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Developing a Tailored Substance Use Intervention for Youth Exiting Foster Care

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Abstract

Youth who are aging out of the foster care system face significant barriers to accessing substance use treatment. Mobile interventions have shown efficacy for several mental and physical health issues and may be helpful in overcoming barriers facing foster youth with substance use problems. A program (iHeLP) for substance use reduction was developed that used a computerized screening and brief intervention (SBI) followed by six months of dynamically-tailored text messages. The program was shown to focus groups of youth (N=24) ages 18-19 who recently left foster care and had moderate to severe substance use risk. Focus group feedback was used to modify iHeLP prior to delivery in an open trial (N=16). Both study phases included assessments of feasibility and acceptability; the open trial also included assessments of substance use outcomes at 3 and 6 months. Focus groups indicated a high level of acceptability for the proposed intervention

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components. Of those screened for the open trial, 43% were eligible and 74% of those eligible enrolled, indicating good feasibility. Retention through the final follow-up was 59%, and drop out was associated with involvement in the criminal justice system. Participant ratings for liking, ease of working with, interest in and respectfulness of the SBI were high. Satisfaction ratings for the texting component were also high. A computerized brief screening intervention for substance use risk reduction together with tailored text messaging is both feasible and highly acceptable among youth who have recently aged-out of foster care.

Keywords

Foster Care; Tailored Intervention; Brief Intervention; Mobile Health; Substance Use

Introduction

Although face-to-face intervention remains the dominant form of mitigating psychosocial stress and its associated ills (Kazdin & Blase, 2011), the feasibility of providing sufficient care in this way is severely limited. Over one-quarter of the U.S. population meets criteria for a DSM-IV disorder (Kessler & Wang, 2008), yet only 700,000 health professionals are able to provide services (Hoge et al., 2007). For substance use disorders, this gap remains steadfast, especially in young populations, with less than 10% of adolescents receiving care in this traditional manner (Center for Behavioral Health Statistics and Quality, 2016).

Youth involved in foster care are no exception to this divide between service need and access; indeed, their outlook may be worse. Youth currently in foster care generally have less access to support services and family resources than their non-foster care counterparts (Courtney et al., 2005; McCoy, McMillen, & Spitznagel, 2008). For those who have left the system, this gap between need and availability widens over time, as the incidence of substance use increases and access to care remains low (Casanueva, Stambaugh, Urato, Fraser, & Williams, 2011).

Given such low access to services, interventions are more likely to be effective when delivered before individuals “age out” (i.e., leave care at the age of majority). However, even with a connection to Medicaid and other state-supported services, youth in foster care tend not to be assessed for substance use problems or referred to treatment (Casanueva et al., 2011). In situations where services are available, barriers to access remain significant and include fears of negative consequences upon acknowledgement of substance use (i.e., being removed from a program; Braciszewski, Moore, & Stout, 2014); difficulty with trust/bonds and general mistrust of institutions (Braciszewski et al., 2014; Davis, 2003); and lack of delivery, coordination, or continuity of care (Horwitz, Owens, & Simms, 2000; Schneiderman, 2004; Simms, Dubowitz, & Szilagyi, 2000). Substance use services that can overcome barriers and are tailored to the needs of youth exiting care should be a priority.

Use of computer- and mobile phone-delivered interventions is on the rise and has shown efficacy for mental health (Ebert et al., 2015; Proudfoot et al., 2013; Richards & Richardson, 2012) and physical health problems (Fanning, Mullen, & McAuley, 2012; Pal et al., 2014), smoking cessation (Bock et al., 2013; Whittaker, McRobbie, Bullen, Rodgers, & Gu, 2016),

and substance use (Marsch, Carroll, & Kiluk, 2014; Mason, Ola, Zaharakis, & Zhang, 2015). These approaches offer significant advantages in content delivery, while also addressing service access. Computers and mobile phones can also increase the likelihood of honest reporting on sensitive topics (Butler, Villapiano, & Malinow, 2009). Use of these devices is nearly ubiquitous, as over 90% of young people own a mobile phone (Pew Research Center, 2017), enabling great reach to individuals unlikely to access traditional care systems. Labor costs can also be reduced, as the majority of financial resources can be allocated toward intervention development rather than service delivery. New technologies allow for a high degree of ongoing tailoring and personalization, increasing acceptability and effectiveness (Ondersma, Chase, Svikis, & Schuster, 2005). Technology-delivered approaches allow screening and brief intervention to be more readily used in settings where adolescents are typically treated, such as in primary care (see Pilowsky & Wu, 2013, for a review), which may reduce significant delays between initial development of problems and onset of treatment (Chapman, Slade, Hunt, & Teesson, 2015; Harris & Knight, 2014; Wang et al., 2005). This approach also overcomes many barriers specific to foster youth such as establishing provider-client bonds, housing instability, case manager burden, and labor costs.

