EFFICACY OF AN INTERNET-BASED INTERVENTION TARGETED TO ADOLESCENTS WITH SUBTHRESHOLD DEPRESSION

by

MARTA MARIA MAKARUSHKA

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Student: Marta Maria Makarushka

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This dissertation has been accepted and approved in partial fulfillment of the requirements for the Doctor of Philosophy degree in the Department of Special Education and Clinical Sciences by:

Christopher Murray	Chairperson
Deanne Unruh	Member
Jeffrey Sprague	Member
John R. Seeley	Member
Sara Hodges	Outside Member

and

Kimberly Espy	Vice President for Research and Graduate Studies/Dean of the Graduate School

Original approval signatures are on file with the University of Oregon Graduate School.

Degree awarded September 2011

DISSERTATION ABSTRACT

Marta Maria Makarushka

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Approved: _____
Christopher Murray

Depression during adolescence is highly prevalent with as many as 20% experiencing a major depressive episode by the age of 18. Adolescent depression causes significant impairment across life areas including school functioning, such as poor academic performance and decreased academic achievement. Despite the existence of many evidence-based treatment options, merely 25% of depressed adolescents receive treatment. For this reason, it is essential that easily accessible preventive interventions for adolescent depression be developed and made available. Computerized interventions could broaden the reach of prevention efforts and preliminary results indicate that they have the potential to successfully prevent adolescent depression.

The Coping with Depression course is an empirically validated cognitive-behavioral depression treatment and prevention program that is well-suited for computerized delivery. This dissertation reports on the development and evaluation of a web-based interactive multimedia version of the adolescent Coping with Depression course with students experiencing subclinical levels of depression. The Blues Blaster program includes the following six modules, with five mini-sessions in each: (a) defining

depression, (b) mood monitoring, (c) increasing fun activities, (d) increasing positive thinking, (e) recognizing negative thinking, and (f) decreasing negative thinking. Key concepts are presented and reinforced in a variety of engaging ways within each session, including video, animation, comic strips, graphics, interactive exercises, and games.

The Blues Blaster program was evaluated in a randomized controlled trial with 161 adolescents who were randomly assigned to either the Blues Blaster or information-only control conditions. Participants were assessed at baseline, post-treatment (six weeks after baseline), and six-month follow-up. Results demonstrated greater improvement for the Blues Blaster condition in depression levels, negative thoughts, behavioral activation, knowledge, self-efficacy, and school functioning compared to the information-only control condition. These findings suggest that this targeted prevention program is appropriate for use with middle school students to decrease depression levels and therefore the risk that they will develop major depression in the future.

CURRICULUM VITAE

NAME OF AUTHOR: Marta Maria Makarushka

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

University of Oregon, Eugene, OR
John Jay College of Criminal Justice, New York, NY
State University of New York, Purchase, NY
University of Grenoble, France

DEGREES AWARDED:

Doctor of Philosophy, Special Education, 2011, University of Oregon
Master of Science, Psychology, 2000, University of Oregon
Bachelor of Arts, Psychology, 1991, State University of New York at Purchase

AREAS OF SPECIAL INTEREST:

Adolescent Depression
Interactive Multimedia Interventions for Depression

PROFESSIONAL EXPERIENCE:

Senior Alcoholism Counselor, Phelps Memorial Hospital, Ossining, NY, 1994-97

Country Representative and Training Director, First Light Partners, Eugene OR and Kiev, Ukraine, 1997-98

Project Manager, Scudder and Associates Research, Eugene, OR, 1998-99

Diagnostic Interviewer, Oregon Research Institute, Eugene, OR, 1998-01

Data Analyst, Oregon Social Learning Center, Eugene, OR, 2001

Research Assistant II, Oregon Research Institute, Eugene, OR, 2001-02

Data Analyst, Oregon Research Institute, Eugene, OR, 2001-03

Project Manager, Oregon Research Institute, Eugene, OR, 2002-present

Project Coordinator, Oregon Center for Applied Science, Eugene, OR, 2003-05

Research Associate, Oregon Center for Applied Science, Eugene, OR, 2005-06

Project Director, Oregon Center for Applied Science, Eugene, OR, 2006-07

Research Scientist, Oregon Center for Applied Science, Eugene, OR, 2007-09

GRANTS, AWARDS, AND HONORS:

Who's Who Among America's Universities and Colleges, 1990

Graduate Teaching Fellowship, Psychology, 1999

Preventing Youth Depression: A Multimedia Parent Program, National Institute of Mental Health, 2005-07

Depression Amelioration for Family Dementia Caregivers, National Institute of Aging, 2005-07

Workplace Internet Program to Prevent Major Depression, National Institute of Mental Health, 2006-08

A Cognitive-Behavioral Multimedia Internet Program to Prevent Youth Depression, National Institute of Mental Health, 2006-09

A Multimedia Program to Improve Antidepressant Adherence and Prevent Relapse, National Institute of Mental Health, 2007-09

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For my parents

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CHAPTER I

INTRODUCTION

Statement of the Problem

Adolescent depression is a significant problem, affecting as many as one in five youth (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993), often with poor academic and psychosocial outcomes and an increased risk for other mental disorders (Birmaher et al., 1996). There are various effective depression treatment approaches, with cognitive-behavioral therapy (CBT) among them (David-Ferdon & Kaslow, 2008). Unfortunately, although many depression treatment options are now available, only about 25% of depressed adolescents receive treatment (Hirschfeld et al., 1997; Keller, Lavori, Beardslee, Wunder, & Ryan, 1991). Given the costs of depression to both the depressed individual and society and the fact that the majority of depressed individuals never receive treatment, it is no surprise that the Institute of Medicine has called for the development, evaluation, and implementation of prevention interventions focused on mental disorders, with depression considered one of the most likely to be prevented (Mrazek & Haggerty, 1994).

There is a dearth of empirical evidence to support the dissemination of universal depression prevention programs, with targeted preventive interventions holding more promise (Spence & Shortt, 2007). Computerized interventions have the potential to expand the reach of evidence-based approaches and have demonstrated success in decreasing depression in adolescents (Richardson, Stallard, & Velleman, 2010). The Coping with Depression (CWD) course, a CBT-based intervention, has demonstrated

efficacy for treating and preventing depression and is well-suited for computerized delivery.

This dissertation (1) summarizes adolescent depression research; (2) reviews current depression treatment and prevention approaches; (3) describes the Coping with Depression course; (4) reviews studies that evaluated the Coping with Depression course; (5) examines advantages and disadvantages of computerized interventions; (6) reviews current studies that evaluated interactive multimedia depression intervention programs; and (7) presents the results of a randomized trial examining the efficacy of a computerized interactive multimedia depression prevention program with middle school students who are experiencing subthreshold depression.

Adolescent Depression

Based on the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM–IV*; American Psychiatric Association, 1994), in order to meet criteria for a major depressive episode an individual must experience five or more of the following symptoms during the same two-week period: (a) depressed mood (can be irritable mood in children and adolescents); (b) loss of interest or pleasure in almost all activities; (c) significant unintended weight changes; (d) too much or too little sleep; (e) psychomotor agitation or retardation; (f) fatigue or loss of energy; (g) feelings of worthlessness or excessive guilt; (h) difficulty thinking, concentrating, or making decisions; and (i) recurrent thoughts of death or suicidal ideation, or planning for or attempting suicide. At least one of the five symptoms must be either depressed (or irritable) mood or loss of interest of pleasure. Moreover, the depressive symptoms must cause some form of

clinically significant distress or impairment for the individual such as impaired functioning at school or impaired social functioning.

Depression is a significant problem among adolescents both in terms of prevalence and impact. As many as 20% of adolescents experience a depressive episode by the time they are 18 years old (Lewinsohn et al., 1993; Newman et al., 1996) and by the age of 16, 9.5% of US children had experienced a depressive disorder (Costello, Mustillo, Erkanli, Keller, & Angold, 2003). Many individuals experience their first serious depressive symptoms or episode of depression during adolescence (Costello et al., 2002; Essau & Petermann, 1999) and early onset depression has been increasingly associated with an often chronic and recurrent course (Costello et al., 2002).

Depression in adolescence has a negative impact across life areas and is associated with impairment in school, work, and interpersonal relationships (Brent & Weersing, 2008). Negative outcomes of adolescent depression also include suicide attempts, substance abuse, and antisocial behavior (Brent & Weersing, 2008; Gotlib, Lewinsohn, & Seeley, 1998; Lewinsohn, Rohde, Klein, & Seeley, 1999; Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2003; Newman et al., 1996; Reinherz, Giaconia, Hauf, Wasserman, & Silverman, 1999). These difficulties have also been reported to occur for adolescents with subclinical levels of depression (Fergusson, Horwood, Ridder, & Beautrais, 2005, Gillham, 2003; Gotlib, Lewinsohn, & Seeley, 1995).

Subthreshold depression. Similar to those who suffer from major depression, adolescents with subthreshold depression also experience substantial distress as a result of their depression symptoms, yet they do not meet diagnostic criteria for major depressive disorder (e.g., at least five depression symptoms). This type of depression has

been referred to by various names including minor, subclinical, subsyndromal, and subthreshold depression. It will be referred to here only as subthreshold depression for both clarity and consistency purposes. There is recent increased interest in and recognition of the importance of subthreshold depression, which is also prevalent and problematic for adolescents. Twelve-month prevalence of subthreshold depression is reported to range from 3-7% (e.g., Fergusson et al., 2005; Gonzáles-Tejera et al., 2005) and late adolescents (mean age of 16) report a lifetime prevalence as high as 26% (Lewinsohn, Shankman, Gau, & Klein, 2004). Subthreshold depression in youth is associated with considerable impairment (e.g., Gonzáles-Tejera et al., 2005; Gotlib et al., 1995; Lewinsohn, Solomon, Seeley, & Zeiss, 2000), as well as an increased likelihood (2 to 4 times) of developing a full syndrome depressive disorder (e.g., Fergusson et al., 2005; Gotlib et al., 1995; Keenan et al., 2008; Oldehinkel, Wittchen, & Schuster, 1999; Pine, Cohen, Cohen, & Brook, 1999).

As a result of their examination of various levels of depression (including those with no symptoms, one key symptom, subthreshold depression, major depression with five or six symptoms, and major depression with seven to nine symptoms), Cuijpers, de Graaf, and van Dorsselaer (2004) concluded that subthreshold depression is a significant health concern. They found subthreshold depression to be associated with a decrease in functioning including physical, mental, and social functioning. Those suffering from subthreshold depression also reported increased service utilization including primary care, mental health and overall healthcare services, and were significantly more likely to develop major depression within two years.

In their comparison of subthreshold and major depression in adolescents, Gonzáles-Tejera et al. (2005) found that 11 to 17 year-old adolescents with subthreshold depression had significant functional impairment across life areas (i.e., at home, with friends, at school, and in the community) and surprisingly had higher rates of mental health service utilization than those with major depression. Furthermore, adolescents with subthreshold depression and those meeting full criteria for major depression had comparable results with respect to psychosocial correlates (e.g., victimization, family-specific loss, parental discord) and comorbidity (e.g., anxiety, substance use) (Gonzáles-Tejera et al., 2005), further highlighting the similarity between these two groups and the fact that subthreshold depression is worthy of considerable attention.

Similar results were reported by Fergusson et al. (2005) who compared asymptomatic adolescents to (a) youth experiencing subthreshold depression and (b) those meeting criteria for major depression. Both the subthreshold and full criteria depression groups had a significantly higher risk of developing depression later in life as well as reporting suicidal thoughts and behaviors. Fergusson et al. conclude that both adolescents with subthreshold and major depression face similar mental health risks.

More recently, Seeley, Stice, and Rohde (2009) reported on risk factors that predict the occurrence of major depression during adolescence. In their study of adolescent girls, the group with the highest risk of developing depression experienced a combination of subthreshold depression and poor school functioning, with 40% reporting an episode of major depression within the subsequent four years. These findings suggest, as Horowitz and Garber (2006) concluded following their recent meta-analytic review, prioritizing research involving targeted depression prevention programs, targeting youth

with subthreshold depression (among other risk-factors) in order to decrease the risk of future incidence of major depression in at-risk adolescents.

Adolescence: A vulnerable time. The World Health Organization (WHO) defines adolescence as the period between the ages of 10 and 19 (WHO, 2011). Adolescence is most often described as starting with the onset of puberty, which, on average, for girls is between 10 and 11 and for boys is between 12 and 13. Clinical depression rates double between early and mid-adolescence (Lewinsohn, Rohde, & Seeley, 1998); that is, the annual incidence rate of depression rises from 1-2% at age 13 to 3-7% at age 15. Early adolescents who have elevated depression symptomatology are at risk of entering a depressive episode in the future. In addition, the transition from elementary school to middle school is an important developmental event that may have significant long-term effects on adjustment among adolescents (Chung, Elias, & Schneider 1998). Considerable research describes and reports the transition to middle school as stressful for many students (Alspaugh, 1998; Anderman, 1996; Chung et al., 1998; Crockett, Peterson, Graber, Schulenberg, & Ebata, 1989; Elias, Gara, & Ubriaco, 1985; Harter, 1981; Jackson & Davis, 2000; Simmons & Blyth, 1987). This transition has been linked with increases in psychological distress (Crockett et al., 1989; Hirsch & Rapkin, 1987) and declines in student functioning, academic achievement, motivation, and attitudes toward school (Alspaugh, 1998; Anderman, 1996; Barber & Olsen, 2004; Blyth, Simmons, & Carlton-Ford, 1983; Harter, 1981; Simmons & Blyth, 1987). For example, Chung and colleagues (1998) reported that following the transition to middle school boys showed a decrease in academic achievement and both boys and girls demonstrated a significant increase in psychological distress.

The stress adolescents experience during the middle school years is thought to be in large part the result of the substantial developmental changes they undergo during this stage of their lives (Chung et al., 1998; Crockett et al., 1989). The most prominent changes, of course, are those resulting from the onset of puberty. Pubertal changes include physical, emotional, and social changes that are reported to contribute to increases in emotionality, conflict and defiance of adults (Berk, 1993). It is expected that pubertal changes will occur at various rates and different ages for youth in the same grade. Other changes adolescents experience during their transition to middle school include becoming more self-conscious and socially aware as well as experiencing changes in their relationships with their parents (Gutman & Midgley, 2000). In addition, Elias and colleagues (1992) reported that peer relationships are the most significant stressor for middle school girls whereas boys experience peer relationships, conflicts with authority, and academic pressures as equal stressors.

Impact on school functioning. There is a well-documented relationship between reported depressive symptomatology and poor academic performance and school functioning (e.g. Fernandez-Castillo & Gutierrez-Rojas, 2009; Frojd et al., 2008; Herrera & Maldonado, 2002; Kaltiala-Heino, Rimpela, & Rantanen, 1998; Kovacs & Goldston, 1991; Marcotte, Lévesque, & Fortin, 2006; Puig-Antich et al., 1993; Slotkin, Forehand, Fauber, McCombs, & Long, 1988). For example, Kaltiala-Heino et al. (1998) analyzed self-reported data from 17,643 adolescents and found a significant correlation between depression and poor school performance. Upon further exploration, this association was not explained by parental education, familial unemployment, or family structure, factors previously found to explain depressive symptoms. Additionally, Frojd and colleagues

(2008) found that, in a sample of 7th-9th grade students, self-reported depression was associated with poor academic achievement, challenges in maintaining effective study habits (e.g., doing homework and preparing for tests), social relationship difficulties (with peers and teachers), trouble with reading and writing, and concentration problems (including paying attention to instruction). Furthermore, results of Shahar and colleagues' (2006) investigation into the impact of depression on academic achievement in middle school demonstrated that increases in depressive symptomatology were directly related to declines in Grade Point Averages. As well, Yousefi, Redzuan, Mansor, Talib, and Juhari (2009) reported that memory difficulties mediated the relationship between depression and academic achievement.

Cognitive abilities may be impaired by such typical depression symptoms as loss of interest, poor initiative, difficulty concentrating, low self-esteem and feelings of worthlessness, and social withdrawal, which may also play a role in decreasing academic ambition and contribute to academic failure (Hammen, 1998; Kirkcaldy & Siefen, 1998; Kovacs & Goldston, 1991). After reviewing research on cognitive processes of depressed individuals, Hartlage, Alloy, Vazquez, & Dykman (1993) conclude that depression often impedes cognitive functioning, specifically effortful processing (i.e., information processing used for learning). They argue that this likely occurs through various mechanisms including (a) a tendency to focus on depression-related thoughts rather than the task at hand; (b) decreased cognitive resources; or (c) narrowing of attention (attention is devoted to a decreased number of cognitive tasks).

Adolescent Depression Treatment and Prevention

Treatment approach. One of the most widely researched approaches for the treatment and prevention of mental health issues is Cognitive Behavioral Therapy (CBT) (Butler, Chapman, Forman, & Beck, 2006). CBT has been applied to addressing a variety of concerns with adolescents including depression, anxiety, posttraumatic stress disorder, panic disorder, and obsessive-compulsive disorder, among others. The theoretical foundation of current CBT for depression is based on a cognitive vulnerability model proposed by Beck, Rush, Shaw, and Emery (1979), all the while acknowledging the biological, behavioral, and environmental aspects of the disorder. This model proposes that vulnerable individuals experience overly negative thinking (e.g., things will never improve) that contributes to the engagement in maladaptive behaviors (e.g. withdrawing from others). In addition to the cognitive model, one of the leading behavioral models contributing to the CBT approach is social learning theory (Lewinsohn et al., 1998), which posits that depression is the result of a disruption in adaptive behavior brought about by stressful life events. The resulting behavior can lead to additional negative experiences which may contribute to an increase in behavioral and cognitive changes that characterize clinical depression. The less skilled individuals are in self-regulating their behavior (e.g., increasing pleasant activities to improve their mood), the greater the disruption is likely to be. CBT-based interventions therefore provide techniques targeting both cognitive distortions and maladaptive coping behaviors (Ledley, Marx, & Heimberg, 2010).

