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Avatar-Based Depression Self-Management Technology: Promising Approach to Improve Depressive Symptoms Among Young Adults

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1. Introduction

Major Depressive Disorder (MDD) afflicts nine percent of American young adults and predisposes young adults to serious impairments in psychosocial functioning. Because of MDD, young adults are at increased lifetime risk for disability, morbidity, mortality, and a decreased quality of life. Depressive symptoms usually first occur in adolescence and young adulthood. Without intervention, young adults with depressive symptoms are at high risk for these symptoms to progress into MDD, a serious debilitating chronic illness that affects most young adults for a decade before receiving treatment. A critical time in human development, young adulthood, delineates the transition from parental dependence to a state of growing independence and autonomy. Young adults are not routinely taught effective depression self-management skills to reduce depressive symptoms and pre-empt future illness. Therefore, depression self-management interventions that focus on depression self-management skill building and problem solving among young adults may prove to significantly blunt the lifetime risks of morbidity and disability associated with early onset depressive symptoms.

Depression self-management is the self-directed behaviors individuals enact on a daily basis to reduce and mitigate depressive symptoms, which includes effective communication with healthcare providers. There is no established evidence-based practice for depression self-management behaviors among young adults that will attenuate depressive symptoms and pre-

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empt MDD. Young adults are unique population because they possess a high comfort level in interacting with technology, and they often prefer this form of interaction over face-to-face encounters. Thus, developmentally-appropriate and innovative approaches are needed to engage this population in depression self-management. We have developed and pilot tested a novel three-dimensional avatar-based depression self-management intervention for young adults with depression, called Electronic Self-Management Resource Training for Mental Health (eSMART-MH).

1.1 Study Purpose

The purpose of this pilot study is to report preliminary evidence on the efficacy of an avatar-based depression self-management intervention, eSMART-MH, among young adults (18-25 years of age).

2. Methods

2.1 Design

This study is a longitudinal randomized controlled trial. Participants were randomly assigned to receive the experimental condition, eSMART-MH, or the attention-control condition, screen-based education on health living (sleep hygiene, physical activity, and nutrition). eSMART-MH is a novel avatar-based depression self-management intervention in which young adults interact with virtual healthcare providers and a virtual health coach in a virtual primary care environment to practice effective communication about depression symptoms and received tailored behavioral feedback. Participants were exposed to eSMART-MH or the screen-based education at baseline, four weeks, and eight weeks. Data were collected before each exposure to the one of the two study conditions and four weeks following their last exposure to the eSMART-MH or attention-control condition.

2.2 Sample

A convenience sample of community-dwelling young adults with depressive symptoms (n=28) was recruited from communities of Northeast, Ohio. Recruitment of participants occurred May 2011 through July 2012. Participants were between the age 18-25 years, able to speak and understand English, and report of depressive symptoms for greater than two weeks or a diagnosis of MDD by healthcare provider. Participants were excluded if they participated in a previous study on chronic physical health conditions using the eSMART platform .

2.3 Measure

2.3.1. Hospital Anxiety and Depression Scale (HAD-S)—Depressive symptoms were assessed by the seven item self-report depression subscale of the HAD-S, scored on a four point scale from 0-4. A summative score on the depression subscale was generated. A cut score of eight was used, which shown to be highly sensitive and specific for MDD and is indicative of an increased clinical risk for depression. The HAD-S depression subscale has established reliability and validity among diverse groups of adults. The internal reliability coefficient for this study ranged from .77 to .84 across timepoints.

2.4 Procedures

2.4.1. Subject Recruitment and Screening—University IRB approval was obtained prior to the conduct of this research. The setting for this study was a private university located in Northeast, Ohio and the surrounding communities. Print advertisements were used for participant recruitment and were posted on campus of a private university in northeast Ohio, in city buses, and in local businesses. Interested young adults contacted the research

staff by telephone. At the time of the call, the research staff read an IRB approved script, which provided detailed information about the study and screening questions for study inclusion and exclusion. Participants were invited into the study if they met inclusion criteria for this study. Interested young adults were then scheduled for a study appointment and written informed consent obtained at the baseline study visit.

