

A Pilot Study of Tablet-Based Multimedia Education Compared to Print Brochures for Improving Depression Literacy and Reducing Stigma in Community Mental Health Clinics

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ABSTRACT

Objectives: A high prevalence of stigma and a lack of accessible patient mental health education programs remain major barriers to the treatment of depression. This study was designed to investigate the efficacy of a tablet-based multimedia education application, in comparison to print brochures, in improving depression literacy and reducing depression stigma among a community mental health clinic patient population.

Methods: A tablet-based multimedia education and a print education module on depression, containing the same information content, were developed. 103 participants completed either the multimedia or print education modules. Primary outcomes were changes in depression literacy and stigma, utilizing a 20-item knowledge quiz and the Depression Stigma Scale score respectively, administered before and after the education intervention.

Results: In comparison to print education, tablet-based multimedia education significantly increased depression-related knowledge (3.0 ± 3.1 versus 1.5 ± 2.9 , $p < .05$), and reduced depression stigma (-6.6 ± 10.7 versus -1.7 ± 7.1 , $p < .05$), especially personal stigma (-6.4 ± 7.1 versus -1.2 ± 4.2 , $p < .001$). Among all participants, a reduction in the personal stigma score was significantly correlated with an increase in knowledge score ($r = -.21$; $p < .05$), though mediation analysis suggests that this reduction in stigma is not mediated by knowledge change. The tablet-based application was very well-accepted by participants, who in comparison to the print brochure group, were more likely to find the multimedia visuals useful and prefer the module to a human health educator ($p < .05$).

Conclusions: With advantages of high scalability, greater user preference, and efficacy in improving depression literacy and stigma, tablet-based multimedia education has the potential to improve the health outcomes of patients with mental illness.

Keywords: *Mental health education, tablet-based multimedia applications, depression literacy, stigma*

INTRODUCTION

People with mental illnesses such as depression may internalize negative stereotypes about mental illness and respond by self-stigmatization (Corrigan & Watson, 2002; Link & Phelan, 2001; Rüsch et al., 2005; Livingston & Boyd, 2010). Unfortunately, despite the high burden of mental illness in the United States, stigma reduction efforts remain scarce, particularly in low-income and minority communities (Greenberg, 2010; Luhrmann, 2000). The lack of patient mental health education and a high prevalence of stigma have been identified as major barriers to implementing the Institute of Medicine's recommendations on the prevention and treatment of mental, emotional, and behavioral disorders (Evans et al., 2012).

Self-stigma among patients with mental illness is associated with decrease help-seeking behavior (Voget et al., 2006; Barney et al., 2006). One survey found that 43% of patients reported at least one significant stigma-related barrier to seeking mental health care, including negative beliefs concerning psychiatric medications and seeing a mental health professional (Bell et al., 2011). Other community-based studies found that between 24% and 29% of individuals with an apparent need for help reported being afraid of what others might think as a reason for not seeking care (Kessler et al., 2001; Wells et al., 1994). Stigma can also interfere with rehabilitation goals, such as pursuing employment, independent living, and having a full social life (Adewuya et al., 2011; Link, 1982). High levels of self-stigma are also associated with low levels of self-efficacy (Fun et al., 2007) and quality of life (Yen et al., 2009). Ultimately, personal stigma may lead to poor health outcomes for patients with mental illness, including increased suicide risk, greater rates of treatment discontinuation, poor medication adherence, and overall reduced use of mental health services (Mojtabai et al., 2002; Sharaf, 2012; Sirey et al., 2001a, 201b).

Research evidence suggests that patient education and de-stigmatization is essential in the treatment of the highly prevalent spectrum of mental illnesses (Clark et al., 2012). Mental illness education has been shown to improve attitudes towards the perceived benefits of psychotherapeutic and medical treatments, as well as the potential for recovery (Corrigan et al., 2001). While early studies of printed depression education material have shown efficacy in reducing stigma, there have been few studies and the effects have been modest (Alvidrez et al., 2009; Hammer & Vogel, 2010).