Cognitive behavior therapy can be an effective approach for child and adolescent emotional problems (Compton et al, 2004; Merry, McDowell, Wild, Bir, & Cunliffe,

2004). More specifically, a number of meta-analyses have reported that CBT is an effective intervention modality in the treatment of child and adolescent depression (Klein, Jacobs, & Reinecke, 2007; Reinecke, Ryan, & DuBois, 1998; Weisz, Baker, McCarty, & Valeri, 2006). In fact, research has found that interventions based on cognitive-behavioral therapy are superior to wait-list control conditions in the reduction of depressive symptoms and at least as, if not generally more, effective than other intervention modalities (Kahn, Kehle, Jenson, & Clark, 1990; Reynolds & Coats, 1986; Rosselló, Bernal, & Rivera-Medina, 2008). For example, in comparing cognitive behavior therapy, systemic behavior family therapy, and individual nondirective supportive therapy for depressed adolescent Brent et al. (1997) found higher rates of remission in the CBT group than in the other treatment groups, although these differences disappeared by the 2-year follow-up, at which point most (80%) of the participants had recovered (Birmaher et al., 2000).

Given the mounting evidence for the efficacy of CBT in treating depression, CBT has become a recommended treatment both in the United Kingdom (the National Institute of Clinical Excellence has recommended CBT for the treatment of children and adolescents suffering from depression, NICE 2005) and the United States (practice parameters of the American Academy of Child and Adolescent Psychiatry include CBT as a recommended treatment for moderate depression, Birmaher & Brent, 2007). Despite the recent Treatment for Adolescents with Depression Study (TADS) finding that CBT did not result in higher remission rates than placebo for moderate to severe depression (16% versus 17%, respectively; Kennard et al., 2006), CBT remains a recommended

intervention modality for the treatment of minor to moderate depression as well as depression prevention (Weersing & Brent, 2006).

Due to the substantial cost adolescent depression imparts on individuals, their families, and society, there has been an increased interest and effort in its prevention over the last 10 years (Horowitz & Garber, 2006). Additional contributing factors to this focus on prevention likely include a mandate put forth by the Institute of Medicine regarding mental disorder prevention (Mrazek & Haggerty, 1994), as well as the expected shift from research on treatment of depression to prevention of depression (Gladstone & Beardslee, 2000).

Preventive interventions. The three-tier intervention model originated within the field of public health (Commission on Chronic Illness, 1957) but has since expanded far beyond into other areas, including education. It is widely used in schools to address a variety of issues on all levels (e.g., Response to Intervention). In fact, Shinn and Walker (2010) recently edited a volume containing descriptions of numerous interventions within the three-tier model to address behavioral, emotional, and academic achievement problems. As originally proposed, the three tiers refer to three types of prevention: primary, secondary, and tertiary. Later, the Institute of Medicine (IOM; Mrazek & Haggerty, 1994) offered another continuum of interventions, namely prevention, treatment, and maintenance for addressing mental health issues. Within prevention, though originally conceived by Gordon (1983) in the area of disease prevention, the IOM categorizes preventive interventions into three groups, based on the population the intervention serves: universal, selective, and indicated. Universal prevention programs serve all members of a population of interest (e.g., adolescents). Selective prevention

programs are intended for a subgroup of the population of interest who are at increased risk for developing a disorder due to some known factor(s) (e.g., offspring of depressed parents). Indicated prevention programs are intended for individuals who are identified as having symptoms of a disorder, but do not meet criteria for diagnosis (e.g., subthreshold depression). Both selective and indicated approaches can be considered targeted as they target their program to a specific population.

Many efficacy trials have been conducted to evaluate both selective and indicated depression prevention interventions designed for at-risk adolescents. Selective prevention research has included youth with a range of risk factors, such as parental depression (Clarke et al., 2001; Garber et al., 2009), poverty (Cardemil, Reivich, & Seligman, 2002), and parental conflict (Jaycox, Reivich, Gillham, & Seligman, 1994). Recent indicated prevention research has included adolescents who have detectable depression symptoms but do not meet diagnostic criteria for depression (e.g., Clarke et al., 1995; Stice, Burton, Bearman, & Rohde, 2006; Stice, Rohde, Seeley, & Gau, 2008).

Although much research has been conducted to evaluate the efficacy of universal prevention programs (Merry et al., 2004; Shochet et al., 2001; Spence, Sheffield, & Donovan, 2003; 2005), it appears that such programs have been less successful. For example, Horowitz and Garber (2006) reviewed 30 depression prevention studies and found mean effect sizes at post-intervention to be .30 for selective, .23 for indicated, and .12 for universal interventions. A similar pattern was found at follow-up with mean effect sizes of .34 for selective, .31 for indicated, and .02 for universal interventions. This may be due to the design of the universal interventions (e.g., duration), the quality of the research methodology (e.g., sample size, measurement issues), or fidelity of

implementation among other issues. Although universal interventions are not without merit, based on these results, Spence and Shortt (2007) recommend focusing research efforts on targeted (i.e., selective and indicated) depression prevention interventions. Given that depression incidence sharply increases around the time of puberty (12-14), this is an important developmental period during which to focus preventive efforts.

The Coping With Depression (CWD) Course

Over the last several decades, numerous depression treatment and prevention programs based on various theoretical frameworks have been developed and evaluated as being efficacious. The Coping with Depression (CWD) course is among them and has become one of the most researched and broadly accessible psychological interventions for both treatment and prevention of depression (Cuijpers, Muñoz, Clarke, & Lewinsohn, 2009). Originally developed by Lewinsohn, Antonuccio, Steinmetz, and Teri (1984) for adults, the CWD is a psychoeducational cognitive-behavioral intervention for depression. The course is derived from both a cognitive approach, based on the theories of Beck (e.g., Beck et al., 1979) and Ellis (Ellis & Harper, 1961), as well as a behavioral approach (Lewinsohn, Biglan, & Zeiss, 1976) to understanding and treating depression. The cognitive components of the course are built upon the notion that negative and irrational thoughts are at the core of depression, as proposed by Beck and Ellis. The course therefore includes sessions which teach aspects of the interventions developed by both Beck and colleagues (1979) and Ellis and Harper (1961), specifically regarding the identification and challenging of negative thoughts and beliefs. The behavioral components of the course stem from the theory that a common precursor of depression is the lack of positive reinforcement, as put forth by Lewinsohn and colleagues (1976). The

course therefore also includes sessions regarding increasing the engagement in pleasant activities and decreasing the frequency with which punishing events are experienced. The adolescent version of the Coping with Depression course (Clarke, Lewinsohn, & Hops, 1990; Lewinsohn, Clarke, Rohde, Hops, & Seeley, 1996; Rohde, Lewinsohn, Clarke, Hops, & Seeley, 2005) is a downward adaptation of the adult course, including very similar, yet simplified content. The original cognitive techniques have been simplified to teach adolescents how to recognize their negative thoughts and beliefs and how to challenge them with positive counterthoughts. Adolescents are provided with practice exercises to help them apply the techniques in their own lives. The behavioral techniques include instruction to help adolescents increase their engagement in pleasant activities including positive social interactions.

Efficacy of the CWD. Over the last 30 years, the CWD course has been translated into several languages including Spanish, German, Dutch, and French and is being used in many countries such as the United States, Canada Mexico, Peru, Germany, Finland, and The Netherlands. It has been adapted to and evaluated with various populations, including adolescents, adults, the elderly, minority groups, and caregivers of the elderly. It has been used as a form of depression treatment, relapse prevention, and prevention. It has been delivered in various formats including group, individual, bibliotherapy, and through television. The CWD course has been the subject of two meta-analyses conducted by Cuijpers and colleagues who report it has small (Cuijpers et al., 2009) to large (Cuijpers, 1998) effect sizes. When directly compared to other intervention approaches, there was no indication that the CWD was any less effective (Cuijpers et al.,

2009). The next section provides a summary of the pertinent studies evaluating the efficacy of the CWD-A.

Treatment for depressed adolescents. Efficacy of the CWD-A was evaluated in a clinical trial with depressed adolescents (Lewinsohn, Clarke, Hops, & Andrews, 1990). Fifty-nine 14-18 year-old adolescents were randomly assigned to one of three groups: group-based CBT treatment, group-based CBT treatment with a separate parent group, or a waitlist control group. The adolescent treatment groups consisted of 14 two-hour sessions conducted over a 7-week period, following the format and content of the original CWD-A. The separate parent group consisted of 7 two-hour sessions during which the parents were taught the adolescent course content as well as additional coping skills for dealing with family-specific difficulties without arguing. Depression measures included (a) a semi-structured diagnostic interview using the Schedule for Affective Disorders and Schizophrenia for School-Aged Children (K-SADS; Orvaschel & Puig-Antich, 1986); (b) the Beck Depression Inventory (BDI; Beck et al., 1979), a 21-item self-report measure of depressive symptomatology; and (c) an abbreviated version of the Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977), 20-item self-report depression measure. Significantly fewer participants in the adolescent only and adolescent with parent treatment groups (57.1% and 52.4%, respectively) met criteria for depression (Chi square (2, $N = 59$) = 9.41; $p < .01$) compared to the control group (94.7%) at posttreatment. In addition, the BDI ($F(1, 38) = 4.27$, $p < .001$) and CES-D ($F(1, 38) = 4.85$, $p < .001$) scores were significantly lower for the treatment conditions compared to the control group. The treatment groups maintained decreased depression levels through the two-year follow-up assessment.

Clarke and colleagues conducted a trial with a larger sample (N = 96) and similar comparison groups in order to replicate the above findings and further examine the efficacy of the CWD-A with depressed adolescents (Clarke, Rohde, Lewinsohn, Hops, & Seeley, 1999). They randomly assigned 14-18 year-old adolescents diagnosed with major depression or dysthymia to one of the three groups described above. The adolescent treatment groups included an additional week of sessions and the separate parent group consisted of one additional two-hour session; two of the sessions included both the adolescents and their parents in order to provide families an opportunity to practice the newly acquired skills. Depression outcome measures included the K-SADS diagnostic interview as well as the BDI. A total of 96 participants completed the intervention they were assigned to. Significantly higher recovery rates (as defined by no longer meeting criteria for major depression or dysthymia for the two weeks prior to the posttreatment assessment) were found in the two treatment groups (average of 67%) compared to the control group (48%) (Cohen's h = 0.38, a small to medium effect size); the treatment groups did not differ from each other. They also found that adolescents in the treatments groups were more than twice as likely to recover as those in the control group (OR = 2.15; 90% Confidence Interval, CI = 1.01 – 4.59). Furthermore, compared to those in the control condition, adolescents in the two treatment groups reported significantly lower depressive symptomatology (change score effect size = 0.61).

Prevention for at-risk adolescents. Clarke et al. (2001) conducted a randomized trial of a CWD-based preventive intervention for 13-18 year-old adolescents at high risk of developing depression, based on both parental depression as well as their own current subthreshold depression symptoms and/or past mood disorder. Data were collected at

baseline, posttreatment, as well as 12 and 24 months after treatment completion. Depression assessments included the CES-D and a K-SADS diagnostic interview. The intervention program was an abbreviated version of the CDW-A, consisting of 15 one-hour sessions for groups of 6-10 adolescents. The comparison group consisted of adolescents who received usual care, meaning that they could initiate or continue any mental health services (also true for the experimental group). Results of random-effects regression analyses showed that the intervention group made greater improvements on the CES-D (p = .005; parameter estimate for the linear effect, -0.15; 95% confidence interval, -0.27 to -0.04). Regarding new episodes of major depressive disorders, survival analyses indicated that the intervention group had significantly fewer new episodes (9%) than the usual care group (29%) at the 12-month follow-up assessment (p = .003). The odds ratio at the 12-month assessment was 5.6 (95% *CI* = 1.6 – 20.4) when adjusted for gender, age, CES-D score, and history of depression, meaning that the control group's risk of developing depression was more than five times greater than that of the intervention group.

***Treatment for delinquent youth*.** In an attempt to extend the generalizability of the intervention's efficacy beyond the highly controlled efficacy studies that had been conducted up until that time, the effectiveness of the CWD-A course was evaluated in a real-world setting by Rohde, Clarke, Mace, Jorgensen, and Seeley (2004). Rohde and colleagues set out to expand the CWD-A research by evaluating it as a form of treatment for depressed adolescents also suffering from conduct disorder, who were referred by a county juvenile justice setting. Ninety-three adolescents (13-17 years-old) with comorbid current major depression and conduct disorder were randomized into either a CWD-A

treatment group or life skills/tutoring control group. Each of the intervention groups lasted two hours and was held twice a week for 8 weeks; each comprised of about 10 male and female adolescents. Assessments included a diagnostic interview and the Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996), a 21-item self-report measure of depressive symptomatology. Adolescents in the CWD-A group (39%) had significantly higher depression recovery rates (after 8 consecutive weeks of few if any symptoms, a major depressive episode was considered to have concluded) following treatment than those in the life skills group (19%); adolescents in the treatment group were, in fact, more than twice as likely to recover than those in the life skills group (*OR* = 2.66, 95% confidence interval 1.03 – 6.85). Moreover, the CWD-A condition was associated with significantly greater improvements on the BDI-II ($r^2 = 0.055$, $p = .033$).

***Brief preventive intervention for at-risk adolescents*.** Recognizing that CBT interventions for preventing depression hold promise but may be difficult to implement due to their length and intensity, Stice et al (2008) developed a brief six-session preventive intervention. In order to better establish the intervention's efficacy, this trial involved comparing the brief group intervention based on the CWD-A to (a) a supportive-expressive group intervention, (b) bibliotherapy, and (c) an assessment-only control group. Adolescents with subdiagnostic depressive symptoms (as measured by CES-D scores of 20 or above) were randomized to one of the four conditions. Participants completed an assessment, including a diagnostic interview and the BDI, at pretest, posttest and six-month follow-up. At posttest, participants in the CBT group reported significantly greater reductions in reported depression symptoms (information gathered during the diagnostic interview) than participants in the three comparison

groups. At six-month follow-up, the CBT group was significantly improved over the control group only, as the participants in the other two intervention groups continued to make improvements (there was no decrease in gains in the CBT group between posttest and the six-month follow-up). In addition, fewer CBT participants (7%) demonstrated an onset of major depression from pretest to six-month follow-up compared to those in the assessment-only control group (13%); participants in the control condition were more than twice as likely to develop depression as the CBT participants (*OR* = 2.5).

Computer-based adaptation of CWD. Clarke and colleagues (Clarke et al., 2002) developed a stand-alone, self-help, Internet program based on the CWD course, which they evaluated in a randomized controlled trial. Adult HMO members (some identified as currently depressed based on their electronic medical records, some nondepressed) were randomized to receive the CWD-based Internet program or usual care. Those in the usual care control group were sent to an HMO members-only website where participants could access information about a variety of health-related topics including depression, as well as request an appointment or ask a question of a nurse or pharmacist. Participants in the treatment condition were linked to the Internet intervention, which was organized into seven sections, each presenting a new skill along with interactive examples and opportunities for practicing the newly acquired techniques. The depression intervention did not include any audio or video in order to maximize its availability, allowing the inclusion of participants with slow Internet connections. The program was self-paced (participants could use the website at their convenience for the duration of the study), self-guided, and did not involve any staff interactions. All participants received email reminders to complete an online version of the CES-D

(Radloff, 1977) at 4-, 8-, 16-, and 32-weeks post-randomization. If assessments were not completed following the receipt of two reminders, staff made an attempt to reach participants by phone. Analyses did not reveal any differences between the treatment and control conditions on the self-report measure of depression. In an effort to understand the lack of intervention effect, post hoc exploratory analyses were conducted. These analyses uncovered that of the participants who reported lower depression scores at baseline (CES-D scores < 20), those in the treatment group were significantly less depressed at both the 16-week (Effect Size, $ES = 0.17$, $p < .05$) and 32-week ($ES = 0.48$, $p < .01$) follow-up assessments. As a result, the authors surmise that such low-intensity self-help depression interventions are likely best suited for those suffering from mild-to-moderate depression.

Summary of CWD research. The above-described studies provide compelling evidence for the effectiveness and efficacy of the CWD-A. It has been examined as a form of treatment for depressed adolescents, including those with co-morbid conduct disorder, a form of prevention for at-risk adolescents, and even a brief version of the course demonstrated efficacy as a depression prevention intervention for at-risk adolescents. Finally, evidence also exists for the effectiveness of a computer-based version of the course as a form of treatment for mild-to-moderately depressed adults.

