Acceptability and Utility of an Open-Access, Online Single-Session Intervention Platform for
Adolescent Mental Health

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Abstract

Background. Many youths with mental health needs are unable to access care. Single-session interventions (SSIs) have helped reduce youth psychopathology across multiple trials, suggesting promise to broaden access to effective, low-intensity supports. Online, self-guided SSIs may be especially scalable, particularly if freely available for as-needed use. However, online SSIs' acceptability and effects have remained unexamined outside of controlled trials, leaving their practical utility poorly understood. *Objective.* We evaluated the perceived acceptability and proximal effects of Project YES (Youth Empowerment & Support; www.schleiderlab.org/yes), an open-access platform offering three online SSIs for youth internalizing distress.

Method. After selecting one of three SSIs to complete, youth participants (ages 11-17 years) reported pre- and post-SSI levels of clinically-relevant outcomes that SSIs may target (e.g. hopelessness; self-hate) and perceived SSI acceptability. User-pattern variables, demographics, and depressive symptoms were collected to characterize youths engaging with YES. *Results.* From 9/2019-3/2020, 694 youths accessed YES, of whom 539 began and 187 completed a 30-minute, self-guided SSI. SSI completers reported clinically-elevated depressive symptoms, on average, and were diverse on several dimensions (53.75% non-white; 78.10% female; 43.23% sexual minorities). Regardless of SSI selection, completers reported pre- to post-program reductions in hopelessness ($d_{av} = .53$; $d_z = .71$), self-hate ($d_{av} = .32$; $d_z = .61$), perceived control ($d_{av} = .60$; $d_z = .72$) and agency ($d_{av} = .39$; $d_z = .50$). Youths rated all SSIs as acceptable (e.g., enjoyable; likely to help peers). *Conclusions.* Results support the perceived acceptability and utility of open-access, free-of-charge SSIs for youth experiencing internalizing distress.

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Acceptability and Utility of an Open-Access, Online Single-Session Intervention Platform for Adolescent Mental Health

The persistent unmet need for youth mental health services, combined with the ubiquity of internet-equipped devices, has fueled a surge of interest in digital mental health interventions. Despite decades of progress in identification of evidence-supported psychosocial treatments, myriad barriers—both systemic (high costs, transportation challenges) and internal (stigma, preferences for self-help)—prevent up to 80% of youth from accessing needed care [1,2]. The notion of low-cost, self-guided digital interventions thus appeals to researchers, providers, and clients alike. Indeed, mental healthcare apps are downloaded by millions of users annually [3,4], and a vast majority of U.S. adolescents have access to internet-equipped smartphones (95%) and computers (88% [5]). These realities create opportunities for youth with no accessible alternatives to engage with digital supports.

Randomized trials suggest the promise of internet- and smartphone-based youth mental health tools [6–10]. However, formal clinical trial outcomes may not reflect the utility or usability of digital supports in naturalistic contexts. First, few evidence-based digital interventions developed for clinical trials are publicly accessible [11], and those that are attract far fewer users than commercially-popular but untested alternatives (e.g., Headspace [12]). Indeed, the most-downloaded mental health apps have been shown to include *few to no* treatment elements found in empirically-supported psychotherapies [13,14]. Second, digital intervention attrition rates differ markedly in clinical trials and “real-world” contexts. In a review of digital self-help tools, including apps and internet-based programs for depression and anxiety, completion rates for programs in clinical trials were 44-99%, whereas completion rates for the same programs in naturalistic, non-research settings—where participants received no incentives

for program engagement—were 1-28% [15]. Overall, daily usage rates for mental health apps hovers at just 4% (based on rates of opening a previously-downloaded program [7]). Reasons for low engagement in youth-directed mental health apps include lack of perceived program value, limits on program accessibility (e.g., within-program fees; limits on 24/7 access), and poor user experience (e.g, high demands on users' time [4,16]). Thus, a need exists for digital mental health supports that (1) include evidence-based content, established in well-controlled trials; (2) show acceptability in naturalistic contexts (i.e., outside of formal trials); (3) minimize demands on users' time, given the high likelihood of accessing a digital intervention only once; and (4) are free of access barriers, such as program costs.

Single-session interventions (SSIs)—structured interventions including *one* component of empirically-supported treatments and requiring *one* encounter with a provider or program—could dramatically improve the acceptability and accessibility of digital mental health tools. Overall, SSI effects on youth psychopathology are slightly smaller than those observed for youth treatments lasting an average 16 sessions ($g = .32$ for single-session interventions [17], versus $g = .46$ for multi-session interventions, [17,18], but their brevity and flexible format magnify their potential public health impact [19]. Additionally, across placebo-controlled trials, self-administered online SSIs have reduced youth depression across 4-9 months in high-symptom and community youth samples [20–22]. These findings suggest untapped potential of online SSIs to improve youths' access to effective support.

In principle, online SSIs might overcome many challenges typical of traditional digital mental health tools. They are completable within one sitting, minimizing engagement burdens on users, and many are cost-free, publicly accessible, and include evidence-based intervention components. However, there have been no formal evaluations of online SSIs' acceptability

outside of controlled clinical trials. To gauge the promise and challenges to realizing online SSIs' potential to benefit youth mental health, we must systematically evaluate usage-patterns, perceived acceptability, and the short-term effects of online SSIs in naturalistic contexts.