Increasingly public and private health players are focusing on the potential of new interactive technologies in improving health care. Studies of health education programs implemented in free clinics show that patients learning from interactive multimedia report the experience as more enjoyable, are more likely to learn something new, and are more likely to trust the information (Trepka et al., 2006; Leeman-Castillo et al., 2007). Through multimedia applications online or on tablet computers, patient mental health education may be delivered effectively, with the potential of low financial and human resource costs for delivery, and high scalability (Lewis et al., 1999). Indeed, one study found that using internet-based health education significantly reduced personal stigma associated with depression (Griffiths et al.,

2004). Other lines of research have found that online self-tests and resources for persons contemplating suicide have shown promising results in preventing suicide, potentially reaching populations that are unable or unwilling to access conventional mental health care services (Mokkenstorm et al, 2012).

Although research has demonstrated that stigma associated with depression has an important effect on health-seeking behavior, outcomes, and rehabilitation goals, there remains a lack of evidence-based educational interventions designed to reduce depression stigma, especially among devices that have potential for high scalability with minimal cost. To address the problem of depression stigma, we developed and tested a tablet-based multimedia application in a controlled pilot study in community-based mental health clinics. Patients waiting in these clinics are predisposed to willingly address their health needs, making the waiting period—often up to a few hours—a prime opportunity for education. Moreover, such clinic populations are often from underserved low-income and low-literacy communities. The purpose of this study is to determine the efficacy of a tablet-based multimedia application, in comparison to traditional print brochures, in improving depression literacy and reducing stigma related to depression.

METHODS

Participants

Participants were 103 adult patients visiting a community mental health clinic. The clinics were non-profit community-based clinics serving mostly patients on Medi-Cal or Medicare, and offering sliding scale fees for the uninsured. The mean participant age was 45.4 (S.D.=11.0), with a range of 20 to 70 years old, and 65% of the participants were female. All the patients were either previously diagnosed with depression or assessed to be at high-risk for depression.

Education Modules

A multimedia education module was developed to be implemented as a tablet-based application for use in community clinics. An initial print prototype discussing multiple facets of depression including symptoms, diagnosis, etiological factors, and treatments with a corresponding knowledge test was created and administered to 20 patients with a range of mental health concerns. Based on their qualitative feedback, the prototype design was improved to produce two education modules based on the same information content: a print brochure and a multimedia application designed for Android tablets. The multimedia application uses multiple animated videos with speaking audio and subtitles, and requires users to tap a button to advance videos. Between videos are short quizzes that users are prompted to complete.

In the initial trial, 70 participants were assigned the print education module. In the second trial, 23 patients were assigned to the multimedia education module. The multimedia education module had fewer participants because the trial was ended earlier given that efficacy of the

application was demonstrated in the analysis, prompting ongoing revisions to the application in preparation for release to the public.

Measurements

An initial questionnaire assessed demographic information, depression literacy based on a 20-item quiz including symptoms, diagnosis, causes and treatments, and depression stigma based on the Depression Stigma Scale. A final questionnaire assessed post-education depression knowledge and depression stigma using the same 20-item knowledge quiz and Depression Stigma Scale. The Depression Stigma Scale, which measures the cognitive components of depression stigma, has been used and validated in a previous study (Griffiths et al., 2004). It is an 18-item test that includes statements assessing status of depression as an illness; extent to which depression is under personal control/fault; and character flaws associated with people suffering from depression such as dangerousness, unpredictability, shame/concealment, and avoidance. Nine of the items form the personal stigma scale, which reflect personal stigmatizing attitudes to depression. The other nine items form the perceived stigma scale, which reflect the participant's perceptions of what most other people believe about depression. Cronbach's alpha values for the total, personal and perceived depression stigma scales are 0.78, 0.76 and 0.82 respectively, and the test-retest reliability of the personal and perceived stigma scale are 0.71 and 0.67 respectively.

Procedure

The participants were recruited by a research assistant in the waiting area of the community clinic. They were asked whether they would be willing to participate in a research study on learning about mental illness. The protocol for informed consent was approved by the Stanford Institutional Review Board. An initial questionnaire assessing demographics, baseline knowledge and baseline stigma was administered. The participants were then asked to complete the education module (i.e., print brochure or the tablet-based application). At completion of the module, a final questionnaire assessing follow-up knowledge and stigma was administered. A research assistant was available through the process to help answer questions. 55.2% of the participants assigned to the print module asked for at least parts of the brochure to be read to them by a research assistant.