Computer-Based Depression Interventions for Adolescents

Although many effective depression treatment options are now available, only about 25% of adolescents receive treatment (Hirschfeld et al., 1997). This highlights the need to increase the accessibility of depression treatment, not to mention prevention, programs. One approach for facilitating access to effective interventions is through the use of technology, or more specifically, by designing and implementing computerized

interventions. Interventions delivered via the Internet are one category of computerized interventions, which have been described by Ritterband et al. (2003) as often being (a) highly structured (as they are based upon effective face-to-face interventions); (b) at least partially self-guided; (c) interactive and include multimedia elements; (d) personalized to the user; and (e) tailored to provide feedback. Programs delivered via computer may be more engaging that other forms of self-help intervention delivery such as books or manuals (Klein, Richards, & Austin, 2006). In addition, although they remove the group component of an intervention experience, a meta-analysis examining the impact of therapeutic interventions in addressing depression in both children and youth found no effect size difference between 31 group-based and 13 individually-administered treatments (B = -0.13, SE = 0.19, p = .49; Weisz, McCarty, and Valeri, 2006), suggesting that the individual, self-directed aspect of computer interventions are not likely to decrease effectiveness. Given their penchant for technology, computerized interventions may be an effective way of actively engaging adolescents. In fact, compelling support exists for using this mode of treatment with the adolescent population to address a variety of issues including anxiety (March, Spence, & Donovan, 2009), obesity (Williamson et al., 2005), asthma (Krishna et al., 2003), and smoking (Patten et al., 2006).

Computerized CBT for adolescent depression. A recently published systematic review of computerized CBT programs for the prevention and treatment of depression (and anxiety) in children and adolescents (Richardson et al., 2010) examined six studies reporting on the use of four different computerized CBT interventions for symptoms of depression. Two of the studies were school-based universal interventions, one for 15-16 year-old adolescent males (N=59; O'Kearney, Gibson, Christensen, & Griffiths, 2006)

and the other for 16-17 year-old adolescent females (N= 157; O'Kearney, Kang, Christensen, & Griffiths, 2009). These two trials, conducted in Australia, evaluated a five-module teacher-supervised online program called 'MoodGYM,' which is based primarily on CBT principles. Three of the studies involved evaluating two unique interventions for adolescents with subthreshold depressive symptomatology. One of these interventions, 'Master your mood online,' is a CWD-based group intervention facilitated by a mental health professional in the Netherlands in the context of a closed online chat room (Gerrits, van der Zanden, Visscher, & Conijn, 2007). Study participants (N=140; mean age = 19.7) referred themselves via the study website. The other targeted intervention, 'CATCH-IT' (Competent Adulthood Transition with Cognitive-Behavioral and Interpersonal Training), was developed by Van Voorhees and colleagues (Van Voorhees, Ellis, Stuart, Fogel & Ford, 2005; Van Voorhees et al., 2009) in the U.S. for adolescents recruited through their primary care physician. The 'CATCH-IT' program incorporates principles from several manual-based approaches with demonstrated efficacy including (a) CBT (more specifically, the CWD course); (b) interpersonal therapy; and (c) behavioral activation. It was initially pilot-tested as an 11 module intervention with fourteen 18-24 year-old late-adolescents (Van Voorhees et al., 2005) and then later evaluated as a 14 module intervention in a larger trial (N=82) with 14-21 year-olds. The last of the six studies included in the systematic review assessed an interactive computer program for adolescents diagnosed with depression. Abeles et al. (2009) developed and evaluated an eight-session (30-45 minutes each) CBT-based stand-alone, self-guided computer program called 'Stressbusters.' Twenty-eight 12-16 year-

olds referred by mental health service providers in the U.K. participated in the evaluation of this intervention.

All four of the programs delivered the intervention entirely online or by computer. All of the programs were interactive and three included multimedia assets (the intervention delivered via online chat room did not include any multimedia components). Intervention elements incorporated across the programs included psychoeducation, videos, animations, exercises and quizzes, printouts, demonstrations, home work assignments, case vignettes, narration, cartoons, and graphics. The number of sessions ranged from 5 (‘MoodGYM’) to 14 (‘CATCH-IT’) with a mean of 9.2 sessions. Session length varied from at least 30 (‘Stressbusters’ and ‘MoodGYM’) to 90 (‘Master your mood online’) minutes.

Contact with a professional during intervention participation ranged from none to minimal. ‘Stressbusters’ was a self-guided intervention delivered without any professional contact. During the ‘CATCH-IT’ evaluation, though participants did not receive ongoing support, contact with a physician occurred prior to beginning the intervention and one of the conditions also received three motivational phone calls from a case manager. The chat room delivered intervention, ‘Master your mood online,’ was facilitated and supervised by a course instructor, who also provided motivation to complete assignments by sending text messages and emails to group participants. Participation in the MoodGYM program, which was implemented as a school-based intervention, occurred during the school day and was supervised by a teacher.

Varying levels of depression improvement were reported across the six studies. Results for the two school-based universal interventions will be summarized first,

followed by the three interventions targeted to adolescents with subthreshold depression, and results of the intervention for depressed adolescents will be summarized last.

The school-based trial involving adolescent males, showed the lowest levels of improvement, which the authors speculatively attribute, in part, to low baseline depression levels (O'Kearney et al., 2006). Though no changes were found between the treatment and control groups from baseline to either of the posttreatment assessments, boys completing three or more treatment modules reported decreases in depression symptoms at post (ES = .34, 95% CI = -.32 – 1.01), though this result was not maintained at the follow-up assessment. Also, the treatment group showed a decreased risk of being depressed (defined as having a CESD score of 16 or greater; 9% decrease) compared to the control group (4% increase) at post. In their trial with adolescent females, O'Kearney et al. (2009) found a faster rate of depression symptom decline in the treatment group (effect for time: β = -0.120, *SE* = 0.056, *Z* = 2.14, *P* = 0.04; effect for time by group: β = -0.200, *SE* = 0.090, *Z* = 2.22, *P* = 0.02) and, though not significant at post, at six-month follow-up the treatment group had significantly lower depression levels than the control group (*d* = .46, 95% *CI* = .1 - .82). They also found that those who had higher baseline depression levels showed greatest improvement in depression at follow-up (*d* = .92, 95% *CI* = .1 - 1.38). These two school-based universal interventions yielded results consistent with previously reported outcomes of universal intervention trials.

The three studies that evaluated interventions for adolescents with subthreshold depression did not include a control group. Participants in the chat room intervention who completed the posttreatment depression assessment reported significantly lower depression levels (CES-D scores) compared to baseline (*t* = 8.23, *df* = 48, *p* < .001;

Gerrits et al., 2007). These participants reported being very satisfied with the program, assigning it a rating of 7.5 on a scale of 1 (very poor) to 10 (very good) and most (79%) reported that they would recommend the chat room intervention. The pilot study that evaluated the 'CATCH-IT' program included only a small sample and consequently the moderate effect size (d = -.43, 95% CI = -1.4 - .58) for depression improvement (CES-D scores) was non-significant (Van Vorhees et al., 2005). In their randomized clinical trial, however, Van Voorhees et al. (2009) reported significant decreases in depression levels (as measured by scores obtained using the 10-item version of the CES-D) for all participants utilizing their computerized intervention from baseline to posttreatment (M = 24.46 to M = 16.46; $p < .001$) and from baseline to 12-week follow-up (M = 24.46 to M = 14.79; $p < .001$).

The last study evaluated 'Stressbusters,' a depression intervention for depressed adolescents (Abeles et al., 2009); it also did not include a control group. Participation in the intervention resulted in a significant decrease in the number of adolescents meeting criteria for a depression diagnosis (as measured by the K-SADS diagnostic interview) from baseline (95%) to posttreatment (22%, $p < .001$), and from baseline to three-month follow-up (7%, $p < .001$).

Though there are many differences between both the interventions and studies described here, the results outlined above suggest that, overall, computerized CBT-based interventions for adolescent depression hold significant promise. As only the studies evaluating the universal intervention included a control group, future research evaluating the efficacy of these innovative interventions should include comparison groups to more meaningfully examine their impact.

Since the publication of the above-described review (Richardson et al., 2010), the review's authors published the results of a pilot study they conducted assessing the efficacy of a computerized CBT program ('Think, Feel, Do') for adolescent depression and anxiety (Stallard, Richardson, Velleman, & Attwood, 2011). The 'Think, Feel, Do' program, delivered via CD-ROM, consists of six 30-45 minute sessions entirely facilitated by a professional. It is an interactive multimedia program that includes graphics, video, music, exercises and quizzes. Twenty participants experiencing either anxiety or depression symptoms were randomly assigned to either an intervention or waitlist control condition. Given the small size of the sample, few conclusions can be drawn from the study. Nevertheless, the pilot study results provide preliminary support for the efficacy of the intervention as the participants who received the program reported significant decreases in depression, while the control participants did not.

Concerns regarding computerized CBT. Although computerized CBT programs have demonstrated promising results, several issues have been raised concerning their use. One of the most commonly raised concerns is regarding the high dropout rate. A review conducted by Waller and Gilbody (2009) found that, though not statistically significant, twice as many participants in the computerized CBT arm were likely to drop out, and only an average of 56% of participants completed a prescribed CBT course. Reasons for dropping out have included (a) experiencing the intervention text and exercises as too demanding (Andersson et al., 2005); (b) not having the time to complete the program (Christensen, Griffiths, & Farrer, 2009; Grime, 2004); (c) not liking the intervention program (Christensen et al., 2009); and (d) experiencing difficulty with the Internet (Christensen et al., 2009). Neil, Batterham, Christensen, Bennett, and

Griffiths (2009) examined adolescent adherence to a CBT website in both school-based and community samples. They found that monitored school-based adolescents were more likely to complete a greater number of exercises as well as the intervention itself. In addition, females in both settings were more likely to complete the program. Within the community (unmonitored) setting, adolescents with higher depression scores at baseline were more likely to complete the program.

Another concern raised regarding computerized CBT is that many such interventions do not include therapist support, which has been associated with poorer outcomes. For example, a meta-analysis conducted by Spek and colleagues (2007) found that the mean effect sizes for interventions with therapist support were large while the effect sizes for interventions without support were small. Results of meta-analyses conducted by Gellatly and colleagues (2007) also found evidence that guided interventions (i.e., including therapist support that is either minimally supportive or just simply monitoring) are superior. Though based on limited information, they found no obvious benefit to contact beyond monitoring.

Advantages of computerized CBT. Though the above concerns regarding computerized CBT have been documented, this intervention delivery format has many potential advantages as well. To start, the highly structured and sequential nature of CBT programs is conducive to adaptation into a computerized format (Kenardy & Adams, 1993). The inherent anonymity in computerized self-help, which is typically engaged in within the privacy of one's own home, has the potential to eliminate the stigma associated with seeing a therapist and may also make it more comfortable to share personal information (Gega, Marks, & Mataix-Cols, 2004; MacGregor Hayward, Peck, &

Wilkes, 2009). With respect to access, patients report valuing the flexibility of being able to use the computerized programs at their convenience (in terms of both time and location) and at their own pace (Beattie, Shaw, Kaur, & Kessler, 2009; MacGregor et al., 2009). Computerized CBT has the potential to address some of the issues around treatment availability as it offers a solution to the shortage of trained CBT therapists (Van Den Berg, Shapiro, Bickerstaffe, & Cavanagh, 2004) and it can offer treatment access to those residing in rural areas who otherwise have poor access to mental health services (Griffiths & Christensen, 2007). With easier access, there is potential for patients to seek treatment sooner as well (Marks, Shaw, & Parkin, 1998).

Depending on the design of the computerized CBT intervention, this delivery modality has the potential to significantly decrease therapist involvement without compromising effectiveness (Wright et al., 2005). Costs of implementing computerized CBT are low, contributing to the efficiency of this form of treatment (Gerhards et al., 2010). Computerized CBT has received high satisfaction ratings from intervention participants (MacGregor et al., 2009; Proudfoot et al., 2004; Whitfield, Hinshelwood, Pashely, Campsie, & Williams, 2006) and clinicians (Craske et al., 2009) alike. Among the perceived benefits reported by parents of children and adolescents using mental health services were anonymity and ease of access to information (Stallard, Velleman, & Richardson, 2010). Additional benefits of computerized CBT include the customizability of the program to each patient's needs, having the means for collecting user data for a variety of purposes, and the ability to build standardized measures into the program for monitoring patient progress (Khanna & Kendall, 2008).

Computerized CWD-A for Adolescent Depression Prevention

As described earlier, there is preliminary support for the use of interactive multimedia programs for depression treatment and prevention. Computerized versions of intervention programs have the potential to increase accessibility and perhaps acceptability of depression interventions within the adolescent population. Given the need for increased prevention and treatment efforts, both in terms of the prevalence of adolescent depression and the high numbers of adolescents not receiving needed treatment, continued research into using this modality for intervention delivery is warranted. Following a recommendation offered by experts in the field, it behooves depression researchers to prioritize research involving this modality on depression prevention programs targeting youth with subthreshold depression.

CBT is a well-researched and documented approach for both treatment and prevention of depression. The CWD course has been well examined and found to be effective as a form of depression treatment and prevention with both adults and adolescents. The adolescent version of the CWD course lends itself nicely to implementation and delivery in an interactive multimedia format. The course is a structured, manual-based intervention with well-defined lessons, practice exercises, and short quizzes with feedback to help reinforce learning. Individuals could access the lesson material independently and at their own pace. Given the positive results of implementing the program in an electronic format in an adult population obtained thus far, and the appropriateness of the delivery format for adolescents, this study adapted the CWD-A into an interactive multimedia format for the prevention of depression in adolescents at risk of developing a major depressive episode. The intervention's efficacy

was evaluated in a randomized trial with middle school students experiencing elevated depression symptoms. (See Tables 1 and 2 for details regarding the similarities and differences between this intervention and study and those previously reported.)

Table 1. Comparison of Intervention Characteristics Across Computerized Interventions for Preventing and Treating Adolescent Depression

Intervention Characteristics	**MoodGYM (2006, 2009)**	**Master Your Mood Online**	**CATCH-IT (2005, 2009)**	**Stressbusters**	**Think, Feel, Do**	**Blues Blaster**
Intervention type	Universal Prevention	Targeted Prevention	Targeted Prevention	Treatment	Treatment	Targeted Prevention
Delivery modality	Website	Chat-room	Website	CD-ROM	CD-ROM	Website
Foundation of intervention (IPT: Interpersonal Psychotherapy; MI: Motivational Interviewing)	CBT	CWD (Lewinsohn & Clarke, 1984)	CWD-A (Clarke, 1994); IPT (Stuart, 2003); MI (Miller & Rollnick, 2002)	Individual CBT (Wood, Harrington, & Moore, 1996	Think Good, Feel Good (Stallard, 2004)	CWD-A (Clarke, Lewinsohn, & Hops, 1990)
How delivered	School computer lab	Online	Primary care	Clinic	In-person, at home	Online
# of modules	5	8	11 and 14	8	6	6
# of sessions	5	8	3-4 and n/a	8	6	30
Duration of each session (minutes)	30-60	90	60	30-45	30-45	10-15
Delivery frequency	Weekly	Weekly	Variable (1-2 per week) and n/a	Weekly	Weekly	Daily
Professional involvement	Minimal	High	Minimal and moderate	Moderate	High	None

Note: If information was not ascertainable from the published article, it was noted as 'n/a,' not available.

Table 2. Comparison of Study Characteristics Across Trials Evaluating Computerized Interventions for Preventing and Treating Adolescent Depression

Study Characteristics	**MoodGYM (2006, 2009)**	**Master Your Mood Online**	**CATCH-IT (2005, 2009)**	**Stressbusters**	**Think, Feel, Do**	**Blues Blaster**
Country of origin	Australia	The Netherlands	U.S. (Chicago)	U.K.	U.K.	U.S. (National)
Control group?	Yes	No	No	No	No	Yes
Point of recruitment	School	Study Website	Primary care MDs	Mental Health Service Providers	Mental Health Service Providers	School, Juvenile Justice agencies
Participant ages	15-16 and 16-17	*M*=19.7 (*SD*=3.8)	18-24 and 14-21	12-16	11-16	11-15
Completed baseline assessments	59 and 157	140	14 and 82	28	20	161
Follow-up period	16 weeks And 20 weeks	7-week posttest	Varied (1-6 week posttest) and 12 weeks	3 months	6-week posttest	6 months

Note: For the MoodGYM and CATCH-IT columns, information for two studies is being reported respectively.

The current study's research questions include the following:

- Will participants randomly assigned to the Blues Blaster (BB) condition report a larger reduction/greater decrease in their depression levels than the control participants?
- Will BB participants increase their knowledge of depression and the CBT skills taught in the program, increase their behavioral activation (how active they are in taking care of themselves), and decrease their negative thinking more than control participants?
- Will BB participants maintain their improvements at the six-month follow-up?

- Will gender, race, and juvenile justice status moderate the intervention effects?
- To what extent will BB participants use the intervention program?
- How satisfied will the BB participants be with the intervention program?

