of the medication(s) you just noted, which ones are you currently taking?" For therapy/counseling, participants were asked, "In the past 12 months, have you received counseling or therapy for your mental or emotional health from a health professional (such as psychiatrist, psychologist, social worker, or primary care doctor)?". Those with an affirmative response were further prompted, "Are you currently receiving counseling or therapy?". Students who reported any current use of MH medications or counseling/therapy were not eligible for randomization into the intervention study. At 6-month follow-up, these items were tailored to assess MH services received since the previous assessment.

Additional Baseline and Outcome Measures

Drug Use Scale.: Items adapted from the Youth Behavior Risk Survey (Kann et al., 2018) were administered at baseline and 6-month follow-up to assess recreational substance use. Participants were asked how often they had used cannabis, prescription stimulants, prescription opioids, and sedatives recreationally over the past three months, and how often they had used other illegal drugs over the past year, with response options for, "0=Never," "1=Once or twice," "2=Monthly," "3=Weekly," and "4=Daily or almost daily."

Depression (full scale).: The six items of the PHQ-9 (Kroenke et al., 2001) that were not part of the original screen were administered at baseline to measure the remaining primary symptoms of depression (e.g., fatigue, concentration difficulties, appetite changes), and the full PHQ-9 (nine items, total scale score range: 0–27) was administered at the follow-up assessments. Internal consistency for the full PHQ-9 scale in this sample was 0.83.

Adaptive Functioning.: The adaptive functioning item of the PHQ (item #10) (Kroenke et al., 2001), which is not included in the PHQ-9 total score, was adapted to assess the perceived impact of any emotional or behavioral problem in the past two weeks. The degree to which these problems were perceived as contributing to difficulty in managing academics, personal responsibilities, and social interactions, was scored on a 4-point Likert scale ranging from "Not difficult at all" to "Extremely difficult" and administered at baseline and follow-up.

Perceived Public Stigma and Personal Stigma.: Three items adapted from the Discrimination-Devaluation Scale (DDS; Link et al., 1989) were administered at baseline and the 6-month follow-up to assess how participants perceive those who receive mental health treatment and how participants believe others perceive those who receive mental health treatment. Internal consistency for this sample was 0.75.

Readiness Scale.: Six items adapted from LaBrie, Quinlan, Schiffman, and Earleywine (2005) were administered at baseline and follow-up assessments to measure participants' willingness to seek help for mental health and other problems from a variety of sources (e.g., websites, family, friends, mental health professionals). Participants scored their readiness on a 0–10 scale, with markers described as: 0 - I have no interest in doing this, 3- Sometimes I think about doing this, 5- I am strongly considering doing this, 7- I have taken steps toward doing this, 10- I already did this. Internal consistency for this sample was 0.79.

Procedures

The institutional review board at each participating university approved all procedures. The study invitation included the following text: *"confidential online research study…about mental health and general well-being among college students. Our goals are to understand the service needs of students and examine the usefulness of eBridge, an online program that may help link students to supportive services".* As a study incentive, all students who were invited to participate were eligible for inclusion in ten drawings for $100 online gift certificates at each university. All participants who met the intervention study criteria for participation received $25 for completing the 6-month assessment. Participants were

recruited in the fall semester of each academic year. Emails were obtained from university registrar offices and sent to students, inviting them to participate. Randomization was stratified by natal sex and history of multiple suicide attempts.

Description of *e*Bridge Intervention and Control Groups

Students in both *e*Bridge and Control groups could view information about mental health resources available in their campus communities (with contact information) on all online pages.

eBridge—Students in the *e*Bridge intervention were offered two online, MI-adherent intervention components: the choice to access their PF and the option of confidential counseling via a secure and confidential online portal with an MH professional who was knowledgeable about local MH resources. After completing the screening survey, these students could select to view their PF and/or, consistent with the MI principle of honoring autonomy and providing a menu of options, they could click on one of three topics ("more about my concerns or my survey feedback," "more about available resources" "other") to begin a confidential exchange with a counselor. Students could initiate or respond to communications with the counselor in an asynchronized manner (and view transcripts of their communications). eBridge counselors focused on facilitating linkage to professional mental health services; they did not provide therapy specifically targeting students' presenting problems.

All communications between eBridge counselors and student participants were via asynchronous online messages. When one posted a message at the secure online site, the other received an email indicating a message had been posted. *e*Bridge counselors used MI-consistent messages that were affirming and supported the students' autonomy. They had no information about students' personal identities; however, they could view students' responses to screening questions and PF. *e*Bridge counselors also initiated communication with students who did not click on any of the communication topics listed above, or who became inactive after initiating communications. Counselors discontinued outreach when two consecutive messages were unanswered by students.

*e*Bridge counselors were master's or doctoral level mental health professionals, including clinicians at participating counseling centers and clinics, clinical psychologists with faculty appointments, and clinicians in advanced training programs (postgraduate social work fellows, postdoctoral fellows). Each participating site identified their study clinicians, which were university counseling center staff at two sites. *e*Bridge counselors completed MI training provided by a clinical supervisor who was a member of the Motivational Interviewing Network of Trainers (MINT) and met study certification criteria prior to providing online counseling for the study. Certification involved interactive messaging role plays with mock participants where counselors were rated for their adherence to MI principles adapted from the Motivational Interviewing Treatment Integrity code (Moyers et al., 2010). Role play transcripts were reviewed by the supervisor, and coded for key MI behaviors (e.g., questions, reflections, affirmations, global ratings) and the feedback was given to counselors to review between role plays. Counselors were expected to exceed

proficiency thresholds on at least 2 role play transcripts prior to being certified to begin contact with enrolled participants. Counselors also attended weekly group supervision meetings that included the review and discussion of online transcripts and drafting responses to student posts in real time.

Control Condition—Students randomized to the Control group were *automatically* taken to a webpage with their PF information displayed after completing the online screen (i.e., this was not presented as an option), and they were not offered the option of online counseling.

