FEASIBILITY ASSESSMENT OF A BRIEF, WEB-BASED BEHAVIORAL ACTIVATION INTERVENTION FOR ADOLESCENTS WITH DEPRESSED MOOD*

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ABSTRACT

Objective: Adolescent depression is a major public health concern. Efficacious interventions exist, but are underutilized. Novel approaches to improving access are therefore a top priority. Web-based approaches offer a

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viable treatment delivery solution; this approach may reach adolescents who might not otherwise receive formal treatment. Behavioral activation (BA) approaches have had success in treatment of depressive symptoms in youth. The purpose of this article is to: (1) describe the development process of a web-based, behavioral activation intervention for adolescents; (2) summarize the preliminary feasibility data; and (3) discuss the benefits and challenges associated with development and evaluation of adolescent self-help resources. *Methods:* The current study is part of a larger NIMH funded study focusing on the development and evaluation of *Bounce Back Now (BBN)*, an evidence-informed, web resource for disaster-affected adolescents and their families. This study is specifically on the development of the BA component of the mood module of *BBN*, which was evaluated more extensively than other components. We present data from a formal usability evaluation conducted with 24 adolescents, and preliminary usage data collected from 2,000 disaster affected adolescents recruited from the tornado-affected coordinates in Alabama and Joplin, MO. *Results:* Preliminary data supported the feasibility of this approach: qualitative data with the clinic-based sample revealed favorable reactions to the intervention, and preliminary data from the large ongoing randomized controlled trial have indicated moderate levels of access. *Conclusions:* Brief, web-based approaches may offer a promising alternative to address access barriers for adolescents with depressed mood.

Depression is the leading cause of disability worldwide [1]. Population-based studies indicate that one in seven adolescents have experienced mood disorders at some time in their lives [2]. Mood disorders are associated with development of other mental health disorders [3], significant likelihood of reoccurrence in adulthood [4-7], and increased risk of suicidal ideation and attempts [8]. Functional impairment also is common in subthreshold depression, which is another appropriate target for brief interventions [9].

Efficacious treatment options exist for depressed adolescents [10], but less than half of all youths with a mental disorder access formal treatment services [11]. As such, new models are needed to assist in overcoming access barriers. E-health/m-health options are one possible alternative [12]. These approaches address two significant gaps in service delivery. First, mobile web approaches may be more likely to reach adolescents who might not otherwise consider seeking formal treatment due to transportation, financial, scheduling, or stigma-related barriers [13, 14]. Second, brief, online interventions may have more success in engaging adolescents than traditional, 12- to 16-session formal treatments [15], in part due to the ubiquity of internet access among youth. Current estimates on a 2012 survey by the Pew Internet & American Life Project of 802 adolescents

indicate that 95% of 12- to 17-year-old youth are online, with about 74% accessing Internet via mobile devices [16]. Moreover, 48% of teens have accessed health and mental health-related information online [17], suggesting that web-based mental health resources are an appropriate delivery strategy in this population.

BEHAVIORAL ACTIVATION

Development of mobile web resources requires careful consideration of intervention approaches that are most appropriate for translation. Highly complex interventions are unlikely to translate well, particularly if users access them by tablet or Smartphone. An important consideration is that the web-based intervention should ideally contain interactive content to engage the user throughout the therapeutic process.

Behavioral activation is an efficacious treatment for depression which focuses on the association between an individual and their environment as well as triggers and maladaptive coping strategies which result in the cause and maintenance of depression [18]. Behavioral activation has been shown to be a straightforward and cost-effective approach—and, therefore, very well suited for Internet delivery [19]. BA interventions are generally time-limited and directive, with patients' success in treatment hinging on completing a range of activities, most of which are completed outside of formal treatment sessions. The goal of BA is to increase healthy (i.e., "fun" and/or functional) activities that are consistent with the patients' life values, thereby increasing positive everyday experiences and improving mood [20]. To achieve this goal, patients identify a series of healthy activities that are practical and feasible. More complicated activities (e.g., seeking part-time employment) also are acceptable provided they are broken down into simple, manageable components to facilitate tracking and ensure that weekly behaviorally specific goals realistically can be set. A small handful of activities are planned and scheduled from this list on a weekly basis, and patients track their progress. Recent efforts to extend BA for use with depressed adolescents have been met with considerable success, suggesting that BA is a viable treatment option to address depressive symptoms in youth [21]. Moreover, the interactive nature of the BA makes it an ideal intervention for adaptation to a self-paced, mobile web delivery format.

The purpose of this article is to:

1. describe the development process of web-based, behavioral activation intervention for adolescents;
2. summarize the preliminary feasibility data; and
3. discuss the benefits and challenges associated with development and evaluation of adolescent self-help resources.