Toward this goal, we conducted an open-access program evaluation of online SSIs for adolescent mental health, Project YES (Youth Empowerment & Support; www.schleiderlab.org/YES), to evaluate the acceptability and initial effects of three free-of-charge, publicly available web-based SSIs for adolescent internalizing distress. In line with SSI design recommendations, each of these three SSIs was intended to target and strengthen *adaptive beliefs* about the self and the world that have been shown to predict youth internalizing distress.

The first SSI, Project Personality, teaches how and why people's traits—including their symptoms—are malleable rather than fixed [20]. Project Personality aims to strengthen adolescents' *perceived control* over their own behavior and emotions while *reducing hopelessness* regarding positive future change. Low perceived control and elevated hopelessness consistently predict the course and severity of youth internalizing problems [23–27]. Further, both perceived control and hopelessness are modifiable via brief intervention, making them ideal proximal SSI targets. In a recent trial relative to a placebo control, Project Personality significantly improved high symptom adolescents' perceived control over emotions and behavior [15], and larger proximal increases in perceived control following Project Personality predicted greater reductions in internalizing symptoms over time [28]. Thus, in the context of Project YES, we assessed Project Personality's link with improvements in perceived control and hopelessness.

The second SSI, Project CARE, teaches how and why one can work towards acting with self-compassion in order to systematically reduce self-hate [29]. Self-hate and closely related constructs (i.e. self-criticism) are linked with current and future internalizing problems in both

youths and adults [30–34]. Preliminary evidence also suggests negative perceptions of the self, including self-hate, are *modifiable* through self-administered interventions as brief as 5-11 minutes [35–37,38]. Thus, within Project YES, we assessed Project CARE’s link with improvements in self-hate.

The third SSI, the ABC Project, is modeled after behavioral activation interventions targeting adolescent depression, which teach that engaging in valued activities can powerfully shape one’s mood [29,39]. The construct of *agency*—one’s self-perceived ability to initiate and work towards goals—is central to mechanisms thought to underlie behavioral activation for youth depression. Specifically, “agency” references one’s perceived capacity to (a) set behavioral goals, and (b) maintain or generate motivation to move toward those goals [40]. Behavioral activation for adolescent depression—including a one-session, therapist-delivered program [41]—has produced marked improvements in adolescents’ perceived agency and depression symptom severity, relative to control conditions [42–44] Thus, within Project YES, we assessed the ABC Project’s link with proximal improvements in agency.

To optimize each SSI’s capacity to shift these clinically-meaningful, proximal outcomes, each 30-minute program was created per a routinely employed SSI design framework, informed by basic social-psychological research and detailed elsewhere [19], wherein youths (1) learn brain science that normalizes each program’s core concept; (2) are treated as “experts” and invited to help researchers learn about youths’ perspectives and challenges; (3) synthesize the program’s ideas using their own words, while offering advice to peers facing difficulties; (4) hear stories from peers who used the program’s content to overcome setbacks. Regardless of SSI selection, youths taking part in YES are invited to offer their “best, anonymous coping advice” to other teens coping with depression or anxiety; each receives the option to share this advice to a

public “YES advice center.” This feature builds on research suggesting that helping or supporting peers can benefit one’s own self-efficacy, motivation, and psychosocial functioning [45,46,47].

All YES participants may complete anonymous pre- and post-program assessments of proximal outcomes that may be altered by SSIs (per prior recommendations for evaluating SSI effects; Schleider et al., 2020) along with feedback on program acceptability. Using pre-SSI, post-SSI, and user-pattern data collected from YES participants ages 11-17 across a seven-month period, we investigated (1) the acceptability of YES SSIs among youths, including completion rates and perceptions of each SSI’s utility, and (2) the *immediate effects* of YES SSIs on interrelated and clinically-relevant outcomes they are designed to target, each of which relates to youth internalizing problems (agency; perceived control; hopelessness; self-hate, assessed using both standardized and study-specific metrics). Specifically, we examined usage-pattern variables (e.g., SSI selection; SSI completion rates), user characteristics (age-range; sex; gender identity; race/ethnicity; depressive symptoms), and acceptability metrics to gauge *which youths* use YES; *how* and *why* they engage with it; and whether they view YES as valuable, helpful, and user-friendly. We also examined whether proximal, clinically-relevant outcomes significantly improved from pre- to post-SSI, both across all YES programs and within each program. This non-experimental, observational project represents a critical step in understanding the promise of online mental health SSIs, and the challenges to realizing that promise.

Method

Participants

Participants were youths ages 11-17 who took part in YES between September 19, 2019 and March 10, 2020. Participants learned about YES through various channels, including unpaid

posts to social media websites (Reddit, Twitter), Instagram advertisements (total costs <\$500), or an article published in *Vox* highlighting the authors' research [48]. Social media posts included invitations to participate in an anonymous program evaluation wherein "teens can learn new ways of dealing with stress and help others do the same." Posts linked to the public YES website (www.schleiderlab.org/yes), which includes additional information and a participation link. YES is completable from any internet-equipped device. Before YES was initiated, all procedures were reviewed and deemed "exempt" (as a program evaluation) by the University's Institutional Review Board (IRB).

Because YES is anonymous and publicly accessible, no inclusion or exclusion criteria are used (as none are enforceable). Thus, adults and children 10 or younger may choose to participate, although the YES website states that programs are meant for youths under age 18—primarily, pre-adolescent- and adolescent-aged youth. Within YES, participants are required to report their age-range and whether they are adults ($\geq$ age 18). Using these data, we limited analyses to our population of interest (youths under age 18).

