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A randomized controlled trial of primary care physician motivational interviewing versus brief advice to engage adolescents with an Internet-based depression prevention intervention: 6-month outcomes and predictors of improvement

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Abstract

We believe that primary care physicians could play a key role in engaging youth with a depression prevention intervention. We developed CATCH-IT (Competent Adulthood Transition with Cognitive Behavioral and Interpersonal Training), an adolescent Internet-based behavior change model. We conducted a randomized comparison of two approaches in engaging adolescents with the Internet intervention: primary care physician (PCP) motivational interview + CATCH-IT

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Disclosures: Benjamin W. Van Voorhees has served as a consultant to Prevail Health Solutions, Inc, Mevident Inc, San Francisco and Social Kinetics, Palo Alto, CA, and the Hong Kong University to develop Internet-based interventions. To facilitate dissemination, the University of Chicago recently agreed to grant a no-cost license to Mevident Incorporated (3/5/2010) to develop a school-based version. Neither Dr. Van Voorhees nor the university will receive any royalties or equity. Dr. Van Voorhees has agreed to assist the company in adapting the intervention at the rate of \$1,000/day for 5.5 days. The CATCH-IT Internet site and all materials remain open for public use and made freely available to healthcare providers at <http://catchit-public.bsd.uchicago.edu/>

All other contributing authors have read the journal's policy on conflicts of interest and have none to declare.

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Internet program (MI) versus PCP brief advice + CATCH-IT Internet program (BA). Participants (N=84) were recruited by screening for risk of depression in 13 primary care practices. We compared depressive disorder outcomes between groups and within groups over 6 months and examined potential predictors and moderators of outcomes across both study arms. Depressive symptom scores declined from baseline to 6 weeks with these statistically significant reductions sustained at the 6 months follow-up in both groups. No significant interactions with treatment condition were found. However, by 6 months, the MI group demonstrated significantly fewer depressive episodes and reported less hopelessness as compared to the BA group. Hierarchical linear modeling regressions showed higher ratings of ease of use of the Internet program predicting lower depressive symptom levels over 6 months. In conclusion, a primary care/Internet-based intervention model among adolescents demonstrated reductions in depressed mood over 6 months and may result in fewer depressive episodes.

INTRODUCTION

Depressive disorders are highly prevalent in adolescence and are often accompanied by comorbid psychopathology and overall decreased functioning.¹ While substantial progress has been made in developing face-to-face interventions to prevent depressive disorders in adolescents, the challenges group psychotherapy models face (stigma, loss of autonomy, complexity of organization, fear of disclosure) may limit implementation in many settings.²⁻⁵ As Internet-based interventions maximize autonomy, reduce stigma, and provide convenient and low cost access, they could be an effective and appropriate mode for delivery of self-guided interventions focusing on improving affect regulation and resiliency against mental disorders.⁶⁻⁸ There have been few rigorous studies of child/adolescent Internet-based mental health interventions⁸. Results from school-based interventions have produced inconsistent results, suggesting the form of engagement and context may play important roles in outcomes.⁸

We developed CATCH-IT (Competent Adulthood Transition with Cognitive Behavioral and Interpersonal Training) on the premise that coupling a primary care physician interview with a structured Internet-based behavior change program could increase both adherence and the efficacy of treatment.⁹ We conducted a randomized comparison of two approaches to engage youth in an Internet program: brief advice (BA), where the physician directs the adolescent to the Internet program based on his or her authority (external motivation), and motivational interviewing (MI), where the physician seeks to help the adolescent to identify his/her own motivation for engaging the Internet program (internal motivation). At the twelve week assessment point, both groups experienced declines in depressed mood, and the MI group demonstrated higher levels of adherence, lower cumulative prevalence of clinician diagnosed depressive episodes and lower prevalence of hopelessness relative to BA group participants.^{10, 11} However, we do not know if the evidence of benefit of the intervention will be sustained or which factors engender more favorable outcomes in Internet-based interventions in adolescents. Knowledge of predictors of intervention response (in general and also specific approaches) could greatly improve intervention design.^{12, 13}