RESULTS

There were no significant differences in gender, age, education attainment, and depression diagnoses between the print and multimedia module groups (see Table 1). The print module group had a greater number of patients self-reporting Asian ethnicity compared to the multimedia module group (7.4% vs 0%; $p < .05$), but no other demographic differences were found between the groups.

[Table 1 here]

Effects for knowledge scores

There were no differences in the baseline knowledge scores between the two groups (see Table 2). The print module group had an average increase of 1.5 on the knowledge score after the education module ($p < .001$). The multimedia group had an increase of 3.0 in the knowledge score ($p < .001$), which was significantly greater than the increase in the print module group ($p < .05$).

[Table 2 here]

Effects for stigma scores

There were no differences in the baseline stigma scores between the groups. The group exposed to the print module had an average decrease of 1.7 in their total stigma score after completing the education module ($p < .05$). By individual scales, the print group showed a significant decrease of 1.2 on the personal stigma scale ($p < .05$), but not on the perceived stigma scale. The multimedia module group had an average decrease of 6.6 in the total stigma score, with individual scales showing a decrease of 6.4 on the personal stigma scale ($p < .001$), but a non-significant decrease on the perceived stigma scale. Comparing the two module types, the group exposed to multimedia education had a greater decrease in total stigma score compared to the print group ($p < .05$), as well as a significantly greater decrease in personal stigma score (-6.4 vs -1.25; $p < .001$). No significant differences were found in the change in perceived stigma score between the groups.

Association between knowledge and stigma scores

Among all participants at baseline, higher knowledge scores were associated with lower stigma ($r = -.24$; $p < .05$) on the personal stigma scale ($r = -.40$; $p < .001$), but not on the perceived stigma scale. After exposure to the education module, the correlations between knowledge scores and both the total and personal stigma scores was also significant ($r = -.27$ and $-.31$; $p < .05$). The increase in knowledge score was associated with a reduction in the personal stigma score ($r = -.21$; $p < .05$), but not the total stigma score. None of the correlations between the perceived stigma scale score and knowledge score were significant.

[Table 3 here]

Mediation analysis of knowledge scores predicting stigma reduction

Table 4 summarizes the results of the mediation analysis for education type predicting stigma change, with knowledge change as the mediator. The standardized regression coefficients and significance for the pathways among variables for the model are presented. When personal

stigma change was regressed on education type, education type was significantly associated with personal stigma change, accounting for 16% of variance ($\beta = -.42, p < .001$). When knowledge change was regressed on education type in the second regression equation, education type was significantly associated with knowledge change, accounting for 3.2% of variance ($\beta = .21, p < .05$). When both education type and knowledge change were entered into the equation predicting personal stigma change in the fourth equation, knowledge change was not significantly related to personal stigma change ($\beta = -.13, p > .05$), although the regression β for education type decreased from $\beta = -.42$ ($p < .001$) in the first equation to $\beta = -.39$ ($p < .001$) when knowledge change was entered as the mediating variable in the fourth equation.

[Table 4 here]

Educational Module Feedback

Between the two groups, there were no significant differences between perceived length of the educational material, the amount of information in the material, the ease of use, or the increased likelihood of speaking to a doctor about depression. Both groups reported favorable responses to the education modules. For example, 87% of participants reported the educational module as “easy” or “very easy” to use, and 69% of patients reported being more likely to speak to a doctor after some form of the educational module. However, participants exposed to the multimedia module reported that the visuals were more helpful than participants exposed to the print module ($p < .05$). Furthermore, the multimedia group was more likely to prefer their education module compared to a human health educator, in comparison to the print group ($p < .01$).

[Table 5 here]

DISCUSSION

This controlled trial demonstrates that relative to a print brochure, a tablet-based multimedia education program leads to a significant increase in depression literacy and a reduction in personal stigma among patients diagnosed or at high risk for depressive symptoms. Although the print education module also improves knowledge and reduces stigma, the effect size of the multimedia module was significantly greater. Overall, a reduction in the personal stigma score was significantly correlated with an increase in knowledge score ($r = -.21; p < .05$), though mediation analysis suggests that this reduction in personal stigma is not mediated by an increase in depression knowledge.