Procedures

YES is a non-randomized, exploratory program evaluation; procedures and analyses were pre-registered on Open Science Framework (<https://osf.io/e52p3>).¹ To maintain youths'

¹ There were three minor deviations from the procedures described in our pre-registration that warrant mention. First, to minimize participation burdens for those completing pre- and post-SSI questionnaires in project YES, we decided approximately one month into data collection to use only the 3-item "Agency" subscale of the State Hope Scale as opposed to the full 6-item scale; we also used a reduced 3-item version of the Self-Hatred Scale; these three items were formally selected using confirmatory factor analysis in a separate sample of $N = 246$ adolescents from the same age group (see Multimedia Appendix 1). Second, the Self-Hatred Scale used in this study included 6 response options, not 7 as noted in the pre-registration, although the anchors are the same as in the originally-validated version and as noted in the pre-registration. Lastly, we had originally pre-registered an exploratory logistic regression to examine whether YES participants' demographic characteristics or symptom levels predicted odds of SSI completion or choice of SSI. Due to high multicollinearity among pre-registered predictors (e.g., biological sex and gender identity; VIF > 10), results of this test could not be responsibly interpreted; thus, we do not report them in this manuscript. An alternative approach to conducting these analyses was applied, and results are reported in the Multimedia Appendix 1.

anonymity and minimize access barriers (e.g., discomfort disclosing psychological distress, as parents are often unaware of their adolescents' depressive symptoms, including suicidal and morbid ideation, in up to 80% of cases [49,50]), parent permission is not required to participate (waived by the University IRB). After clicking the YES participation link and advancing past a "Project Information" page where agreement to participate is indicated, participants provide non-identifying demographic information; select one of three SSIs to complete; and may then complete pre-SSI questionnaires, the SSI, and post-SSI questionnaires, designed to gauge the SSI's acceptability and short-term effects. Lastly, participants are invited to anonymously share their "best advice for others dealing with depression, anxiety, or stress." They may elect or decline to share their advice in the YES "Advice Center" for others to see.

Interventions

Each SSI within Project YES is designed according to four primary elements proposed by Schleider and colleagues [19] for self-guided youth mental health SSIs. These elements were drawn from basic social-psychological research, along with qualities common among SSIs that have demonstrated efficacy [19,22,41,51,52]. Each YES SSI (1) uses brain science-based explanation to enhance content credibility; (2) empowers youth to take on an 'expert' or 'helper' role throughout the program; (3) includes guided writing assignments, often termed "saying-is-believing" or "self-persuasion" exercises, to enhance content internalization and generalization; and (4) includes testimonials from trusted others, such as older peers or scientific experts. For a detailed description of these four principles for SSI design, see Schleider et al., 2020.[19]

Materials for all SSIs in Project YES are publicly available via the Open Science Framework (Project Personality [53] ; Project CARE [29]; The ABC Project: [39]). All three are

30-minute, self-administered programs. All materials viewed by youths who take part in Project YES are publicly viewable on Project YES' website (www.schleiderlab.org/yes).

Project Personality. This SSI includes: An introduction to the brain and a lesson on neuroplasticity; Testimonials from older youths who describe their views that traits are malleable; Further stories by older youths, describing times when they used "growth mindsets" to persevere during social/emotional setbacks; Study summaries noting how/why personality can change; And an exercise in which youths write notes to younger students, using scientific information to explain people's capacity for change. Project Personality has demonstrated effectiveness in several trials [20,21,54].

Project CARE. This SSI includes: an introduction to the science behind why adolescents might think disliking themselves is necessary for success and thus fear self-compassion; Scientific evidence and testimonials from other teens that being self-compassionate actually predicts being more successful socially and academically; Evidence-based tips for overcoming common, fear of self-compassion based obstacles to self-compassion in day to day life; And an exercise in which youths write notes to younger students, using scientific information to explain the benefits of using self-kindness.

The ABC Project. This SSI draws from components of behavioral activation. It introduces the concept that engaging in value-based activities that build pleasure and accomplishment can combat sad mood and low self-esteem; includes psychoeducation about depression, including how behavior shapes feelings and thoughts; walks participants through a life values assessment, where youth identify key areas from which they draw enjoyment and meaning; and supports participants in creating an activity hierarchy, where youth identify and personalize 3 activities to target for change. Lastly, the ABC Project includes an exercise in which youths write about

benefits that might result from engaging in each activity; identify obstacles that might keep them from doing the activities; and a strategy for overcoming identified obstacles.

Measures

Demographics. Participants selected age bracket (provided in ranges to maintain anonymity: 11 to 13, 14 to 16, 17 to <18), biological sex, gender identity, sexual orientation, and race/ethnicity.

Mood and Feelings Questionnaire–Short. The SMFQ is a valid, reliable screening tool for depression in youth [55]. Pre-SSI, participants rated their agreement with 13 statements (e.g. “I felt lonely”; “I felt miserable or unhappy”; “I felt I was no good anymore”) reflecting thoughts and feelings in the past two weeks on a 3-point Likert scale (0=“not true”; 2=“true”). Internal consistency was $\alpha = 0.92$. Note that the SMFQ does not measure suicidal ideation or suicidality, which are not assessed in the context of Project YES.