Data Analyses

We examined between-group differences for demographic factors (e.g., age, gender, race), clinical factors (e.g., depression, suicide attempt history), and treatment-seeking factors (e.g., past-year service utilization, treatment readiness) to ensure that randomization resulted in group equivalence at baseline. Similarly, we examined differences between participants who were and were not retained for 6-month follow-up to determine if demographic, clinical, and MH service attitude variables may have been related to retention. We used an intent-to-treat (ITT) strategy and logistic regression to examine our primary hypothesis that *e*Bridge would have a positive effect on linkage with MH services. For secondary outcomes, related to improvement in MH functioning (e.g., depression severity), we used an ITT strategy and linear regressions, adjusting for key covariates (gender, age; baseline PHQ-9 score, AUDIT score, suicidal ideation, history of multiple suicide attempts). Following ITT analyses, we examined whether or not the subgroup of students randomly assigned to eBridge who actively engaged in online counseling had improved outcomes relative to the control group. Finally, we examined potential moderators of intervention effects: gender identity, baseline severity (lifetime history of multiple suicide attempts), and baseline readiness score. For both sets of analyses, ITT and with the actively engaged subgroup, we analyzed moderators by estimating regressions with interactions between intervention assignment and the moderator variables.

Results

Baseline Characteristics and Group Equivalence

At baseline, the majority of randomized students (54.3%) reported past-year suicidal ideation; 25.6% reported a lifetime suicide attempt. Participants had an average PHQ-9 score of 12.88 (*SD*=5.7), indicating moderate to moderately severe depressive symptoms. We did not find significant differences at baseline between *e*Bridge and Control groups for any of the examined demographic variables (e.g., age, gender, race/ethnicity) (see Table 1) or clinical variables (e.g., depression, alcohol use, suicidal ideation, suicide attempt history) (see Table 2).

Retention Analyses

Six-month follow-up data were obtained from 79.0% (2,659 of 3,363) of study participants. Follow-up retention did not differ as a function of intervention assignment [$\chi^2(1) = 1.17$, $p = .28$]. Retention was found to differ, however, by study site $\chi^2(3) = 56.11$, $p < .001$, with rates

ranging from 72.3% to 87.3%. Men (72.6%) were less likely to participate in the follow-up than women (82.4%) and gender minorities (84.9%), $\chi^2(2) = 46.41$, $p < .001$. Similarly, students with higher depression scores at baseline [M(SD) 13.33(5.7) vs. 12.77(5.6), $t(3361) = 2.37$, $p = .018$] and students who reported suicidal ideation in the past month [$\chi^2(1) = 4.37$, $p = .037$] were less likely to participate in the follow-up (76.3% vs. 79.8%). There were no differences in retention based on participants' age, race, ethnicity, use of alcohol, past-year suicidal ideation, or history of suicide attempt.

eBridge Engagement (Personalized Feedback and Online Counseling)

Among the 1,673 students who screened positive for suicide risk and were randomized to eBridge, 833 students (49.8%) viewed each of their feedback reports (alcohol, depression) once and 245 students (14.6%) viewed a report more than once. A total of 126 students (7.5%) viewed their depression feedback only, and 463 students (27.7%) did not view either of their feedback reports. Among this same group, 627 (37.5%) logged into the eBridge counseling site at least once, and 355 (21.2%) posted at least one message to the online counselor [187 (11.2%) posted one message, 68 (4.0%) posted two messages, and 100 (6.0%) posted three or more messages]. Asian students were significantly more likely than students who did not identify as Asian (29.1%; $\chi^2(1) = 16.22$, $p < .001$), White students were significantly less likely than students who did not identify as White (18.8%; $\chi^2(1) = 15.40$, $p < .001$), and 18-year-old students were significantly less likely than students of other ages (17.8%; $\chi^2(1) = 7.65$, $p = .006$) to post any message. Those posting messages had significantly higher scores at baseline for depression [$M(SD)$: 13.53(5.7) vs. 12.65(5.6); $t(1668) = 2.59$, $p = .010$] and readiness to seek help from a mental health professional [$M(SD)$: 4.78(3.1) vs. 4.04(3.1); $t(1671) = 3.98$, $p < .001$] than those who did not post a message. In addition, those posting messages had a higher prevalence of past year suicidal ideation (61.7% vs. 53.6%; $\chi^2(1) = 7.33$, $p = .007$) than those who did not post a message.

eBridge Efficacy: Intent-to-Treat Analyses

In a multivariate logistic regression controlling for demographics and baseline clinical characteristics, there were no significant main effects for eBridge at 6-months for our primary outcome of MH services utilization (i.e., obtaining psychotherapy and/or psychotropic medications). A total of 807 students (31.6%), including 392 students (31.1%) in the eBridge condition and 415 students (31.9%) in the Control condition, obtained mental health services prior to 6-month follow-up (see Table 2).

The significant predictors of MH services utilization were depression severity (PHQ-9 score), alcohol use (AUDIT score), history of multiple suicide attempts, and an age of 23–30-years (see Table 3). Similarly, in ITT multivariate linear and logistic regression analyses, we found no significant eBridge main effects for our secondary outcomes: students' readiness for MH services, MH stigma, depression, alcohol use, suicidal ideation, or suicide attempt.

We did not find any evidence of significant moderators for the intervention effects; none of the interactions between intervention assignment and moderator variables (2 versus   2

positive suicide risk screens, readiness for treatment, gender, and history of multiple suicide attempts) were significant at p<0.05.

eBridge Outcomes Associated with Engagement in Online Counseling

Since a majority of students in eBridge did not meaningfully engage with online counseling, we examined outcomes for the subgroup of students assigned to eBridge based on whether they posted zero, one, or two or more messages to the online counselor. Those who posted one message to the online counselor had 47% greater odds of receiving any MH treatment (i.e., psychotherapy and/or psychotropic medications) compared to those in the Control group, and those posting two or more messages had 57% greater odds of receiving any MH treatment, and 72% greater odds of receiving psychotherapy, relative to the Control group (see Table 3). We did not find any evidence of significant moderators of these intervention effects.

Regarding secondary outcomes, students' readiness to seek MH treatment was higher at 6-month follow-up among students who posted messages. An ANOVA with four factors [control, eBridge (no message), eBridge (1 message), eBridge (2 messages)] was significant, $F(3, 2554) = 8.08$, p <.001, and post-hoc Tukey tests indicate that readiness scores for the eBridge one message [$M = 5.7$ ($SD = 3.7$)] and 2+ message [$M = 6.0$ ($SD = 3.7$)] groups were significantly higher than those for the no message [$M = 4.7$ ($SD = 3.7$)] and control [$M = 4.8$ ($SD = 3.6$)] groups. Students who posted messages did not differ from students in the Control group at 6-months with respect to other secondary outcomes.