The current study is part of a larger NIMH funded study focusing on the development and evaluation of *Bounce Back Now (BBN)*, an evidence-informed, web

resource for disaster-affected adolescents and their families (R01MH081056). The primary focus of the *Bounce Back Now* site (www.bouncebacknow.org) was to include content targeting disaster-affected adolescents at risk for post-disaster mental health problems. To this end, we developed several evidence-informed modules to provide education and recommendations addressing post-disaster mental health and health-risk areas. The four adolescent modules are: *stress and anxiety* (addressing posttraumatic stress symptoms), *mood* (addressing depressed mood), *smoking,* and *alcohol use.* Each module was designed to function as a stand-alone brief intervention.

This article will focus specifically on the development of the BA component of the mood module of *BBN*, which was evaluated more extensively than other components.

OVERVIEW OF BEHAVIORAL ACTIVATION TOOL

The main goal of the BA resource is to provide specific guidance and structure to assist participants in adhering to the BA protocol. The general structure of the component is as follows. The BA resource begins by providing a brief rationale for the approach: engaging in fun and/or functional activities can decrease depressive mood. Second, participants are presented with a comprehensive list of activities divided into separate categories (see Figure 1): Helping (e.g., "Volunteer work"), Smarts (e.g., "read a book"), Arts (e.g., "Make up a new dance move"), Social (e.g., "Go to my friend's house"), and Other (e.g., "Apply for job"). In addition, participants have the option to type in a new activity not listed. Third, users are asked to identify which activities they find personally appealing and consistent with their values. Fourth, users select specific activities to complete during an upcoming week. Users are instructed to pick a day and specific time for each activity and record their scheduled activities on their daily planner. If they do not have a daily planner, they are given the option to print out a blank calendar to assist with scheduling their activities (see Figure 2). Finally, we incorporated a troubleshooting section to help users address potential barriers to completing their BA tasks. Users were encouraged to return to the website on a regular (e.g., weekly) basis to indicate what activities they had completed, to identify and receive education around barriers to completing activities, and then to select and schedule activities for the following week.

DESIGN PROCESS

We designed this BA resource to be used as a brief intervention approach, and to be delivered to adolescents with both subthreshold and diagnostic levels of depression. A key goal of the design phase was to encourage participant engagement and treatment completion by making the website visually

Figure 1. Sample of behavioral activation tool.

Activity Bank

Record your activities you picked from Bounce Back Now here:

1. _____   3. _____   5. _____

2. _____   4. _____   6. _____

Write your activities from your bank ⋙ into a day and
time when you have 15-30 minutes to do it. If you have a
planner for your school you can use that too.

MONDAY _____

MORNING 🐓 _____
AFTERNOON ☀ _____
EVENING ☾ _____

TUESDAY _____

MORNING 🐓 _____
AFTERNOON ☀ _____
EVENING ☾ _____

WEDNESDAY _____

MORNING 🐓 _____
AFTERNOON ☀ _____
EVENING ☾ _____

THURSDAY _____

MORNING 🐓 _____
AFTERNOON ☀ _____
EVENING ☾ _____

FRIDAY _____

MORNING 🐓 _____
AFTERNOON ☀ _____
EVENING ☾ _____

SATURDAY _____

MORNING 🐓 _____
AFTERNOON ☀ _____
EVENING ☾ _____

SUNDAY _____

MORNING 🐓 _____
AFTERNOON ☀ _____
EVENING ☾ _____

Come back to
Bounce Back
Now and tell us
how it went!

BOUNCE BACK NOW

In a nutshell, the more you do and the more
you do it, the better and faster you'll feel!

Figure 2. Printable BA schedule calendar.

attractive and user-friendly. This required developing a comprehensive activities list appealing to teenagers, utilizing humor to maintain user interest, creating visually appealing illustrations and cartoons [22] to take teenagers through the process of BA, and crafting clear and concrete instructions. Due to the varied reading levels among the adolescent population, the website text was kept simple and straightforward, and short sentences were used rather than lengthy paragraphs.

The development team, which consisted of researchers, clinicians, design technicians, and programmers, met on a weekly basis to discuss content development and the translation of BA into a web-based format. After being provided with design specifications, the programmers developed webpage prototypes that were reviewed by the team. The design specifications were then modified to take into account budget and time constraints, and then the programmers coded the initial application. In an iterative process, programmers made modifications and corrections to the application as the design team reviewed the website and provided feedback. The use of interdisciplinary collaborations allowed the team to effectively address challenges in development and implementation.

STUDY 1: USABILITY EVALUATION

Procedure

After the initial release of the website, a formal usability study was conducted to assess user satisfaction and response to the depression module, which included the BA resource [23]. A summary of the results relevant to the BA resource are presented here. The full procedures, methods, and results of the usability study are presented in a separate paper [24]. All procedures were approved by the MUSC Institutional Review Board.