State Hope Scale. The SHS [56] is a 6-item self-report scale designed to evaluate hope in youth, including two reliable subscales: agency and pathways. The “agency” subscale measures one’s perceived ability to generate plans and work towards one’s goals (e.g., “I can think of many ways to reach my current goals”); the “pathways” subscale reflects how one’s perceived success in meeting those goals (e.g., “At this time, I am meeting the goals I have set for myself”). In Project YES, we expected possible shifts in *agency* scores, but not in *pathways* scores, as participants would not have had opportunities to pursue goals in a new way from pre- to immediately post-SSI. Thus, we indexed hope using the 3-item SHS agency subscale. Immediately pre- and post-intervention, participants rated each of 3 statements to reflect how they felt about themselves right now on an 8-point Likert scale (0 = “definitely false”; 8 = “definitely true”). Internal consistency was $\alpha = 0.74$ and 0.82 at pre- and post-SSI, respectively.

Beck Hopelessness Scale—4. The BHS-4 [57] is a reliable, shortened version of the 20-item BHS used to measure hopelessness in youth [58]. Immediately pre- and post-intervention, participants rated each of 4 statements to indicate their sense of hopelessness “right now, in this moment” on a 4-point Likert scale (0 = “absolutely disagree”; 3 = “absolutely agree”). Internal consistency was $\alpha = 0.85$ and 0.89 at pre- and post-SSI, respectively.

Self-Hate Scale. The SHS [59] is a reliable, 7-item measure designed to measure feelings of self-hatred. A shortened, 3-item version of the original scale was adapted for the purposes of this study. Items were formally selected using confirmatory factor analysis in an initial sample of $N = 246$ adolescents from the same age group (ages 11-17; see Multimedia Appendix 1). Immediately pre- and post-intervention, participants rated how true each of 3 statements was for them right now (“I hate myself”, “I feel disgusted when I think about myself”, “I feel ashamed of myself”) on a 6-point Likert scale (1 = “not all all true for me”; 6 = “very true for me”). Internal consistency was $\alpha = 0.92$ and 0.94 at pre- and post-SSI, respectively.

Perceived Control. A single-item measure of adolescent perceived control was developed for this study. Immediately pre- and post-intervention, participants rated agreement with the statement, “right now, I feel like things are out of my control” from 0-10 (“not at all” to “a lot”).

Perceived Change in Hopelessness and Problem-Solving. Two questions, developed for use in the present study based on previously established guidelines for assessing subjectively-perceived change following an intervention [60], evaluated participants’ perceived change in hopelessness and ability to solve problems. Immediately post-intervention, these questions asked, “to what extent are you feeling hopeless right now?” and, “to what extent are you able to solve the problems facing you right now?”, when “compared to before doing this activity”. Perceived change in hopelessness and problem solving ability were both rated on a 5-point Likert

scale (“much more hopeless” to “a lot less hopeless”; “much less able to solve problems” to “a lot more able to solve problems”). These measures were created based on established methods used to calculate the “smallest effect size of interest”, or, the smallest possible effect size associated with a detectable, subjective change within individuals [60].

Program Feedback Scale. The PFS [61], which is routinely used to evaluate acceptability and user perceptions of SSIs [62–65] asks participants to rate agreement with 7 statements indicating perceived acceptability and feasibility of their selected SSI (e.g. “I enjoyed the program”) on a 5-point Likert scale (1=“really disagree”; 5=“totally agree”). The scale was adapted from existing, validated acceptability assessments of digital interventions; adaptations from existing scales were necessary in order to exclude items that are inapplicable to web-based SSIs (e.g., items referencing frequency of use or interest in continuing to revisit the program). The PFS also assessed participants’ open-response feedback. PFS item scores may be evaluated individually or via a mean-score across items. Internal consistency across PFS items was $\alpha=0.88$, but mean responses to *each* PFS items was considered independently in this study to inform understandings of acceptability in specific domains (e.g., enjoyability; ease of use; ease of understanding).

Analytic Plan

Sample characterization and usage-patterns. To assess YES usage-patterns, we identified numbers of youths who began YES; selected, started, and completed an SSI; which SSI youths selected; and demographics, symptom levels, and hopelessness, self-hate, and for youths who selected, started, and completed an SSI. For youths who completed an SSI and the PFS, we computed overall and item-level means to assess acceptability and feasibility of each SSI. Per our pre-registration, mean scores of >3 on any PFS item indicates item endorsement (i.e, positive

feedback/adequate acceptability); a mean *overall* score of >3, across all items, reflects overall perceived SSI acceptability. Using the sub-sample of SSI completers, descriptive statistics for pre-to-post SSI “perceived change” items were computed. Mean ratings >0 on either item indicated an overall, subjectively-detectable pre-to-post SSI change on that dimension (*hopelessness* or *problem-solving ability*).

SSI effects on proximal outcomes. Within-group effect sizes (Cohen’s *d*, including 95% confidence intervals) were computed reflecting change in pre-SSI to post-SSI levels of each immediate post-SSI outcome variable (*hopelessness*, *self-hate*, *agency*), both across and within SSIs. Because there are multiple approaches to computing Cohen’s *d* for within-subject designs [66], we report both d_{av} and d_z to maximize transparency:

$$\text{Cohen's } d_{av} = \frac{M_{\text{diff}}}{\frac{SD_1 + SD_2}{2}} \qquad \text{Cohen's } d_z = \frac{M_{\text{diff}}}{\sqrt{\frac{\sum (X_{\text{diff}} - M_{\text{diff}})^2}{N-1}}}$$

When the correlation between pre- and post-intervention outcome assessments is $r > 0.5$, d_z is larger than d_{av} ; when $r < 0.5$, Cohen’s d_z is smaller than Cohen’s d_{av} . Whereas d_z accounts for within-subject correlations between pre- and post-program measures, d_{av} does not. Here, conclusions were drawn based on patterns of effect sizes across both approaches to computing Cohen’s *d*.

