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## Contents

### Regular Articles

- |  |   |      |
|--|---|------|
| <b>Louise Quarmby, Katharine A. Rimes, Alicia Deale, Simon Wesseley and Trudie Chalder</b>                       | Cognitive-behaviour therapy for chronic fatigue syndrome: Comparison of outcomes within and outside the confines of a randomised controlled trial | 1085 |
| <b>Michelle G. Craske, Todd J. Farchione, Laura B. Allen, Velma Barrios, Milena Stoyanova and Raphael Rose</b>   | Cognitive behavioral therapy for panic disorder and comorbidity: More of the same or less of more?  | 1095 |
| <b>Martin E.P. Seligman, Peter Schulman and Alyssa M. Tryon</b>  | Group prevention of depression and anxiety symptoms   | 1111 |
| <b>John R.Z. Abela and Steven A. Skitch</b>  | Dysfunctional attitudes, self-esteem, and hassles: Cognitive vulnerability to depression in children of affectively ill parents                   | 1127 |
| <b>Alishia D. Williams and Michelle L. Moulds</b>  | Cognitive avoidance of intrusive memories: Recall vantage perspective and associations with depression  | 1141 |
| <b>Gerald J. Haefel, Lynn Y. Abramson, Paige C. Braze, James Y. Shah, Bethany A. Teachman and Brian A. Nosek</b> | Explicit and implicit cognition: A preliminary test of a dual-process theory of cognitive vulnerability to depression                             | 1155 |

*[Continued on outside back cover]*

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## Group prevention of depression and anxiety symptoms

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### Abstract

To prevent depression and anxiety, we delivered a brief, classroom-based cognitive-behavioral workshop along with ongoing Web-based materials and e-mail coaching to college students at risk for depression. At risk was defined as having mild to moderate depressive symptoms on a self-report measure of depression. Two hundred forty students were randomized into either an eight-week workshop that met in groups of 10, once per week for 2 h or into an assessment-only control group. We plan to track participants for 3 years after the workshop and here we report the 6 month preventive effects on depression and anxiety. The workshop group had significantly fewer depressive symptoms and anxiety symptoms than the control group, but there was no significant difference between the conditions on depression or anxiety episodes at 6 month follow up. The workshop group had significantly better well being than the control group, and the workshop group had significantly greater improvement in optimistic explanatory style than the control group. Improved explanatory style was a significant mediator of the prevention effects from pre- to post-workshop for depressive and anxiety symptoms, as well as for improved well being.

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*Keywords:* Prevention; Depression; Anxiety; Cognitive behavioral intervention; Positive psychology; Optimism; Explanatory style

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Depression has such a high human, social, and financial cost that discovering inexpensive and disseminable ways to prevent it is a high public health priority. Unipolar depression is one of the most common psychological disorders in adulthood and adolescence, affecting approximately 11 million individuals each year in the United States alone. Estimates of its monetary costs exceed \$43 billion a year in treatment and lost productivity, a toll slightly larger than the costs of heart disease (Greenberg, Stiglin, Finkelstein, & Berndt, 1993). Various estimates indicate that somewhere between 10% and 25% of American adults will experience an episode of depression during their lifetime (Muñoz, 1987).

Cognitive-behavior therapy (CBT) has proven to be roughly as effective in treating unipolar depression among adults as antidepressant medication, and produces marked relief in about 65–70% of patients (Dobson, 1989; Beck, Hollon, Young, Bedrosian, & Budenz, 1985; Hollon et al., 1992). Recent research suggests that CBT is an efficacious treatment for adolescent depression as well (Harrington, Whittaker, & Shoebridge, 1998; Kaslow & Thompson, 1998).

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Depressive episodes and depressive symptoms are linked to a pessimistic explanatory style (Peterson & Seligman, 1984; Sweeney, Anderson, & Bailey, 1986; Robins & Hayes, 1995; Abramson et al., 2000) and making explanatory style more optimistic seems to be one of the mediators by which a cognitive-behavioral intervention prevents and relieves depression and anxiety (Seligman, Schulman, DeRubeis, & Hollon, 1999; DeRubeis & Hollon, 1995; Seligman et al., 1988). We therefore included a measure of explanatory style in this study.

Most documented depression prevention programs are based on cognitive-behavioral theories of depression (Beck, 1976; Ellis, 1962; Seligman, 1991; Lewinsohn, Muñoz, Youngren, & Zeiss, 1978). Can the skills taught in cognitive therapy for depression also be taught preventively to individuals at risk? The answer seems to be yes, but there has been relatively little prevention research. We first review prevention research with college-age students and adolescents, then middle school students.

In research similar to the study we report in this article, Seligman, Schulman, DeRubeis, and Hollon (1999), found a significant prevention effect using a targeted cognitive-behavioral intervention with college students at risk for depression. The intervention group had significantly fewer moderate depressive episodes through three years of follow-up, but there was no preventive effect for severe depressive episodes, which were few in number in this college student sample. In addition, they found significantly fewer episodes of moderate generalized anxiety disorder than the control group, and again there were very few severe episodes in this population. Further, the intervention group had significantly fewer depressive symptoms and anxiety symptoms than the control group and significantly greater improvements in explanatory style, hopelessness, and dysfunctional attitudes, each of which were significant mediators of depressive symptom prevention. Finally the intervention group had better physical health than the control group (Buchanan, Gardenswartz, & Seligman, 1999). In this study, we were primarily interested in the prevention of depression, but included measures of anxiety, given the high comorbidity of depression and anxiety.

The term “targeted intervention” means that participants in the study are at an elevated risk for depression, whereas a “universal intervention” does not restrict participation to only those at elevated risk. There is evidence that those at elevated risk benefit more from an intervention than those who are not at elevated risk.