Taken together, youth exiting foster care are limited in accessing substance use services due to both restricted availability and a lack of options that engage this specific population. Technology-based interventions have the strong potential to mitigate these shortcomings, as they are easily tailored, widely disseminable, and can fluidly adapt to changes in participant behavior and motivation, yet we are unaware of any such approaches being used within the foster care population. As such, we developed and sought to test initial feasibility and acceptability for iHeLP (Interactive Healthy Lifestyle Preparation), a computer- and mobile phone-based substance use intervention that dynamically adapts to fluid levels of motivation to change substance use. We hypothesized that, by collaborating with youth exiting foster care and tailoring the intervention, participants would rate iHeLP as highly acceptable, while the approach (i.e., a technology-based intervention) would result in excellent feasibility.

Method

Participants

For both study phases, young adults were recruited from a large New England agency that provides post-foster care transition services. Inclusion criteria were: (1) 18-19 years old; (2) no more than 2 years removed from foster care; (3) a score of moderate or severe risk on the Alcohol, Smoking, and Substance Involvement Screening Test (WHO ASSIST Working Group, 2002); (4) not currently in or seeking substance abuse treatment; (5) owning a mobile phone; and (6) using text messaging at least weekly. Young people were identified through flyers and referral by agency staff, inviting them to be screened for a general health study for former foster youth aged 18 or 19.

Intervention

iHeLP combines an initial 20-minute computerized screening and brief intervention (SBI) with tailored, dynamic text messaging to target substance use reduction. The SBI is adapted from previously tested models, designed and implemented using Computerized Intervention

Authoring Software (CIAS; Ondersma et al., 2005), a sophisticated intervention development tool that allows for the modification and delivery of screening, assessment, and intervention, that is personalized for individual participants. CIAS is unique in that a three-dimensional cartoon character (*Peedy the Parrot*) serves as a narrator and guide throughout the process. Peedy is capable of over 50 animated expressions, mimicking one-on-one conversations.

iHeLP addresses alcohol and substance use by using an approach consistent with Motivational Interviewing (MI; Miller & Rollnick, 2013) and following the FRAMES (Miller & Sanchez, 1994) approach to brief interventions. MI has received substantial support as an intervention strategy for problematic substance use, often in single-session formats (Burke, Arkowitz, & Menchola, 2003; Hettema, Steele, & Miller, 2005; Vasilaki, Hosier, & Cox, 2006). FRAMES involves six major elements found in effective, brief clinical trials (Miller & Sanchez, 1994): (1) Constructive, non-confrontational Feedback, tailored to the individual; (2) Emphasizing personal control and Responsibility; (3) Provision of nonjudgmental Advice through educational information or suggestions; (4) Offering a Menu of options or strategies; (5) Displaying Empathy; and (6) Promoting feelings of Self-efficacy.

Following an assessment of their alcohol and drug use, participants received SBI content through CIAS tailored to their drug of choice and readiness for change, using an MI-consistent approach adapted from previous studies addressing alcohol and drug use in populations who similarly lack access to quality substance use services that meet their unique needs (Ondersma et al., 2005; Tzilos, Sokol, & Ondersma, 2011). Consistent with the MI principle of autonomy (Miller & Rollnick, 2013), participants using more than one substance were asked about which substance they would prefer to talk with Peedy. Youth who were not interested in cutting down/quitting any substance received intervention content consistent with engagement and building motivation to change (Miller & Rollnick, 2013). The SBI narrator normalized feelings of ambivalence, noting that most people can identify both positive and negative aspects to their substance use. Youth who immediately endorsed interest in reducing substance use proceeded directly to content consistent with primary goal setting. In this section, the narrator began by asking if the participant wanted to set a change goal. If they did not wish to do so, the narrator reflected their current lack of readiness and elicited information that might suggest to the participant that they need to change. If they wished to set a change goal, the narrator guided them through a brief change planning process. After finishing their respective phases, all participants were asked to provide a final “Readiness Ruler” score; that is, “On a scale of 0 to 10, how ready are you to make a change (quit or cut down) in your use of [drug of choice]?”

Following completion of the SBI, participants received daily text messages for a period of three months, followed by an additional three months of messages sent every other day. Message content is theoretically grounded in MI (Miller & Rollnick, 2013) and the Transtheoretical Model (TTM; Prochaska & DiClemente, 1992). Messages were delivered in one of the following three ways: Those who, at the end of the SBI, indicated a low readiness/interest in reducing their use (i.e., Pre-contemplation) received message content appropriate for those who may not see substance use as a problem (e.g., “How would your life be

different if you reduced your alcohol use?”). Messages for participants with a medium level of readiness/interest in reduction (i.e., Contemplation) reflected that ambivalence (e.g., “What goals do you have for the next year? How does drinking fit into those goals?”). Lastly, those reporting a high level of motivation for change (i.e., Preparation/Action) received messages that include advice and tips on reducing substance use (e.g., “Reducing stress can make these changes easier. How can you reduce stress in your life?”).