This was a phase 2 clinical trial intended to lay the foundation for randomized clinical trial comparing the optimized CATCH-IT intervention with control arm (treatment as usual + with attention control Internet intervention). Consequently, the aims of this study were twofold: (1) to determine if the a motivational interview was superior to brief advice in terms of clinical outcomes and (2) to determine if pre/post changes observed within groups supported the potential efficacy of the CATCH-IT intervention. We hypothesized that (1) the MI group would demonstrate superiority over the MI group in clinical outcomes and (2) that both MI and BA interventions show sustained reductions in depressed mood. Additionally, we seek to identify possible predictors of depressed mood over 6 months^{9, 11, 14} including participant characteristics (demographics, vulnerability and protective factors, and motivation¹⁵) and aspects of adolescent experience based on the Principles of Effective Prevention framework (positive relationships (e.g., physician), dose, training and socio-cultural relevance^{12, 13, 16, 17}), and their potentially different predictive ability in the two intervention groups. No a priori hypotheses about predictors of treatment response were made.

METHODS

Study design

Overview: Previous publications by our research group provide a detailed description of the study design and procedures.^{10, 11} Two versions (PCP brief advice + Internet program versus PCP motivational interview + Internet program) of a primary care/Internet-based intervention were evaluated in a diverse group of adolescents in 13 primary care sites in the United States. Because PCPs performed the interviews, they could not be blinded as to condition. Recruitment was accomplished by screening all adolescents visiting the primary care physician (PCP) for risk of depressive disorder (having any core symptom, i.e., depressed mood, anhedonia, and/or irritability for “at least a few days in last two weeks”).¹⁸ Adolescents with major depression, frequent self-harm thoughts/intent, substance abuse disorder, schizophrenia, bipolar disorder, or probable conduct disorder were excluded. Participants were randomized, and their group assignment was provided to them after enrollment. Both groups received equal and private (secure sign-in) access to the Internet site. Details of recruiting, inclusion/exclusion criteria, enrollment consent, sample size calculations, and stopping rules have been reported in prior publications.^{10, 11} All protocols were approved by the University of Chicago Institutional Review Board and local sites' Institutional Review Boards.

Intervention overview:

Both groups received a PCP interview before and after the Internet intervention use as well as three safety assessment calls during the intervention. The MI group also received 3 motivational phone calls and completed a motivational interview questionnaire before meeting with the physician. The intervention consisted of 14 modules based on Behavioral Activation (BAC), Cognitive Behavioral Therapy (CBT),^{19, 20} Interpersonal Psychotherapy (IPT),^{21, 22} and a community resiliency concept model (Figure 1), with the overarching goal of providing a sense of mastery over emotions in a range of domains (e.g., peer, family, school). The CATCH-IT intervention, including training of physicians, fidelity of physician

interviews and adolescent adherence, has been extensively described in prior publications.^{10, 11, 14} The Internet site is freely available to the public at <http://catchit-public.bsd.uchicago.edu>.

Outcome Variables and Predictor Variables

Table 1 provides a description of all the outcome and predictor variables.

Data analysis

Assessment of outcomes and attrition: Analyses for the present study were based on the 83 adolescents included in the intervention. Outcomes were ascertained through blinded phone assessment interviews at baseline, 6 weeks, 12 weeks, and 6 months post randomization. Blinding and assessment of blinding has been reported in prior publications.^{10, 11, 14} As appropriate, the t-test, the Pearson chi-square test, or the Fisher's exact test was used to evaluate the impact of missing data by comparing those missing from 6 month follow-up to those present. Stopping rules and sample size calculations have been previously reported.^{10, 11, 14}

Within and between group comparisons: Pre-test data were available for all participants. Hierarchical linear modeling (HLM) was performed to establish within and between group differences with regard to improvement over time (baseline, 6 weeks, 12 weeks, and 6 months). A two-level model was used with time points nested within participants. Time was a fixed factor. As part of this analysis we included a random intercept to model individual variability in starting point. (We also checked for individual variability of slope over time, and since this did not improve our model we only report the results from random intercept model). Effect sizes were calculated according to Cohen's d for both within group pre/post (baseline to 6 months) and between group comparisons as have been described in prior publication.¹¹ HLM models account for missing data and can fit individual trajectories over time even if time points are missing. The method assumes that data are missing at random and these missing data do not impact or bias the intervention effects. Stata SE Version 10.0 was used for within and between group analyses.²⁵