All available data were used for each test described above. Missing data rates are reported but not imputed, as usage-patterns (including attrition) were of direct empirical interest. Anonymized data and code for all analyses are available via Open Science Framework (osf.io/mzhjk/).

Results

Sample and usage-patterns in YES.

From 9/2019-3/2020, 694 youths accessed Project YES, of whom 612 selected, 539 began, and 187 finished a 30-minute SSI, for an overall completion rate of 34.32% among those who began an intervention (see Tables 1 and 2 for details). Those who selected, began, and completed an SSI reported clinically-elevated depressive symptoms, on average (per an SMFQ cut-off score of 11 for early adolescents, [67], established via comparisons with diagnostic interviews and validated depression screening measures), and were diverse on several dimensions (across all youths who accessed YES: 53.28% non-white; 78.98% biologically female; 50.13% identified as non-heterosexual; see Table 1 for details). Among those who selected an SSI, 43.30% chose Project Personality (30.67% completion rate among those who began the SSI), 19.45% chose Project CARE (37.37% completion rate), and 37.25% chose the ABC Project (37.13% completion rate). Completion rates did not differ significantly from one another. Among youths who began an SSI, users ages 11-13 completed their chosen programs at higher rates than older users (57.75% of 11-13 year-olds, 29.45% of 14-16 year-olds and 33.09% of 17 to <18 year-olds). Biological sex (male versus female versus intersex), sexual orientation (non-heterosexual versus heterosexual), racial/ethnic identity, and depressive symptom severity (total SMFQ score) were not associated with odds of SSI completion.

Table 1.
Full Sample Demographics by SSI Completion Status

	Total Sample M (SD) or N (%)	Selected an SSI M (SD) or N (%)	Started an SSI M (SD) or N (%)	Completed an SSI M (SD) or N (%)
N	694	612	539	187
SMFQ	17.09 (6.41)	17.09 (6.41)	17.09 (6.43)	16.51 (6.34)
Age				
≤ 10	6 (0.86%)	5 (0.82%)	3 (0.56%)	3 (1.60%)
11 to ≤ 13	93 (13.40%)	80 (13.07%)	71 (13.17%)	41 (21.93%)
14 to ≤ 16	416 (59.94%)	367 (59.97%)	326 (60.48%)	97 (51.87%)
17 to < 18	178 (25.65%)	159 (25.98%)	139 (25.79%)	46 (24.60%)
Missing	1 (0.14%)	1 (0.16%)	0 (0%)	0 (0%)
Race/Ethnicity				
White	321 (46.25%)	295 (48.20%)	259 (48.05%)	89 (47.59%)
Black	19 (2.74%)	14 (2.29%)	11 (2.04%)	5 (2.67%)
Latino/Hispanic	18 (2.59%)	15 (2.45%)	11 (2.04%)	3 (1.60%)
Asian	89 (12.82%)	72 (11.77%)	65 (12.06%)	17 (9.09%)
Multiracial	46 (6.63%)	43 (7.03%)	41 (7.61%)	19 (10.16%)
Other	194 (27.95%)	168 (27.45%)	149 (27.64%)	54 (28.88%)
Missing	7 (1.01%)	5 (0.82%)	3 (0.56%)	0 (0%)
Sex				
Female	542 (78.10%)	478 (78.11%)	429 (79.59%)	150 (80.21%)
Male	142 (20.46%)	125 (20.43%)	105 (19.48%)	36 (19.25%)
Intersex	2 (0.29%)	1 (0.16%)	1 (0.19%)	0 (0%)
Missing	9 (1.30%)	8 (1.31%)	4 (0.74%)	1 (0.53%)
Gender Identity differs from sex				
Yes	147 (21.18%)	124 (20.26%)	113 (20.97%)	45 (24.06%)
No	489 (70.46%)	438 (71.57%)	385 (71.43%)	130 (69.52%)
Unsure	48 (6.91%)	42 (6.86%)	37 (6.87%)	11 (5.89%)

Missing	10 (1.44%)	8 (1.31%)	4 (0.74%)	1 (0.53%)
Sexual Orientation				
Heterosexual	295 (42.51%)	269 (43.95%)	235 (43.60%)	83 (44.39%)
Homosexual	6 (0.86%)	6 (0.98%)	5 (0.93%)	0 (0%)
Bisexual	104 (14.99%)	97 (15.85%)	85 (15.77%)	28 (14.97%)
Queer	12 (1.73%)	12 (1.96%)	10 (1.86%)	4 (2.14%)
Gay	12 (1.73%)	12 (1.96%)	10 (1.86%)	2 (1.07%)
Lesbian	29 (4.18%)	26 (4.25%)	25 (4.64%)	8 (4.28%)
Pansexual	32 (4.61%)	29 (4.74%)	28 (5.20%)	10 (5.35%)
Asexual	19 (2.74%)	17 (2.78%)	15 (2.78%)	7 (3.74%)
Other	31 (4.47%)	28 (4.58%)	24 (4.45%)	7 (3.74%)
Unsure	55 (7.93%)	50 (8.17%)	47 (8.72%)	18 (9.63%)
No response	50 (7.20%)	44 (7.19%)	38 (7.05%)	16 (8.56%)
Missing	49 (7.06%)	22 (3.60%)	17 (3.15%)	4 (2.14%)

Table 2
Demographics and mean depressive symptoms among SSI completers, by selected SSI