Behavior change is dynamic, where non-linear transformations take place as a result of complex, adaptive processes and need to be considered within the context of interventions (Resnicow & Page, 2008). Accordingly, individuals’ motivation levels were assumed to fluctuate over the course of the study. To account for these changes, we used weekly “poll questions” to assess major outcomes (e.g., heavy drinking episodes), as well as readiness to change (via the Readiness Ruler). Algorithms used participant responses to determine the tailored messages each participant received, allowing for fluid change in the intervention. That is, when a participant's stage of change altered (e.g., moving from pre-contemplation to contemplation), the content of their messages reflected that change. This design allowed more up-to-the-minute tailoring of message content, rather than relying on baseline or follow-up data collected months after the initial interview. While static motivational messages could become off-putting, especially among young people, this approach allows content to vary over time, sustaining participant attention and tracking participants' levels of readiness at the rate they desire. Although some text messaging approaches have used ongoing feedback based on post-baseline assessments (e.g., Suffoletto, Callaway, Kristan, Kraemer, & Clark, 2012), and one tobacco intervention study has implemented a similar model of dynamic change (Bock et al., 2013), we believe ours to be the first study involving active adaptation to fluid levels of motivation to change substance use.

Procedure

Focus groups—Participants ($n = 24$) were briefed with regard to confidentiality in a group setting and were informed that the group would be audio-recorded. Upon obtaining informed consent, the facilitators presented a rationale for the project, informing the group members about the rise in post-exit substance use, for many former foster youth, and the role they could play in preventing such outcomes by providing the researchers with their expertise on working with youth exiting the system.

The major goal of these focus groups was to obtain specific feedback on the initial structure of iHeLP, as designed by the investigative team. The SBI component of iHeLP was presented using a mock intervention for exercise. Participants were led, *in vivo*, through a program designed to approximate the study SBI, but focusing on a less self-revealing topic. Throughout the mock exercise, group members were asked for feedback about the overall structure, language, narrator voice, animations, length of time, privacy, and likelihood of use and benefit to their peers. After fielding all queries about the SBI, participants were then oriented to the text messaging component of iHeLP, including the proposed duration, frequency, and content of messages, as well as the dynamic nature of message delivery. Group members also completed a card-sort task to provide feedback on specific message content, the procedures and results of which are described elsewhere (Deleted to protect

blind review). Using a semi-structured script, the first and fourth authors co-facilitated groups lasting between 1 and 1.5 hours each. The facilitators had extensive experience with conducting focus groups and were trained to avoid leading questions and to interact with the respondents in a matter-of-fact, value-neutral manner.

Open trial—Using feedback from the focus groups, iHeLP was modified and delivered in an open trial. Consenting participants ($n = 16$) completed a baseline interview and the computerized SBI. Follow-up interviews were conducted 3 and 6 months post-baseline, during which time participants received the text messaging component of iHeLP. Participants were asked to provide feedback throughout the 6-month process, including a semi-structured interview at the final follow-up. Appropriate ethical human subjects guidelines were followed for both the focus group and open trial phases. Study procedures were reviewed and approved by the Pacific Institute for Research and Evaluation Institutional Review Board.

Measures

Feasibility—We measured feasibility in four ways. First, we calculated eligibility rates for both focus group and open trial participants as the number who met eligibility criteria divided by the number screened. Second, we assessed open trial enrollment rates as the number of participants who enrolled divided by the number who were eligible. Reasons for non-enrollment were also recorded. Third, open trial retention was calculated using the rate of three- and six-month follow-up interview completion. Finally, we assessed intervention reach within the open trial using the response rate to the weekly poll questions.

Acceptability—We collected data on multiple forms of acceptability. At the conclusion of each focus group, participants completed a survey assessing their opinions about iHeLP. Eleven questions captured different aspects of the computerized SBI and text messaging components (e.g., “I like the computer/texting part,” “Others in foster care would use the computer/texting part,” “Receiving texts for 6 months would be annoying”). Response options were on a 5-point Likert scale with higher scores indicating more satisfaction. Open-ended questions regarding the best/worst aspects of the intervention were also included. We also assessed acceptability through the guided focus group discussions about the content, presentation, and utility of iHeLP.

Upon completing the SBI, open trial participants were asked 5 questions about their satisfaction with the computerized portion (e.g., overall satisfaction, ease of use), each on a Likert scale ranging from 1 (not at all) to 5 (very much). At the 6-month follow-up interview, a similar satisfaction measure was given for the SBI, consisting of 7 questions (e.g., “I liked the computerized component,” “I found the computerized component to be easy to use,” “I found the computerized component to be humorous”) and using the same Likert scale.

Participants also completed a usability measure for the text messaging component at this final interview. Questions about helpfulness, ease of use, content relevance, and ease of finding poll questions were rated on a 5-point scale with higher scores indicating positive experiences. Questions about message reading level, length, frequency, quantity, and

intervention length were rated on a 5-point scale where an answer of 3 represented best practices (e.g., 1 = too short, 5 = too long). Utility (“Do you think other foster youth would use this?”) and portability (“Where you able to use it whenever/wherever you wanted?”) were rated dichotomously (i.e., yes/no).