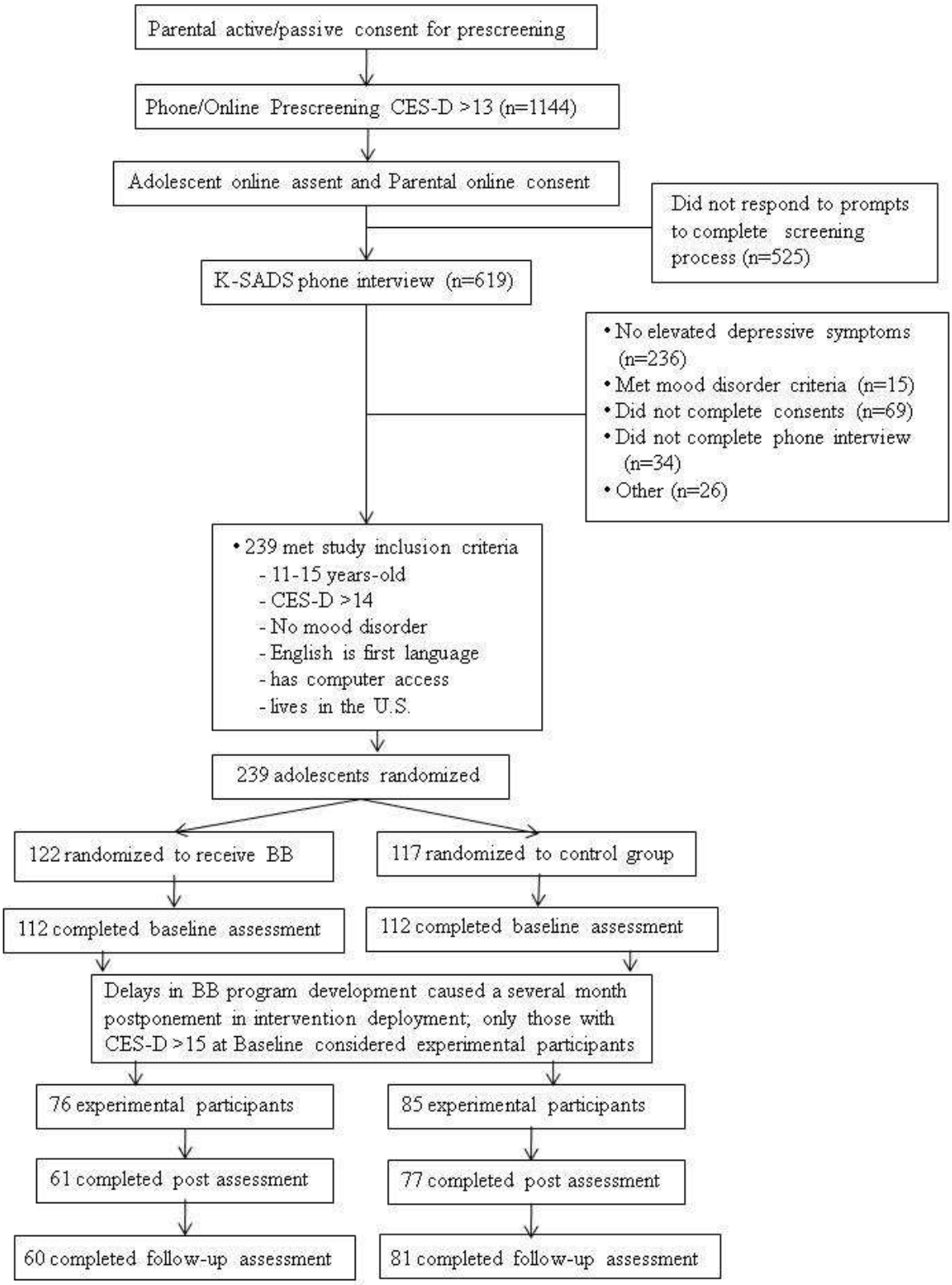
CHAPTER II

METHODS

Research Participants

Participants were recruited via contacts with a variety of professionals, organizations, and agencies that serve school-based and juvenile justice-involved youth: (a) school-based professionals including school counselors and psychiatrists, nurses or health clinics, and other administrative and professional staff; (b) direct service mental health professionals; (c) professionals assisting youth with both formal and informal probation; (d) individuals and organizations that assist youth and families with supports and resources; (e) professionals who provide health or medical services; (f) recreation and/or after school programs; and (g) Craigslist and social networking sites. Recruitment occurred over a 14-month period yielding an initial participant pool of 1144 youth with a CES-D score greater than 13 (see Figure 1 for details regarding the study flow) who completed an initial prescreening. Of these, 619 youth were further assessed by phone for study eligibility including a diagnostic interview to determine if the potential participant met diagnostic criteria for a mood disorder (an exclusion criterion). Criteria for participation included: (a) 11 to 15-years-old; (b) not currently meeting criteria for a mood disorder (Major Depression, Dysthymia, Mania); (c) English speaking; and (d) access to high-speed internet connection. Of the youth who were found eligible, 239 were randomly assigned to one of two conditions (treatment or control). Due to a lengthy lag between screening and program deployment (caused by unexpected delays in program development), only those adolescents whose Center for Epidemiologic Studies-

Figure 1: Participant Flow Through the Study



Depression Scale (CES-D) score was 16 or greater (i.e., meeting criteria for subthreshold depression) at baseline were considered experimental subjects.

An overview of the experimental participant demographic characteristics by condition is found in Table 3. A total of 161 adolescents with subthreshold depressive symptomatology from 30 U.S. states participated in the study. About half (56%) of the participants were female, two-thirds (65%) were White, and mean participant age was 12.7 (*SD* = 1.24). About two-thirds of participants' parents: (a) were married or living with their partner (63%); (b) had at least some college education (67%); (c) were employed (58%), either part-time (16%) or full-time (39%); and (d) had a household income of at least $20,000 per year (63%).

Procedures

All questionnaire assessments were collected through Survey Console, a secure research hosting website. Upon eligibility determination based on the initial screening, potential participants completed assent forms and their parent/guardian completed informed consents. Diagnostic interviews were then administered via phone and determination of eligibility completed; participants were assigned to condition. Six weeks after completing the baseline assessment, all participants received a link to complete the post test. Following completion of the posttest, treatment participants were encouraged to continue using the program. Both treatment and control participants completed the follow-up assessment six months after completing the pretest assessment.

Diagnostic interview. The Schedule for Affective Disorders and Schizophrenia for School-Age Children, Epidemiological Version (K-SADS-E; Orvaschel & Puig-Antich, 1987), a semi-structured interview designed to assess *DSM-IV* disorders in 6-18

Table 3. Baseline Demographics by Condition

	Control (n = 85)		Treatment (n = 76)	
	n	*%*	*n*	*%*
Gender				
Male	39	49.6	32	42.1
Female	46	54.1	44	57.9
Race				
White/Caucasian	55	65.5	50	65.8
Black/African American	8	9.5	12	15.8
Hispanic/Latino	4	4.8	0	0
Other	18	21.2	14	18.4
Parent Marital Status				
Married/Living with partner	59	69.4	43	56.6
Divorced/Separated	14	16.5	8	10.5
Single/Widowed	3	3.5	10	13.2
Did not respond	9	10.6	15	19.7
Parent Education				
Some high school	0	0	4	5.3
High school graduate	8	9.4	8	10.5
Some college or Associates degree	0	0	23	30.3
College graduate	15	17.6	10	13.2
Graduate/professional school	24	28.2	12	15.8
Trade school	4	4.7	2	2.6
Did not respond	10	11.8	17	22.4
Parent Employment Status				
Part time	15	17.6	11	14.5
Full time	39	45.9	23	30.3
Not currently employed	18	21.2	24	31.6
Other	2	2.4	1	1.3
Did not respond	11	12.9	17	22.4
Annual Household Income				
Less than $20,000	10	11.8	11	14.5
$20,000-$39,999	11	12.9	14	18.4
$40,000-$59,999	1	1.2	7	9.2
$60,000-$79,999	13	15.3	7	9.2
Greater than $80,000	20	23.5	15	19.7
Did not respond	17	20.0	22	28.9

Notes. Baseline differences in the outcome measures between treatment and control subjects were analyzed using chi-square and grouped *t*-tests. No significant differences were observed.

year-olds, was administered by project staff at baseline and 6-month follow-up. All adolescents found eligible for study participation during screening completed a K-SADS-E interview to determine whether they met diagnostic criteria for a mood disorder according to the *DSM-IV*; adolescents meeting diagnostic criteria were excluded from the study and provided with mental health referral information. The Longitudinal Interval Follow-up Evaluation (LIFE; Keller et al., 1987) was administered along with the K-SADS-E at the 6-month follow-up interview in order to provide a retrospective weekly assessment of mood symptoms as well as mood disorder onset and offset since baseline.

All interviewers completed extensive K-SADS-E and LIFE training as well as ongoing supervision for the use of these diagnostic tools. Interviewers were required to demonstrate a minimum interrater reliability of 80% in two practice interviews before beginning study assessments. Most interviewers had a master's degree and one had a bachelor's degree.

Study Conditions

Participants were either (a) provided access to the BB intervention program (treatment group), or (b) directed to a website that included links to depression education websites geared toward teens (control group).

Blues Blaster intervention condition. The (BB) program website was designed to (a) teach adolescents about depression; (b) educate adolescents about mood monitoring and provide them with an engaging method to do so; (c) help adolescents increase their pleasant activity engagement and monitor their progress; and (d) help adolescents decrease negative thinking and increase positive thinking. The program uses text and graphic novel depictions to present the intervention material. Flash-based interactive

exercises provide an opportunity to practice the skills taught. Quizzes and homework assignments allow for further reinforcement of the knowledge and skills learned.

The BB online intervention was designed by an expert in the field of education game design in order to produce an engaging intervention for youth experienced in the use of technology. As described earlier, the program was derived from the CWD-A. It includes six modules within each of which there are five levels, resulting in 30 mini-lessons. Users are encouraged to complete one mini-lesson per day and then spend two days practicing what they learned. The expectation is that users will complete one module per week and therefore complete the program over a period of six weeks. Each mini-lesson is framed in the context of a lesson goal and includes five components: (a) a video to introduce the lesson goal along with a graphic illustration of the goal; (b) a Flash animation activity to teach the lesson's teaching points; (c) a Flash animation activity to reinforce the lesson's teaching points; (d) a comic strip depicting characters role playing the key concept presented in the lesson; (e) a video testimonial speaking to the lessons topic; (f) the lessons 'key', or summary statement; (g) quiz questions on the lessons content; and (h) a summary video providing positive reinforcement and encouragement.

The six modules cover critical content from the Coping with Depression course including (a) defining depression; (b) mood monitoring; (c) increasing fun activities; (d) increasing positive thinking; (e) recognizing negative thinking; and (f) decreasing negative thinking. Users are encouraged to track their mood ratings and fun activities, which are depicted together on a graph to help illustrate a relationship between them. The various activities in the program yield personalized data in the form of lists that are made available to the user via a link to 'My Stuff'; the lists can be modified (e.g. users

can add an entry to their 'mood triggers' list) and/or printed. In the event that the user is experiencing a 'Mood Emergency' and in need of immediate support, a link to a crisis line which provides local support is provided.

Four versions of the program were developed in order to facilitate program engagement for males, females and those who are and are not involved in the justice system. The differences between the programs include (a) a male and female version of the comic strips and (b) four versions of the video: two male and two female actors were chosen based on the likelihood that they would represent each of the juvenile justice populations (those involved and not involved).

Information-only control condition. The information-only control website included links to five websites geared toward teens that include depression education (i.e., http://kidshealth.org/teen/your_mind/mental_health/depression.html,, http://www.checkupfromtheneckup.ca/teen.html, http://www.teenmentalhealth.org/index.php/families/depression/, http://www.mpoweryouth.org/411PopTopDepression.htm, and http://au.reachout.com/find/articles/depression-types-causes-and-symptoms). Control participants were encouraged to browse any and all of the websites for as long as they wanted. They were offered access to the BB program upon their completion of the 6-month assessment.

Measures

Measures were selected based on the conceptual framework of the intervention. As stated above, the BB program includes modules to address the following: (a) defining depression; (b) mood monitoring; (c) increasing fun activities; (d) increasing positive

thinking; (e) recognizing negative thinking; and (f) decreasing negative thinking. As such, measures were included to assess whether BB had an impact in these areas. Computer-based pretest, posttest, and follow-up assessments were used to assess: (a) depression level; (b) knowledge about depression and the CBT skills taught in the program; (c) frequency of negative cognitions; and (d) degree of behavioral activation across life areas. In addition, it was expected that after using the BB program participants would feel more confident in their ability to perform the skills taught. It was also expected that as result of their lower depression levels, their scholastic performance would improve. Assessments were therefore also included to measure self-efficacy and school functioning. Program evaluation, including both user satisfaction and program usability, was also assessed and intervention use was documented. Participants completed the program measures before viewing the BB program or control group website (pretest), at six weeks after the pretest (posttest), and six months after completing the pretest (follow-up).

Demographics. Demographic data were collected during the screening process from both the participating adolescents and their consenting parents/guardians, including: (a) gender; (b) age; (c) race/ethnicity; (d) parental marital status; (e) parental highest completed education; and (f) household income.

Depression symptoms. The Center for Epidemiologic Studies-Depression Scale (CES-D; Radloff, 1977) is a 20-item questionnaire that assesses depression symptoms. Participants were asked to rate how many times they experienced each of the statements (e.g., 'I felt sad,' 'I did not feel like eating; my appetite was poor,' 'I could not get going') during the last week on a 4-point scale (1 = Rarely or none of the time; 4 = Most

or all of the time). The CESD has acceptable internal consistency (alpha = .74 to .91), reliability (test-retest r = .57 to .59), and convergent validity with clinician ratings of depressive symptoms (r = .88; Andrews, Lewinsohn, Hops, & Roberts, 1993; Roberts, Lewinsohn, & Seeley, 1991). In this trial, the CES-D demonstrated good internal consistency (α = .83).

Knowledge. Knowledge regarding depression and the CBT skills taught in the program for preventing depression was assessed based on the mastery learning tests that were developed for the program. The knowledge measure is considered an index of treatment receipt (participants' comprehension and mastery of content). To assess treatment receipt, participants answered 18 multiple-choice knowledge questions about the program's key learning objectives related to: (a) understanding depression; (b) mood monitoring; (c) pleasant activity engagement and scheduling; (d) increasing positive thoughts; and (e) decreasing negative thoughts.

Negative cognitions. Negative thinking was assessed with the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980). The ATQ was designed to measure the frequency of automatic negative thoughts associated with depression. Research has provided evidence of the reliability and validity of the ATQ for use with adolescents (Jolly & Wiesner, 1996; Kazdin, 1990). The ATQ consists 30 questions representing four subscales: (a) Personal Maladjustment and Desire for Change, (b) Negative Self-Concept and Negative Expectations, (c) Low Self-Esteem, and (d) Giving Up/Helplessness. The ATQ has demonstrated excellent internal consistency (α = .92) and 1-week test-retest reliability (r = .74; Rohde, Clarke, Lewinsohn, Seeley, & Kaufman, 2001). Participants were asked to rate how often they experienced each of the thoughts

(e.g., ‘I’m no good,’ ‘No one understands me,’ and ‘My life is a mess’) over the last week on a 5-point scale (1 = Not at all; 5 = All the time). In this trial, the ATQ demonstrated good internal consistency (α = .97).

Behavioral activation. Behavioral activation (how actively individuals are taking care of themselves, including making positive choices) was expected to increase as a result of the intervention. This was measured using the Behavioral Activation for Depression Scale (BADS; Kanter, Mulick, Busch, Berlin, & Martell, 2007). This scale consists of 25 items divided into four subscales: (a) Activation; (b) Avoidance/Rumination; (c) School Impairment; and (d) Social Impairment. Participants were asked to rate items (e.g., ‘I did something that was hard to do but it was worth it,’ ‘I spent a long time thinking over and over about my problems,’ ‘I did not see any of my friends’) on a 7-point scale (0 = not at all; 6 = completely) indicating how true each of the statements was for them over the last week. All subscales except the ‘Activation’ subscale were reverse-coded so that a higher total score reflected greater activation. The BADS had excellent overall internal consistency (α = .87) and 1-week test-retest reliability (r = .74) (Kanter et al., 2007). In this trial, the BADS demonstrated good internal consistency (α = .82).

School functioning. Adolescents’ degree of passivity (difficulty functioning) within the school context was measured by a subset of the BADS questions. As mentioned above, the original item scores were recoded to represent degree of activation, so that higher scores represent greater improvement in the adolescents’ ability to function in the school environment. Participants were asked to rate the five items (e.g., ‘My schoolwork suffered because I was not as active as I needed to be,’ ‘There were certain

things I needed to do that I didn't do') on a 7-point scale (0 = not at all; 6 = completely) indicating how true each of the statements was for them over the last week. In this trial, the BADS school functioning subscale demonstrated acceptable internal consistency (α = .71).

Self-efficacy. Bandura's Social Cognitive Theory (Bandura, 1977) posits that there is a relationship between self-efficacy and outcome behavior. We assessed subject self-efficacy in performing the recommended behaviors. Self-efficacy items documented change in the subjects' perceptions of their mastery of the skills presented in the program (e.g., mood monitoring, engaging in pleasant activities, using the social skills), and their self-efficacy to perform them as a function of this training. Participants were asked to rate the 22 items (e.g., 'How confident are you that you can keep track of how you are feeling each day,' 'How confident are you that you can change your negative thoughts to more positive ones,') on a 5-point scale (1 = not at all confident; 5 = extremely confident) indicating their degree of confidence about each item for the upcoming week. In this trial, the self-efficacy measure demonstrated good internal consistency (α = .94).