Clarke and colleagues conducted a randomized controlled study of the prevention of depressive disorders in adolescents, using a targeted cognitive-behavioral intervention (Clarke et al., 1995). This intervention significantly prevented depressive disorders through 1-year follow up. The intervention also significantly reduced self-reported depressive symptoms at post-intervention, but not over the follow-up period, and not for clinician-rated depressive symptoms.

Peden and colleagues found that a brief, targeted cognitive-behavioral group intervention significantly prevented depressive symptoms over 18 months of follow up with female college students who were at risk for depression. Being at risk was based on having mild to moderate depressive symptoms. There was no clinician-rated measure of major depressive episode (Peden, Rayens, Hall, & Beebe, 2001).

In a targeted cognitive-behavioral group intervention to prevent depression and bulimia among college-age women who were identified as being at risk based on their body image concerns, the intervention group had significantly reduced depressive symptoms at 3 months of follow up, but the effect faded at 6 months. This intervention, however, was particularly brief, consisting of four 1 h sessions. There was no clinician-rated measure of major depressive episode (Bearman, Stice, & Chase, 2003).

Using a brief, targeted cognitive intervention with high-risk offspring (aged 13–18 years) of adults treated for depression, Clarke and colleagues found a significant preventive effect for both self-reported depressive symptoms and clinician-rated major depressive episodes at 1-year follow up. By the 2-year follow up, however, the preventive effects faded (Clarke et al., 2001).

Among middle school age children, Gillham and her colleagues gave a cognitive behavioral prevention program to late elementary and middle school children identified as being at risk for depression. They found that the intervention group reported significantly fewer depressive symptoms than controls through 2 years of follow-up. The intervention group was significantly less likely to report moderate to severe levels of symptoms over 2 years of follow up. The preventive effects, however, did not endure beyond 2 years (Jaycox, Reivich, Gillham, & Seligman, 1994; Gillham, Reivich, Jaycox, & Seligman, 1995; Gillham & Reivich, 1999; Gillham, Hamilton, Freres, Patton, & Gallop, 2006).

Cardemil and colleagues conducted a cognitive-behavioral prevention program with inner-city middle school children in a universal design and found a significant prevention effect in the Latino sample, but not the African-American children (Cardemil, Reivich, & Seligman, 2000). Yu (1999) delivered a cognitive-behavioral prevention program in a targeted intervention with Mainland Chinese children who were selected on the basis of above average reports of depressive symptoms and/or family conflict. The intervention group reported significantly fewer depressive symptoms at post-intervention, 3 month and 6 month follow up.

In sum, there has been relatively little prevention research, especially among college-age young adults, and there is some evidence that cognitive interventions can reduce depressive symptoms in the short term, sometimes prevent clinical episodes of depression in the short term, and the effects are usually short-lived.

Is there research that supports the use of computer-based or web-based materials for depression? There is limited research on this relatively new method, but some positive indications for the treatment of depression. There is evidence that computer-based cognitive behavioral therapy can effectively treat depression (Wright & Wright, 1997; Greist, 1989; Cavanagh & Shapiro, 2004; Proudfoot et al., 2003). Contrary to predictions that patients would have a negative response to computer-assisted therapy, research has shown that patients typically report high satisfaction with computer-assisted therapy and find the experience beneficial (Wright & Wright, 1997; Greist, 1989; Colby, Gould, & Aronson, 1989; Nadelson, 1987; Locke & Rezza, 1996; Bloom, 1992; French & Beaumont, 1987). We therefore decided to supplement our classroom-based workshop with Web-based materials.

We now report a replication and extension of the study by Seligman and colleagues (1999), adding Web-based material and e-mail coaching as a supplement to the workshop. In the original study, the intervention effects diminished gradually over the course of the 3-year follow up. To try to boost and maintain the intervention effect, we added two new components to this replication that did not exist in the original study—Web-based materials and e-mail coaching, on the grounds that these would be convenient ways for participants to refresh and retain the skills they learned in the classroom-based workshop. We also made many stylistic and substantive improvements to the classroom-based workshop for this study, based on more than a decade of experience delivering the workshops to various populations, discussed in more detail below. The primary goal of this study was therefore to replicate the preventive effects found by Seligman and colleagues, and to determine whether Web-based material and e-mail coaching could maintain the intervention effect over three years of follow up. We are still in the process of collecting the 3 years of follow up data, so this article presents only the short term effects of the intervention, up to 6 months of follow up.

The primary outcomes of interest were depression episodes and depressive symptoms. Given the high comorbidity of depression and anxiety, we included measures of anxiety episodes and anxiety symptoms.

Are the participants in this study at high risk for depression? We have found in our previous research with University of Pennsylvania students that the overall incidence of definite or severe major depressive episodes is lower than in the general population (Seligman et al., 1999). Relative to other University of Pennsylvania students, however, the participants in this study are at higher risk for depression, by virtue of having mild to moderate depressive symptoms on the Beck Depression Inventory (BDI). The best predictor of future depression is current depression (Joyce & Paykel, 1989; Keller, Shapiro, Lavori, & Wolfe, 1982) and the BDI is an extensively validated measure of depressive symptoms. While one of our targets is preventing episodes of depression, we believe that the focus on clinical diagnoses as the target for prevention overlooks the importance of preventing sub-clinical conditions as well. Individuals who report high levels of symptoms are at a substantially increased risk for depressive disorders (Clarke, Hawkins, Murphy, Sheeber, Lewinsohn, & Seeley, 1995; Lewinsohn, Hoberman, & Rosenbaum, 1988; Muñoz, 1993). Horwarth and colleagues found that adults with elevated depressive symptoms were 4.4 times as likely as those with few or no symptoms to develop depressive disorders within a 1-year period (Horwarth, Johnson, Klerman, & Weissman, 1992). Thus, an intervention that treats or reduces high levels of symptoms is likely to prevent depressive episodes (Muñoz, 1993). Equally important, we believe that the symptoms of depression are wholly continuous with the “disorder” of unipolar depression and that preventing the symptoms will in and of itself prevent considerable human suffering and dysfunction.