To assess acceptability of the text messages in real time, every other day for the 6-month intervention, participants received a second text immediately after their daily study message that asked, “Did you like the study text you just received? Was it helpful? Please reply yes or no.” Messages that received more positive than negative responses were considered to have approval. Finally, participants provided qualitative feedback concerning intervention format, content, and utility during a short exit interview at the 6-month follow up.

Substance use outcomes—The Timeline Follow Back (Sobell & Sobell, 1992) captured substance use for a variety of drugs including tobacco, alcohol, marijuana, cocaine, amphetamines, inhalants, sedatives, hallucinogens, opioids, prescription opioids, bath salts, and synthetic cannabinoids for open trial participants. Former foster youth reported the number of days they used each substance per week over the past 90 days. The primary outcome of interest was the percent days abstinent of each participant's drug of choice. To provide some validity for these retrospective measures, substance use was also assessed via weekly poll questions, where participants were asked if they used their drug of choice in the last week (yes/no).

Data Analytic Strategy

Qualitative data—Audio recordings were transcribed verbatim for use in coding and analysis, which consisted of count data on specific aspects of iHeLP (e.g., intervention duration: shorter, longer, just right) and identifying emergent themes through the principals of thematic analysis (Braun & Clarke, 2006). Coding proceeded in an iterative fashion; the first and last author independently read two focus group transcripts in their entirety and assigned preliminary codes to those first two transcripts. The coders then met to discuss their respective preliminary code lists, identify any discrepancies (e.g., title and/or meaning) in coding, and create a final list of codes. The final list was first constructed by creating parent themes; subsequent child codes that offered further detail were assigned, where appropriate. This master codebook was then used to independently analyze the final 4 transcripts. Coders met weekly to discuss their ratings, including new parent and/or child codes that were created for text that did not fit the current version of the codebook. As new codes were added, coders reexamined previous transcripts and amended as necessary. Discrepancies resulted in reexamination of the text in question, as well as previous transcripts with similar text selections, until agreement was reached. The third author remained available in the event that consensus could not be reached, but this did not occur. Analyses were conducted using Dedoose (SocioCultural Research Consultants, 2016), a web-based software for facilitating mixed methods data analysis.

Quantitative data—We calculated descriptive statistics for the acceptability and usability measures. Repeated measures hierarchical linear modeling (Raudenbush & Bryk, 2002) was used to examine changes in monthly percent days abstinent (PDA) for drug of choice at the

1-month follow-up, as well as linear change over the full 6-month follow-up period. We conducted analyses using an intent-to-treat model. Although hierarchical linear modeling is robust to missing data, analyses were conducted twice, once using all available data and a second time using a last observation carried forward model to provide evidence of equality across models. Percent agreement between weekly TLFB data and weekly poll questions was also conducted.

Results

Focus Groups

Feasibility and demographics—A total of 89 young adults were screened over four months, of whom 41 (46%) were eligible. The most common reasons for ineligibility were low risk use of substances ($n = 32$) and no lifetime use of substances ($n = 12$), followed by currently in/seeking substance use treatment ($n = 2$), does not text ($n = 1$), and no cell phone ($n = 1$). Seventeen eligible youth were interested in participation, but were unable to attend a focus group due to scheduling issues. All of the eligible youth indicated that they were interested in participating at the time of screening.

Of the 24 who participated in the focus groups ($n = 6$, 3-6 participants per group), 38% were female and 29% of the sample were Hispanic/Latino. Thirteen percent were Black/African American, 63% Caucasian, 4% American Indian/Alaskan Native, 4% were Asian, and 17% reported more than one race. Our sample was representative of the larger population of youth exiting care in this area, with slightly fewer females than expected. Almost two-thirds (62%) were currently employed and participants averaged 10.92 years of education ($SD = 2.02$). Length of time in foster care ranged from 1 to 15 years ($M = 4.04$, $SD = 3.42$), with an average of 6.04 placements ($SD = 8.02$).

Acceptability—After viewing the computerized intervention mock-up, focus group participants voiced support for the SBI, particularly the animated narrator, Peedy. Youth felt that the combination of the SBI content and Peedy's delivery made for an engaging intervention. Two participants summed this up:

“If you checked it out and saw the conversation that it actually has back with you and it doesn't make you [feel bad] for the way you're thinking and it's actually on your side, then people would use it.”

“You kind of build a connection with the little bird, you know?”

Others expressed excitement about having such a conversation, but without the challenges of speaking with a human:

“I like it just for that face that it's not a human. I feel like, if someone needed just the counseling part of it and the smile on their face, that would do it.”

“A green bird can't arrest you if you're talking about drugs, that's how I feel.”

Two other participants elaborated on the struggles of interactions with professionals:

[P1]: “[Peedy] is corny and [he’s] kind of like, oh alright, it’s calling itself fat, but I mean, it makes you feel more comfortable answering back because the bird’s not arguing with you and saying, are you sure you want to pick that?”

[P2, responding to P1]: “Yeah, I felt like I’ve gone to therapy and everything and I feel like, [Peedy] was more like, you can talk [to Peedy] without feeling uncomfortable about your answers and everything so you can be honest about what you really feel and everything so I liked it.”