	ABC Project M (SD) or (%)	Project CARE M (SD) or (%)	Project Personality M (SD) or (%)
N	75	38	74
SMFQ	17.47 (6.84)	16.24 (6.80)	15.69 (5.46)
Age			
≤ 10	1 (1.33%)	2 (5.26%)	-
11 to 13	16 (21.33%)	9 (23.68%)	16 (21.62%)
14 to 16	47 (62.67%)	18 (47.37%)	32 (43.24%)
17 to < 18	11 (14.67%)	9 (23.68%)	26 (35.14%)
Race/Ethnicity			
White	33 (44.00%)	18 (47.37%)	38 (51.35%)
Black	3 (4.00%)	1 (2.63%)	1 (1.35%)
Latino/Hispanic	1 (1.33%)	-	2 (2.70%)
Asian	4 (5.33%)	4 (10.53%)	9 (12.16%)

Other	26 (34.67%)	10 (26.32%)	18 (24.32%)
Multiple	8 (10.66%)	5 (13.15%)	6 (8.11%)
Sex			
Female	63 (85.14%)	28 (73.68%)	59 (79.73%)
Male	11 (14.86%)	10 (26.32%)	15 (20.27%)
Intersex	-	-	-
Gender identity differs from sex			
Yes	20 (27.03%)	11 (28.95%)	14 (18.92%)
No	49 (66.22%)	25 (65.79%)	56 (75.68%)
Unsure	5 (6.76%)	2 (5.26%)	4 (5.41%)
Sexual Orientation			
Heterosexual	27 (36.99%)	23 (62.16%)	33 (45.21%)
Homosexual	-	-	-
Bisexual	10 (13.70%)	4 (10.81%)	14 (19.18%)
Queer	-	3 (8.11%)	1 (1.37%)
Gay	1 (1.37%)	-	1 (1.37%)
Lesbian	6 (8.22%)	1 (2.70%)	1 (1.37%)
Pansexual	7 (9.59%)	2 (5.41%)	1 (1.37%)
Asexual	3 (4.11%)	1 (2.70%)	3 (4.11%)
Other	4 (5.48%)	-	3 (4.11%)
Unsure	8 (10.96%)	1 (2.70%)	9 (12.33%)
No response	7 (9.59%)	2 (5.41%)	7 (9.59%)

On average, youths who completed YES in full spent 44.71 minutes on the YES website (SD = 37.24 minutes; median = 34.96 minutes; range = 10.95-292.23 minutes), inclusive of all questionnaires, their chosen SSI, and writing anonymous coping advice for the YES Advice Center. Across all youths who accessed the website, including those who neither began nor completed an SSI, average time spent on YES was 27.92 minutes; this value did not differ significantly across the three programs.

Did youths perceive YES as acceptable? Youths who completed an SSI and the PFS (N = 187), both collapsing across SSIs and within each SSI (Table 3; all item-level means > 3.50/5) found YES acceptable. Overall, youths rated their chosen SSI as enjoyable ($M = 3.72/5.00$), easy to understand ($M = 4.25/5.00$), easy to use ($M = 4.31/5.00$), likely to help their peers ($M = 4.04/5.00$), and worth recommending to others ($M = 3.83/4.00$). Youths also generally endorsed trying their hardest on the SSI ($M=3.83/5.00$) and agreement with the SSI's message (4.29/5.00). Ratings on these items did not differ by SSI selection.

Table 3
Means and standard deviations of Program Feedback Scale items among SSI completers, by selected SSI and across all SSIs

	ABC Project M (SD)	Project CARE M (SD)	Project Personality M (SD)	All SSIs M (SD)
PFS item				
Enjoy	3.57 (1.03)	3.84 (0.75)	3.81 (1.00)	3.72 (0.97)
Understood	4.16 (0.85)	4.08 (0.88)	4.43 (0.74)	4.25 (0.83)
Easy to use	4.28 (0.83)	4.21 (0.74)	4.39 (0.76)	4.31 (0.78)
Tried hardest	3.85 (1.09)	3.55 (1.08)	3.95 (1.03)	3.83 (1.07)
Helpful	3.97 (1.08)	4.16 (0.89)	4.05 (1.06)	4.04 (1.03)
Recommend to friend	3.72 (1.16)	3.95 (1.01)	3.89 (1.15)	3.83 (1.13)
Agree with message	4.11 (0.95)	4.47 (0.76)	4.38 (0.75)	4.29 (0.85)
PFS full scale	3.95 (0.82)	4.04 (0.61)	4.13 (0.69)	4.04 (0.73)

Did hopelessness, agency, perceived control, and self-hatred improve from before to after YES? We tested SSI short-term utility both across SSIs, given their common structures and shared principles underlying each program's development, and separately, as each SSI differed