We had five hypotheses: (1) the intervention would reduce depressive and anxiety symptoms, (2) the intervention would prevent depressive and anxiety episodes, (3) the intervention would increase well-being, (4) the intervention would lead to a more optimistic explanatory style, and (5) explanatory style would be one of the mediators of these intervention effects.

## Method

### *Participants*

All 240 participants entered the study as first year undergraduates at the University of Pennsylvania. Sixty five percent of the participants were female and 35% were male. College students have several advantages for prevention studies of depression: (1) a high percentage agree to participate, (2) attrition is very low, (3) they are easily tracked longitudinally and (4) they are at a time of life with heightened risk for mild to moderate depression because of transition from home, new relationships, and major shifts to emotional and physical autonomy.

All participants were identified as being at risk for depression and are being tracked for at least 3 years following the classroom-based workshop. We mailed the BDI to all incoming students in the summer before their first semester at the university. Students were eligible to participate if they met all of the following criteria:

1. At risk for depression by virtue of scoring between 9 and 24 on the BDI, which are considered mild to moderate levels of depressive symptoms. We excluded those with a BDI score above 24, however, as these individuals were more likely to be in a current major depressive episode, and the purpose of the study was to prevent depression, not to treat current depression. Those who scored above 24 were 1.5% of the total.
2. Read and sign the voluntary consent form.

### *Measures: diagnosis*

We used the structured clinical interview for the DSM-IV to assess major depressive episodes and generalized anxiety disorders (SCID: First, Spitzer, Gibbon, & Williams, 2001). The SCID is a structured diagnostic interview designed to yield DSM-IV diagnoses across five axes. We only used the MDD and generalized anxiety disorder (GAD) sections from the SCID. All diagnostic interviews were audiotaped, unless the participant objected (less than 1% objected), and 10% of the tapes were randomly selected and checked by a second interviewer for diagnostic accuracy. We also used a short, self-report version of the Longitudinal Interval Follow Up Evaluation to determine who might be having a current episode of MDD or GAD and therefore who should receive a diagnostic interview (LIFE: Keller et al., 1987). We created this short version for this study, so there is no research on this instrument. This instrument included questions only pertaining to depression and generalized anxiety disorder. There were eight yes-no questions for MDD and eight for GAD, yielding a score of 0–8 for each.

### *Measures: symptoms*

We used the 21 item self-report BDI to measure depressive symptoms (BDI: Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the 21 item self-report beck anxiety inventory (BAI) to measure anxiety symptoms (BAI: Beck, Epstein, Brown, & Steer, 1988).

### *Measures: well being*

We administered two measures of well being: the Satisfaction with Life Scale (SLC) and the Fordyce Emotions Questionnaire. The Satisfaction with Life Scale is a four-item measure of general life satisfaction (Diener, Emmons, Larsen & Griffin, 1985). The Fordyce Emotions Questionnaire asks two questions on happiness. In the first question, the test-taker selects from a list of 11 items ranging from extremely happy to extremely unhappy. In the second question, the test-taker is asked to rate the percentage of time he or she is happy, unhappy, and neutral (Fordyce, 1988).

### *Measures: mediators*

We measured explanatory style as a potential mediator of the prevention effect. The Attributional Style Questionnaire (ASQ; Seligman, Abramson, Semmel, & von Baeyer, 1979; Peterson et al., 1982) is a self-report instrument that yields scores for explanatory style for bad events and for good events using three causal dimensions: internal vs. external, stable vs. unstable, and global vs. specific causes. The ASQ presents 12 hypothetical events, half good and half bad events, and the test-taker is asked to write down the one major cause of each event and then rate the cause along a 7-point continuum for each of the three causal dimensions. We report results for the ASQ variable that represents all of the questions on the instrument, the explanatory style for good events minus the explanatory style for bad events.

### *Measure: manipulation check*

We developed a 25-item multiple choice questionnaire for this study, to measure how well participants learned the skills taught in the workshop and see if these are common sense notions that the control group would understand without having received the intervention. There is therefore no prior research on this questionnaire.

### *Diagnostic interviewers*

Diagnostic interviewers administered the SCID. All interviewers were graduate students at area doctoral clinical psychology programs and had experience and training in diagnosis and assessment prior to joining the study. For our study, interviewers went through about 10 h of in-class training, which consisted of lectures, discussion, and role-playing, plus about 10 h of homework. To be accepted as an interviewer, trainees had to pass a written test of the diagnostic criteria for the SCID and have satisfactory reliability on several audiotaped interviews. In addition, throughout the entire diagnostic interviewing phase, all interviewers met in a group with the supervisor several times each semester to discuss questions and the entire group did a reliability check using an audiotaped interview that was then discussed as a group. The purpose of these meetings was to prevent the interviewers from drifting from the appropriate interview techniques.

### *The workshop*

The classroom-based workshop consisted of 16 h of meetings, one 2 h meeting/week for 8 weeks, plus between-meeting homework. The workshop was given to 10–12 freshmen per group by one leader. In addition, the leader met one-on-one with each participant on one occasion early in the workshop. The purpose of this individualized meeting was to: (1) introduce the leader to the participant and build rapport, (2) address participant's initial concerns and questions, (3) guide the participant in identifying key challenges and stresses where the skills taught in the workshop could be most helpful.