User satisfaction and program usability. At posttest, treatment participants completed a 26- item questionnaire related to evaluating their experience in the program. Users were asked to what degree they agreed or disagreed with program use statements on a 6-point scale (1=strongly disagree; 6=strongly agree). The measure included eight items related to degree of satisfaction with the program to assess the social validity and acceptability of the program (e.g., 'The program was fun,' 'The program was helpful to me'), eight items regarding the usability of the program (e.g., appearance, navigation, level of engagement during use; 'The program was easy to use,' 'The activities/games in

each cell helped me learn the material'), and ten items inquiring about the degree to which the program educated the participants on the main teaching points (e.g., ' The program helped me understand depression,' 'The program helped me learn what makes my mood go up and down'). In addition to the questionnaire, participants viewing the BB program were asked open-ended questions about their experience using the program as part of the six-month follow-up phone interview. The semi-structured interview questions included 'Which part(s) of the program helped you the most,' 'Which part(s) of the program did you like least,' 'Which of the skills taught in the program have you used since viewing the program?' and 'Tell me how have you used them.'

Intervention use. Use of the intervention was monitored via system log files. The number visits to the program, the number of modules completed, and time spent in the program were documented.

Data Analysis

Preliminary analyses were conducted to examine baseline differences between the treatment and control groups on both demographics and outcome measures, using *t* tests for numerical measures and contingency table analysis for categorical measures. Pre (baseline) to post change in the outcome measures were tested with analysis of covariance (ANCOVA), adjusting for baseline levels. Similar analyses (pre to follow-up) were conducted to examine the maintenance of gains on the follow-up outcome measures. To confirm the results within an intent-to-treat framework, data were imputed using the Expectation Maximization (EM) algorithm for both post and follow-up missing data. The EM algorithm substitutes a predicted value on the basis of the available variables (McLachlan & Krishnan, 1996; Schafer, 1997). Results of the ANCOVA

models run with imputed data are presented in Tables 4 and 5 and, for reference, ANCOVA results using observed data can be found in Appendix A. To test for potential moderating effects, gender, juvenile justice status, and race were included as between-subjects factors in separate analyses. Cohen's d-statistic (Cohen, 1988) was used to estimate study effect sizes and was calculated by dividing the difference between the intervention and control mean adjusted post and follow-up assessment scores by the pooled standard deviation; small, medium, and large effects are .2, .5, and .8, respectively.

CHAPTER III

RESULTS

Baseline Equivalency and Attrition

To assess the random assignment of groups, the treatment and control conditions were compared on baseline demographic characteristics and outcome measures. The groups did not significantly differ on any of the baseline demographic characteristics or outcome measures.

Examination of attrition across the three waves of data revealed differential attrition rates that were statistically significant between the treatment and control conditions ($\chi^2[1, 161] = 5.30$, $p = .02$). About twice as many treatment participants failed to complete the posttest or follow-up assessment compared to control participants (28.9% versus 14.1%). We compared those who failed to complete all post-baseline assessments with those who had completed all of the assessments on demographic characteristics and outcome measures collected at baseline and found no main effects.

Posttest Main Effects

Analysis of covariance (ANCOVA) adjusting for pretest measures was used to evaluate between-subject effects in each of the outcome measures at posttest and at the follow-up assessment. Study condition was the 2-level (treatment vs. control) between-subjects factor. ANCOVA models using imputed data (see Table 4) showed that all six posttest measures, controlling for pretest measures, were statistically significant (See Appendix A for ANCOVA results using observed data, which were highly comparable).

Knowledge had the largest effect size ($d = .57$ medium effect); the remaining measures, including depression level, negative thinking, behavioral activation, school

Table 4. Descriptive Statistics for Baseline and Posttest Outcome Measures and Pre to Post ANCOVA Results for Imputed Data

	Control (n = 85)			Treatment (n = 76)			Test Statistics		
Domain/Measure	Baseline *M (SD)*	Post *M (SD)*	M_{Adj}	Baseline *M (SD)*	Post *M (SD)*	M_{Adj}	*F*	*p-value*	Effect size, *d*
Depression Level (CES-D)	27.19 (9.12)	25.01 (10.09)	24.94	26.91 (8.74)	21.47 (9.04)	21.55	6.60	.010	-.36
Knowledge	.70 (.12)	.70 (.12)	.70	.69 (.10)	.77 (.12)	.77	16.51	<.001	.57
Negative Thoughts	73.63 (28.73)	68.98 (29.23)	70.22	77.63 (26.90)	62.20 (26.00)	60.81	6.43	.012	-.34
Behavioral Activation	104.73 (19.68)	105.74 (24.24)	104.70	101.21 (19.44)	114.01 (20.03)	115.17	11.89	.001	.47
School Functioning	22.44 (6.42)	22.17 (6.43)	22.01	21.83 (5.44)	23.93 (6.14)	24.10	5.79	.017	.33
Self Efficacy	2.70 (.66)	2.81 (.75)	2.84	2.83 (.73)	3.21 (.84)	3.17	9.07	.003	.42

Note. *M* = Mean, *SD* = Standard Deviation, M_{Adj} = Post mean adjusted for baseline levels.

functioning, and self-efficacy had small-to-medium effect sizes ranging between .33 and .47. Results suggest that the targeted theoretical constructs improved more for the intervention participants, following use of the program, compared to the control participants. The differential change corresponded, on average, to a small to medium treatment effect.

Follow-up Main Effects

The same statistical methods were applied at follow-up. ANCOVA models using imputed data (see Table 5) showed that five of the six follow-up measures, controlling for pretest measures, were statistically significant (See Appendix A for ANCOVA results using observed data, which were highly comparable). The CES-D had a trend level effect (p = .059) and had a small effect size (d = -.29). Closer examination of the CES-D results reveals that the treatment group's depression levels continued to decrease between the posttest and follow-up assessments (adjusted mean at posttest = 21.55; adjusted mean at follow-up = 18.09). The control group's depression levels also decreased during that period (adjusted mean at posttest = 24.94; adjusted mean at follow-up = 21.44), likely explaining the small decrease in effect size (posttest CES-D d = -.36; follow-up CES-D d = -.29).

Self-efficacy had the largest effect size (d = 0.58, medium effect); the remaining measures, including knowledge, negative thinking, behavioral activation, and school functioning had small-to-medium effect sizes ranging between .39 and .48. Effect sizes for negative thoughts, school functioning and self-efficacy were larger at follow-up compared to posttest. Closer inspection reveals that though the control group demonstrated slight improvements in these areas, the treatment group's continued

Table 5. Descriptive Statistics for Baseline and Follow-up Outcome Measures and Pre to Follow-up ANCOVA Results for Imputed Data

	Control (n = 85)			Treatment (n = 76)			Test Statistics		
Domain/Measure	Baseline *M (SD)*	Follow-up *M (SD)*	M_{Adj}	Baseline *M (SD)*	Follow-up *M (SD)*	M_{Adj}	*F*	*p-value*	Effect size, *d*
Depression Level (CES-D)	27.19 (9.12)	21.58 (10.35)	21.44	26.91 (8.74)	18.62 (9.67)	18.09	3.61	.059	-.29
Knowledge	.70 (.12)	.69 (.14)	.69	.69 (.10)	.76 (.16)	.76	10.28	.002	.45
Negative Thoughts	73.63 (28.73)	67.84 (29.81)	68.60	77.63 (26.90)	58.39 (24.96)	57.54	7.13	.008	-.40
Behavioral Activation	104.73 (19.68)	108.56 (20.46)	107.72	101.21 (19.44)	115.22 (22.85)	116.17	7.47	.007	.39
School Functioning	22.44 (6.42)	22.70 (6.38)	22.59	21.83 (5.44)	25.38 (5.94)	25.52	10.52	.001	.48
Self Efficacy	2.70 (.66)	2.93 (.77)	2.94	2.83 (.73)	3.39 (.76)	3.37	13.52	<.001	.57

Note. *M* = Mean, *SD* = Standard Deviation, M_{Adj} = Post mean adjusted for baseline levels.

improvement was greater. Effect sizes decreased between the posttest and follow-up assessments for the knowledge and behavioral activation measures. The mean for knowledge decreased only very slightly for the treatment group (posttest adjusted mean = .77 versus follow-up adjusted mean = .76) as it did for the control group (posttest adjusted mean = .70 versus follow-up adjusted mean = .69). Though the mean for behavioral activation continued to increase from posttest to follow-up for the treatment group (adjusted posttest mean = 115.17; adjusted follow-up mean = 116.17), the control group mean also increased (adjusted posttest mean = 104.70; adjusted follow-up mean = 107.72). Taken together, results suggest that gains in depression amelioration, knowledge, decreased negative thinking, behavioral activation, school functioning and self-efficacy at posttest were maintained or increased through the follow-up assessment.

Moderation Effects

Given that the program was tailored by gender and juvenile justice status, both of these factors were included in the moderation analyses. Two-way ANCOVA models tested whether gender, juvenile justice status, or race moderated the condition effects reported in Tables 4 and 5 by including condition by gender, condition by juvenile justice status, and condition by race interaction terms. Examination of the interaction term showed no significant condition by gender, condition by juvenile justice status, or condition by race interaction effect on pretest-adjusted outcome measures at the posttest or follow-up assessments. Hence, the program effects are considered to be comparable across gender, juvenile justice status, and race.

Program Usage and Dose Response Analysis

All treatment participants visited the program at least once, with a mean of six visits and the number of visits ranging from 1 to 20. The average amount of time spent on the website, across all visits, was 117 minutes (*SD* = 86 minutes). Half (50%) of the treatment participants completed all six intervention program modules and 18% did not complete a single module; the average number of intervention modules completed was 3.5 (SD = 2.63).

To assess whether completion of more intervention modules resulted in greater reduction in depression symptoms, change scores were computed for treatment participants as the posttest measure minus the pretest measure and the follow-up measure minus the pretest measures, and were correlated with number of modules completed. A significant correlation was found between total modules completed and the depression measure posttest change score (r = -.28, p = .029) as well as the follow-up change score (r = -.38, p = .003), suggesting that those who viewed more of the program experienced greater reductions in depression scores from pretest to posttest and pretest to follow-up. The observed correlations correspond to medium effect sizes.

User Satisfaction and Program Usability

User satisfaction and program usability items indicated a favorable perception of the program from treatment participants (see Table 6). Overall participant scores were computed across the relevant items for each of the three domains: User satisfaction, program usability, and perceived program effectiveness. A mean score of 4.62 (*SD* = 1.02) on a six-point scale indicated that treatment participants were very satisfied with the program. A mean score of 4.63 (*SD* = .99) indicated that treatment participants found the

Table 6. Summary of Program Evaluation Items

	Overall		Strongly Disagree	Mostly Disagree	Slightly Disagree	Slightly Agree	Mostly Agree	Strongly Agree
Satisfaction items:	*M*	*SD*	%	%	%	%	%	%
The program was fun.	4.63	1.07	1.8	1.8	8.9	26.8	41.1	19.6
The program was helpful to me.	4.80	1.00	0	3.6	5.4	23.2	42.9	25.0
I felt like this program was made for someone like me.	4.45	1.54	7.1	7.1	8.9	17.9	28.6	30.4
I would recommend the program to a friend.	5.20	.96	0	1.8	3.6	16.1	30.4	48.2
I liked the amount of reading.	4.36	1.42	3.6	9.1	10.9	27.3	21.8	27.3
I liked the narrator.	4.27	1.33	3.6	5.4	17.9	28.6	23.2	21.4
I liked the comic strips.	4.45	1.71	10.7	3.6	16.1	8.9	21.4	39.3
I liked earning points.	4.75	1.37	3.6	5.4	7.1	17.9	28.6	37.5

Table 6. Summary of Program Evaluation Items (continued)

Usability items:	Overall		Strongly Disagree	Mostly Disagree	Slightly Disagree	Slightly Agree	Mostly Agree	Strongly Agree
	M	*SD*	%	%	%	%	%	%
The program was easy to use.	5.20	1.19	0	5.5	7.3	7.3	21.8	58.2
I liked the program pace - it was not too fast or too slow.	4.89	1.22	1.8	0	16.1	12.5	28.6	41.1
I liked having the next and previous buttons to move around in the program.	4.27	1.53	7.1	8.9	10.7	21.4	26.8	25.0
I liked seeing a graph of my mood and activities.	4.52	1.27	3.6	1.8	16.1	19.6	35.7	23.2
The activities/games in each cell helped me learn the material.	4.57	1.53	7.1	3.6	10.7	19.6	21.4	37.5
The quests helped me practice what I learned.	4.62	1.27	1.8	7.3	3.6	32.7	23.6	30.9
My Fun Activities List was useful to me.	4.42	1.32	3.6	5.5	10.9	29.1	27.3	23.6
The Mood and Activities Tracking form was easy to fill out.	4.58	1.15	0	3.6	16.4	23.6	30.9	25.5

Table 6. Summary of Program Evaluation Items (continued)

Pedagogical items: The program helped me…	Overall		Strongly Disagree	Mostly Disagree	Slightly Disagree	Slightly Agree	Mostly Agree	Strongly Agree
	M	*SD*	%	%	%	%	%	%
… understand depression.	5.02	.92	0	1.9	1.9	24.1	37.0	35.2
… understand the connections between feelings, actions, and thoughts.	5.05	1.08	0	5.5	0	21.8	29.1	43.6
… understand how to prevent a downward spiral and create an upward spiral.	4.89	1.12	1.8	3.6	0	27.3	32.7	34.5
… know more about monitoring my mood.	4.98	1.11	0	3.6	5.5	23.6	23.6	43.6
… understand more about the importance of pleasant activities.	4.89	1.14	1.8	3.6	3.6	19.6	37.5	33.9
… learn what makes my mood go up and down.	4.96	1.04	0	3.6	5.4	17.9	37.5	35.7
… learn how to increase my positive thoughts.	4.91	1.13	0	7.3	1.8	18.2	38.2	34.5
… learn about my negative thoughts.	4.91	1.13	0	7.1	1.8	19.6	35.7	35.7
…learn how to change my negative thoughts into positive ones.	4.91	1.01	0	3.6	3.6	23.2	37.5	32.1
The quizzes helped me understand the material better.	4.89	1.30	1.8	3.6	12.5	12.5	25.0	44.6

program quite usable. A mean score of 4.93 (*SD* = .97) indicated that treatment participants experienced the program as very educational on the primary intervention teaching points.

CHAPTER IV

DISCUSSION

The goal of this study was to broaden the CWD-A efficacy research by developing a computerized version for individual use by adolescents experiencing subthreshold depressive symptoms. The discussion that follows includes (a) a summary and examination of the study findings, (b) limitations of the current study, and (c) directions for future research and activities.

Summary of Findings

The purpose of this study was to develop and evaluate the efficacy of Blues Blaster, a web-based intervention designed to teach adolescents key concepts adapted from the adolescent version of the Coping with Depression course to help ameliorate subthreshold depressive symptoms. Findings from our evaluation are promising as they suggest that viewing the BB program results in significant improvements in participant depression level (as measured by the CES-D), knowledge of the key intervention concepts (e.g., understanding depression and CBT skills), negative cognitions, behavioral activation, school functioning, and self-efficacy.

The program effects were significant at both the posttest and follow-up outcome assessments, except for the CES-D which had a trend level effect at follow-up. Upon closer inspection, the lack of significance is not due to a deterioration of effects, but rather continued treatment group improvement coupled with improvement for control participants as well. Further, the effect sizes for half of the six outcome measures further increased from posttest to follow-up. Interestingly, the largest effect size at follow-up was for self-efficacy. It appears the treatment participants had an opportunity to put the skills

they learned in the program into practice hence increasing their confidence regarding their ability to do so. This supposition is also supported by the fact that compared to the posttest, treatment participants had fewer negative thoughts and increased school functioning at follow-up. They also improved their levels of behavioral activation, though the control group did as well. It may be that just completing the BADS a second time provided the control participants with ideas regarding more positive and engaging ways to interact with their environment.

The effect sizes in this study range from .29 to .57, with an average effect size of .42 across post and follow-up analyses. Spek et al.'s (2007) meta-analysis of Internet-based interventions for anxiety and depression found that interventions including therapist support yielded large effect sizes (d = 0.75 – 1.24), but interventions without therapist support had small-to medium effect sizes (d = 0.08–0.44). Given that participants in the current study did not receive any therapist support, the results are well within the expected range. In a real-world setting, the preferred intervention delivery method would include the involvement of a support person (e.g., school counselor). It is expected that this additional support would increase the intervention's effect to the higher levels Spek and colleagues (2007) reported.

Examination of program use revealed that the more intervention modules the user completed, the greater the reduction in depression level they experienced. The strength of this relationship increased at follow-up, suggesting that the depression levels of the participants who completed more modules continued to improve beyond the period during which they were engaged in the intervention. Completion rates found in this study are comparable to those reported in both the group-based and Internet-based CWD

efficacy studies as well as computerized CBT studies. This study's average intervention completion rate of 58% is in line with those reported for the group-based adolescent CWD interventions, which range from 53% to 88%, and is higher than the Internet-based CWD intervention for adults (see Table 7). Also, this study's 50% rate of intervention completion is comparable to other studies of computerized CBT programs, which range from 30% of participants completing 60% of the program to participants completing 85% (see Table 8). The two programs that produced higher completion rates, namely Stressbusters (Abeles et al., 2009) and Think, Feel, Do (Stallard, Richardson, Velleman, & Attwood, 2100) both included at least moderate support, which likely contributed to the increased compliance. Finally, the 12% overall attrition rate at 6-month follow-up (across conditions) for this study was lower than half of the studies evaluating the CWD and all of the studies evaluating computerized CBT for adolescents (see Tables 7 and 8). Measures of program satisfaction completed by the treatment group demonstrated that they were quite satisfied with the provided content, that they felt the program was usable, and that they experienced the program as educating them on the key concepts. The most highly endorsed items (mean score of greater than 5 on a 6-point scale) included (a) they would recommend the program to a friend, (b) the program was easy to use, and (c) the program helped them understand depression and the connection between feelings, actions, and thoughts. These appear to be some of the most salient items, representing that which would likely influence utilization (expected appeal to others and ease of use) as well as the some of the most important concepts. These results are encouraging as it can be challenging to develop an educational program that appeals to adolescents who are quick to judge and reject.