in content. Across SSIs, and for each SSI separately, effect sizes d_{av} and d_z , 95% confidence intervals are reported (Table 4). Collapsing across SSIs, youths reported significant pre-to-post-SSI improvements in all proximal outcomes, regardless of d computation approach. For overall reductions in self-hatred, small-to-medium effects emerged ($d_{av}=.32$, 95% CI [.16, .47]; $d_z=.61$, 95% CI [.44, .77]), with post-SSI self-hatred showing a 55% chance of being lower than pre-SSI self-hatred (per the “common language effect size” estimate; see Lakens, 2013). For overall reductions in hopelessness, medium-to-large effects emerged ($d_{av}=.53$, 95% CI [.37, .69]; $d_z=.71$, 95% CI [.54, .87]), with post-SSI hopelessness showing a 62% chance of being lower than pre-SSI hopelessness. For overall improvements in agency, small-to-medium effects emerged ($d_{av}=.39$, 95% CI [.24, .55] ; $d_z=.50$, 95% CI [0.34, 0.65]), with post-SSI agency showing a 59% chance of being higher than pre-SSI agency. For overall improvements in perceived control, medium-to-large effects emerged ($d_{av}=.60$, 95% CI [.44, .76]; $d_z=.72$, 95% CI [.55, .89]), with post-SSI self-hatred scores showing a 64% chance of being lower than pre-SSI scores. SSI-specific effect sizes fell within similar ranges (see Table 3). Within and across SSIs, 95% effect size confidence intervals overlapped across proximal outcomes, suggesting no detectable differences in youths’ pre-to-post-program changes in hopelessness, self-hatred, agency, or perceived control as a function of SSI selection.

Table 4. Means, Standard Deviations, and Effect Sizes by Selected SSI

	ABC Project M (SD) or 95% CI	Project CARE M (SD) or 95% CI	Project Personality M (SD) or 95% CI
Agency			
Pre-SSI	4.36 (1.69)	4.66 (1.62)	4.69 (1.64)
Post-SSI	5.03 (1.84)	5.42 (1.34)	5.24 (1.73)
d _{av} [95% CI]	0.40 [0.15, 0.65]	0.58 [0.20, 0.95]	0.31 [0.07, 0.55]
d _z [95% CI]	0.60 [0.34, 0.86]	0.65 [0.26, 1.02]	0.34 [0.10, 0.58]
Hopelessness			
Pre-SSI	2.81 (0.82)	2.75 (0.79)	2.59 (0.86)
Post-SSI	2.38 (0.89)	2.16 (0.80)	2.13 (0.76)
d _{av}	0.44 [0.19, 0.69]	0.83 [0.44, 1.21]	0.49 [0.25, 0.74]
d _z	0.62 [0.36, 0.87]	1.01 [0.60, 1.42]	0.66 [0.40, 0.91]
Self-Hate			
Pre-SSI	4.15 (1.74)	4.05 (1.70)	3.79 (1.74)
Post-SSI	3.57 (1.65)	3.49 (1.80)	3.13 (1.80)
d _{av}	0.31 [0.06, 0.55]	0.35 [-0.02, 0.71]	0.31 [0.07, 0.55]
d _z	0.65 [0.38, 0.91]	0.72 [0.32, 1.11]	0.54 [0.29, 0.79]
Perceived Control			
Pre-SSI	6.72 (2.81)	6.43 (2.65)	6.32 (2.77)
Post-SSI	5.12 (2.76)	4.69 (2.66)	4.90 (2.19)
d _{av}	0.54 [0.29, 0.79]	0.75 [0.35, 1.14]	0.59 [0.33, 0.85]
d _z	0.68 [0.41, 0.94]	1.03 [0.59, 1.45]	0.65 [0.38, 0.90]

Did youths subjectively detect changes in hopelessness and problem-solving ability from before to after YES? Collapsing across SSIs, at post-intervention, 15.6% of youths reported feeling “much less hopeless” compared to before beginning the SSI; 53.1% felt “a little less hopeless”; 27.9% felt “the same amount hopeless”; 3.4% felt “a little more hopeless”; and 0.0% felt “a lot more hopeless.” Separately, 8.4% of youths reported feeling “much more able to solve problems” compared to before beginning the SSI; 50.0% felt “a little more able to solve

problems”; 38.8% felt “the same amount able to solve problems”; 2.8% felt “a little less able to solve problems”; and 0.0% felt “a lot less able to solve problems.”

Discussion

This nonexperimental study evaluated the perceived acceptability and short-term effects of Project YES, an open-access platform for youths offering three 30-minute, self-directed SSIs, each teaching a strategy for coping with internalizing distress. Regardless of SSI selection, youths who completed an SSI reported significant pre-to-post-program reductions in hopelessness ($d_{av} = .53$; $d_z = .71$), self-hate ($d_{av} = .32$; $d_z = .61$), perceived control ($d_{av} = .60$; $d_z = .72$) and agency ($d_{av} = .39$; $d_z = .50$). Youths who completed an SSI rated it as enjoyable, easy to understand, likely to help peers, and worth recommending to others, and there was no evidence for adverse SSI effects (e.g., no youths reported feeling “much more hopeless” or “much less able to solve problems” after program completion). Based on largely-overlapping confidence intervals for d_{av} and d_z , no evidence emerged for differential SSI effects on proximal outcomes.

Findings reinforce and extend evidence supporting the utility of SSIs for youth experiencing internalizing distress [19,20,51]. Past studies have raised the possibility that open-access, online SSIs might benefit youths experiencing elevated symptoms, but no studies have tested their acceptability or utility in naturalistic settings (versus in controlled trials, which offer participation incentives, necessitate parental involvement, and prevent youth from choosing which SSIs they wish to receive). This study provides the first evidence that online SSIs may be acceptable—and potentially helpful—when delivered in the “real-world” as free, publicly-available supports. Within-group post-SSI effects were modest; even so, the accessibility, cost-free nature, and brevity of YES suggest its public health value, especially if available

continuously and on a large scale. Indeed, the youth sample self-selecting into YES reported elevated depressive symptoms on average (among all youths who started YES, SMFQ $M (SD) = 17.06 (6.40)$, and among youths who completed a YES SSI, SMFQ $M (SD) = 16.51 (6.34)$, both $>50\%$ higher than commonly-used screening cut-offs for adolescent depression [67], indicating YES's acceptability and possible utility among youths with immediate clinical needs.