The workshop taught a range of cognitive-behavioral techniques based largely on Beck's and colleagues' cognitive therapy for depression (Beck, 1964, 1967, 1976; Beck, Rush, Shaw, & Emery, 1979; Hollon & Beck, 1979; Seligman, 1991). The workshop included the following topics: (1) the cognitive theory of change (the relationship between thoughts, feelings, and behaviors); (2) identifying automatic negative thoughts and underlying beliefs; (3) marshaling evidence to question and dispute automatic negative thoughts and irrational beliefs (empirical hypothesis testing); (4) replacing automatic negative thoughts with more constructive interpretations, beliefs and behaviors (generating alternatives, thought stopping, distraction techniques); (5) behavioral activation strategies (graded task breakdown, time management, anti-procrastination techniques, creative problem solving, assertiveness training); (6) interpersonal skills (active listening, taking each other's perspectives, controlling emotions, passive vs. assertive vs. aggressive behaviors); (7) stress management (relaxation training); and (8) generalizing these coping skills to new and relevant situations.

We developed a highly detailed and scripted manual to standardize the delivery of the workshop (Gillham et al., 1991; Reivich, Shatte, & Gillham, 2003). The format of the workshop meetings consisted of rapport-building, some lecturing, Power Point presentations with multimedia (e.g., video, animation, and audio

role-playing by actors), participant role-playing, games and activities, group discussion and homework reviews, and the use of a detailed participant's notebook with homework and written materials that review the major points of the workshop. Since the first version of the manual in 1991, the new manual incorporated numerous changes and improvements based on more than a decade of experience delivering the workshops to various populations. Attendance at the workshop averaged 84%.

All leaders were trained and experienced cognitive therapists who currently or had worked at Aaron Beck's Center for Cognitive Therapy in Philadelphia, Pennsylvania. Prior to the intervention, all leaders attended about 25 h of training from Dr. Karen Reivich, who developed the structured manual. There were a total of 10 leaders who delivered 12 workshops over a 2-year period. Throughout the workshops, the leaders received supervision from Dr. Karen Reivich to ensure they were closely adhering to the structured manual. Workshop leaders were not allowed to also play the role of diagnostic interviewer, as diagnostic interviewers needed to be blind to which condition the participant was in, to ensure their ratings would not be biased by such knowledge.

### *The web-based supplement (WBS)*

After the completion of the workshop, participants had access to the WBS throughout the follow up. The WBS could be used any time, any place, with any computer that had an Internet connection. We hoped that easy access to a booster that periodically reinforced skills would increase the effects and duration of the prevention by stemming the decline in intervention effects over time that is commonly found in therapy (Muñoz, Hollon, McGrath, Rehm, & VandenBos, 1994). The WBS included homework and review materials from the classroom-based workshop, relevant reading materials and Special Topics that enabled students to apply the basic cognitive-behavioral skills to issues of immediate personal interest. Examples of the Special Topics are Dealing with Procrastination, Managing Your Time, Improving Grades, Handling Tests, Finding a Job or Graduate School, among others. The Web materials were interactive—at numerous points throughout the materials, participants were asked multiple choice questions to determine skill acquisition, given feedback on whether their answers were correct, and provided with links to relevant materials when their answers were incorrect. As we expected usage of the WBS to vary greatly given its self-paced and self-directed nature, we collected data on the participants' usage of the WBS with user tracking software for data analysis purposes to determine the moderating effects of usage (dosage) on outcome. Each participant had a unique UserID and password to access the Web site.

### *Coaching by e-mail*

After the completion of the classroom-based workshop, the trainers from the workshop continued on as coaches and stayed in touch with their workshop participants by e-mail. We standardized the content and timing of the e-mails. Every few weeks, we asked the coaches to send the e-mails that contained refreshers of the skills they learned in the workshop, tips, and exercises to try. In the e-mail from coaches to participants, coaches offered feedback and further coaching if the participant had any questions. In each e-mail, we encouraged the participant to use the Web-based resilience resources, and the e-mail included the Website address and participant's unique user ID and password. In the 6 months following completion of the workshop, the coaches sent a total of six e-mails to each of their workshop participants.

### *Triggered face-to-face boosters*

When participants had an increase of four or more points on the BDI over consecutive assessments, those individuals had a one-on-one face-to-face booster with their coach. These boosters were structured, lasted about 30–45 min and the coaches covered the following topics: (1) to discuss and review the resilience skills, using a handout that summarized the skills; (2) to help the student identify specific ways in which he/she could apply the skills in times of stress; (3) to help the student create a list of skills they could use in their life now; (4) to help the student identify appropriate materials on the Web-based resources that were specific to their

stressors. In the 6 months following completion of the workshop, only 10 participants met the BDI criteria and had a face-to-face booster with their coach.

### Procedure

We recruited a total of 240 participants over two years. We mailed the BDI in late May of each year to all incoming first year undergraduates who lived in the United States. In the letter accompanying the BDI, we told them that if they completed the BDI, we might contact them later to see if they were interested in participating further in our research. We told them that if they chose to participate further, they could receive up to \$400 for completing all phases of the study and that “The purpose of this study is to evaluate a workshop that will teach stress management skills to first year students.” We provided our phone number and encouraged them to call us collect if they had any questions. We believe this was a good way to cast the intervention for the following reasons: (1) if we informed them that the primary purpose of the study is depression and anxiety prevention, participants would be aware of the purpose and this could bias their responses; (2) we have found that most people seem to be attracted to the notion of stress management, and (3) we were concerned that participants would find depression prevention stigmatizing. See Table 1 for details.

In mid-July, we mailed a consent form to those who scored between 9 and 24 (inclusive), as these were the individuals we believed were at elevated risk for depression, and we enclosed a pre-stamped, pre-addressed return envelope. The consent form described in detail what participation would entail, that participants would be randomly assigned to either the workshop or a no-workshop comparison group, that they could receive up to \$400 if they completed all phases of the research, and we again encouraged them to call us collect if they had any questions. In mid-August we mailed a letter to those who mailed us a signed consent form. In this letter, we informed them that they were officially a participant in the study, that we would ask them to take some online questionnaires in early September, and again encouraged them to call us collect or e-mail us if they had any questions.