Discussion

We conducted an RCT at four universities to examine the efficacy of eBridge for linking students at elevated risk for suicide to MH services (psychotherapy, psychoactive medication, or both). We also examined possible moderators (e.g., gender, baseline readiness to seek services) of eBridge effectiveness in linking students to services. Although a program that is effective at screening students and linking those at risk to MH services has the potential to help large numbers of vulnerable young adults during a developmental phase marked by important life transitions, our findings suggest that it is extremely challenging to engage students in such a program. In ITT analyses involving all students who were randomized to eBridge or the control condition, eBridge had no effects on our primary outcome (linkage to MH services) or secondary outcomes (improved MH functioning). Nevertheless, eBridge was associated with greater linkage to MH services in subgroup analyses that included only students in the eBridge condition who engaged in the optional online counseling. Among this subgroup, which may have been inclined toward help-seeking, eBridge seems to have facilitated their decision to seek mental health treatment.

Nearly one-quarter of the students invited to participate in this study (23%) consented to participate and completed the eBridge online suicide risk screen. They consented with the understanding that if they were invited to participate in the study's intervention phase, their continued participation would be optional. Across the four study universities, this 23% initial participation rate translated into reaching thousands of students for suicide risk

screening (and personalized feedback) and was approximately twice as high as rates that have been reported for previous similar initiatives. In their study of ISP with undergraduate students at two universities, Haas et al. (2008) reported that, among students invited to participate, approximately 8% completed their online Stress and Depression Questionnaire. In a descriptive study of ISP implementation with graduate students that employed several strategies in an effort to increase participation (e.g., personal email from president of Graduate Student Council encouraging participation), only 9.8% of students completed the online screening questionnaire (Moffitt et al., 2014). Screening initiatives in medical schools that have used email invitations to residents, fellows, and faculty, or to these groups and medical students, report screen participation rates of 8% (Haskins et al., 2016) and 13% (Moutier et al., 2012), respectively. The higher rate of participation in *e*Bridge screening could be accounted for by the content or timing of our email invitation and/or by the incentive prize drawings that we held at each university. These prize drawings totaled only $1000 per university (10, $100 gift certificates) and could be a cost-effective strategy for possibly doubling rates of participation.

Despite this relatively high rate of participation, many students chose not to participate. This may have reflected a preference not to participate in research; however, it may also have reflected students' preferences regarding participation in screening. Further research is recommended on the impact of group- or university-level incentives or other types of "nudges" on student participation rates in mental health screening or, more specifically, suicide risk screening. It is also possible that a university community could decide to make it mandatory to participate in the screening component, which includes personalized feedback. This would have some parallel to a requirement to have inoculations up to date. Another option would be for universities to use an "opt-out" rather than "opt-in" enrollment strategy, which would likely result in the participation of more male students (a higher proportion of females than males participated in the present study) and a higher proportion of students overall.

The rates of participation in *e*Bridge intervention components, MI-adherent PF and online counseling, were similar to what has been reported for other online and mobile applications designed to promote mental health, including among college students. Among those randomized to *e*Bridge, students were given the option of viewing their PF, in keeping with MI principles, and 72% viewed this feedback. In contrast, among those randomized to the Control condition, all students were automatically taken to a web page with PF, which may have been helpful in facilitating their treatment linkage and partially account for the absence of differences in treatment linkage between groups. The intention of PF is to provoke thoughtful consideration of current high risk behaviors and/or emotions (Miller et al., 2013), and it has been shown to reduce suicide risk factors, such as alcohol misuse and depressive symptoms, with modest effects (Geisner et al., 2006; Miller et al., 2013). Although a meta-analysis indicated that single-session PF interventions are associated with significant reductions in drinking problems among students (Riper et al., 2009), research has also indicated that counselor-guided PF is associated with even greater reductions (Doumas et al., 2011).

Among students randomized to *e*Bridge, 11% sent one message to the online counselor, and 10% sent two or more messages to the online counselor. Despite presenting the online counseling option in an MI format with multiple options to check (e.g., information about resources, discuss PF, other), engagement with this component of *e*Bridge was relatively low, albeit consistent with previous efforts. In a study of self-guided mental health applications with adults, Arean et al. (2016) reported that nearly 60% of adults did not even download an assigned depression intervention application. Additionally, those with higher depression and anxiety scores were less likely to use their assigned applications, and usage rates for all participants steadily declined over time. In one recent study, university students reported using a mental health support application an average of at least eight out of ten days when in constant contact with study staff; however, more than half of these participants reported never using the application during the following 30-day period when they were not contacted (Flett et al., 2019). Owen et al. (2015) investigated usage of a PTSD-treatment application and found that, among all 153,834 downloads of the application, 38.9% of users never opened the application after the day of download. This study also found that usage rates decreased further over time, with only 15.2% of Apple users and 9.3% of Android users using the application 3 months after download (Owen et al., 2015). Finally, a review of technology-based mental health interventions indicated that adults' rates of use in 'real-life' outside of empirical studies, are even lower than when adults are actively engaged in an experimental condition (Baumel et al., 2019).

There are many possible reasons for these largely consistent low usage rates. Two studies of 100 and 389 college students, respectively, found that students reported cost, privacy concerns, questions of credibility and quality, and inaccessible interfaces as reasons why they were skeptical of using most web or mobile app-based MH services (Levin et al., 2018; Melcher et al., 2020). Many students worry that personal information collected by such websites or mobile apps will be seen by others, leading to stigmatization from peers (Levin et al., 2018). Although we used confidentiality assurances in *e*Bridge to temper anticipated privacy concerns, these may have persisted. It is interesting to note that one recent pilot study of a smartphone application for risky substance use among adolescents and young adults did not identify such privacy concerns (Coughlin et al., 2021). Nevertheless, this study differed from *e*Bridge in that it used a two-stage enrollment process and only 55% of those who screened positive in the first stage, making them study eligible, were enrolled in the second stage to provide feedback about the application. The second stage sample may have been self-selected for interest in mobile health apps. In eBridge, a one-stage enrollment process was used (with understanding that only a subset would be randomized to the intervention, for which participation would be optional), and all students who screened positive and had complete survey data were randomized (> 90%).