Prediction analysis: We selected variables based on a prediction model that included socio-demographic characteristics, baseline vulnerability and protective factors related to depressive disorder, participant attitudes toward intervention, motivation, and Internet experience. Predictors were assessed at baseline (participant factors) and during/post intervention (intervention experience). To identify those variables with evidence of a univariate association with the outcome, a separate HLM model was conducted for each potential predictor variable for the outcome of depressive mood (6 weeks, 12 weeks, and 6 months) as measured by the CESD-10 total score. All models were adjusted for depressed mood at baseline, as measured by the CESD-10 total score. Time was a fixed factor. In order to mitigate the possibility of Type 1 error, *P* values were adjusted for the number of comparisons with Bonferroni's method ($0.05/14=0.004$). Variables with $P>0.004$ from the exploratory analyses were dropped from further consideration. The final predictors were selected for inclusion in the multivariate regression model to see which of the variables

showed an independent contribution to treatment outcome. SPSS version 16.0²⁶ was used for prediction analyses.

RESULTS

Sample characteristics:

We evaluated 116 individuals for participation of which 103 were eligible, 84 were enrolled, and 83 were included in the analyses (Figure 2). One participant was immediately disenrolled because of meeting exclusion criteria. The sample was ethnically diverse (40% non-white) and approximately divided equally by gender (female 56.6%, male 43.4%) with a mean age of 17.47 (SD = 2.04) years. There were no significant differences between the two treatment groups at baseline in gender, ethnicity, age, education, family, or teen variables, past treatment history, family history, or baseline depressed mood and disorder.

Attrition analysis:

A total of N=19 had no data at 6-months for analysis (withdrew n=3, disenrolled n=3, lost to follow-up n=13 and died n=1 (see adverse events below), Figure 2). There were no significant differences for baseline and 6 weeks for depressed mood, gender, ethnicity and age between those not available for follow-up at 6 months (N=19, 23%) and those who were available.

Within-group comparisons

CESD-10: CESD-10 scores declined significantly from baseline to 6 months followup for both treatment groups (6 weeks, MI: $B=-3.58$, $SE=0.96$, $P<0.001$; BA: $B=-5.27$, $SE=1.11$, $P<0.001$; 6 months, MI: $B=-5.83$, $SE=0.96$, $P<0.001$; BA: $B=-6.35$, $SE=1.31$, $P<0.001$). A similar pattern followed those who reported depressive symptoms (CESD-10 score > 9), which also declined from baseline to 6 months follow-up for both groups (6 weeks, MI: $B=-2.46$, $SE=0.83$, $P<0.001$; BA: $B=-2.10$, $SE=0.71$, $P<0.001$; 6 months, MI: $B=-3.34$, $SE=0.91$, $P<0.001$; BA: $B=-2.96$, $SE=0.81$, $P<0.001$) (Table 1). Baseline to 6-month effect sizes were in the moderate to large range: .98 for the MI group, and 1.15 for the BA group. The percentage of those reporting depressive symptoms by virtue of having a CESD-10 score > 9 also significantly declined from baseline to 6 months for both groups (MI: 67.44% to 27.91%, McNemar's test= 17.00, $P<.001$; BA: 65.00% to 17.50%, McNemar's test= 15.70, $P<.001$).

PHQ-A depressive disorder: Depressive symptoms (PHQ-A total score) decreased over 6 months (6 weeks, MI: $B=-2.87$, $SE=0.59$, $P<0.001$; BA: $B=-2.10$, $SE=0.78$, $P=0.01$; 6 months, MI: $B=-4.29$, $SE=0.63$, $P<0.001$; BA: $B=-2.86$, $SE=0.86$, $P<0.001$) and the likelihood for reporting a core symptom of depression only at 6 months and only for the BA group ($B=-2.12$, $SE=0.85$, $P=0.01$). In the MI group, the likelihood of reporting a core symptom of depression at 6 weeks and 6 months did not differ from baseline (6 weeks, $B=0.59$, $SE=0.78$, $P=0.45$; 6 months, $B=-0.59$, $SE=0.64$, $P=0.36$). The prevalence of any likely depressive disorder at 6 weeks and 6 months remained low and not significantly different from baseline for both treatment groups. Effect sizes were 1.12 for the MI group, and 0.63 for the BA group.