In early September, soon after students arrived at the University of Pennsylvania for the fall semester, we sent all participants an e-mail asking them to take the initial online questionnaires that would take about one hour to complete. We provided each participant with the Website address and a unique user ID and password to access the Website.

We did not conduct the SCID at intake to screen out any of the axis I disorders for the following reasons: (1) students are high functioning in order to gain entrance to a competitive school like the University of

Table 1  
Participant recruiting at each phase

	Year 1	Year 2	Total
Total incoming class	2 332	2 427	4 759
BDI mailing (US only)	2 250	2 220	4 470
Total returned BDIs	995	826	1 821
Total response rate (%)	44	37	41
Scored 9–24 on BDI	200	251	451
Assigned to workshop	51	62	113
Assigned to controls	59	68	127
Total participants	109	131	240
	Condition		
	Workshop	Controls	Total
Total participants	113	127	240
Completed pre-workshop assessments	102	125	227
Completed post-workshop assessments	102	125	227
Completed follow up 1 assessments	98	123	221
Completed follow up 1b assessments	92	120	212



Pennsylvania and have a lower incidence of axis I disorders than the general population. In our previous similar research with University of Pennsylvania students, only 11% of the control group had definite or severe depression over the entire three years of follow up (Seligman et al., 1999); (2) our ultimate goal is mass dissemination at schools in which no one is screened out because such screening is too expensive and stigmatizing, so an argument could be made that we should see the intervention effects for everyone; (3) the randomizing procedure should result in a random assignment of the few students who have axis I disorders; and (4) conducting diagnostic interviews for all participants at intake would be quite costly in terms of time and money, and we do not believe these costs would be justified by the benefits of screening out the small percentage who have axis I disorders at intake.

In mid- to late-September, we sent an e-mail to participants who completed the initial online questionnaires, asking them to come in to our office so they could be randomized into either the workshop or the no-workshop control group. Participants were stratified on the basis of gender, ASQ score (above vs. below the median) and BDI score (above vs. below the median), to ensure that the conditions were balanced. When they came in to our office, we also collected their mailing addresses and phone numbers.

The control group did not receive the workshop, Web-based materials, coach e-mails or face-to-face boosters. The control group did not receive a placebo, as a 16 h long placebo plus web and coaching placebo would be conceptually daunting as well as costly. The control group only took the questionnaires and had diagnostic interviews at the same times as the intervention group.

At the end of the fall semester, after the 8-week workshop, we sent an e-mail to all participants asking them to go online again to complete the post-workshop questionnaires. We informed them that these would take about one hour to complete, that they would receive \$100 for completing the pre- and post-workshop questionnaires, and provided the Website address and their unique user ID and password. Participants had about three weeks to complete the questionnaires, after which access to the Website was closed.

In the participants' second semester and all subsequent semesters of participation for a total of six semesters of follow up, we asked participants to take online questionnaires both at the beginning and end of the semester. Participants had about 1 month to complete each set of questionnaires and received \$50 for completing the questionnaires administered at the beginning of the semester. There was no payment for the questionnaires taken at the end of the semester, as there were only three short questionnaires which took about 5 min: the BDI, BAI and short version of the LIFE for MDD and GAD.

At pre-workshop, which was in the beginning of the fall semester of the freshman year, we administered the BDI, BAI, ASQ, SLC, and Fordyce Emotions Questionnaire. At post-workshop, which was at the end of the fall semester of the freshman year, we administered the BDI, BAI, ASQ, SLC, Fordyce, and a manipulation check. At the first follow up, which took place early in the spring semester of the freshman year, we administered the BDI, BAI, ASQ, SLC, Fordyce, the MDD self report, and GAD self-report. Late in the spring semester of the freshman year, we administered the BDI, BAI, MDD self-report, and GAD self-report.

We asked participants to come to our offices for a diagnostic interview if they met the following criteria on the questionnaires taken at the beginning of the semester: (1) A BDI score of 12 or more or (2) A BAI score of 12 or more or (3) they endorsed at least four of the eight items on the shortened LIFE MDD questions or (4) They endorsed at least four of the eight items on the shortened LIFE GAD questions. Seventy-two percent of the participants met this criteria in the 6-month follow up. In the diagnostic interview, we administered only the SCID questions for MDD and GAD. Prior to each diagnostic interview, research assistants asked participants to not tell the interviewer which condition they were in. This was to ensure that interviewers remained unaware as to which condition the participant was in, so that their interviews and diagnoses would be unbiased by our research goals.

The attrition rate thus far is 5.4% (13/240). All those who discontinued said that their reason for discontinuing participation was that they were too busy. A review of the tables indicates that the missing data often exceeds 5.4%. At any given assessment, some participants were temporarily unreachable or unavailable or did not take the online questionnaires within the allotted time frame. Common reasons for this include that they were studying abroad for one or two semesters or they were too busy to participate at that particular assessment.

### Statistical procedures

We used the following technique to determine mediation of the workshop effects (Sobel, 1982). Path 'a' is the treatment effect on cognition change. Path 'b' is the cognition effect on symptom change. This procedure allows us to test the hypothesis that the workshop led to cognition change which in turn led to symptom change. We computed the coefficient estimate and standard error for path 'ab.'

- The coefficient estimate for  $ab$  = coefficient of path 'a' multiplied by the coefficient of path 'b'.
- Standard error ( $S$ ) = square root of  $(b^2s_a^2 + a^2s_b^2 + s_a^2s_b^2)$ .
- $t$  statistic = coefficient $_{ab}$  divided by the standard error. The  $t$  statistic is used to obtain the  $p$  value.