As a second potential barrier to engagement, *e*Bridge counselors at one site in the current study reported that a number of students who participated in online counseling asked whether or not the counselor was "a bot." This suggests a possible concern about credibility and perhaps a preference for connection with a "real person." It is possible that the asynchronous nature of counselor communications or the fact that all communications were online contributed to this perception. Video conferencing, which has become much more prevalent since the COVID-19 pandemic (e.g. Evans, 2020), may be one way to lessen

this perception, although this may also lessen students' sense of privacy or anonymity. In another study using asynchronous messaging via a similar platform, we have created a webpage where counselors are introduced with photos and brief biographies, which may also minimize this perception (Bonar et al., in press).

Empirical research on strategies to boost student engagement in online mental health interventions is a critical next step for the field. In addition to examining the extent to which intervention engagement is improved by personalizing the online counselors or using video conferencing, further research is recommended on the cultural tailoring of intervention website interfaces, understanding that such tailoring may need to occur regularly due to changes in student preferences. Although we sent up to two "friendly" MI-adherent follow-up messages to students in *e*Bridge who did not make use of online counseling, it is possible that other types of "nudge" strategies would be helpful, and these warrant further investigation. It would also be useful to examine strategies for integrating interventions into university infrastructure, which could facilitate student engagement. Possibilities include linking *e*Bridge or a similar intervention with student orientations or class registrations, offering *e*Bridge as an "opt-out" intervention, and/or having *e*Bridge be introduced by trusted university personnel such as academic advisors or residence hall advisors. For first year college students, it is possible that involvement of their parents at orientation would be helpful. Finally, it would be beneficial to examine strategies for changing students' beliefs regarding the helpfulness of treatment. The Health Belief Model (e.g. Janz et al., 2002) emphasizes the importance of these beliefs to treatment seeking, which is supported by recent research suggesting that students with more severe depression are not more likely to obtain treatment. In a study of college students' mental health practices, students with moderate depressive symptoms and impairment were more likely to obtain services than those without depressive symptoms, while those with even more severe depressive symptoms and impairment were not (Cadigan et al., 2019).

Promising, albeit preliminary, findings suggest that interventions aimed at linking at-risk students to professional care may be helpful to the students who engage with them. In addition to our findings that engagement with *e*Bridge was associated with linkage to mental health services, Ray et al. (2019) reported promising findings for the "Student Resilience Project," an online wellness intervention for college students. Conceptualized as a trauma resistance education strategy, this intervention incorporated videos about key developmental issues (e.g., relationship breakups), psychoeducational talks, online skills training, and links to campus resources. In their quasi-experimental study of 382 undergraduate students, in which treatment and control groups were compared using post-tests only, students in the intervention group reported greater self-efficacy to address their "struggles and challenges," a higher likelihood of engaging in self-help activities, and a greater intention to use mental health resources.

This study had substantial strengths, including its randomized design, prospective 6-month follow-up, and large sample size drawn from four universities. In addition, our relatively large sample size enabled us to control for potential baseline group differences in readiness to seek treatment and clinical characteristics, such as depression. Despite these strengths, our sample was not nationally representative, and we could only reach the approximately 25% of

invited students who enrolled in the study and completed the suicide risk screen. Although this is higher than the participation rates found previously for online interventions for mental health concerns among college students (e.g. Moffitt et al., 2014), it indicates the importance of multiple strategies for reaching students at risk. Regarding study design, it is possible that our Control condition, which included screening with PF and the presentation of MH resource information on all screening and PF website pages, was beneficial to students and obscured differences between intervention groups. Nevertheless, we believe it is important to offer PF to all students who participate in screening as they are at elevated risk for suicidal behavior, PF is already known to be somewhat helpful, and the critical scientific questions at this time pertain to how we can build upon this effectiveness. Further research is recommended, however, that provides PF automatically to students in both conditions, rather than requiring those in the *e*Bridge condition to actively choose to view this PF. In keeping with the theoretical basis of *e*Bridge and its emphasis on personal choice, we made viewing PF an option for students in the *e*Bridge condition; however, this necessitated an additional step to view the feedback, which may have created an artificial hurdle and negatively impacted engagement and intervention effects.

In summary, although the majority of students in the *e*Bridge condition viewed their PF, many fewer engaged in the optional online counseling. This was despite the nonthreatening MI-adherent approach of the *e*Bridge online counselors, including their use of up to two "reach outs" to students who did not initiate online counseling. These findings suggest the importance of further research to identify strategies to facilitate the engagement of students in online interventions and in MH services. Although it cannot be interpreted as an *e*Bridge effect per se, *e*Bridge was associated with greater linkage to MH services, relative to the control condition, for students in the *e*Bridge condition who engaged in online counseling. In line with a public health approach, this suggests that *e*Bridge is a promising strategy for reaching some students at risk, perhaps as part of multi-pronged campus plans to address suicide risk, and that a number of different strategies are likely needed to reach a larger proportion of college students at elevated risk for suicide.

Acknowledgments

References

American College Health Association. (2019). American College Health Association - National College Health Assessment II: Reference group executive summary spring 2019. Retrieved from

American Foundation for Suicide Prevention. (2020). American Foundation for Suicide Prevention. Retrieved from https://afsp.org/

Arean PA, Hallgren KA, Jordan JT, Gazzaley A, Atkins DC, Heagerty PJ, & Anguera JA (2016). The use and effectiveness of mobile apps for depression: Results from a fully remote clinical trial. Journal of Medical Internet Research, 18(12), e330. [PubMed: 27998876]

Baumel A, Edan S, & Kane JM (2019). Is there a trial bias impacting user engagement with unguided e-mental health interventions? A systematic comparison of published reports and real-world usage of the same programs. Translational Behavioral Medicine, 9(6), 1020–1033. [PubMed: 31689344]

Becker SP, Holdaway AS, & Luebbe AM (2018). Suicidal behaviors in college students: Frequency, sex differences, and mental health correlates including sluggish cognitive tempo. Journal of Adolescent Health, 63(2), 181–188.