Twenty-four adolescents were seated in front of a computer and were prompted to utilize the depression module while being video recorded and observed by research staff. Participants were instructed to voice their opinions about the website aloud in real-time for each page they visited. This method allowed for the data capture of participants' immediate thoughts and feelings in response to specific aspects of the website. Participants' interactions with the webpages (e.g., mouse clicks, typing) also were recorded by the observing researchers. Finally, participants completed self-report surveys regarding their reactions to the website. Qualitative analyses employing constructivist grounded theory's line-by-line analysis [25] were conducted on the video transcriptions to identify common themes in the participants' website experience. Initial themes were detected through primary coding using NVivo-9 and then accuracy was checked through secondary coding. Finally, an additional round of coding merged similar themes under parent nodes.

Participants

Participants were 24 adolescents recruited from listserv messages and flyers posted at psychiatric clinics on a medical university campus. Participants consisted of 14 girls (58.3%) and 10 boys (41.7%), with ages ranging from 12 to 17 years of age ($M = 14.12$, $SD = 1.57$). With regard to race, 67% of adolescents self-identified as Caucasian/European American while 33% identified as Black/African American. Of that sample, 13% reported being from Hispanic or Latino ethnic origin. The participants' mean score on the Center for Epidemiologic Studies Depression Scale-10 (CESD-10) [26] was 13.5 ($SD = 9.9$), with 29% obtaining a clinical cut-off score of 15 or greater. All of the participants reported using a computer at school, home, or workplace on at least an occasional basis, with the majority of participants (95.8%) using the Internet at least 3-5 days per week. Seventy-nine percent of participants reported feeling comfortable when using the Internet in general (e.g., browsing websites and checking e-mail).

Results

The results of the usability analysis provided detailed information on how teenagers responded to the depression module and to specific parts of the BA resource. Qualitative analysis of the most common themes verbally expressed by participants found that the depression module's strengths included its helpfulness to depressed individuals (96%), its ability to increase users knowledge about depression and its treatment (67%), its applicability to a wide variety of people (42%), its use of humor, and its personalization features (e.g., creating a BA plan based on activities the user found personally appealing). With regards to the BA resource specifically, qualitative analyses found that 87.5% of the participants thought that the BA resource was easy to use and understand. Participants also commented on how they liked the variety of options in the activities list (55%). Furthermore, 25% of participants utilized the option to type an additional activity and add it to their list.

The qualitative analysis also found several usability issues in the depression module. Most participants (75%) had one or more instances where they were confused about the navigation or text in the depression module. With regard to the BA resource specifically, 29% of participants did not click through all the activities categories to view all the potential activities, possibly because they did not realize they could do so. Another usability issue was that 17% of participants were confused about what to do on the page that gave users the option to print a PDF of a blank weekly schedule. In addition, users who neglected to make any selections from the Activities List found the subsequent webpages confusing because they did not have any activities to put on their planners.

The self-report survey about the BA tool found that the majority of participants reported that they liked the tool "a lot" (81%), would find it helpful if they were depressed (82%), and were "extremely likely" (63%) or "somewhat likely"

(25%) to use the activities tool if depressed. On an open-ended survey question asking participants to explain their response, the majority wrote comments expressing how the tool would be helpful in reducing depression and motivating the individual to engage in treatment.

In summary, the usability study found the BA resource to be well received by the vast majority of teenage participants. Because not all participants demonstrated clinical levels of depression, it is possible that the reactions from a clinically depressed adolescent population may differ. In addition, data was collected based on one session of using the depression module, but not on return visits to the module. However, we found the usability study to be a useful way to gather comprehensive information of how teenage users respond to specific parts of the intervention in real-time. This allowed us to identity both strengths and specific usability issues for future improvements. The information gained from this study will be utilized to inform future releases of the depression module, as well as the development of other future web-based self-help interventions for youth.

STUDY 2: PRELIMINARY EVALUATION VIA POPULATION-BASED RECRUITMENT OF 2,000 FAMILIES

Procedure

As previously mentioned, the current study is part of a larger NIMH funded study focusing on the development and evaluation of *Bounce Back Now (BBN)*, an online, evidence-based intervention for disaster-affected adolescents. *BBN* is currently undergoing a large-scale evaluation with 2,000 families (i.e., adolescents aged 12-17 years and a parent) recruited from tornado-affected coordinates in Alabama and Joplin, MO using an address-based sampling approach [27]. These areas experienced the costliest and deadliest tornados in United States history during the spring of 2011 [28]. Census block IDs were assigned to the radii around each coordinate (e.g., 0.5 mile, 2 miles) to serve as the sampling strata from which addresses were identified. Household addresses with matched phone numbers were contacted directly by phone for recruitment. Addresses without a matched phone number were mailed a letter. Eligible participants had access to a telephone (landline or mobile), a home Internet connection, adolescents ages 12-17 years, and were fluent in English. The overall cooperation rate, calculated according to the American Association for Public Opinion Research industry standards (i.e., [number screened] divided by [number screened + screen-outs + unknown eligibility]), was 61%. When households had multiple eligible adolescents, one was selected randomly. On completion of a baseline telephone interview, parents and adolescents were given access to the website via a unique login. Adolescents were randomized to the experimental condition (access to treatment and assessment components of website) or the control condition (access only to assessment

components of website). Participants in both interventions completed 4- and 12-month follow-up assessments. All procedures were approved by the MUSC Institutional Review Board.