More generally, we report one-tailed  $p$  values below when there is a clear, unidirectional hypothesis that the workshop group will do better than the control group. Two-tailed  $p$  values are noted when used. Also, in all analyses, symptoms at pre-workshop were covaried to control for initial level of symptoms. In other words, for all the ANCOVA analyses, all post-workshop and follow up measures are residualized using the pre-workshop measure. The effect sizes in the tables are equal to the difference between the means divided by the standard deviation of the control group.

### Results

Overall the workshop group had significantly fewer depressive symptoms and anxiety symptoms than the control group, but there was no significant difference between the conditions on depressive or anxiety episodes at six month follow up. Additionally the workshop group had significantly better well being than the control and had significantly greater improvements in explanatory style than the control group. Explanatory style was a significant mediator of the prevention effects on depressive and anxiety symptom prevention, as well as a mediator of the intervention effects on the well being measures.

#### Baseline

There were no significant differences between the workshop and control condition at the pre-workshop evaluation for any of the variables, with one exception. On the Fordyce Emotions Questionnaires, a  $t$ -test revealed that the control group at pre-workshop had a significantly higher percentage of the time they were unhappy  $t(225) = 2.3, p < .02, n = 227$ .

Manipulation Check. Did those in the workshop learn the skills taught in the workshop and score better than the control group on a test of knowledge of these skills? Yes. In a  $t$ -test analysis at post-workshop, the workshop condition had significantly better scores than the control group,  $t(169) = 15.0, p < .0001, n = 225$ .

#### Symptom levels of depression and anxiety

ANCOVA analyses found that the workshop group had significantly fewer symptoms of depression than the control group, covarying depression symptoms at pre-workshop, for the BDI at post-workshop ( $n = 227$ ),  $F(1,225) = 23.0, p < .0001$ , and for the BDI at 6-month follow up ( $n = 221$ ),  $F(1,219) = 22.2, p < .0001$ . The intervention effect sizes were small to moderate. See Table 2 for details.

The workshop group also had significantly fewer symptoms of anxiety than the control group, covarying anxiety symptoms at pre-workshop, for the BAI at post-workshop ( $n = 227$ ),  $F(1,225) = 6.5, p < .006$ , and for the BAI at 6-month follow up ( $n = 221$ ),  $F(1,219) = 12.3, p < .0003$ . The intervention effect sizes were small. See Table 2 for details.

#### Well being

ANCOVA analyses found that the workshop group had significantly higher life satisfaction than the control group, covarying pre-workshop levels, at post-workshop ( $n = 225$ ),  $F(1,223) = 3.5, p < .03$ , and at 6-month

Table 2  
Adjusted means and ANCOVAs for symptom measures

Variable	Control group			Workshop group			<i>F</i> (df)	<i>p</i>	Effect size
	Mean	<i>n</i>	s.d.	Mean	<i>n</i>	s.d.			
BDI Pre	10.4	125	5.7	9.8	102	5			
BDI Post	12	125	4.6	8.9	102	4.9	23.0(1.225)	.0001	.67
BDI F1	10.8	123	5.4	7.6	98	4.7	22.2(1.219)	.0001	.59
BDI F1b	9.5	120	6	8.1	92	6.2	2.8(1.210)	.05	.23
BAI Pre	11.8	125	7.6	10	102	5.7			
BAI Post	10.5	125	6.1	8.6	102	5	6.5(1.225)	.006	.31
BAI F1	9.4	123	5.8	6.9	98	4.6	12.3(1.219)	.0003	.43
BAI F1b	7	120	5.4	6.3	92	5.8	0.9(1.210)	ns	.13
MDD F1 self report	4.2	121	1.8	3.3	96	2.2	<i>t</i> = 2.9(182)	.002	.50
MDD F1b Self Report	4.4	120	2.1	3.6	92	2.3	<i>t</i> = 2.5(210)	.006	.38
GAD F1 Self Report	4.7	121	2	4.3	96	2.5	<i>t</i> = 1.4(182)	ns	.20
GAD F1b Self Report	4.5	120	2.6	3.7	92	2.4	<i>t</i> = 2.4(210)	.008	.31

Notes: ANCOVA = analysis of covariance. Model: symptom follow-up = symptom pre + condition.

All pre workshop variables are actual data rather than adjusted data.

All *p* values are one-tailed.

Pre = pre-workshop; post = post-workshop.

F1 = follow up 1. F1b = about 2 months after F1 in the same semester.

Effect size = the difference between the means divided by the standard deviation of the control group.

BDI = beck depression inventory, higher score is worse.

BAI = beck anxiety inventory, higher score is worse.

MDD self-report = a measure to determine if individual is having depressive episode, lower is better.

GAD self-report = a measure to determine if individual is having GAD episode, lower is better.

follow up ( $n = 219$ ),  $F(1,217) = 5.0$ ,  $p < .01$ . ANCOVA analyses found that the workshop group had significantly better Fordyce happiness ratings than the control group, covarying pre-workshop levels, at post-workshop ( $n = 225$ ),  $F(1,223) = 5.2$ ,  $p < .01$ , and at 6-month follow up ( $n = 219$ ),  $F(1,217) = 3.6$ ,  $p < .03$ . On another measure from the Fordyce questionnaire that measures the percentage of time an individual is happy, ANCOVA analyses found that the workshop group had significantly better happiness percentages than the control group, covarying pre-workshop levels, at post-workshop ( $n = 225$ ),  $F(1,223) = 4.2$ ,  $p < .02$ , but not at 6-month follow up ( $n = 219$ ),  $F(1,217) = 0.0$ , ns. See Table 3 for details.

### Explanatory style

An ANCOVA analysis revealed that the workshop group had significantly more optimistic levels of explanatory style than the control group, covarying pre-workshop levels at post-workshop ( $n = 225$ ),  $F(1,223) = 14.6$ ,  $p < .0001$  and at 6-month follow up ( $n = 219$ ),  $F(1,217) = 5.9$ ,  $p < .008$ . The intervention effect sizes were moderate. See Table 4 for details.