2.4.2. Data Collection—Data were collected by structured interviews at enrollment and monthly over a three month observational period for a total four study visits. At each study visit, questionnaires were administered to assess domains of depression self-management (i.e., patient activation, mental health literacy, mental illness stigma, patient-provider communication) and mental health services utilization (i.e., entry to treatment, unscheduled visits to primary care provider, visits to an urgent care or emergency room). However, this preliminary report describes the demographic characteristics of the sample and scores on HAD-S depression subscale.

2.5. Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 20; Somers, NY). Descriptive statistics and repeated measures analysis of variance (RMANOVA) were employed to address the aims of this preliminary report. Prior to the conduct of the statistical analysis, we confirm that the assumptions for test were adequately met. The criterion for statistical significance for each statistical test was $p < .05$.

3. Results

3.1. Sample characteristics

Table 1 shows the sample characteristics of the participants ($n = 28$). This convenience sample of community-dwelling young adults had a mean age of 22 years ($SD = 2.2$). Most participants were non-white (82%), females (64%), earned a high school diploma (75%), and were not taking psychotropic medications or receiving psychotherapy (71%) at baseline. When stratified by depressive symptom severity, 69% (HAD-S cut-off score ≥ 8) of participants reported a depressive symptom severity consistent with a clinical diagnosis of MDD.

3.2 Comparison of group difference over time

A RMANOVA was conducted to examine the differences in depressive symptoms over time and determine if there was an interaction between group assignment and changes in depressive symptom severity across the three month observational period. Over time, the scores on the HAD-S ($F(3,69) = .84, p = .47$) did not differ between participants exposed to eSMART-MH or the screen-based health education. However, the interaction between group assignment and time was statistically significant ($F(3,69) = 3.65, p = .01$), which provides preliminary evidence for a significant reduction over the three month observational period in depressive symptoms among participants exposed to eSMART-MH when compared to the attention control group. The observed power ($1 - \beta$) for this interaction was .78.

4. Discussion

Depressive symptoms were prevalent among young adults in this study. Based on the HAD-S depression subscale cut score of eight, roughly one third of young adults had scored below the cut score, indicating subclinical depressive symptoms at baseline. Sixty nine percent of participants were above the cut score, possessing depressive symptoms consistent with a DSM-IV-TR diagnosis of MDD. Despite the small sample size, initial efficacy of eSMART-MH was demonstrated. Participants who received eSMART-MH showed a statistically

significant reduction in their depressive symptoms over the three month study. Despite this small sample, this finding of a decrease in depressive symptoms is clinically significant; at baseline, the intervention group HAD-S score was greater than eight ($M=8.10$, $SD=4.73$), consistent with a diagnosis of MDD, and this score decreased over three months to less than eight ($M=6.50$, $SD=4.23$). Adding further support for the efficacy of eSMART-MH, participants assigned to the attention control group showed no change (baseline $M=8.50$, $SD=3.82$ and three month follow-up $M=8.53$, $SD=3.30$) in depressive symptoms over this short period of time, which is consistent with findings of epidemiological studies; depressive symptoms tend to stay the same and gradually worsen without intervention. With this, eSMART-MH has demonstrated initial efficacy and is a promising developmentally appropriate depression self-management intervention for young adults.

4.1 Limitations

There are several limitations to this study which impacts the generalizability of the study results. First, this pilot study has a small sample size and the characteristics of young adult participants restrict the external validity. Second, a majority of the sample were African American females, which may not represent the characteristics of most young adults with depressive symptoms. Lastly, it unknown how the intervention may perform in other groups of individuals with differing characteristics and across differing levels of symptom severity.

5. Conclusion

This was the first evaluation of an avatar-based depression self-management of this kind among young adults. This study establish the feasibility of administering a depression self-management intervention using this novel avatar-based methodology, and the initial efficacy of using avatars as health providers and coaches in virtual primary care environments, to reduce depressive symptoms over time in a group of young adults with depressive symptoms.

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Table 1

Sample Characteristics (n=28)

Variable	N	%
Gender: Female	18	64
Race: Non-white	23	82
Education		
Less than high school	3	11
High School	18	65
Bachelor's Degree	5	18
Master's Degree	1	3
Other	1	3
Psychotropic Medication Use		
Medication	8	29
No Medication	20	71

Note. Race=non-White vs. White