Blanco C, Okuda M, Wright C, Hasin DS, Grant BF, 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. [PubMed: 19047530]

Bonar E, Kelley M. Kidwell KM, Bohnerte A, Bourquea CA,Carter PM, Clark SJ, Glantzj MD King CA, Losmang ED, McCabe SE, Philyaw-Kotova ML, Prosser LA, Voepel-Lewisf T, Zheng K, Walton MA. Optimizing scalable, technology-supported behavioral interventions to prevent opioid misuse among adolescents and young adults in the emergency department: A randomized controlled trial protocol. Contemporary Clinical Trials. In Press.

Bruffaerts R, Mortier P, Auerbach RP, Alonso J, Hermosillo De la Torre AE, Cuijpers P, … Hasking P (2019). Lifetime and 12-month treatment for mental disorders and suicidal thoughts and behaviors among first year college students. International Journal of Methods in Psychiatric Research, 28(2), e1764. doi:10.1002/mpr.1764 [PubMed: 30663193]

Burke BL, Arkowitz H, & Menchola M (2003). The efficacy of motivational interviewing: a meta-analysis of controlled clinical trials. Journal of Consulting and Clinical Psychology, 71(5), 843. [PubMed: 14516234]

Cadigan JM, Lee CM, & Larimer ME (2019). Young adult mental health: A prospective examination of service utilization, perceived unmet service needs, attitudes, and barriers to service use. Prevention Science, 20(3), 366–376. [PubMed: 29411197]

Centers for Disease Control and Prevention. (2020). Web-based Injury Statistics Query and Reporting System (WISQARS). Retrieved from www.cdc.gov/ncipc/wisqars

Conner KR, Huguet N, Caetano R, Giesbrecht N, McFarland BH, Nolte KB, & Kaplan MS (2014). Acute use of alcohol and methods of suicide in a US national sample. American Journal of Public Health, 104(1), 171–178. [PubMed: 23678938]

Coughlin LN, Nahum-Shani I, Philyaw-Kotov ML, Bonar EE, Rabbi M, Klasnja P, … Walton MA (2021). Developing an adaptive mobile intervention to address risky substance use among adolescents and emerging adults: Usability study. JMIR mHealth and uHealth, 9(1), e24424. doi:10.2196/24424 [PubMed: 33448931]

Czyz EK, Horwitz AG, Eisenberg D, Kramer A, & King CA (2013). Self-reported barriers to professional help seeking among college students at elevated risk for suicide. Journal of American College Health, 61(7), 398–406. [PubMed: 24010494]

Deci EL, & Ryan RM (1985). The general causality orientations scale: Self-determination in personality. Journal of Research in Personality, 19(2), 109–134.

Doumas DM, Workman C, Smith D, & Navarro A (2011). Reducing high-risk drinking in mandated college students: Evaluation of two personalized normative feedback interventions. Journal of Substance Abuse Treatment, 40(4), 376–385. [PubMed: 21295938]

Eisenberg D, Gollust SE, Golberstein E, & Hefner JL (2007). Prevalence and correlates of depression, anxiety, and suicidality among university students. American Journal of Orthopsychiatry, 77(4), 534–542. [PubMed: 18194033]

Eisenberg D, Hunt J, Speer N, & Zivin K (2011). Mental health service utilization among college students in the United States. The Journal of Nervous and Mental Disease, 199(5), 301–308. [PubMed: 21543948]

Evans B (2020). The Zoom revolution: 10 eye-popping stats from tech's new superstar. Retrieved from https://cloudwars.co/covid-19/zoom-quarter-10-eye-popping-stats-from-techs-new-superstar/

Fergusson DM, Horwood LJ, Ridder EM, & Beautrais AL (2005). Suicidal behaviour in adolescence and subsequent mental health outcomes in young adulthood. Psychological Medicine, 35(7), 983–993. [PubMed: 16045065]

Flensborg-Madsen T, Knop J, Mortensen EL, Becker U, Sher L, & Grønbæk M (2009). Alcohol use disorders increase the risk of completed suicide—Irrespective of other psychiatric disorders. A longitudinal cohort study. Psychiatry Research, 167(1–2), 123–130. [PubMed: 19359047]

Flett JA, Hayne H, Riordan BC, Thompson LM, & Conner TS (2019). Mobile mindfulness meditation: a randomised controlled trial of the effect of two popular apps on mental health. Mindfulness, 10(5), 863–876.

Gallagher RP (2006). National Survey of Counseling Center Directors 2005. Retrieved from http://www.education.pitt.edu/survey/nsccd/

Garlow SJ, Rosenberg J, Moore JD, Haas AP, Koestner B, Hendin H, & Nemeroff CB (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. [PubMed: 17559087]

Geisner IM, Neighbors C, & Larimer ME (2006). A randomized clinical trial of a brief, mailed intervention for symptoms of depression. Journal of Consulting and Clinical Psychology, 74(2), 393. [PubMed: 16649884]

Ginley MK, & Bagge CL (2017). Psychiatric heterogeneity of recent suicide attempters: A latent class analysis. Psychiatry Research, 251, 1–7. [PubMed: 28167395]

Haas A, Koestner B, Rosenberg J, Moore D, Garlow SJ, Sedway J, … Nemeroff CB (2008). An interactive web-based method of outreach to college students at risk for suicide. Journal of American College Health, 57(1), 15–22. [PubMed: 18682341]

Haskins J, Carson JG, Chang CH, Kirshnit C, Link DP, Navarra L, … Yellowlees P (2016). The suicide prevention, depression awareness, and clinical engagement program for faculty and residents at the University of California, Davis Health System. Academic Psychiatry, 40(1), 23–29. doi:10.1007/s40596-015-0359-0 [PubMed: 26063680]

Hawton K, i Comabella CC, Haw C, & Saunders K (2013). Risk factors for suicide in individuals with depression: A systematic review. Journal of Affective Disorders, 147(1–3), 17–28. [PubMed: 23411024]

Henshaw EJ, & Freedman-Doan CR (2009). Conceptualizing mental health care utilization using the health belief model. Clinical Psychology: Science and Practice, 16(4), 420–439.

Horwitz AG, McGuire T, Busby DR, Eisenberg D, Zheng K, Pistorello J, … King CA (2020). Sociodemographic differences in barriers to mental health care among college students at elevated suicide risk. Journal of Affective Disorders, 271, 123–130. [PubMed: 32479307]

Janz N, Champion V, & Strecher V (2002). The Health Belief Model. In Glanz K, Rimer B, & Lewis F (Eds.), Health Behavior and Health Education: Theory, Research, and Practice. San Francisco, CA: Jossey-Bass Inc. Pub.