### Mediation

We used the Sobel (1982) formulas to determine mediation (detailed in Statistical Procedures). Based on the Sobel formulas, explanatory style was a significant mediator of the effect of the intervention from pre- to post-workshop for the reduction in depressive symptoms (BDI), the reduction in anxiety symptoms (BAI), the increase in satisfaction, and the increase in happiness as measured by the Fordyce happiness rating and the Fordyce happiness percentage. Explanatory style was a significant mediator but does not account for most of the prevention effects. See Table 5 for details.

Table 3  
Adjusted means and ANCOVAs for well being measures

Variable	Control group			Workshop group			F (df)	p	Effect size
	Mean	n	s.d.	Mean	n	s.d.			
Satisfaction pre	21.4	125	6.3	22.5	102	6			
Satisfaction post	21.6	125	5.1	22.8	100	4.4	3.5(1,223)	.03	.24
Satisfaction F1	22	121	5	23.5	98	4.7	5.0(1,217)	.01	.30
Fordyce rating pre	6.4	125	1.7	6.6	102	1.7			
Fordyce rating post	6.2	125	1.7	6.7	100	1.3	5.2(1,223)	.01	.29
Fordyce rating F1	6.3	121	1.6	6.7	98	1.3	3.6(1,217)	.03	.25
Fordyce happy pre	45.2	125	23.6	50.4	102	20.4			
Fordyce happy post	43.5	125	16.3	48.1	100	17.4	4.2(1,223)	.02	.28
Fordyce happy F1	46	121	15.3	45.8	98	20	0.0(1,217)	ns	-.01

Notes: ANCOVA = analysis of covariance. Model: symptom follow-up = symptom pre + condition.

All pre workshop variables are actual data rather than adjusted data.

All *p* values are one-tailed.

Pre = pre-workshop; post = post-workshop.

F1 = follow up 1. F1b = about 2 months after F1 in the same semester

Effect size = the difference between the means divided by the standard deviation of the control group.

Satisfaction = satisfaction with life scale, higher score is better.

Fordyce rating = the average happiness rating from the Fordyce questionnaire, higher is better.

Fordyce happy = the % of time feels happy, higher is better.

Table 4  
Adjusted means and ANCOVAs for possible cognitive mediator

Variable	Control group			Workshop group			F (df)	p	Effect size
	Mean	n	s.d.	Mean	n	s.d.			
ASQ Pre	1.9	125	3.1	2.1	102	3.4			
ASQ Post	1.6	125	2.3	2.8	100	2.4	14.6(1,223)	.0001	.52
ASQ F1	1.4	121	2.7	2.7	98	2.4	5.9(1,217)	.008	.48

Notes: ANCOVA = analysis of covariance. Model: symptom follow-up = symptom pre + condition

All pre workshop variables are actual data rather than adjusted data.

All *p* values are one-tailed.

Pre = pre-workshop; post = post-workshop.

F1 = follow up 1. F1b = about 2 months after F1 in the same semester

Effect size = the difference between the means divided by the standard deviation of the control group.

ASQ = overall score from attributional style questionnaire (ASQ), higher score is better.

Table 5  
Mediation calculations using sobel formulas

	Coefficient				
	Path <i>a</i>	Path <i>b</i>	<i>ab/s</i>	<i>t</i>	<i>p</i>
BDI	1.187	.597	.709/.249	2.9	.004
BAI	1.187	.302	.358/.192	1.9	.04
Satisfaction	1.187	.577	.685/.241	2.8	.004
Fordyce rating	1.187	.145	.172/.058	3.0	.003
Fordyce happy	1.187	1.600	1.899/.756	2.5	.007

Notes: The sample size is 225. All measures are at post-workshop, residualized with the pre-workshop measure. ASQ = attributional style questionnaire; BDI = beck depression inventory; BAI = beck anxiety inventory; satisfaction = satisfaction with life scale; Fordyce rating = average happiness rating; Fordyce happy = percent of time feels happy.

### *Web-based resources and e-mail coaching*

Only six of the 102 participants in the intervention group completed Web-based review materials, despite our frequent encouragements to use these materials in the coach e-mails. We did not keep records of the number of replies to the coach e-mails, but coaches said replies were rare. We did not expect or require replies to the coach e-mails, as the purpose of these e-mails was to give participants brief reminders how to use the skills learned in the workshop.

### *Episodes of depression and anxiety*

We performed chi-squared analyses to determine differences between the conditions in the number of depressive and anxiety episodes. The SCID rates major depression on a 1–6 scale. A rating of 3 on the SCID is considered moderate depression, a rating of 4 is marked, 5 is definite and 6 is severe. Few participants had a rating of 5 ( $n = 12$ ) or 6 ( $n = 0$ ) for major depression at 6 month follow up. There was no significant difference in depressive episodes between the conditions, when a depressive episode was defined as 3 or more on the SCID (moderate and above),  $X^2(1, N = 154) = .04$ , ns, or when an episode was defined as 4 or more (marked and above),  $X^2(1, N = 137) = 0.5$ , ns. Among those who scored 3 or more on the SCID, 26% (16/62) of the workshop group had a depressive episode and 27% (25/92) of the control group. Among those who scored 4 or more, 15% (8/54) of the workshop group had a depressive episode and 19% (16/83) of the control group.

The SCID assesses GAD on a 1–3 scale. A rating of 2 is considered moderate and a rating of 3 is definite GAD. There was no significant difference in anxiety episodes between the conditions, when an anxiety episode was defined as 2 or more,  $X^2(1, N = 154) = .07$ , ns, or when an episode was defined as 3,  $X^2(1, N = 130) = 0.5$ , ns. Among those who scored 2 or more, 21% (13/62) of the workshop group had an anxiety episode and 23% (21/92) of the control group. Among those who scored 3, 5% (3/62) of the workshop group had an anxiety episode and 8% (7/92) of the control group.