PHQ-A self-harm and hopelessness: Self-harm thoughts significantly declined only for the BA participants from baseline to 6 months ($B=-2.48$, $SE=1.32$, $P=0.06$). The feeling of hopelessness declined significantly only for the MI participants from baseline to 6 months ($B=-1.71$, $SE=.84$, $P=0.04$).

Between-group comparisons for all outcomes:

Mood outcomes at 6 months were similar between the MI and BA groups for the outcomes of depression with two exceptions. First, for hopelessness, the MI group reported significantly less hopelessness than the BA group at 6 months ($X^2(1) = 4.04$, $P=0.044$). Second, the cumulative prevalence of self-reported depression treatment episode as assessed by physicians (described in Table 1) was significantly lower in the MI group at 4.5% ($N=2$, $N=2$ with PHQ-A diagnosis) versus 27.4 % ($N=11$, $N=2$ with PHQ-A diagnosis and $N=9$ with primary care or mental health specialist diagnosis and treatment) for the BA group ($X^2(1) = 4.08$, $P=0.04$) with an $NNT=4.36$. The multilevel analyses yielded no significant findings of treatment group for any of the main outcomes of depression, PHQ-A depressive disorders or self-harm ideation and hopelessness. Furthermore, no significant interaction between treatment condition and time of assessment was obtained for any of the reported measures.

Adverse events

One participant attempted suicide one week after enrollment. There was one completed suicide 5 months after enrollment. Neither of these events was believed to be study related. Both individuals had prior histories of self-harm behaviors and psychiatric hospitalizations.

Predictors of treatment outcome

Table 3 shows results from multilevel univariate analyses (all results adjusted for baseline depressed mood). Regression analyses for CESD-10 depression outcomes over 6 months (adjusted for baseline CESD-10 depression score) revealed one trend toward significance for automatic negative thoughts ($P=0.02$) predicting higher CES-D 10 scores. In terms of principles of effective prevention, greater levels of ease of use significantly predicted lower CESD-10 depression scores over 6 months ($P=0.004$). No other variables were significant at the 0.004 Bonferroni-corrected alpha levels. Consequently, we did not perform a multivariate analysis. Also, there were no significant interactions between predictor variables and intervention group (analyses not shown).

DISCUSSION

This study aimed to investigate intervention effects and predictors of intervention success over 6 months, for 2 versions (Motivational Interviewing (MI) and Brief Advice (BA)) of a primary care/Internet-based intervention intended to prevent depressive disorders in a diverse group of adolescents in 13 US primary care practices. There was some support for hypothesis (1) that the MI yielded superior outcomes (hopelessness and depressive episodes). As hypothesized (2), both intervention groups demonstrated substantial declines in depression symptoms that were sustained at 6 months after treatment. Moreover, the cumulative prevalence of clinically significant depressive episodes and prevalence of

hopelessness were significantly lower in the MI group than the BA group. There was some evidence that higher ratings of Internet site ease of use was significantly associated with lower levels of depressed mood over 6 months.

To our knowledge, this is the first report of a long-term follow-up from a primary care and Internet-based depression prevention study for adolescents. Gillham and colleagues have demonstrated that primary care based model for depression prevention using a face-to-face version of the Penn Resiliency Program reduced risk of depressive and anxiety disorders for adolescents with high symptom levels at baseline.³⁷ Within-group (pre/post) effect sizes were in the moderate to high range (Cohen's $d = 0.63 - 1.15$). The size of treatment effects in the present study is either comparable to or somewhat higher than long-term within-group effect sizes of successful targeted preventive interventions for adolescents using face-to-face group psychotherapy (Cohen's $d = 0.51 - 1.08$),^{3, 27} and to preventive Internet interventions in adults (Cohen's $d = .60 - .99$).²⁸⁻³⁰ However, variations in study design such as baseline levels of depressed mood, setting and circumstances of recruitment, and variations in length of follow-up warrant a tentative approach to such comparisons. Our findings support the use of well-designed cost-efficient Internet interventions for adolescents. The intervention included many characteristics reported to predict larger intervention effects including: enrolling high-risk individuals, older adolescents, shorter intervention duration that included homework assignments, delivered by professional interventionists, and combining three or more intervention methods.^{31, 32}