Kann L, McManus T, Harris WA, Shanklin SL, Flint KH, Queen B, … Thornton J (2018). Youth risk behavior surveillance—United States, 2017. MMWR Surveillance Summaries, 67(8), 1.

Kessler RC, Berglund P, Chiu WT, Demler O, Heeringa S, Hiripi E, … Zaslavsky A (2004). The US national comorbidity survey replication (NCS-R): design and field procedures. International Journal of Methods in Psychiatric Research, 13(2), 69–92. [PubMed: 15297905]

Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, & Walters EE (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. [PubMed: 15939837]

King CA, Eisenberg D, Zheng K, Czyz E, Kramer A, Horwitz A, Chermack S (2015). Online suicide risk screening and intervention with college students: A pilot randomized controlled trial. J Consult Clin Psychol. 2015; 83(3): 630–636. [PubMed: 25688811]

Kokotailo PK, Egan J, Gangnon R, Brown D, Mundt M, & Fleming M (2004). Validity of the alcohol use disorders identification test in college students. Alcoholism: Clinical and Experimental Research, 28(6), 914–920. [PubMed: 15201634]

Kroenke K, Spitzer RL, & Williams JB (2001). The PHQ-9: Validity of a brief depression severity measure. Journal of General Internal Medicine, 16(9), 606–613. [PubMed: 11556941]

Kroenke K, Spitzer RL, & Williams JB (2003). The Patient Health Questionnaire-2: Validity of a two-item depression screener. Medical Care, 1284–1292. [PubMed: 14583691]

LaBrie JW, Quinlan T, Schiffman JE, & Earleywine ME (2005). Performance of alcohol and safer sex change rulers compared with readiness to change questionnaires. Psychology of Addictive Behaviors, 19(1), 112. [PubMed: 15783287]

Levin ME, Stocke K, Pierce B, & Levin C (2018). Do college students use online self-help? A survey of intentions and use of mental health resources. Journal of College Student Psychotherapy, 32(3), 181–198.

Link BG, Cullen FT, Struening E, Shrout PE, & Dohrenwend BP (1989). A modified labeling theory approach to mental disorders: An empirical assessment. American Sociological Review, 400–423.

Lipson SK, Lattie EG, & Eisenberg D (2019). Increased rates of mental health service utilization by US college students: 10-year population-level trends (2007–2017). Psychiatric Services, 70(1), 60–63. [PubMed: 30394183]

Löwe B, Kroenke K, & Gräfe K (2005). Detecting and monitoring depression with a two-item questionnaire (PHQ-2). Journal of psychosomatic research, 58(2), 163–171. [PubMed: 15820844]

Markland D, Ryan RM, Tobin VJ, & Rollnick S (2005). Motivational interviewing and self–determination theory. Journal of Social and Clinical Psychology, 24(6), 811–831.

Melcher J, Camacho E, Lagan S, & Torous J (2020). College student engagement with mental health apps: Analysis of barriers to sustained use. Journal of American College Health, 1–7.

Miller MB, Leffingwell T, Claborn K, Meier E, Walters S, & Neighbors C (2013). Personalized feedback interventions for college alcohol misuse: An update of Walters & Neighbors (2005). Psychology of Addictive Behaviors, 27(4), 909. [PubMed: 23276309]

Miller WR, & Rollnick S (2012). Motivational interviewing: Helping people change. New York, NY: Guilford Press.

Moffitt LB, Garcia-Williams A, Berg JP, Calderon ME, Haas AP, & Kaslow NJ (2014). Reaching graduate students at risk for suicidal behavior through the interactive screening program. Journal of College Student Psychotherapy, 28(1), 23–34.

Moskos M, Olson L, Halbern S, Keller T, & Gray D (2005). Utah youth suicide study: Psychological autopsy. Suicide and Life-Threatening Behavior, 35(5), 536–546. [PubMed: 16268770]

Moutier C, Norcross W, Jong P, Norman M, Kirby B, McGuire T, & Zisook S (2012). The suicide prevention and depression awareness program at the University of California, San Diego School of Medicine. Academic Medicine, 87(3), 320–326. doi:10.1097/ACM.0b013e31824451ad [PubMed: 22373625]

Moyers T, Martin T, Manuel J, Miller W, & Ernst D (2010). Revised global scales: Motivational interviewing treatment integrity 3.1. 1 (MITI 3.1. 1). Retrieved from Albuquerque, NM: https://casaa.unm.edu/download/miti3_1.pdf

Office of the Surgeon General, & National Action Alliance for Suicide Prevention. (2012). 2012 national strategy for suicide prevention: goals and objectives for action: a report of the US Surgeon General and of the National Action Alliance for Suicide Prevention.

Owen JE, Jaworski BK, Kuhn E, Makin-Byrd KN, Ramsey KM, & Hoffman JE (2015). mHealth in the wild: Using novel data to examine the reach, use, and impact of PTSD coach. JMIR Mental Health, 2(1), e7. [PubMed: 26543913]

Patrick H, & Williams GC (2012). Self-determination theory: Its application to health behavior and complementarity with motivational interviewing. International Journal of Behavioral Nutrition and Physical Activity, 9(1), 18. [PubMed: 22385676]

Ray EC, Arpan L, Oehme K, Perko A, & Clark J (2019). Helping students cope with adversity: the influence of a web-based intervention on students' self-efficacy and intentions to use wellness-related resources. Journal of American College Health, 1–8.

Richards D (2011). Prevalence and clinical course of depression: A review. Clinical Psychology Review, 31(7), 1117–1125. [PubMed: 21820991]

Riper H, van Straten A, Keuken M, Smit F, Schippers G, & Cuijpers P (2009). Curbing problem drinking with personalized-feedback interventions: A meta-analysis. American Journal of Preventive Medicine, 36(3), 247–255. [PubMed: 19215850]

Rosenstock IM (1966). Why people use health services. The Milbank Quarterly, 44, 94–127.