With regard to the texting component of iHeLP, participants were in unanimous support of the proposed duration (6 months), frequency (daily messages for 3 months, followed by every other day for 3 months), and timing (random times between 10am and 10pm). Although we proposed SBIs tailored to individual drugs of choice (e.g., alcohol, marijuana, cocaine, sedatives), participants strongly indicated a preference that text messages should not use content that specifically mentions drugs other than alcohol and marijuana. That is, if a participant’s drug of choice was not alcohol or marijuana, youth suggested that the text messages refer to “substances,” rather than the specific substance (e.g., cocaine).

When asked broadly about the proposed efficacy of iHeLP, focus group participants endorsed our approach:

“I think everything is good. I think the presentation itself is good. It’s clear. It’s understandable. It’s not that hard to grasp the concept of what the bird wants to make you feel. Like it’s not going to judge you, it’s not really there to criticize you, it’s there to take your answer and help you with the next questions.”

Another participant added:

“I liked it. I liked everything. I wish I had it when I was starting out in foster care. I honestly believe that it will help a lot of kids that are going through these situations in foster care in the future.”

Analyses of the mechanisms by which participants felt that iHeLP could be helpful supported three prominent themes. First, youth reported that the messaging encouraged them to consistently reflect on their behaviors:

“I think that it could help them just by putting it in their brain, you know what I mean. By showing them like if they quit, you know what I mean? Cause not a lot of people would think about it, if they’re a user, they’re not going to be thinking about, ‘Oh, how would life be like if I quit, if I wasn’t using?’ you know what I mean? They’re only going to be thinking about chasing their next high so I mean, if you put it in their brain and just showed them like, “you know, this is how you could be living if you wasn’t on drugs” and then you know what I mean, maybe that would be how they’d want to be living or maybe not, you know what I mean. But it could help them just by showing them this program, you know what I mean, to put it in their head just to even have it there cause some people don’t even have it there.”

Others echoed these statements:

“I really like this texting idea because people will actually think about it all day. Like they'll think about...it'll just be in their mind for the rest of the day. ... if I had a big problem with a drug, I'd think about that all day long and it would bother me so when I have to, when I actually want to stop the drug, the drug's not going to let me, it would make me like, 'I don't want that.'”

Participants often discussed the timing of the text messages and how they could disrupt the process of using through the process of reflection:

“[The messages] will catch someone when they're about to use so they'll be like, 'Oh, maybe I shouldn't' and it'll make them stop and think about it.”

Second, youth indicated that iHeLP could be a catalyst for change through its provision of support. One participant stated:

“I think it's good because it's sort of like checking in with them. You're showing like, you know what I mean, there's somebody there that actually cares and is gonna text you every day to see how you're doing, whatever, it just shows that it could help, with that one text a day.”

Another participant felt that the support alleviated a sense of isolation, which can be common among youth who have resided in foster care:

“Like you're not alone. There are other people going through the same struggles as you and everything.”

Finally, participants felt that while iHeLP may not be able to turn people from daily users into abstainers, it could help “be the first step for them to get where they need to get,” as one participant stated. Another supported this idea of “small changes”:

“[My] favorite [message] was something about, 'Quitting is a process not an immediate thing' or whatever. And a lot of times, people fail to realize. Cause I'm the #1 person for immediate change, like if I want something, it has to happen right away. Like I filled out a job application yesterday and I'm getting so anxious because they're not calling me but I know it takes a week. So a lot of times people need to be reminded that it's a process and it's going to take time...people need to be reminded that you know, 'You're doing good. It's paying off. It may not seem like it now.'”

Youth suggested several areas for improving iHeLP, including additional sessions with Peedy, possibly through the use of an app or at follow-up interviews; addressing content areas outside of substance use, such as depression, anxiety, and trauma; having a human with whom participants could check in and ask questions; and more information/facts about substance use.

Survey data indicated that most of the 24 participants liked the computerized part of the intervention ($M = 3.71$, $SD = 0.95$), although ratings for the texting component were higher ($M = 4.17$, $SD = 0.87$). Nearly all participants (92%) thought the computerized SBI was easy to use. Utility for youth in foster care (i.e., “Other kids in foster care would use/like this”) was also rated highly, with a slight preference for the texting component (computer: $M =$

3.83, $SD = 1.05$; texting: $M = 4.04$, $SD = 0.75$). Indeed, 75% of participants agreed or strongly agreed that the texting component would be attractive to youth in foster care. Finally, participants had a favorable view of the intervention's ability to curb alcohol and drug use (i.e., "The computer/texting part would help people use less alcohol/drugs"), again with a slight advantage to the texting component (computer: $M = 3.46$, $SD = 0.83$; texting: $M = 3.62$, $SD = 0.97$).

Common "best aspects" of the SBI were the individual tailoring ($n = 5$), the narrator ($n = 5$), the support for personal autonomy ($n = 3$), and its non-judgmental stance ($n = 2$). The narrator's voice was the most frequently endorsed item to change ($n = 6$). Favorite aspects of the texting component were convenience ($n = 6$), consistency ($n = 4$), and the tailoring to stage of change ($n = 3$). There was no clear pattern of suggestions for changing the text messaging.