On the short self-report LIFE measures of MDD and GAD, a  $t$ -test analysis found that the workshop group had a significantly lower level of depression than the control group, at 6-month follow up,  $t(182) = 2.9$ ,  $p < .002$ ,  $n = 217$ , but did not have a significantly lower level of anxiety than the control group at 6-month follow up,  $t(182) = 1.4$ , ns,  $n = 217$ . The intervention effect sizes were small. See Table 2 for details.

## **Discussion**

The short term effects of the intervention are encouraging. The workshop group had significantly fewer depressive symptoms and anxiety symptoms than the control group and their well being increased relative to the control. An increase in optimistic explanatory style mediated these intervention effects from pre-workshop to post-workshop.

We now address four issues about these findings: (a) effect sizes, (b) why there was no effect on depressive and anxiety episodes, (c) usage of the Web-based materials, and (d) costs of dissemination.

### *Effect sizes*

The intervention effects on the depression symptom measure were moderate in size and more than double the size we found in similar research we conducted with University of Pennsylvania college students in the original study (Seligman et al., 1999), (.67 vs. .32 at post-workshop, .59 vs. .12 at six month follow up). The intervention effects on the anxiety symptom measure were small in size but also larger than the previous research we conducted (.31 vs. .09 at post-workshop, .43 vs. .06 at six month follow up). The intervention effect on explanatory style was moderate in size and about double the size in the previous study (.52 vs. .32 at post-workshop, .48 vs. .20 at six month follow up).

Although further research would be needed to determine the active ingredients of the increased intervention effect, we suspect the doubling of our previous effect sizes in this replication is likely due to the improvements we made in the classroom-based intervention. These improvements include the many stylistic changes in the classroom-based workshop, such as more professional looking materials and multimedia (i.e., the workshop

participant's manual, video, PowerPoint presentations, animation, audio role-playing by actors); many substantive changes in the workshop, including a strong focus on building a practical set of skills that participants could apply to their everyday life; and the email coaching materials. These skills were taught in a way that was less didactic, more user-friendly, and more interactive with real-life exercises. The fact that the Web resources were minimally used indicates that this component played little if any role in increasing the effect sizes.

#### *No effects on episodes*

We found no significant difference between the conditions at 6 month follow up for the clinician-rated measures of depression or anxiety episodes. In the original Seligman et al., 1999 study, we found a prevention effect with the episode data, but only for moderate levels of depression and anxiety after the 6 month follow up, though not with severe levels. In the original study, there were no significant differences in the episode data at the 6 month follow up, so it is possible that more time needs to elapse before differences appear, even with the greater effect sizes on symptoms. In the study we report here, there was a sample size of only 17 with moderate levels of depression and 24 with moderate levels of anxiety. As more time passes and more participants have moderate levels of depressive and anxiety episodes, this might yield detectable differences. It is also possible that the criteria we used in order to determine who might be having an episode and therefore who should receive the diagnostic interview (using the online questionnaires scores) might not have been wholly accurate at identifying who was having a clinical episode of MDD or GAD. In the original study, we conducted diagnostic interviews with all participants each semester.

#### *Usage of the web-based materials*

Few participants used the Web-based materials. This component was added to try to prevent the deterioration of skills and to maintain the intervention effect over time. As we collect more data, we will find out if the intervention effect is maintained or fades over time. Also, we will try to encourage more usage of these materials, through the coach e-mails. We will also ask participants to provide us with feedback on the Web-based materials, to see what they liked and did not like. We do not yet know why participants did not use the Web-based material, but it is possible that it was not sufficiently engaging and interactive, in this age of sophisticated video games.

As only a small minority of participants made use of the Web materials, its contribution to the prevention effect is likely to be small at best. Future research is therefore needed to determine how participants can be encouraged to use Web-based materials, such as by using email reminders. Also, the Web materials could be introduced in more depth during the classroom-based workshop to familiarize participants with how it works and emphasize the importance of using the Web materials. Also, future research could offer the prevention program with and without the Web-based component, to see if it meaningfully contributes to the prevention effect.

#### *Costs of dissemination*

The costs to disseminate this intervention should be relatively small, as we have already developed the expensive, fixed cost items, including the highly scripted and professional-looking leader's manual, participant's manual, PowerPoint presentation with multimedia, Web-based materials, a large number of scripted e-mails for the coach to send to participants, and the face-to-face booster protocol. The costs for dissemination include the workshop leader (about \$2000/10–15 participants for experienced cognitive therapists to deliver an 8-week workshop), costs to post the Web-based materials, about \$55/h for the coaches to send and reply to the pre-written coach e-mails, about \$55/h for the coaches to conduct face-to-face boosters with participants whose BDI score increases substantially, and compensation for someone to coordinate the delivery of the intervention.

Given the limited usage of the Web-based materials, it might not be cost-effective to continue this component. Future research could determine the necessity of using expensive, experienced cognitive therapists

to deliver the workshop. It would also be useful to know for cost-reduction purposes if a shorter intervention could achieve similar prevention effects. Another question for future research is the importance of fidelity to the intervention, and whether the leader can stray from the highly scripted manuals and still obtain preventive effects.

In conclusion, we have replicated the short-term efficacy of a prevention program for depression and anxiety symptoms among at risk college students. The effect size for the prevention of depressive symptoms roughly doubled relative to the original program. The new program in its brief, group format reduced depressive and anxiety symptoms, is relatively inexpensive, and is easily exported.

Fewer than 20% of individuals with an affective disorder seek treatment (Shapiro et al., 1984), but if depression and anxiety can be prevented by group interventions among at-risk young adults in our schools, this could produce public health benefits on a large and long lasting scale. Our ultimate goal is to provide school and work settings with easily implemented, cost-effective prevention programs for depression and anxiety.

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