Saunders JB, Aasland OG, Babor TF, De La Fuente JR, & Grant M (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption--II. Addiction, 88(6), 791–804. [PubMed: 8329970]

Sontag-Padilla L, Woodbridge MW, Mendelsohn J, D'Amico EJ, Osilla KC, Jaycox LH, … Stein BD (2016). Factors affecting mental health service utilization among California public college and university students. Psychiatric Services, 67(8), 890–897. [PubMed: 27032662]

Strecher VJ, Champion VL, & Rosenstock IM (1997). The health belief model and health behavior. In Gochman D (Ed.), Handbook of health behavior research I: Personal and social determinants (pp. 71–91). New York: Plenum Press.

The Jed Foundation. (2020). The Jed Foundation. Retrieved from https://www.jedfoundation.org/

Turecki G, & Brent DA (2016). Suicide and suicidal behaviour. The Lancet, 387(10024), 1227–1239.

Turecki G, Brent DA, Gunnell D, O'Connor RC, Oquendo MA, Pirkis J, & Stanley BH (2019). Suicide and suicide risk. Nature Reviews Disease Primers, 5(1), 1–22.

Xiao H, Carney DM, Youn SJ, Janis RA, Castonguay LG, Hayes JA, & Locke BD (2017). Are we in crisis? National mental health and treatment trends in college counseling centers. Psychological Services, 14(4), 407. [PubMed: 29120199]

Public Health Significance

Suicide is the second leading cause of death among college students. Moreover, recent national surveys indicate that more than 10% of college students have seriously considered attempting suicide within the past year. In keeping with recommendations in the National Strategy for Suicide Prevention (Office of the Surgeon General & National Action Alliance for Suicide Prevention, 2012), this project examined the efficacy of *e*Bridge, an online intervention that identifies students at elevated suicide risk and facilitates their linkage to mental health services, in a multi-university randomized controlled trial.

178,879 Invited to participate

Enrollment

42,148 (23.6%) consented to participate
40,334 (95.7%) completed screen

34,544 (85.6%) Negative Screen

5,790 (14.4%) Screened Positive

2,083 (36.0%) Current MH Tx
89 (1.5%) Missing MH Tx

3,618 (62.5%) Eligible for Randomization

255 (7.0%) Incomplete survey

3,363 (93.0%) Randomized

1,673 (49.7%)
Allocated to
eBridge

Allocation

1,690 (50.3%)
Allocated to
Control

1310 (78.3%) initiated
6-month assessment

Follow-Up

1349 (79.8%) initiated
6-month assessment

Analysis

75 (2.8%) not included in
regressions due to insufficient
data at follow-up
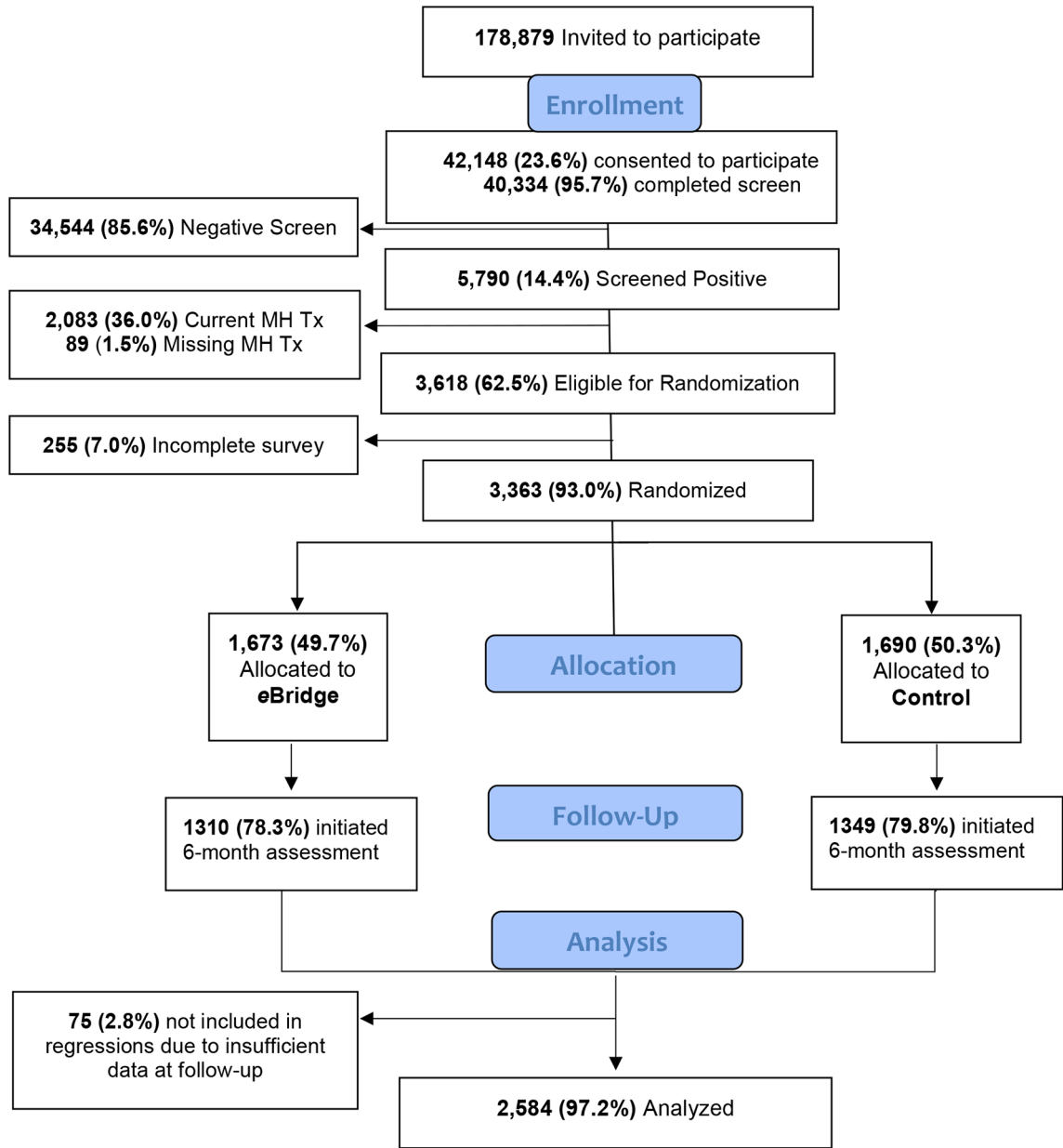
2,584 (97.2%) Analyzed