Between-group differences for depressed mood were insignificant; however the MI group demonstrated a lower cumulative prevalence of clinically significant depressive episodes and hopelessness. Given the limitations of the clinically significant depressive episode outcome as measure (largely based on adolescent report of treatment in limited partial cohort follow-up), primacy in interpretation of these apparent disparate outcomes should be given to the more standardized self-report data from the CES-D and PHQ-A. One interpretation would be that "clinically significant depressive episodes" variable is primarily a "health services utilization" variable and not so much a "clinical" outcome. In this scenario, similar CES-D 10 scores but greater levels of clinically significant depressive episodes could be found if: 1) a much greater proportion of the BA participants were diagnosed with depressive episodes and received antidepressant medication and/or face-to-face psychotherapy after the study began, resulting in a lower CES-D score; 2) the BA group participants may have experienced greater distress and/or lower levels of self-efficacy with regard to life situations at similar levels of depressed mood that resulted in more treatment seeking behaviors or 3) there's physician and/or participant bias. These possibilities are supported by the findings that individuals with similar levels of depressed mood may adopt different treatment seeking behaviors based on perceived impairment, need or attitudes.^{38, 52} Similarly, primary care physicians rarely utilize formal criteria and depression treatment and are often influenced by subjective factors. Additionally, participants or physicians may have been biased by a sense of investment in the success of the MI.

An alternative perspective is that the participants, despite similar levels of depressed mood, did experience greater levels of perceived impairment related to depressed mood. In this framework, several explanations could be considered: 1) greater levels of motivation leading

to greater fidelity (adherence/dose in Internet study) influenced better coping strategy and reduced the inter assessment interval episodes for MI participants, or 2) the MI participants simply perceived themselves as being less impaired and more capable, without necessarily being so. The finding of greater adherence, lower prevalence of hopelessness, and increased positive affect and motivation for depression prevention in the MI group 12 weeks that we have previously reported could support one or both of these interpretations.⁹⁻¹⁰ Similarly, the hopefulness is an important protective factor and Gilliam demonstrated that greater fidelity was associated with better primary care depression prevention outcome.^{37, 39-40}

Although there were a number of predictors analyzed for CESD-10 scores, we only found higher ease of use to be significant after applying the stringent Bonferroni criteria. Previous research on providing health care information to patients emphasized the importance of ensuring that the readability level is appropriate for the targeted patient group.³³ However, the ease of use items perhaps more closely approximates a global appraisal of satisfaction (“module was easy to use”) with the user experience rather than only with one element. No treatment outcome moderators were found, suggesting that possible subgroups of adolescents who are more likely to benefit from one of the two approaches in engaging youth in the Internet program cannot be identified. Although no treatment outcome moderators were found, future studies should evaluate whether the proposed moderators change during the intervention. Such find was not possible to assess in our study due to limited data values on the moderators only for baseline.

The results presented here should be interpreted with respect to the following limitations. Without a treatment as usual control group, it is possible that findings were due to depressive symptoms resolving over time,³⁴ regression to the mean, or a tendency for those with fewer symptoms to respond to the follow-up call at 6 months.³⁵ However, there were no differences in baseline and 6-week outcomes between responders and non-responders which may reduce the bias. Another limitation of this study was its lack of power due to its small sample size, making our analyses exploratory with regard to the prediction of intervention effect. Moreover, it is unclear whether the MI participants had higher levels of engagement with the intervention because of the physician-conducted MI interview, because of the pen and paper questionnaire with MI questions completed as preparation for the interview or because the participants received three phone calls, regardless of whether the content was consistent with MI techniques. However, many adolescents did not receive the phone calls, making this possibility less likely. We acknowledge that the findings of non-significance for many possibly relevant variables in the regression models have to be interpreted with caution because of our design limitations, such as the relatively small sample size.