There may be several reasons for the greater efficacy of the tablet-based multimedia program in reducing stigma. Previous studies have shown that an interactive technology-based experience may provide more enjoyment and thus greater patient engagement, as well as a

greater trust in the information presented (Trepka et al., 2006; Leeman-Castillo et al., 2007). Although we found that stigma reduction was associated with knowledge change, mediation analysis showed that the reduction in personal depression stigma was largely independent of improvements depression-related knowledge. This replicates results from a similar study of stigma reduction, but using internet-based information websites as the educational intervention (Griffiths et al., 2004).

Given the qualitative feedback demonstrating significant higher patient ratings of visual effectiveness in the multimedia module, we hypothesize that virtual contact with the animated narrative figure may be a reason for greater improvements in depression literacy and reduction in personal stigma. Indeed, in a study of different stigma reduction strategies, Corrigan and colleagues (2001) found that a contact strategy, defined as facilitating interactions with persons with the illness, produces positive reductions in depression stigma that exceeds a knowledge-based education strategy. Other studies have demonstrated an inverse relationship between having contact with a person with mental illness and endorsing psychiatric stigma (Penn et al. 1999). Huxley (1993) identified direct contact with people who have had “helpful treatment for episodes of mental illness” as a key factor in lowering stigma. Although the multimedia application utilizes videos of animated persons instead of real individuals, the narrative conveyed through this medium may have been sufficient to facilitate an experience with effects similar to the contact strategies shown in the previous studies.

This study is not without limitations. Although the control study design compared a print and multimedia design that was based on the same information content and tested using the same procedure, the developmental timeline of the multimedia prototype did not permit simultaneous implementation of both modules and thus randomization. Our mediation analysis must also be considered exploratory, given a lack of power to detect significant in our sample size and modest effect size (Fritz & MacKinnon, 2007). Thus, we cannot conclude with certainty that stigma reduction is not mediated by knowledge improvement. Follow-up studies should also investigate the relationship between education modules and its impact on health behaviors, including communication with healthcare professionals, treatment adherence, and most importantly illness and rehabilitation outcomes. Finally, future research also needs to determine whether the immediate improvements in depression literacy and stigma persist over time.

Given the barrier of stigma in seeking care its significant impact on poor treatment and rehabilitation outcomes, it is essential to address stigma among populations diagnosed and at risk for depression. Low-cost, sustainable, and preventative health education programs are particularly useful for non-profit clinics that face time, human resource and budget constraints. Such clinics, including free community-based clinics, need a cost-effective means to implement health education into the working infrastructure of each clinic site without drastically increasing the time demands on healthcare workers during a clinic visit. While these clinics may have a large number of printed pamphlets and brochure, they are often outdated and disregarded by the community clinic population. Moreover, populations with depressive symptoms are nearly 3 times more likely to have low health (Gazmararian et al., 2000).

Importantly, the majority of patients exposed to both the print and multimedia education intervention reported they were more likely to speak with their physician about depression after the modules. Patients exposed to the tablet-based multimedia application rated the module favorably in terms of visual helpfulness, and were more likely to prefer it as an alternative to a human health educator, compared to patients exposed to the print brochure. This suggests that a tablet-based multimedia education program may be both practical and feasible. Although further studies are needed to replicate our findings of the efficacy of tablet-based multimedia education applications in improving depression literacy and reducing stigma, as well as further studying its effect on potentially improving health-seeking behaviors and treatment outcomes, this pilot study suggests that such applications may play an important role in improving outcomes people with depression and other mental illness.

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Tables

Table 1: Demographics of Sample Size by Type of Education

		Print Module	Multimedia Module
Sample size		n = 70	n = 23
		%	%
Gender	Female	63.8	65.2
	Male	36.2	34.8
Age		45.4	45.1
Education	Less than high school	20.0	17.4
	High school	52.9	52.2
	Greater than high school	27.1	30.4
Race	African American	37.7	34.8

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	<i>Asian</i>	7.2	0
	<i>Mexican/Hispanic</i>	15.9	13.0
	<i>Native American</i>	2.9	0
	<i>White</i>	27.5	34.8
	<i>Multiracial</i>	8.7	17.4
Depression	<i>Diagnosed with depression</i>	85.1	90.6

Table 2: Comparison of Baseline and Change in Mental Health Knowledge Score and Stigma Scores by Type of Education Module Groups