Open Trial

Feasibility and demographics—For the open trial, 53 young adults were screened over six weeks, of which 23 (43%) were eligible. Reasons for ineligibility were low risk use of substances ($n = 18$), no lifetime use of substances ($n = 8$), currently in/seeking substance use treatment ($n = 3$), and no cell phone ($n = 2$). Seventeen youth enrolled in the open trial, 47% of whom were female. Twenty-nine percent were Hispanic/Latino. Racial representation was 24% Black/African American, 41% Caucasian, 18% American Indian/Alaskan Native, 6% Native Hawaiian/Pacific Islander, 6% Asian, and 6% more than one race. As with the focus groups, these demographics are representative of youth exiting care in this area of New England, though slightly more of our sample was American Indian/Alaskan Native. Eight were currently employed and participants averaged 11.24 years of education ($SD = 1.20$). Length of time in foster care ranged from 1 to 18 years ($M = 7.26$, $SD = 5.70$), with an average of 9.62 placements ($SD = 11.13$). Of the six eligible participants that did not enroll, five expressed interest in enrollment at the screening, but could not be contacted to arrange a baseline interview, while the sixth eligible young adult declined participation at the screening.

Retention for the open trial was 59% at both the 3- and 6-month interviews. Youth who did not complete any of the follow-up interviews ($n = 7$) looked similar to those who completed at least one follow-up interview ($n = 10$) on key variables such as percent days abstinent at screening (15% vs. 14%) and readiness to change at baseline (4.6 vs. 4.7). An examination of a public record state-level judiciary database revealed that among the participants who did not complete a follow-up interview ($n = 7$), 6 had been involved in the criminal justice system in the past year, whereas only 1 of the 10 retained participants had been involved with the legal system. Finally, the overall response rate to the weekly texted poll questions was 82% ($M = 70$, $SD = 0.34$, range: 0 to 100). Eight participants responded to over 94% of the questions and all but four responded to more than 55%.

Acceptability—Satisfaction with the computerized SBI, captured immediately following completion of the baseline session with all 17 open trial participants, was positive, with high ratings for liking the narrator ($M = 4.06$, $SD = 1.18$), finding the computer easy to work with

($M = 4.94$, $SD = 0.25$), thinking the narrator was interesting to work with ($M = 3.88$, $SD = 1.09$), and finding Peedy to be respectful ($M = 5.00$, $SD = 0.00$). Participants did not find Peedy or the SBI to be bothersome ($M = 1.88$, $SD = 1.09$). Those who completed the delayed satisfaction measure at 6-months ($n = 9$) provided positive ratings, with high scores on liking the intervention overall and finding it interesting, easy to use, understandable, and respectful (Table 1).

Among this same group ($n = 9$), participant satisfaction with the texting component was equally positive (Table 2). Participants found the messaging to be relevant, while the reading level, navigation of poll questions and use of text messaging were all easy. Although the messaging was helpful, participants varied in their opinions about message length, frequency of messaging (i.e., once/day for 3 months, every other day for 3 months), quantity of messages (i.e., number of texts per day), and the length of the intervention (6 months). Most respondents felt that other foster youth would use the texting intervention and that it could be used no matter where they were. The approval rating for the text messages was 73%; that is, of the messages that were rated at least 3 times, 73% were rated as helpful more than they were rated as unhelpful (e.g., two yes votes against one no vote).

Exit interviews ($n = 9$) indicated strong acceptability for iHeLP. Specifically, all participants stated that the computerized intervention was a good length (i.e., time on task), easy to use, and that Peedy was enjoyable to work with. All but one participant thought that the length of the study text messages (i.e., the number of characters in the messages) was good, with the one exception wanting them to be shorter. Most participants reported a strong desire to have the messages delivered more frequently (e.g., once daily or more), rather than tapering to every other day in the second half of the intervention. Most also wanted the intervention to last longer than 6 months. All participants felt that iHeLP was private and confidential, and indicated that it was better than the alternative of speaking with a counselor or case manager about substance use.

Finally, all participants reported that iHeLP was customized to their specific, individual needs; however, there were four requested changes that were consistently voiced across participants. First, echoing the focus group results, most participants wanted someone with whom they could check in, ask questions, and talk about their goals. All youth who mentioned this indicated that the contacts would be as needed, and likely no more than once per week. Second, youth requested weekly feedback on substance use via text message. Given that youth are asked each week to provide the number of days they used their drug of choice, participants were hoping to get encouraging feedback on their successes. Third, participants had reported goals they had for substance use, including reasons and methods to cut down, as well as how others could help them achieve these goals, during the SBI. The majority of youth wanted to be reminded of these goals via text message. Finally, despite presenting information on the negative effects of substance use and the positive results from cutting down, half of the participants asked for more facts about substance use, which was also mentioned during the focus group sessions.