Table 7.Comparison of Attrition and Participation Across CWD Studies

	Lewinsohn et al., 1990	**Clarke et al., 1999**	**Clarke et al., 2001**	**Clarke et al., 2002 (Internet)**	**Rohde et al., 2004**	**Stice et al., 2008**
Average intervention completion rate	n/a	14.1 out of 16 sessions or 88%	9.5 out of 15 sessions or 63%	2.6 session out of 7 chapters or 39%	8.4 out of 16 sessions or 53%	n/a
% participants completing the program	n/a	80% completed 80% of program	n/a	n/a	n/a	44%
Overall attrition rate	25% at 6 months	22% did not complete acute phase	10% at 12 months	34% at 6 months	8% at 6 months	7% at 6 months

Note: If information was not ascertainable from the published article, it was noted as 'n/a,' not available.

Table 8.Comparison of Attrition and Participation Across Computerized CBT Studies

	MoodGYM (2006, 2009)	**Master Your Mood Online**	**CATCH-IT (2005, 2009)**	**Stress-busters**	**Think, Feel, Do**	**Blues Blaster**
% of participants completing the program	40% completed 60% of program and 30% completed 60% of program	36%	57% and n/a	70%	85%	50%
Overall attrition rate	39% at 16 weeks and 47% at 20 weeks	64% at 7 week posttest	43% at 1-6 week posttest and 7% at 12 weeks	39% at 3 months	25% at 6 week posttest	12% at 6 months

Note: If information was not ascertainable from the published article, it was noted as 'n/a,' not available. For the MoodGYM and CATCH-IT columns, information for two studies is being reported respectively.

Although this trial did not include an adequate follow-up period to determine depression prevention, the intervention program demonstrated reduction in a key risk factor (i.e., subthreshold depression) and showed a significant impact on putative mediators (e.g., increases in pleasant activities and decreases in negative thinking), supporting the CBT prevention model, providing support for the efficacy of a web-based

intervention for middle school age adolescents with subthreshold depression symptoms. The results replicate findings of previous studies, in which the intervention was delivered in a group format (Clarke et al., 1995; Stice, Rohde, Seeley, & Gau, 2008). These comparable findings across studies suggest the consideration of self-administered Internet-based depression prevention programs as potentially successful substitutes for the more traditional group-based intervention program that are more costly to deliver, inconvenient to attend, and not available 24 hours a day, seven days a week.

Study Limitations

We acknowledge several limitations of this efficacy trial and offer some cautions in interpreting the findings. First, our sample is limited in at least a couple of ways. While we made a concerted effort to recruit broadly (as evidenced by the inclusion of subjects from 30 states) and our focused recruitment efforts included the use of resources that target racial minorities and resulted in 35% ethnic/racial minorities, the final sample was nevertheless predominantly White. Thus, study findings reflect White adolescents experience with the program, more so than non-White adolescents and should therefore not be generalized to non-Whites. We examined the data, however, and found that program effects were not moderated by minority status. Further evaluation with African American and Latino populations is needed to determine efficacy within those populations. This may require further developing collaborative relationships with individuals, agencies, and middle schools responsible for providing mental health referral and services to non-Whites. In addition, although an increasing number of middle school youth have high-speed Internet access, the sample was limited to those with an email address and access to broadband Internet and thus included a limited number of low-

income households. Finally, although random assignment was used, all the participants were volunteers and thus represent a convenience sample of interested youth and cannot be considered representative of the entire population of middle school adolescents.

Second, the differential attrition rates between the treatment and control groups threaten the internal validity of the study. However, we compared the group who completed all post and follow-up assessments to the group who did not and found no differences in demographics or baseline outcome measures. In addition, dose response findings provide evidence that those within the treatment condition who used the program showed greater improvement. Finally, we performed intent-to-treat analyses in which missing data were imputed and the results lead to comparable results and identical conclusions, providing additional support to the results presented herein.

Third, outcome measures are comprised entirely of participant-completed self-report surveys. This has the potential to introduce bias as those who received the intervention may report improvement if for no other reason than being aware that they are expected to improve. Including data from various sources would improve the data's validity. Parent-report measures of adolescent depression, negative behaviors, and level of functioning would increase the strength of the results. Including a teacher-report measure of adolescent functioning or school records would further augment validity.

Fourth, due to unforeseen delays in program completion and the lengthy enrollment period (14 months), there was an inconsistent and sometimes quite lengthy lag between screening and program deployment across study participants. As a result, only two-thirds (67%) of the screened participants initially met and continued to meet study criteria (i.e., subthreshold depressive symptoms as measured by a CES-D score above 15)

at baseline. These participants were considered experimental subjects and included in all of the analyses. An examination of any differences on demographics or outcome measures at baseline between those who did and did not improved prior to intervention delivery may provide insight into possible differences between adolescents who are more likely to improve on their own and those who are more likely to require intervention. In addition, examining the differences between those who did and did not improve as a result of intervention engagement could assist with determining for whom the intervention is best suited.

Fifth, half of the treatment participants completed all intervention modules. While this could be considered a strength of the study (given that completion rates tend to be lower when the intervention involves no therapist support), it should not be interpreted as an outcome of the program. Because this was sponsored research that provided compensation to participants, it cannot be determined whether completion of the program would occur at the same rate without compensation. This finding can also be considered a weakness of the study, as a higher intervention completion rate would be preferable, thereby implying the need for improved engagement. Further analyses are needed in order to discern the intervention completers and non-completers. As mentioned above, it is expected that incorporating some level of professional support would likely increase compliance. Evaluating various levels of support would possibly elucidate the optimal degree of support that is simultaneously efficient and cost-effective.

Finally, although data were collected six months after the baseline assessment, which represents the longest follow-up period across the computerized CBT studies reported above, the lack of a longer-term follow-up limits the conclusions that can be

drawn regarding depression prevention (i.e., escalation to full-syndrome depression). Given the low incidence rate of major depression during this period, at least a two-year follow-up period is needed in order to allow sufficient time for the development of depression thereby allowing for the evaluation of the program's efficacy in preventing depressive disorder onset. According to Gillham, Shatté, & Reivich (2001), participants often need to pass through a period of elevated risk for preventative effects to emerge and this might take some time. Without long-term follow-ups potential effects can be missed and the effectiveness of intervention programs underestimated. Long-term follow-ups are also essential in determining the duration of effects, and the period at which booster sessions may be beneficial (Gillham et al., 2001). They would also allow time for the control group to improve, allowing for an examination of recovery rates in untreated adolescents at risk of developing depression. Future studies therefore should include adequate follow-up assessments to ensure all effects are detected.

In spite of the limitations described herein, the results of this study provide support for the significance and value of a stand-alone computerized CBT intervention based on the CWD. Further evaluation of this intervention is needed in order to maximize its utility and impact.

Future Directions

Although CBT has proven effective in decreasing depressive symptoms and therefore the risk of future episodes of major depression, there is a paucity of research examining the mechanisms responsible for these results (Hoek, Schuurmans, Koot, & Cuijpers, 2009; Kaufman, Rohde, Seeley, Clarke, & Stice, 2005; Stice, Rohde, Seeley, &

Gau, 2010). Indeed, Kazdin and Nock (2003) argue that "almost no studies to date provide evidence for why or how treatment works" (p. 1116).

As explicated in recent manuscripts (Kaufman et al, 2005; Stice et al., 2010), there is a critical need for research investigating the mechanisms by which CBT improves depression. Not only would this enlighten the field regarding why treatment works, but it could also contribute to the augmentation of treatment effect as well as the generalization of critical treatment characteristics into clinical practice (Kazdin & Nock, 2003). In addition to the fundamental premise of examining potential mediators and moderators described by Baron and Kenny (1986), additional recommendations have been made with respect to gaining insight into the mechanisms of therapeutic change. Among those proposed by Kazdin and Nock (2003) are (1) assessing two or more potential mediators, (2) including more than one assessment of potential mediators and outcomes during treatment implementation (i.e., between the pre and post assessments) and (3) when possible, alter or vary the mediator across groups. Stice and colleagues (2010) recommend including the measurement of nonspecific factors as well.

In addition, comparisons of program effects based on delivery method could further inform the field regarding the best use of Internet-based adolescent depression programs. Are Internet-based programs more beneficial than in-person or group-based programs? Are they comparable in their benefits? For whom are different delivery models most effective? To what extent does the provision of minimal monitoring and/or support increase program effects?

Given the increasingly wide adoption of mobile technology, particularly among youth, it seems critical to incorporate aspects of the intervention that can be delivered via

the Smart phone and other mobile devices. This may lead to broader acceptance and/or increased utilization of the intervention and therefore improved outcomes for a greater proportion of the treatment group.

Due to its stand-alone nature, dissemination of the BB intervention can occur in a variety of settings. Middle schools that implement Positive Behavior Support are likely to be excellent candidates. In these schools, a system for addressing student difficulties already exists. Within this context, as in others as well, there remains a need for an identification system; that is, a procedure school personnel can use to more effectively identify students who are experiencing subthreshold depression symptoms. Additional training of school personnel on identifying youth with subthreshold depression is necessary. Once the student is identified as needing support for their depressed mood, the support specialist and/or team would have the BB program in their arsenal of interventions.

APPENDIX A

BLUES BLASTER PROGRAM SCREENSHOTS

Figure 1. Training Chart Showing the Five Levels of the Six Modules

Figure 2. My Stuff Page: Allows for Easy Access to Personalized Entries

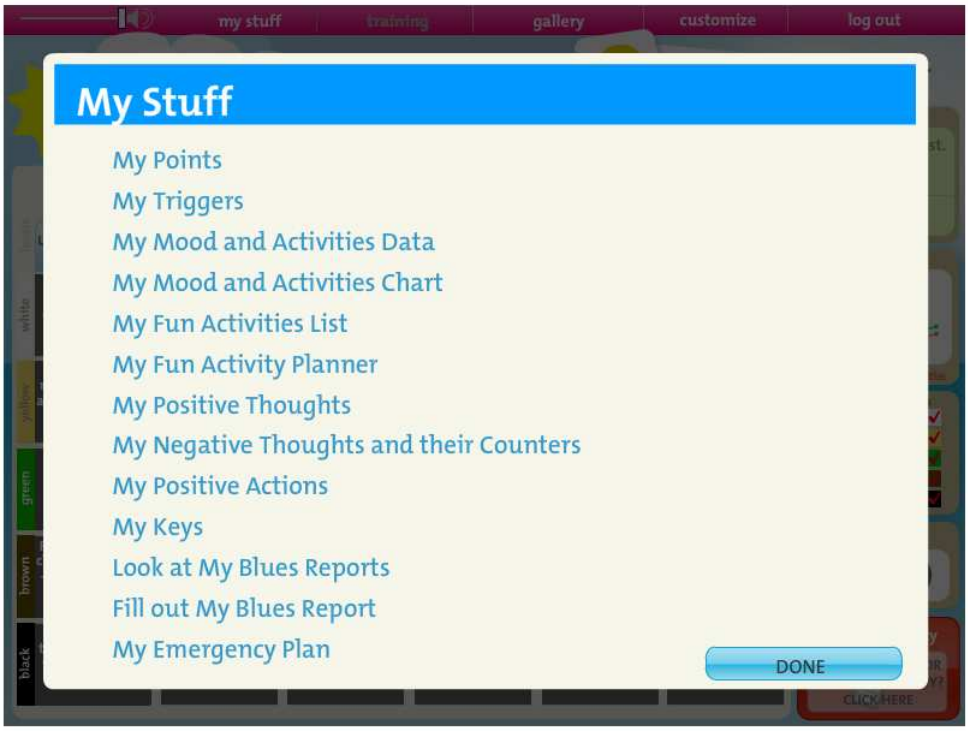


Figure 3. Sample Mini-Session Introduction Page

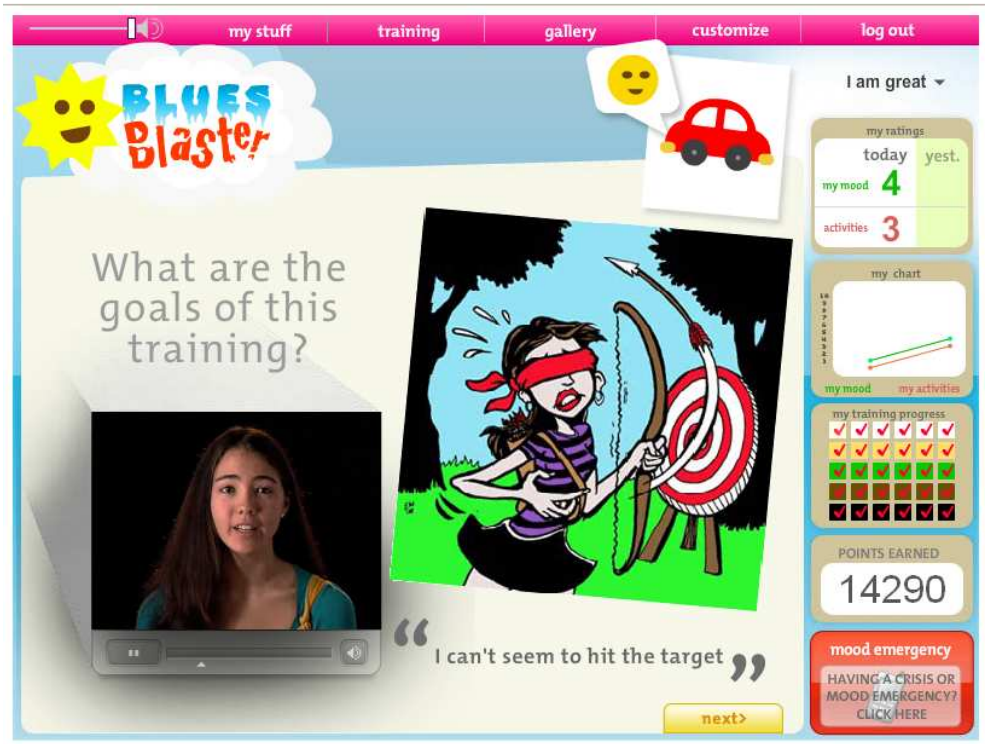


Figure 4. Sample Activity Teaching the Impact of Actions on Mood

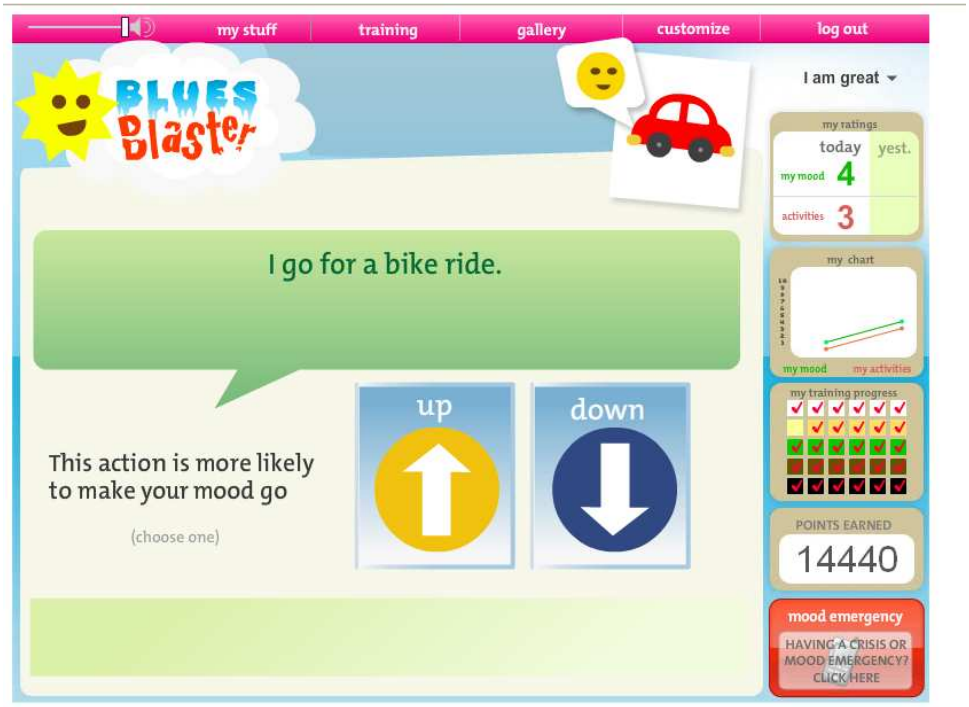


Figure 5. Sample Activity Teaching the Relationship Between Thoughts, Feelings, and Actions