We are not aware of another study of a public health approach (screening, primary care engagement and low cost Internet intervention) to prevent adolescent depression, particularly one implemented in community practice settings. This study provides support for the potential impact of a primary care/Internet-based intervention for the sustained reduction of depressive symptoms among adolescents. The next step would be to conduct a randomized controlled trial to test the efficacy of our interventions in comparison to a control condition. Considering the difficulty in disseminating and implementing public health approaches for preventing mental disorders like depression,³⁶ this study indicates that

using modern technology in what we call “behavioral vaccines”, could be a useful strategy to tackle this public health dilemma. Short-term psychological interventions provided via the Internet through a primary care setting may be more cost-effective and more accessible to adolescents than a relatively longer treatment using traditional mental health practitioners. Our results clearly call for more studies on this form of treatment, involving a true control condition, larger samples, and perhaps consideration of a factorial design that could elucidate the contribution of components of the current intervention such as the parent workbook. Two phase-3 randomized controlled trials of CATCH-IT or adaptations of CATCH-IT have been funded by United States National Institute of Mental Health and the Robert Wood Johnson Foundation and are scheduled to begin in October 2011. Also, future comparative treatment studies should clarify and identify additional predictors of treatment impact.

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Figure 1: CATCH-IT Intervention

This diagram represents the CATCH-IT intervention including the primary care and Internet components. Prior to visiting the Internet site, the adolescents are first engaged by the primary care physician by the means of either a motivational interview or a brief advice interview. Each adolescent regardless of the group (motivational interview or brief advice interview) receives the same Internet-based treatment. The treatment consists of modules that are tailored to focus on certain behavioral areas such as individual coping skills, school and peer relationships, community and social factors and family factors. For simplicity we did not include the post interview in the diagram, but participants received the same type of interview post-Internet as they did at pre-Internet.

Figure 2: Consort Diagram

This diagram describes the flow of participants through the study from initial eligibility assessment, followed by randomization of the eligible participants into either motivational interview group or brief advice group, excluding the ones that did not meet the criteria. The remaining diagram shows the flow of analysis for each of the two groups separately as they were receiving treatment (same for each group).

Table 1

Table of variables (outcomes)