Most participants felt iHeLP was helpful to them and their ascribed reasons fit two major themes. First, youth indicated that iHeLP, particularly the text messages, allowed them the space to think critically about their choices to use, forcing them to reflect before they acted.

“It kind of gives you that realization that there's change out there. That there are better things for you to do instead... It...gives you that positive mindset and makes you think twice about doing it.”

Another participant noted:

“It kind of helped you visualize how it can affect your life because sometimes you don't notice because it's your own life.”

In addition to reflection, youth felt that iHeLP aided their desire to reduce substance use by offering support. One young person stated:

Yeah, I guess [iHeLP] was more of a person too. Like the program was something telling me how I should stop or how I could stop and how much better I feel, and a lot of the messages were really encouraging too, like the ones that say, ‘If you're having a bad day... I don't know...there was just a lot of encouragement.’”

This seemed to be particularly relevant for a population that tends to lack such supports:

“I feel like a lot of people feel like nobody notices or cares, but when you get that text message, it's like, ‘Oh, I do have someone.’”

Outcomes—Analyses of all available data revealed a non-significant increase in percent days abstinent one month after baseline ($\beta = 0.13$, $t(29) = 1.76$, $p = 0.089$), corresponding to a medium-to-large effect size of $d = 0.56$. No linear change was observed over time ($\beta = 0.00$, $t(87) = 0.07$, $p = 0.946$). Using the last observation carried forward method for missing data indicated the same non-significant increase in percent days abstinent after one month ($\beta = 0.08$, $t(50) = 1.34$, $p = 0.186$), equal to an effect size of $d = 0.33$. As with the model utilizing all available data, no linear change occurred over time ($\beta = 0.00$, $t(150) = 0.09$, $p = 0.925$). Percent agreement between the weekly poll question responses and retrospective TLFB data was 66%.

Discussion

Results suggest that youth who have recently exited foster care are in strong support of a technology-based substance use intervention. Focus groups and a 6-month open trial of iHeLP demonstrated feasibility of recruitment and retention, initial acceptability of intervention content, format, and utility, and main outcome findings that trend in the hypothesized direction. Taken together, there is solid preliminary evidence from which we can continue building and improving iHeLP to reduce substance use among youth exiting the foster care system.

Overall, recruitment and enrollment were highly feasible, with a large proportion of young people being eligible, despite a relatively high bar for inclusion. A substantial literature shows a high prevalence of substance use among current and former foster youth (Pilowsky & Wu, 2006; Vaughn, Ollie, McMillen, Scott Jr, & Munson, 2007; White, O'Brien, White,

Pecora, & Phillips, 2008). That nearly half of all screened youth in our study had at least a moderate problem with alcohol or drugs is of significant concern. At the same time, however, it is encouraging that nearly all eligible youth were interested in participating in the study; a sign that at least some have a desire to change their use of substances.

Participant retention in the open trial was not robust, as over 40% of youth did not complete a follow-up interview. Of the 7 youth who were lost to follow-up, 6 were located in a state-level judiciary database, making criminal justice involvement the primary variable that separated dropouts from retained participants. Given that over 50% of youth in foster care are involved with the legal system (Courtney, Terao, & Bost, 2004), excluding such youth from future studies would severely impact generalizability. Thus, rather than screening out young people with a criminal justice history, future studies will need to implement retention strategies that can account for the likely incarceration of participants. For example, prospective tracking using a state-level judiciary database, contact with participant-identified locators (e.g., parents, partners, siblings), and utilizing outcome measures with high reliability for retrospective reporting (i.e., after participants are released from jail), can help attenuate significant attrition.

The response rate to our weekly poll questions (82% for all, 95% for study completers) was encouraging. Ecological momentary assessment (EMA) of substance use among young people often occurs over shorter time spans (e.g., 1-2 months) than our protocol (6 months), with similar rates of response (Garcia et al., 2014; Gwaltney, Bartolomei, Colby, & Kahler, 2008; Phillips, Phillips, Lalonde, & Dykema, 2014; Schnall et al., 2013). Incentivizing EMA-type responses can be key for increasing both response rates and study retention (Runyan et al., 2013) and can include per-response payments or bonuses for achieving a specified rate of response.

In addition to the advantages afforded by technology-based interventions, such as decreased cost (Newman, Szkodny, Llera, & Przeworski, 2011), reliability of delivery (Lord & Marsch, 2011), tailoring (Ondersma et al., 2005), and minimizing staff burden (Bishop, Bryant, Giles, Hansen, & Dusenbury, 2006), such approaches are also highly appealing to young people (Bosworth, 2006). Indeed, youth have indicated that technology-based interactions concerning their health behavior are more favorable when compared to face-to-face meetings with providers (Pilowsky & Wu, 2013). Thus, the acceptability results gathered here, while encouraging, are not altogether surprising. Foster youth, however, may have an additional proclivity toward technology-based approaches. By virtue of their placement in foster care, these vulnerable young people have had mildly to severely challenging relationships with people in authority. This is evident not only through their experiences of abuse and neglect at the hands of adults, but also through frequent home and school mobility. In a large, representative study of youth in care, over half (53%) had changed schools more than 3 times, while over one-third had more than 5 school changes (Courtney et al., 2004). In this same sample, 53% also had 3 or more home placements during their time in foster care and 16% had 7 or more. Thus, the constant rotation of homes, schools, case managers, caregivers, and health providers may result in skepticism about divulging personal information (e.g., substance use) to someone who may soon exit their lives.