		Print Module	Multimedia Module	Difference Between Modules
		<i>Mean (S.D.)</i>	<i>Mean (S.D.)</i>	<i>Mean (S.E.)</i>
Baseline Knowledge Score		11.8 (3.2)	12.0 (2.2)	-.17 (0.72)*
Change in Knowledge Score		1.5 (2.9)**	3.0 (3.1)**	-1.4 (0.72)*
Baseline Stigma Score	<i>Total Score</i>	30.0 (10.7)	28.6 (11.8)	1.36 (2.6)
	<i>Personal Scale</i>	12.2 (6.5)	11.1 (7.2)	1.1 (1.6)
	<i>Perceived Scale</i>	17.7 (7.0)	17.5 (6.9)	.22 (1.7)
Change in Stigma Score	<i>Total Score</i>	-1.7 (7.1)*	-6.6 (10.7)**	4.9 (2.0)*
	<i>Personal Scale</i>	-1.2 (4.2)*	-6.4 (7.1)**	5.3 (1.2)**
	<i>Perceived Scale</i>	-.48 (5.3)	-.10 (6.1)	-.36 (1.3)

Change scores were calculated as post-education score minus baseline scores. Difference between modules scores were calculated as print module minus multimedia module scores.

* $p < .05$

** $p < .001$

Table 3: Correlation between Knowledge Scores and Stigma Scores

		Baseline Knowledge Score	Post-Module Knowledge Score	Change in Knowledge Score
Baseline Stigma Score	<i>Total Score</i>	-.24*		
	<i>Personal Scale</i>	-.40**		
	<i>Perceived Scale</i>	-.01		
Post-Module Stigma Score	<i>Total Score</i>		-.27*	
	<i>Personal Scale</i>		-.31**	
	<i>Perceived Scale</i>		-.12	
Change in Stigma Score	<i>Total Score</i>			-.20
	<i>Personal Scale</i>			-.21*
	<i>Perceived Scale</i>			-.095

* $p < .05$ ** $p < .001$

Table 4: Mediation Analysis of Education Type Predicting Personal Stigma Change with Knowledge Change as the Mediator

Model Predicting Stigma Change	Variance (Adjusted R-square)	Dependent Variable	Independent Variable 1	β	Significance	Independent Variable 2	β	Significance
A: Education → Stigma	.16	Personal Stigma Change	Education Type	-.42	$p < .001$			
B: Education → Knowledge	.032	Knowledge Change	Education Type	.21	$p < .05$			
C: Knowledge → Stigma	.035	Personal Stigma Change	Knowledge Change	-.21	$p < .05$			
D: Education + Knowledge → Stigma	.17	Personal Stigma Change	Education Type	-.39	$p < .001$	Knowledge Change	-.13	$p > .05$

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Table 5: Education Module Feedback from Participants

	Print	Multimedia	Group Difference	Fields
	<i>Mean (S.D.)</i>	<i>Mean (S.D.)</i>	<i>Mean (S.E.)</i>	
Text helpfulness	4.2 (.89)	4.4 (.73)	-.25 (.21)	5 - very helpful, 1 - not helpful at all
Visual helpfulness	3.9 (1.0)	4.4 (.66)	-.53 (.23)*	5 - very helpful, 1 - not helpful at all
Length	3.1 (.83)	3.3 (.56)	-.17 (.19)	5 - way too long, 3 - just right, 1 - way too short
Amount of information	3.0 (.60)	2.9 (.67)	.10 (.15)	5 - way too much, 3 - just right, 1 - way too little
Ease of use	4.0 (.85)	4.4 (.50)	-.32 (.19)	5 - very easy, 1 - very hard
Preference to human	2.7 (1.5)	3.6 (1.4)	-.95 (.35)**	5 - definitely prefer module/brochure, 1 - definitely prefer health educator
Want to go through more	3.9 (1.1)	4.3 (1.1)	-.36 (.27)	5 - definitely go through them, 1 - definitely not go through them
Likeliness to speak to doctor	3.9 (.98)	4.1 (1.1)	-.26 (.24)	5 - much more likely to talk to the doctor, 1 - much less likely to talk to the doctor

Change scores were calculated as post-education score minus baseline scores.

* $p < .05$

** $p < .001$