Outcome Variables	
<i>Measure</i>	<i>Description</i>
Center for Epidemiologic Studies Depression (CES-D, 10 item scale)	We reported outcomes as derived from the Center for Epidemiologic Studies' Depression Scale ⁴⁴ 10-item measure (CESD-10). We reported the total CESD-10 score, yielding scores between 0 and 30, and the proportion of adolescents reporting depressive symptoms by virtue of having a CESD-10 score > 9. ⁴⁵ The recorded Cronbach's alpha at baseline was 0.83
Patient Health Questionnaire Adolescent	We used the Patient Health Questionnaire – Adolescent (PHQ-A) ¹⁸ to assess current prevalence of any depressive disorder (likely major depression, minor depression or dysthymia), and core symptoms of depression in the last two weeks (every day, a few days, or none) for which fewer symptoms are assessed than are required for any specific DSM-IV diagnosis. We also report a score derived from a total of twelve items related to depressive disorder, which could range from 0-31. The recorded Cronbach's alpha at baseline=0.75
Self-Harm Ideation	We reported adolescent responses with regard to self-harm risk with two questions from the PHQ-A ¹⁸ (“have you often had thoughts that you would be better off dead, or of hurting yourself in some way in the last two weeks?” and, “has there been a time in the past month when you have had serious thoughts about ending your life?”). A response of “yes” to either of these items was considered endorsing “any self-harm thoughts.”
Hopelessness	With regard to hopelessness, we reported the percentage who responded “yes” to the PHQ-A item ¹⁸ “In the last two weeks, have you often felt hopeless about the future?” We report this separately because of the importance of hopelessness as a risk factor for future episodes.
Clinically significant depressive episodes	We also report cumulative incidence of “clinically significant depressive episodes”, which includes all individuals who met criteria for major depressive disorder according to the DSM-IV-TR at the assessment points or who were diagnosed and treated for depression by a non-study clinician. The method of ascertaining follow-up status was telephone interviews by master's level social worker or psychologist using the PHQ-A instrument and CES-D 10. If the calling social worker had any concerns regarding the presence of major depression based on the structured assessment, or with worsening depressed mood, self-harm thoughts or worsening of symptoms of other mental disorders, she recommended follow-up with the primary care physician and further evaluation. The follow-up checks were conducted within 24 hours and then at 2-3 weeks post initial assessment to determine if their primary physician or mental health specialists diagnosed/treated them for a depressive episode. This follow-up was only done for individuals whom the social workers recommended follow-up on. As has been reported previously, the social worker callers worked off site and were unaware of study arm assignment. ¹¹
Independent Variables (Regression Model)	
<i>Measure</i>	<i>Description</i>
Socio-demographic characteristics	Demographics of participants were collected with a self-constructed instrument comprised of 23 questions concerning socio-demographic characteristics. Gender, ethnicity (dichotomized as white versus non-white, with African Americans comprising the majority of the non-white group (n=19), and age were measured.
Automatic Negative Thoughts-Revised (ATQ-R)	The Automatic Thoughts Questionnaire Revised (ATQ-R) ⁴⁷ is a 30-item scale that measures the frequency of cognitive self statements associated with depressed mood. A total score, ranging from 0 to 120, was calculated with higher scores reflecting a greater number of negative automatic thoughts. Cronbach's alpha =0.96
Perceived Support from Friends (PSS-fr)	The Perceived Social Support from Family (PSS-fa, 20-item scale) ⁴⁸ measures the extent to which an individual perceives that his/her needs for support; information and feedback are fulfilled by family. Scores ranged from 0 to 20, with higher scores reflecting more perceived social support from family. Cronbach's alpha = 0.85
Perceived Support from Family (PSS-fa)	The Perceived Social Support from Family (PSS-fa, 20-item scale) ⁴⁸ measures the extent to which an individual perceives that his/her needs for support; information and feedback are fulfilled by family. Scores ranged from 0 to 20, with higher scores reflecting more perceived social support from family. Cronbach's alpha =0.76
Self-efficacy	Perceived control was assessed with the Mastery Scale. ⁴⁹ The seven items on the scale measure the extent to which participants see themselves as being in control of the forces that significantly affect their lives. Responses are rated on a 4-point Likert scale, with higher scores indicating greater self-efficacy. Cronbach's alpha= 0.72
Motivation Scale	Motivation to change risk-factor behaviors was measured pre and post intervention by using Miller & Rollnick's ⁵⁰ three-item motivation assessment tool. Scores from the three items assessing

Outcome Variables	
<i>Measure</i>	<i>Description</i>
	importance, readiness and self-efficacy, are summed to form a total score ranging from 3 to 30 with higher scores indicating a higher level of importance, readiness and self-efficacy of participating in the intervention. For the purposes of our study, we used the scores prior to intervention as a measure of motivation to participate. Cronbach's alpha= 0.79
Attitudes Scale	The beliefs and attitudes toward depression preventive intervention behaviors and subjective social norm items were measured by adapting the items from a previous questionnaire that was adjusted based on the preventive health model. ⁵¹⁻⁵² We had previously administered this questionnaire in a pilot study and found it reliable, acceptable, and easily understood. ⁴ The scale is reported as 1-5 scale (mean response for each item) with higher score indicative of a favorable view toward the intervention. Cronbach's alpha 0.75
<u>Intervention experiences</u>	
<i>Measure</i>	<i>Description</i>
Positive Relationships	To assess physician relationships, 8 questions were asked – on a 5-point Likert scale (1=strongly disagree, to 5=strongly agree) regarding physician relationship (understanding, participation, helpfulness, comfort, trust). Higher scores reflect more positive relationships with physician. Cronbach's alpha 0.8.
Adherence/Dose	Characteristics of the Internet intervention were collected. The Internet website tracked time on the website per page every six seconds. To avoid measuring time spent on other opened pages, the time counter stopped after more than five minutes of inactivity on the page. For every participant, total time on-site and exercise completion (reported as total number of characters typed in) was reported.
Program Components Training Ratings	Training ratings of ease of use and helpfulness of the program were measured. Ease of use was assessed with one question, i.e., "this module was easy to use", and helpfulness was assessed with the question "I found this module helpful". Items were scored using a 5-point Likert scale with 1 = strongly disagree to 5 = strongly agree. Cronbach's alpha = 0.94.
Socio-cultural relevance	Perceived benefits of the intervention in cognitive behavioral and interpersonal principles were measured with an adaptation of the helpfulness scale in a previous study. ⁵³ The scale encompasses eight questions on a 10-point Likert scale (1=very unhelpful, to 10=very helpful) with higher score indicating a stronger perceived benefit for learning behavioral therapeutic techniques.