In addition to frequently reporting clinically-elevated depressive symptoms, many youths accessing YES reported one or more marginalized identities, including sexual minority status (50.13% of users) and racial/ethnic minority status (53.28% of users). This is notable, as YES includes no exclusion or screening criteria—youths from these communities *self-selected* into participation—and no formal efforts were made to recruit members of specific groups. Thus, YES and similar platforms may represent efficient avenues for providing support to youths that may be likely to need, but unlikely to access, traditional services. Simultaneously, more female than male adolescents self-selected into YES. This discrepancy may reflect higher rates of depression among adolescent girls versus boys, but it also fits with research suggesting that boys experiencing depression access treatment less often than girls [68]. Future work may focus on redesigning YES-like platforms that appeal to both adolescents regardless of sex.

Regarding usability, more than 34% of youths who began an SSI finished it. This rate compares favorably with prior studies of “real-world” engagement with self-directed, tech-based psychological supports (1-28% retention [15,68]), and even with rates of retention in outpatient youth psychotherapy (premature drop-out rates range from 16-75% [69,70]). However, Project YES is the first naturalistic evaluation of web-based, youth-directed SSIs; thus, further research is needed to gauge whether a 34% completion rate is typical of this type of program, as well as the degree to which this rate could be improved. Systematically testing strategies for further

improving retention in YES-like platforms will be valuable—especially among older users (above age 14), for whom completion rates were lower than for younger users (ages 13 and younger). Possible approaches include eliminating or minimizing questionnaires (all YES questionnaires are optional, but their presence may have deterred some users from continuing); decreasing intervention length further, and iteratively re-testing ‘hyper-brief’ SSIs for acceptability and utility; personalizing intervention content for youths of different age-ranges or developmental stages; and optimizing YES for smartphone-based completion (currently, YES is completable across internet-equipped devices but is optimized for desktop and laptop users).

Notably, no evidence emerged for differential SSI effects on hopelessness, perceived control, agency, or self-hatred, despite the fact that each SSI was initially intended to target a different proximal outcome (e.g., Project CARE was designed to reduce self-hatred; Project Personality was designed to strengthen perceived control and combat hopelessness; The ABC Project was intended to strengthen perceived agency over behavior). However, no evidence emerged for domain-specific effects across SSIs. This outcome, while quite preliminary, fits with existing evidence that change-mechanisms may be more similar than different across psychotherapies [19,71]. Here, each SSI was designed according to a common set of principles [19] and included several elements in common (e.g., neuroscience-based psycho-education; testimonials from scientists and peers; opportunities to offer advice to others), which themselves may promote a shared set of adaptive thinking styles.

A second possibility is that the constructs assessed in this study—and in clinical psychology intervention research more broadly—have shown considerable overlap, both conceptually and statistically [72,73] and may not reflect fully distinct constructs. Additional measurement-focused work is needed to determine the extent to which self-report assessments of

agency, perceived control, hopelessness, self-hate, and numerous other “thinking styles” commonly studied in intervention research reflect genuinely distinct factors, versus features of a shared latent construct.

A third possibility involves the role of *personal choice* in the platform. YES users independently decide not only whether to participate, but which SSI to complete and whether to publicly share anonymous advice with peers. These opportunities to exert agency, common across YES SSIs, may contribute to similar cross-program outcomes, at least proximally. This possibility is especially relevant to adolescents, for whom autonomy development and assertion are both highly motivating and key developmental tasks. Future work may formally test how personal choice and opportunities to develop autonomy shape adolescents’ receptivity and response to YES-like supports—and to mental health treatment more broadly.

Study limitations suggest directions for future research. First, this study is nonexperimental, observational, and anonymous. All of these features are necessary given the study’s objectives (to evaluate acceptability and utility of SSIs in naturalistic settings), but results should be interpreted with caution. For instance, despite targeted social media-based advertising, it is impossible to determine with certainty that participants were sincere when reporting their age-ranges. Further, as in any non-randomized program evaluation, possible selection bias cannot be overlooked. For instance, youths who self-initiate and complete a given SSI may be those most likely to benefit from it; thus, present findings may not reflect the SSIs’ utility for *all* youths. Future randomized trials that proactively address selection bias are needed to unpack this possibility. Third, given the anonymous nature of YES, we could not follow-up with participants; however, prior trials suggest these and similar SSIs’ capacities to confer longer-term clinical benefits [19,41,51]. Additionally, our SSIs are available only in English at this time, limiting

access for large portions of the global population. Translation and further pilot-testing is needed to begin gauging the cross-contextual, cross-cultural promise of YES and similar platforms.

Overall, results suggest that open-access, free-of-charge SSIs for adolescents ages 11-17 are acceptable; associated with proximal improvements in hopelessness, agency, perceived control, and self-hatred; and show no evidence for adverse effects. Overall, YES-users were more likely to perceive *some* psychological benefits than *none*—either in hopelessness, problem-solving skills, or both. Certainly, YES-like platforms cannot and should not replace longer-term psychotherapies—but they may offer much-needed low-cost, easily-accessible support to the many youths who might otherwise go without treatment. Future work may examine the broader-scale use of YES across cultures, integration of YES-like platforms with more intensive forms of support, and systematically examine the role of SSI choice in adolescents' response to similar interventions.

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