Figure 6. Sample Game in Which the Goal is to Destroy the Negative Mood

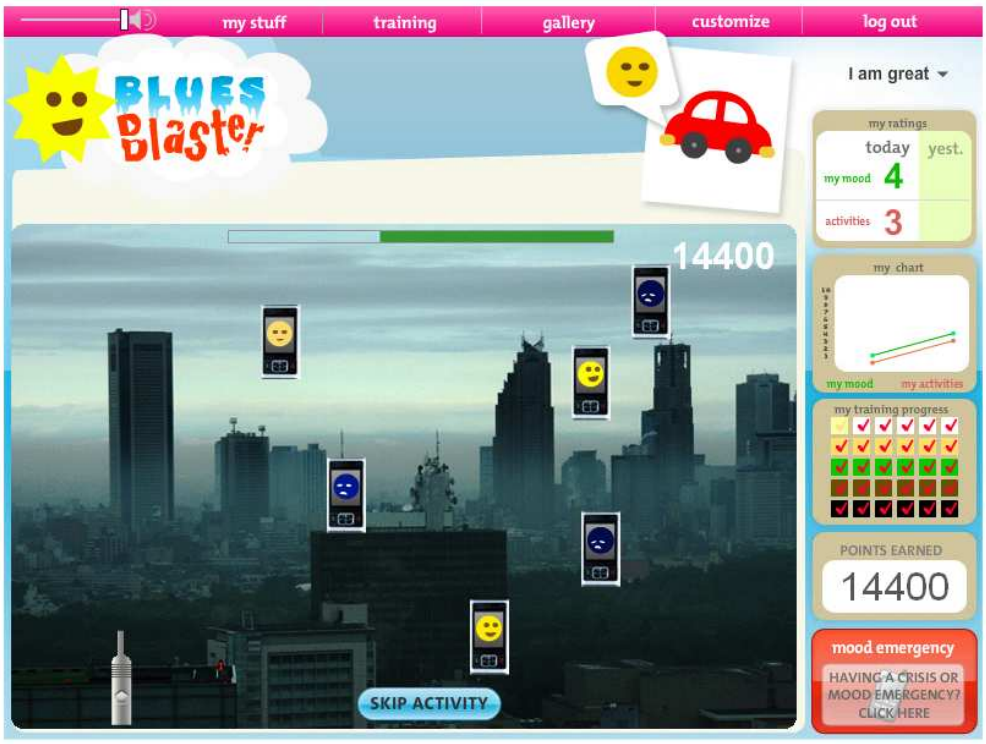
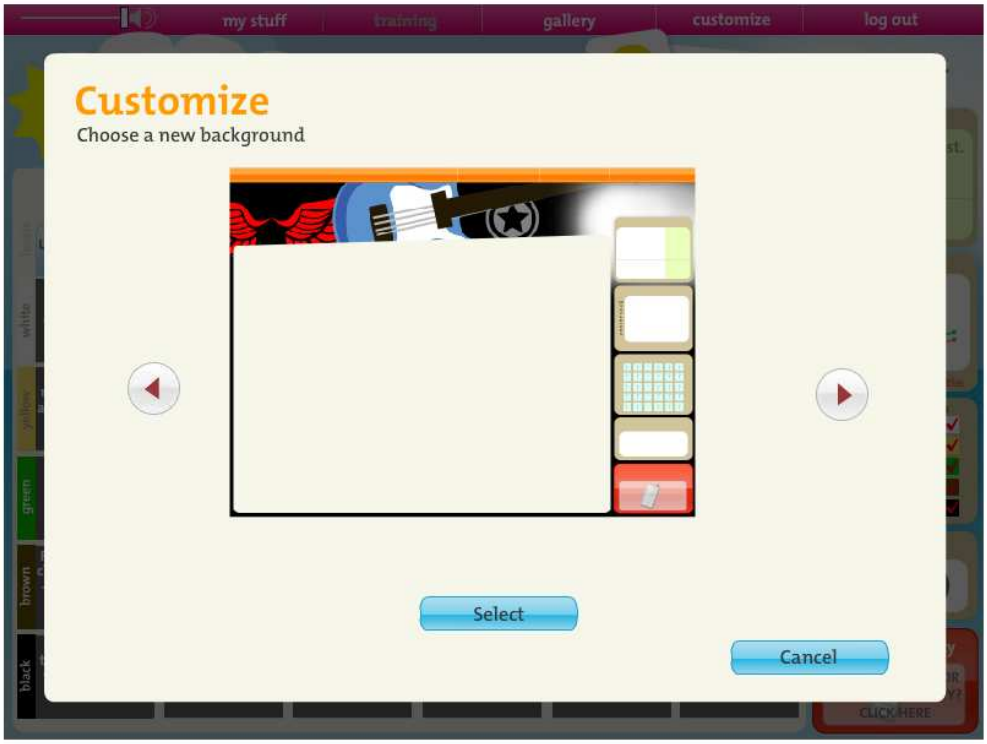


Figure 7. Reinforcement With Point Earnings

Figure 8. Sample of Alternate Interface Design



APPENDIX B

MEASURES

1. Center for Epidemiological Studies – Depression Scale
2. Knowledge Questionnaire
3. Automatic Thoughts Questionnaire
4. Behavioral Activation for Depression Scale, including School Functioning Subscale
5. Self-Efficacy Questionnaire
6. Satisfaction Questionnaire
7. Follow-up Usability Interview

1. Center For Epidemiological Studies – Depression Scale

How often did you feel this way during the past week:	rarely or none of the time	some or little of the time	occasionally or a moderate amount of time	most or all of the time
1. I was bothered by things that usually don't bother me.	1	2	3	4
2. I did not feel like eating; my appetite was poor.	1	2	3	4
3. I felt that I could not shake off the blues, even with help from my family or friends.	1	2	3	4
4. I felt that I was just as good as other people.	1	2	3	4
5. I had trouble keeping my mind on what I was doing.	1	2	3	4
6. I felt depressed.	1	2	3	4
7. I felt that everything I did was an effort.	1	2	3	4
8. I felt hopeful about the future.	1	2	3	4
9. I thought my life had been a failure.	1	2	3	4
10. I felt fearful.	1	2	3	4
11. My sleep was restless.	1	2	3	4
12. I was happy.	1	2	3	4
13. I talked less than usual.	1	2	3	4
14. I felt lonely.	1	2	3	4
15. People were unfriendly.	1	2	3	4
16. I enjoyed life.	1	2	3	4
17. I had crying spells.	1	2	3	4
18. I felt sad.	1	2	3	4
19. I felt that people disliked me.	1	2	3	4
20. I could not get "going."	1	2	3	4

2. Knowledge Questionnaire

1. Which ONE of the following statements is true:
   a. Moods get out of control and there's nothing you can do about them.
   b. I have no control over my moods and I never will.
   c. There are skills I can learn to help me control my mood and get more control of my life.
   d. My moods have nothing to do with choices I make.

2. Which best completes the following sentence?
   "My moods _____ control over me."
   a. have complete
   b. don't have to have
   c. never have

3. Select all of the statements that are true:
   a. The actions I take (or don't take) make my mood go up or down.
   b. My thoughts should not have an impact on my mood.
   b. I can make choices that will lift my mood.
   c. The things I think about can make me feel more frustrated.
   d. Feeling mad can cause me to make bad choices.

4. What is the hardest part of your personality for you to change?
   a. Your Feelings
   b. Your Actions
   c. Your Thoughts
   d. None of the above

5. If you are sad and irritated, no longer interested in the things you used to like, eating and sleeping differently than you normally do, and you have been this way for at least two weeks, and you find all of this is causing problems at home and in school, you may be experiencing which one of the following:
   a. A negative personality
   b. A bad mood
   c. Clinical depression
   d. Teenage emotions
   e. The blues

6. Which ONE of the following is NOT a myth:
   a. Teens who claim to be depressed are weak and moody and just need to pull themselves together.
   b. There is nothing anyone can do to help people who are depressed – they just need to work through it.
   c. If you are Clinically Depressed you should go talk to someone and get help.
   d. Telling someone to cheer up usually helps.

7. Which of the following are reasons for monitoring your mood?
   a. To catch yourself in a low mood and do something about it
   b. To brag to your friends how good your mood is
   c. To understand your negative thinking.
   d. To know if your mood is spiraling down.
   e. To be more self-aware about your moods

8. Which of the following are reasons why it is important to look at your mood data on a graph:
   a. You can notice up or down trends
   b. You can see if you're clinically depressed.
   c. You can see how your mood changes over time.
   d. If your mood is going down, you can take action.

9. Select ALL the statements that are TRUE
   a. There is nothing I can do to improve my mood
   b. When I have fun my mood generally improves
   c. I should try to do more of the activities I enjoy
   d. You shouldn't try to do fun things when you are in a bad mood.
   e. Just staying home and doing nothing will probably make me feel worse

10. Select all of the important factors to remember when choosing fun activities for yourself?
   a. Can I afford them
   b. Do I have time to do them
   c. Do I enjoy them
   d. Will I actually do them
   e. Have I done it before

11. Select all the reasons to track your fun activities
   a. So I can see if my friends like the same things I do
   b. So I'll remember how many I did
   c. So I can see the relation between the number of fun activities I do and my mood
   d. So I can see how busy I am

12. Which is a positive alternative to "I know I'll fail the test?
   a. I'll probably fail
   b. If I study, I might pass
   c. I'm not smart enough
   d. The teacher likes to give us trick questions

13. Thinking more positively helps me: (select all that apply)
   a. Make better choices
   b. Feel better
   c. Have better luck
   d. Have more success

14. Thinking about the movie you're going to see this weekend is an example of which positive thinking strategy?
    a. Savoring
    b. Anticipating
    c. Prompting

15. Which of these are THOUGHTS and NOT feelings?
    a. I can do it
    b. I'm depressed
    c. She doesn't seem to like me
    d. I'm not happy
    e. I'm going to fail

16. "I failed the test - I'll never graduate!" is an example of which type of negative thinking?
    a. Black and white thinking
    b. Catastrophizing
    c. Blaming
    d. Being right

17. Recognizing my negative thoughts is important because: (select all that apply)
    a. They lead to negative feelings
    b. I can change them to positive thoughts
    c. They let me know if I have a negative personality
    d. They make me feel bad

18. To find unrealistic thoughts, listen for words like (select all that apply)
    a. Never
    b. Always
    c. Often
    d. Should
    e. Sometimes

3. Automatic Thoughts Questionnaire

How often did you feel this way during the past week:	not at all	sometimes	moderately often	often	all the time
1. I feel like I'm up against the world.	1	2	3	4	5
2. I'm no good.	1	2	3	4	5
3. Why can't I ever succeed?	1	2	3	4	5
4. No one understands me.	1	2	3	4	5
5. I've let people down.	1	2	3	4	5
6. I don't think I can go on.	1	2	3	4	5
7. I wish I were a better person.	1	2	3	4	5
8. I'm so weak.	1	2	3	4	5
9. My life's not going the way I want it to.	1	2	3	4	5
10. I'm so disappointed in myself.	1	2	3	4	5
11. Nothing feels good anymore.	1	2	3	4	5
12. I can't stand this anymore.	1	2	3	4	5
13. I can't get started.	1	2	3	4	5
14. What's wrong with me?	1	2	3	4	5
15. I wish I were somewhere else.	1	2	3	4	5
16. I can't get things together.	1	2	3	4	5
17. I hate myself.	1	2	3	4	5
18. I'm worthless.	1	2	3	4	5
19. Wish I could just disappear.	1	2	3	4	5
20. What's the matter with me?	1	2	3	4	5
21. I'm a loser.	1	2	3	4	5
22. My life is a mess.	1	2	3	4	5
23. I'm a failure.	1	2	3	4	5
24. I'll never make it.	1	2	3	4	5
25. I feel so helpless.	1	2	3	4	5
26. Something has to change.	1	2	3	4	5
27. There must be something wrong with me.	1	2	3	4	5
28. My future is bleak.	1	2	3	4	5
29. It's just not worth it.	1	2	3	4	5
30. I can't finish anything.	1	2	3	4	5

4. Behavioral Activation For Depression Scale, With School Functioning Subscale

	During the past week:	not at all		a little		a lot		completely
1.	I stayed in bed for too long even though I had things to do.*	0	1	2	3	4	5	6
2.	There were certain things I needed to do that I didn't do.*	0	1	2	3	4	5	6
3.	I am content with the amount and types of things I did.	0	1	2	3	4	5	6
4.	I engaged in a wide and diverse array of activities.	0	1	2	3	4	5	6
5.	I made good decisions about what type of activities and/or situations I put myself in.	0	1	2	3	4	5	6
6.	I was active, but did not accomplish any of my goals for the day.*	0	1	2	3	4	5	6
7.	I was an active person and accomplished the goals I set out to do.	0	1	2	3	4	5	6
8.	Most of what I did was to escape from or avoid something unpleasant.*	0	1	2	3	4	5	6
9.	I did things to avoid feeling sadness or other painful emotions.*	0	1	2	3	4	5	6
10.	I tried not to think about certain things.*	0	1	2	3	4	5	6
11.	I did things even though they were hard because they fit in with my long-term goals for myself.	0	1	2	3	4	5	6
12.	I did something that was hard to do but it was worth it.	0	1	2	3	4	5	6
13.	I spent a long time thinking over and over about my problems.*	0	1	2	3	4	5	6
14.	I kept trying to think of ways to solve a problem but never tried any of the solutions.*	0	1	2	3	4	5	6

Behavioral Activation For Depression Scale, With School Functioning Subscale (continued)

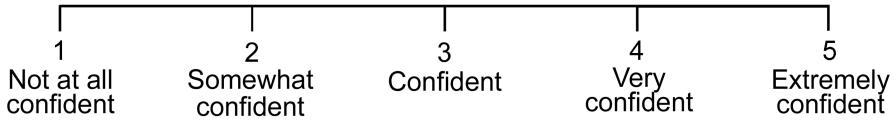
During the past week:	not at all		a little		a lot		completely
15. I frequently spent time thinking about my past, people who have hurt me, mistakes I've made, and other bad things in my history.*	0	1	2	3	4	5	6
16. I did not see any of my friends.*	0	1	2	3	4	5	6
17. I was withdrawn and quiet, even around people I know well.*	0	1	2	3	4	5	6
18. I was not social, even though I had opportunities to be.	0	1	2	3	4	5	6
19. I pushed people away with my negativity.*	0	1	2	3	4	5	6
20. I did things to cut myself off from other people.*	0	1	2	3	4	5	6
21. I took time off of work/school/ chores/responsibilities simply because I was too tired or didn't feel like going in.*	0	1	2	3	4	5	6
22. My work/schoolwork/chores/ responsibilities suffered because I was not as active as I needed to be.*	0	1	2	3	4	5	6
23. I structured my day's activities.	0	1	2	3	4	5	6
24. I only engaged in activities that would distract me from feeling bad.*	0	1	2	3	4	5	6
25. I began to feel badly when others around me expressed negative feelings or experiences.*	0	1	2	3	4	5	6

Note: All items with a '*' were reverse-coded; a higher total score represented greater activation. The School Functioning subscale includes items 1, 2, 6, 21, and 22.

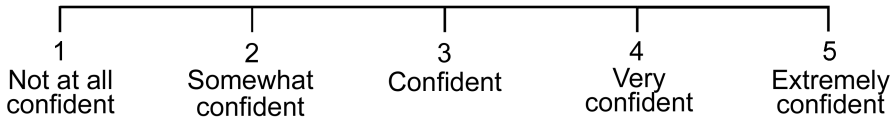
5. Self-Efficacy Questionnaire

Please answer the following questions about the next 7 days.

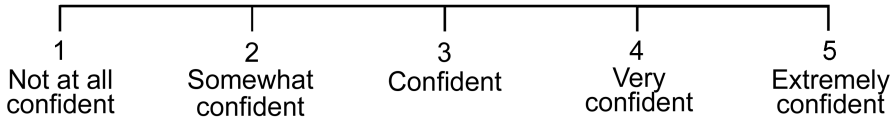
1. How confident are you that you can do activities with other people on a daily basis?



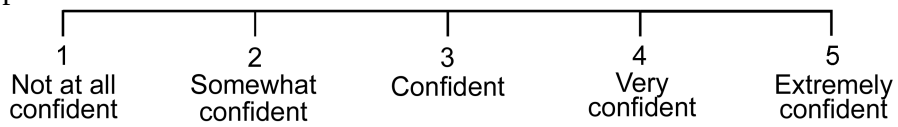
2. How confident are you that you can schedule pleasant activities on a daily basis?



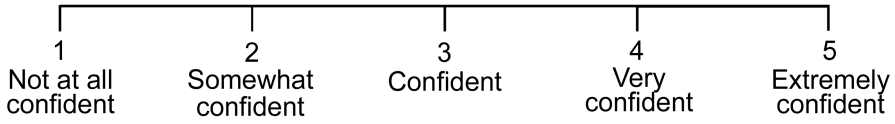
3. How confident are you that you can do pleasant activities on a daily basis?



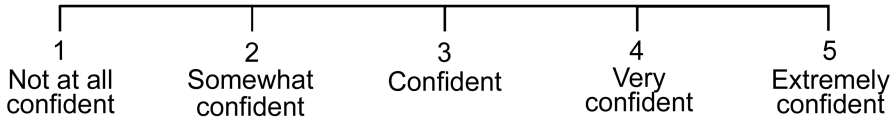
4. How confident are you that you can increase the number of pleasant activities you participate in?