Figure 1.
Participant Flow Chart

Table 1

Sample Demographic Characteristics with Between-Group Comparisons

	Overall n = 3363	Control n=1690	*e*Bridge n=1673	Test statistic χ^2 (df) or t(df)
Study Site				χ^2 (3) = 1.67
Site A	11.2%	10.7%	11.7%	
Site B	26.9%	26.4%	27.4%	
Site C	37.5%	38.1%	36.9%	
Site D	24.4%	24.8%	24.0%	
Age Group				χ^2 (3) = 6.01
18 Years	39.7%	40.4%	39.0%	
19–22 Years	36.6%	34.8%	38.4%	
23–30 Years	20.1%	20.8%	19.4%	
31+ Years	3.5%	4.0%	3.1%	
Gender				χ^2 (2) = 0.70
Male	35.0%	35.3%	34.7%	
Female	62.2%	62.1%	62.3%	
Transgender/Genderqueer	2.8%	2.6%	3.1%	
Race				
White	73.2%	74.4%	72.0%	χ^2 (1) = 2.62
Black	7.0%	6.6%	7.4%	χ^2 (1) = 0.92
Asian	19.9%	18.8%	21.0%	χ^2 (1) = 2.47
American Indian	2.1%	1.7%	2.5%	χ^2 (1) = 2.23
Pacific Islander	1.0%	0.8%	1.1%	χ^2 (1) = 0.82
Other Race	8.6%	8.2%	8.9%	χ^2 (1) = 0.50
Ethnicity				
Hispanic or Latinx	12.4%	12.8%	12.0%	χ^2 (1) = 0.53

Note. Participants could select more than one race.

Table 2

Sample Clinical Characteristics with Between-Group Comparisons

	Baseline			6-Month		
	Overall Mean (SD) N = 3363	Control Mean (SD) n = 1690	*e*Bridge Mean (SD) n = 1673	Overall Mean (SD) n = 2659	Control Mean (SD) n = 1,349	*e*Bridge Mean (SD) n = 1,310
Wanted to Die	58.6%	59.3%	57.9%	28.7%	27.7%	29.8%
Suicidal Ideation	54.3%	53.3%	55.3%	26.6%	27.3%	25.8%
Suicide Attempt	25.6%	25.3%	25.6%	0.7%	0.6%	0.7%
Medication				14.1%	14.8%	13.3%
Counseling or Therapy				25.6%	25.7%	25.4%
Any MH treatment				31.6%	31.9%	31.1%
Depression (PHQ9)	12.88 (5.7)	12.93 (5.7)	12.84 (5.7)	10.28 (6.0)	10.44 (6.1)	10.11 (5.9)
Adaptive Functioning (PHQ10)	1.34 (0.9)	1.33 (0.9)	1.34 (0.9)	1.28 (0.9)	1.27 (0.9)	1.29 (0.9)
Alcohol Use (AUDIT)	6.08 (5.7)	6.17 (5.8)	5.99 (5.6)	4.92 (5.2)	4.86 (5.2)	4.97 (5.3)
Readiness Average	3.60 (2.3)	3.57 (2.3)	3.63 (2.3)	4.11 (2.6)	4.08 (2.6)	4.14 (2.5)
Ready Seek Information	4.67 (3.4)	4.63 (3.4)	4.71 (3.4)	5.25 (3.7)	5.21 (3.7)	5.29 (3.7)
Ready Talk to Family	3.36 (3.7)	3.39 (3.7)	3.33 (3.6)	4.03 (4.0)	4.07 (4.0)	3.98 (3.9)
Ready Talk to Friend	4.30 (3.7)	4.24 (3.7)	4.37 (3.7)	4.97 (3.9)	4.80 (3.9)*	5.15 (3.9)*
Ready Seek Professional Help	4.15 (3.2)	4.10 (3.2)	4.20 (3.1)	4.85 (3.7)	4.78 (3.6)	4.92 (3.7)

Note. $p < .05$. Chi-square tests and t-tests were used to examine between group differences between baseline and 6-month scores for categorical and continuous variables, respectively.

Table 3

Logistic Regression Examining Predictors of Mental Health Services Utilization at 6-month Follow-Up

	Any Tx at Follow-Up (ITT)		Any Tx at Follow-up (Engaged)		Therapy at Follow-up (Engaged)	
	z	AOR (95% CI)	z	AOR (95% CI)	z	AOR (95% CI)
Intervention ITT (Ref: Control)	−0.50	0.96 (0.81, 1.14)	---	---	---	---
No messages (n = 1,148)	---	---	−2.01*	0.83(0.69, 0.99)	−1.66	0.85(0.69, 1.03)
One message (n = 168)	---	---	2.09*	1.47 (1.02, 2.12)	1.28	1.29 (0.88, 1.89)
Multiple messages (n = 156)	---	---	2.41*	1.57 (1.09, 2.26)	2.85**	1.72 (1.18, 2.50)
Depression	6.81***	1.06 (1.04, 1.07)	6.65***	1.06 (1.04, 1.07)	5.49***	1.05 (1.03, 1.07)
Alcohol Use	2.18*	1.02 (1.00, 1.03)	2.12*	1.02 (1.00, 1.03)	1.22	1.01 (0.99, 1.03)
Past year SI	0.39	1.04 (0.87, 1.23)	0.21	1.02 (0.85, 1.21)	0.92	1.09 (0.91, 1.32)
Lifetime Suicide Attempts (Ref: None)	---	---	---	---	---	---
One attempt	0.51	1.07 (0.82, 1.39)	0.55	1.08 (0.83, 1.40)	0.54	1.08 (0.82, 1.42)
Multiple attempts	3.52***	1.60 (1.23, 2.09)	3.53***	1.61 (1.24, 2.09)	3.33**	1.59 (1.21, 2.10)

Note.

*
$p < .05$

**
$p < .01$

***
$p < .001$.

Age, gender, university, and year of study were included as covariates. Any Tx refers to attending a counseling/therapy session or taking a prescribed medication for emotional/behavioral issue during follow-up period.

ITT = Intent to Treat. SI = Suicidal ideation.