Table 2

Pre-treatment, post-treatment and 6 months outcomes for MI (N = 43) and BA (N = 40) participants

		BA condition						MI condition					
		Baseline		6 weeks		6 months		Baseline		6 weeks		6 months	
<i>CESD-10</i>													
Total score	M(SD)	12.59	(6.29)	7.59	(7.20)	6.21	(4.04)	11.90	(6.13)	8.96	(7.34)	6.83	(5.91)
Depressed (CESD-10>9)	% (N)	65.00	(26/40)	30.00	(12/40)	17.50	(7/40)	67.44	(29/43)	32.56	(14/43)	27.91	(12/43)
<i>PHQ-A DSM-IV outcomes</i>													
Total score	M(SD)	7.13	(4.34)	5.00	(4.34)	4.38	(4.36)	7.56	(3.23)	4.67	(3.92)	3.56	(3.83)
Any depressive disorder	% (N)	10.00	(4/40)	7.50	(3/40)	5.00	(2/40)	11.63	(5/43)	4.65	(2/43)	6.98	(3/43)
Core Symptoms present	% (N)	95.00	(38/40)	40.00	(16/40)	50.00	(20/40)	97.67	(42/43)	62.79	(27/43)	48.84	(21/43)
<i>PHQ-A self-harm and hopelessness</i>													
Any self-harm thoughts	% (N)	17.50	(7/40)	7.50	(3/40)	2.50	(1/40)	11.63	(5/43)	2.33	(1/43)	2.33	(1/43)
Hopelessness	% (N)	27.50	(11/40)	15.00	(6/40)	22.50	(9/40)	25.58	(11/43)	18.60	(8/43)	6.98	(3/43)

* CESD, Center for Epidemiologic Studies Depression Scale; PHQ-A, Patient Health Questionnaire-Adolescent assessment; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition.

Table 3

Univariate predictors of depressive symptoms over 6 months for all participants

	<i>B (S.E.)</i>	<i>P</i>
<u>Participant characteristics</u>		
<i>Socio-demographic characteristics</i>		
Female gender	0.83 (0.90)	0.359
Ethnicity white	−0.23 (1.04)	0.828
Age	0.37 (0.22)	0.099
<i>Vulnerability and protection</i>		
Perceived social support from family	0.36 (1.55)	0.815
Perceived social support from friends	1.51 (1.79)	0.403
Self-efficacy	−1.47 (0.98)	0.139
Automatic negative thoughts	0.05 (0.02)	0.024
<i>Motivation and attitudes</i>		
Attitudes toward intervention	0.22 (1.08)	0.838
Motivation	0.18 (0.30)	0.553
<u>Internet experience</u>		
<i>Physician relationships</i>		
Physician relationships	−1.30 (0.69)	0.064
<i>Adherence/dose</i>		
Total time on site	0.21 (0.24)	0.383
<i>Training ratings</i>		
Ease of use of the program	−2.23 (0.74)	0.004
Helpfulness	−1.14 (0.69)	0.113
<i>Perceived benefits</i>		
CBT + IPT helpfulness	−0.04 (0.03)	0.130