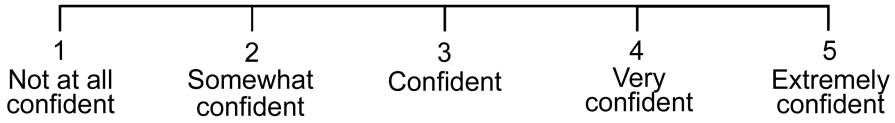
5. How confident are you that you can compare how you are feeling each day to how you have felt in the past?



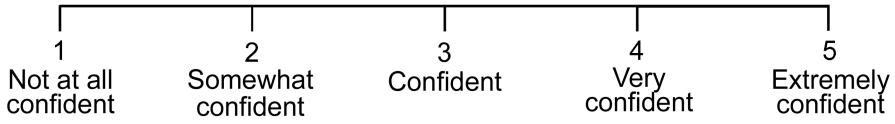
6. How confident are you that you can keep track of how you are feeling each day?



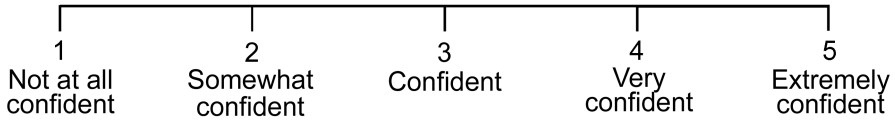
7. How confident are you that you can check in with yourself to see how you are feeling at the same time everyday?



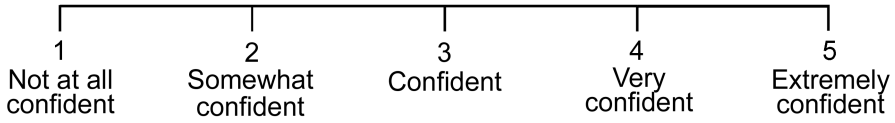
8. How confident are you that you can talk to somebody to get help if you are feeling depressed?



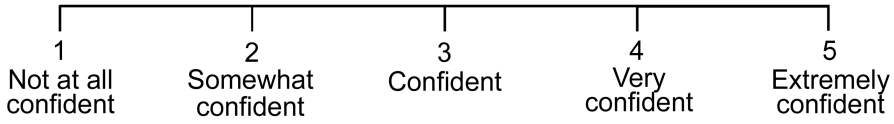
9. How confident are you that you can change your actions to help change how you feel?



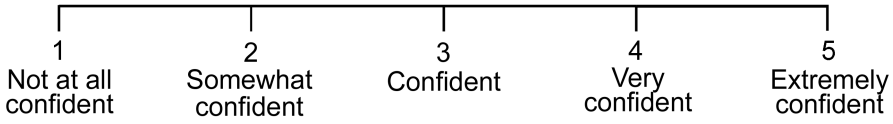
10. How confident are you that you can recognize your positive thoughts?



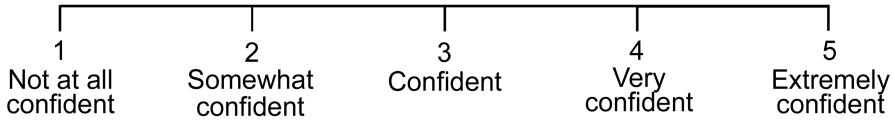
11. How confident are you that you can recognize your negative thoughts?



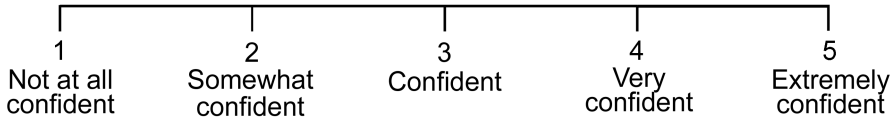
12. How confident are you that you can change your negative thoughts to more positive ones?



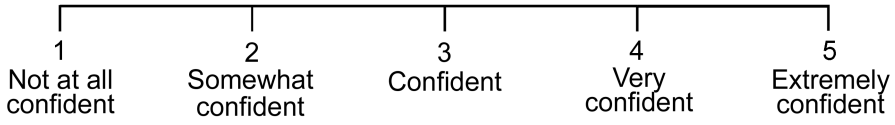
13. How confident are you that you can change your thinking to help you feel better and more in control of your life?



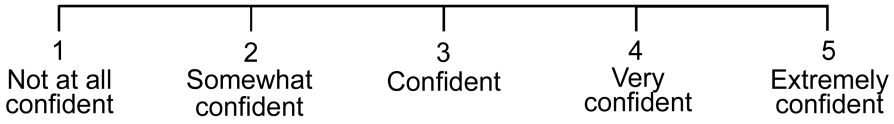
14. How confident are you that you can find positive thoughts in negative situations?



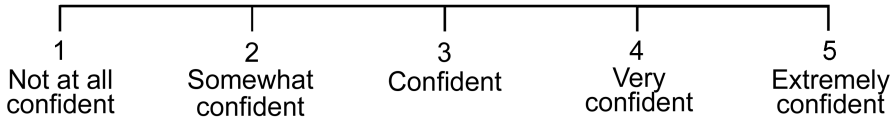
15. How confident are you that you know which positive thoughts work for you,?



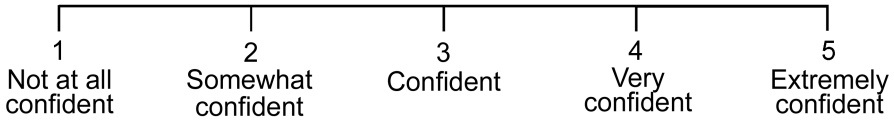
16. How confident are you that you can tell the difference between your thoughts and your feelings?



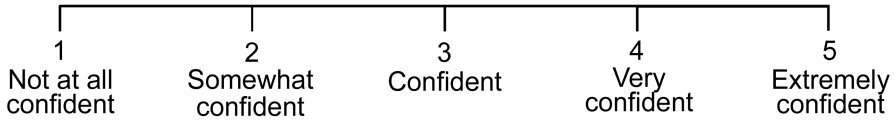
17. How confident are you that you can recognize the events and thoughts that lead to bad feelings?



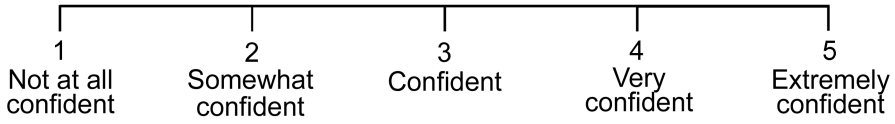
18. How confident are you that you can recognize your own negative thinking?



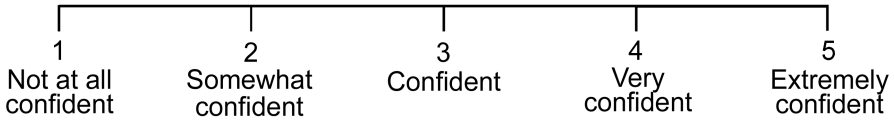
19. How confident are you that you know the difference between realistic and unrealistic thoughts?



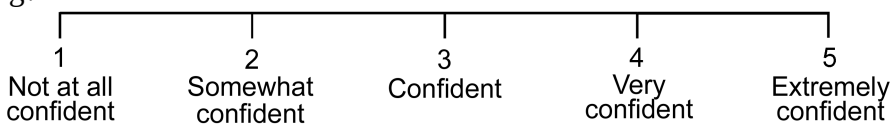
20. How confident are you that you can change an unrealistic thought to a realistic one?



21. How confident are you that you can counter your negative thinking with positive thoughts?



22. How confident are you that you can take positive actions to counter your negative thinking?



6. Satisfaction Questionnaire

How much do you agree with each of the statements below?	Strongly disagree	Mostly disagree	Slightly disagree	Slightly agree	Mostly agree	Strongly agree
1. The program was fun.	1	2	3	4	5	6
2. The program was helpful to me.	1	2	3	4	5	6
3. I felt like this program was made for someone like me.	1	2	3	4	5	6
4. I would recommend the program to a friend.	1	2	3	4	5	6
5. The program was easy to use.	1	2	3	4	5	6
6. I liked the program pace - it was not too fast or too slow.	1	2	3	4	5	6
7. I liked having the next and previous buttons to move around in the program.	1	2	3	4	5	6
8. I liked the amount of reading.	1	2	3	4	5	6
9. I liked the narrator.	1	2	3	4	5	6
10. I liked the comic strips	1	2	3	4	5	6
11. I liked earning points.	1	2	3	4	5	6
12. I liked seeing a graph of my mood and activities.	1	2	3	4	5	6
13. The activities/games in each cell helped me learn the material.	1	2	3	4	5	6
14. The quests helped me practice what I learned.	1	2	3	4	5	6
15. My Fun Activities List was useful to me.	1	2	3	4	5	6
16. The Mood and Activities Tracking form was easy to fill out.	1	2	3	4	5	6
17. The program helped me understand depression.	1	2	3	4	5	6
18. The program helped me understand the connections between feelings, actions, and thoughts.	1	2	3	4	5	6
19. The program helped me understand how to prevent a downward spiral and create an upward spiral.	1	2	3	4	5	6

Satisfaction Questionnaire (continued)

How much do you agree with each of the statements below?	Strongly disagree	Mostly disagree	Slightly disagree	Slightly agree	Mostly agree	Strongly agree
20. The program helped me know more about monitoring my mood.	1	2	3	4	5	6
21. The program helped me understand more about the importance of pleasant activities.	1	2	3	4	5	6
22. The program helped me learn what makes my mood go up and down.	1	2	3	4	5	6
23. The program helped me learn how to increase my positive thoughts.	1	2	3	4	5	6
24. The program helped me learn about my negative thoughts.	1	2	3	4	5	6
25. The program helped me learn how to change my negative thoughts into positive ones.	1	2	3	4	5	6
26. The quizzes helped me understand the material better.	1	2	3	4	5	6

7. Follow-Up Usability Interview

Program Experience

What would you tell a friend about Blues Blaster?

Would you recommend they use it? *(yes/no)*

Why or why not?

If you were going to recommend it to a friend, what would you say?

What is the best part of the Blues Blaster program?

- ☐ Narrator_____
- ☐ Personal Stories/Video Testimonials_____
- ☐ Comic Strips _____
- ☐ Activities/Games_____
- ☐ Quizzes_____
- ☐ Quests/Assignments _____
- ☐ Graphing & Tracking Mood & Activities_____
- ☐ Fun Activity Planning_____
- ☐ Earning Points_____
- ☐ Graphics_____
- ☐ Other_____

What did you like about that part? OR Why is that the best part?

What part helped you the most?

What part was the most interesting?

What part(s) bugged or annoyed you?

- ☐ Narrator_____
  _____
- ☐ Personal Stories/Video Testimonials_____
- ☐ Comic Strips _____
- ☐ Activities/Games_____
- ☐ Quizzes_____
- ☐ Quests/Assignments _____
- ☐ Graphing & Tracking Mood & Activities_____
- ☐ Fun Activity Planning_____
- ☐ Earning Points_____
- ☐ Graphics_____
- ☐ Other_____

Why was _____ annoying?

Perceived Effectiveness

Blues Blaster teaches how to track moods, use fun activities to change moods, increase positive thinking, and decrease negative thinking.

Which of these skills have you used since you started the Blues Blaster study?
Tell me about how you used _____ [skill].

- ☐ Tracking your moods
- ☐ Scheduling/tracking fun activities
- ☐ Using fun activities to improve your mood
- ☐ Figuring out your mood triggers
- ☐ Increasing your positive thinking
- ☐ Decreasing your negative thinking

Which skills were easiest to learn?

- ☐ Tracking your moods
- ☐ Scheduling/tracking fun activities
- ☐ Using fun activities to improve your mood
- ☐ Figuring out your mood triggers
- ☐ Increasing your positive thinking
- ☐ Decreasing your negative thinking

Which skills were the hardest to learn?

- ☐ Tracking your moods
- ☐ Scheduling/tracking fun activities
- ☐ Using fun activities to improve your mood
- ☐ Figuring out your mood triggers
- ☐ Increasing your positive thinking
- ☐ Decreasing your negative thinking

Which skills helped you the most?

- ☐ Tracking your moods
- ☐ Scheduling/tracking fun activities
- ☐ Using fun activities to improve your mood
- ☐ Figuring out your mood triggers
- ☐ Increasing your positive thinking
- ☐ Decreasing your negative thinking

If not tried, why haven't you tried them?

Design

The people who made Blues Blaster are thinking about adding a program for parents, so they can help with their child's/kid's moods.

Did your parents know when you were using the BluesBlaster program?

Did your parents talk to you about the program?

Did they help you learn the skills?

Did you ask your parents to help you?

Do you think it would be a good idea to have parents help their children/kids use the Blues Blaster program to learn the skills? *(yes/no)* Why or why not?

Which parts would be good to have parents help their children/kids with? Why?

Which parts would *not* be good for parents to help with? Why?

If parents did help their children/kids with Blues Blaster, which would be better:

- ☐ Children/kids doing each session together with their parent?
- ☐ Children/kids doing each session on their own and then talking about it with a parent? Why?

Do you think children/kids would like to be able to control what their parents see? *(yes/no)* Why do you think that?

Markets And Delivery

The people who made Blues Blaster are thinking about putting parts of it on a cell phone.

What parts do you think kids would like to use that way?

- ☐ Narrator_____
- ☐ Personal Stories/Video Testimonials_____
- ☐ Comic Strips _____
- ☐ Activities/Games_____
- ☐ Quizzes_____
- ☐ Quests/Assignments _____
- ☐ Graphing & Tracking Mood & Activities_____
- ☐ Fun Activity Planning_____
- ☐ Earning Points_____
- ☐ Graphics_____
- ☐ Other_____

Think about electronic devices and other technologies that you have used and seen. Can you think of any that would be good to use with Blues Blaster?

My last two questions are a little bit different. They are not really about Blues Blaster, but are about fun activities…

What fun things do you do *with your parent(s*)?

What fun things would you *like* to do with your parents?

APPENDIX C

TABLES OF DESCRIPTIVE STATISTICS AND ANCOVA RESULTS FOR BASELINE, POSTTEST, AND FOLLOW-UP OUTCOME MEASURES FOR OBSERVED DATA

TABLE 1. DESCRIPTIVE STATISTICS FOR BASELINE AND POSTTEST OUTCOME MEASURES AND PRE TO POST ANCOVA RESULTS FOR OBSERVED DATA

	Control (n = 77)			Treatment (n = 61)			Test Statistics		
Domain/Measure	Baseline *M (SD)*	Post *M (SD)*	M_{Adj}	Baseline *M (SD)*	Post *M (SD)*	M_{Adj}	*F*	*p-value*	Effect size, *d*
Depression Level (CES-D)	27.19 (9.12)	24.99 (10.53)	25.02	26.91 (8.74)	21.07 (9.70)	21.03	6.88	.010	-.39
Knowledge	.70 (.12)	.70 (.12)	.70	.69 (.10)	.78 (.13)	.78	17.82	<.001	.62
Negative Thoughts	73.63 (28.73)	68.57 (30.41)	69.80	77.63 (26.90)	60.47 (28.39)	58.82	6.24	.014	-.37
Behavioral Activation	104.73 (19.68)	105.36 (25.17)	104.83	101.21 (19.44)	114.61 (21.91)	115.31	8.69	.004	.44
School Functioning	22.44 (6.42)	22.05 (6.58)	22.07	21.83 (5.44)	24.15 (6.71)	24.13	4.18	.030	.31
Self Efficacy	2.70 (.66)	2.81 (.78)	2.83	2.83 (.73)	3.23 (.88)	3.20	8.86	.003	.45

Note. *M* = Mean, *SD* = Standard Deviation, M_{Adj} = Post mean adjusted for baseline levels.

TABLE 2. DESCRIPTIVE STATISTICS FOR BASELINE AND FOLLOW-UP OUTCOME MEASURES AND PRE TO FOLLOW-UP ANCOVA RESULTS FOR OBSERVED DATA

	Control (n = 81)			Treatment (n = 60)			Test Statistics		
Domain/Measure	Baseline *M (SD)*	Follow-up *M (SD)*	M_{Adj}	Baseline *M (SD)*	Follow-up *M (SD)*	M_{Adj}	*F*	*p-value*	Effect size, *d*
Depression Level (CES-D)	27.19 (9.12)	21.42 (10.37)	21.44	26.91 (8.74)	18.12 (9.70)	18.09	3.85	.052	-.32
Knowledge	.70 (.12)	.71 (.12)	.71	.69 (.10)	.80 (.13)	.80	30.98	<.001	.78
Negative Thoughts	73.63 (28.73)	68.08 (29.96)	68.44	77.63 (26.90)	55.75 (28.39)	55.23	7.55	.007	-.46
Behavioral Activation	104.73 (19.68)	108.67 (20.73)	108.44	101.21 (19.44)	117.07 (21.91)	117.39	6.25	.014	.40
School Functioning	22.44 (6.42)	22.68 (6.51)	22.64	21.83 (5.44)	25.72 (6.71)	25.78	8.93	.003	.48
Self Efficacy	2.70 (.66)	2.94 (.77)	2.95	2.83 (.73)	3.42 (.88)	3.40	11.91	.001	.58

Note. *M* = Mean, *SD* = Standard Deviation, M_{Adj} = Post mean adjusted for baseline levels.

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