Participants

Participants were 2,000 adolescents with ages ranging from 12 to 17 ($M = 14.12$, $SD = 1.57$). Males comprised 49% of the sample and females 51%. With regard to race, 62.5% of adolescents self-identified as White, 33.3% identified as Black, 3.8% Other, and 11.1% declined to answer. Of that sample, 2.7% reported being from Hispanic or Latino ethnic origin. Most households had partnered parents (73.4%). Median annual income was between $40,000 and $60,000; 71.1% reported at least some college education.

Results

Preliminary baseline data ($N = 2,000$) indicates that 35.9% ($n = 717$) of youth accessed the *BBN* site. Of these, 453 participants accessed the BA module; 291 were assigned to the experimental condition. Results presented in this section refer to these 291 adolescents. Over half of these adolescents (61.11%) completed this module. Moreover, 96.2% of adolescents who screened-into the module (i.e., reported at least three out of the nine DSM-IV-TR criteria for depression) completed the module. In addition, 49.80% of adolescents who screened-out of this module completed this. While in the module, participants were presented with a comprehensive list of activities they would find enjoyable and were encouraged to select activities they thought would be fun for them to do over the following week. Results indicated that the most popular activities were: "be extra nice to a friend" (26.1%), "be nice to a family member" (23.2%), and "help make dinner" (23.8%). Other highly selected activities included: "babysit" (16.5%), "volunteer at an animal shelter" (16.5%), and "go to a friend's house" (15.7%). Less popular items included participating in baseball (3.8%), skateboarding (2.9%), and street hockey (2.3%). However, the popularity of specific activities may have been related to their placement on the activities list (activities under the Helping category were shown first). With regard to the use of the overall intervention, web usage data collected from 4-month follow-up assessment indicated that 86.9% of adolescent participants used *BBN* for more than 15 minutes with 37.3% using it for an hour or more. The majority of users reported that use of the site was "easy" or "very easy" (92.9%) and 90.2% stated that they would recommend *BBN* to others.

Currently, we have collected 4-month follow-up data and are in the process of completing 12-month follow-up telephone interviews with this sample, including assessment of mental health and health-risk outcomes, parent-child relationship variables, barriers to accessing and completing the *BBN* site, and retention of knowledge gained from the site. These evaluation data will guide

further refinements to the *BBN* site and BA tool and inform plans for large-scale dissemination.

DISCUSSION

Overall, the online delivery of a BA brief-intervention with teens appears to be feasible and well-received. The results from the qualitative assessment indicated that adolescents responded favorably to the intervention. Moreover, results from the preliminary efficacy assessment have taught us that adolescents, many of whom were reporting depressive symptoms, are willing to use and complete this intervention if offered after a stressful life event, such as a disaster. Findings from both the qualitative and preliminary efficacy assessments will assist us in improving the intervention to address usability issues. However, additional research on the efficacy of online BA is needed. A major benefit of this online self-help modality is that it could be disseminated to a large number of teenagers who could access this intervention on their own time and at their own convenience. However, a number of challenges and considerations were encountered during the development process of turning BA into a web-based, self-help format. Of particular importance were the questions of how to engage teenagers and make the content appealing and understandable to their age group. In addition, budget and timeline considerations limited the features that were developed for the BA resource.

Many opportunities exist for expanding and enhancing the current BA resource. For example, the current resource does not track and remember the completion of activities or the teenagers' ratings of mastery and pleasure. Additional features could be developed to track activity completion and ratings and generate reports on what activities are associated with improved mood. In addition, mobile technology could be ideally used to send teenagers text messages, e-mail reminders, or push notifications when it is time for scheduled activities, and to have them record their mastery/pleasure ratings in real-time [29, 30]. These advanced and mobile tracking features could potentially increase engagement, adherence, and accountability of teenagers during the BA intervention.

The next step in the development of this BA resource is to make improvements to its features, aided by usability evaluations with target users. This would be followed by a randomized controlled efficacy evaluation of the BA resource as a stand-alone online self-help intervention for teenagers with depression. As the popularity of Internet-based and mobile technologies rises among teenagers, so does the relevance and potential of online self-help interventions to offer convenient treatments on a large-scale basis.

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