Foster care staff and administrators have voiced concern about such instability and potential distrust of authority figures. (Deleted for blind review) proposed the implementation of brief interventions, delivered by either health care staff or former foster youth, as an approach for mitigating foster youth substance use. These interventions are often rooted in Motivational Interviewing (Miller & Rollnick, 2013), are delivered in one or two 30-60 minute sessions, and have been effective at reducing substance use among youth in several environments (D'Amico, Miles, Stern, & Meredith, 2008; Mitchell et al., 2012; Spirito et al., 2004). Foster parents, staff, and administrators were ambivalent about whether youth would be able to secure a solid therapeutic bond in 1-2 sessions. If such a bond were to develop, participants voiced strong concern that the end of the therapeutic relationship could be detrimental for the foster youth, as these young people have had recurring patterns of important adults exiting their lives. Thus, the use of technology can deliver empirically-supported intervention content without the potential negative side effects of disrupting an important therapeutic bond.

Participants in both study phases indicated that iHeLP could be helpful through increased feelings of support. Social support – specifically support for abstinence from alcohol and drugs – is among the most robust predictors of sustained abstinence from substances (Kelly, Hoepfner, Stout, & Pagano, 2012). Youth who have been exposed to adverse events, however, report having smaller social support networks (Ford, Clark, & Stansfeld, 2011). Any avenues by which we can decrease feelings of isolation and increase a sense of support for young people in care should be paramount, particularly as it relates to substance use.

Programs developed with participant input are more likely to appeal to that target population (D'Amico & Edelen, 2007). As such, we made a concerted effort to invite youth to help us create and improve iHeLP, resulting in the useful suggestions noted above. In addition, recent updates in the CIAS software allow for booster SBI sessions sent via text message; thus, youth would be able to continually interact with Peedy on a pre-determined schedule.

Limitations

While we are encouraged by the results of these two study phases, there are limitations to the research presented here. All youth were from the same geographic location and may not be representative of former foster youth in other states or regions of the United States. We note the sociodemographic diversity of our sample; however, it is possible that other issues or constructs may have arisen in groups recruited from different areas. Related to this, each focus group participant engaged with us in only one group. Subsequent conversations with time between encounters with our staff might have provided individuals more time to consider relevant issues and may have generated additional issues or concerns. In addition, no actual intervention was provided for youth in the focus groups and participants' anticipation of desired components for a hypothetical intervention may differ from their reactions in actual practice. Open trial results, however, largely overlapped, particularly in the areas of acceptability, utility, suggestions for future iterations of iHeLP, and mechanisms of change. Finally, the open trial consisted of a small sample and substantial attrition; thus, our quantitative data should be interpreted with the cautions associated with small samples.

Future Research

Continued involvement of participant voice is essential, as young people are often the most knowledgeable of and facile with new technologies. Indeed, following participant suggestions, we are currently testing a version of iHeLP that sends weekly goal reminders and feedback on substance use within a small, randomized trial; acceptability data on these features are forthcoming. Future iterations of iHeLP could also utilize brief human interventionist contact and/or leverage weekly poll questions on substance use to deliver additional tailored intervention content, corresponding to fluctuations in participant substance use over time. These features should be tested in a fully-powered and representative trial of iHeLP that would provide robust conclusions about the non-significant upward trend in percent days abstinent found here. Finally, future research should examine developmentally-appropriate versions of these interventions for youth currently in care, as early prevention can mitigate increases in substance use post-foster care.

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Table 1
Delayed Satisfaction with the Computerized Intervention (CI; n = 9)

Item	M (SD)
Liked the CI	3.67 (0.71)
Found the CI interesting	3.67 (1.41)
CI was easy to use	4.89 (0.33)
CI was understandable	4.56 (0.73)
Narrator was respectful	4.78 (0.44)
Narrator was bothersome	2.11 (1.05)
Narrator was humorous	2.67 (1.12)

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Table 2
Usability of the Text Message Component (n = 9)

Item	M (SD) / n (%)
1. Poll questions were easy to locate	4.67 (0.50)
2. Was helpful	3.67 (1.32)
3. Ease of use	4.89 (0.33)
4. Text content was relevant/useful	4.00 (1.22)
5. Reading level was appropriate	4.11 (0.78)
6. Message length was appropriate	3.44 (0.73)
7. Frequency of messages was appropriate	3.11 (0.60)
8. Quantity of messages was appropriate	3.33 (0.50)
9. Length of intervention was appropriate	3.33 (0.50)
10. Others would use it (yes/no)	7 (78)
11. Could use wherever you wanted (yes/no)	8 (89)

Note. Questions 1-4, higher scores are better; questions 5-9, a score of 3 is best.

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