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BRIEF REPORT



## The Effectiveness of Light Therapy for College Student Depression

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### ABSTRACT

There is a growing number of students on college campuses with mental health problems and college counseling services are reporting significant increases in student demand for counseling. Depression, a mental illness consisting of profound sadness, fatigue, and irritability, as well as low motivation, poor academic performance, and suicidal behaviors, is one of the top presenting concerns for students who seek help. This study investigates the effectiveness of light therapy in a sample of 79 college students who suffer from depression. This study examines changes in overall depression scores and also assesses changes in sleep, appetite, pain, and concentration levels. Results showed significant improvements in overall depression scores as well as improved sleeping behaviors and decreases in somatic aches and pains, concentration difficulties, and appetite problems. These promising results suggest light therapy may be an effective and inexpensive means for reducing symptoms of young adult depression.

### KEYWORDS

College student mental health; depression; light box; light therapy; seasonal affective disorder

Widely known to the field of college counseling is that college counseling services are reporting significant increases in student demand for counseling services, severity of mental health problems, and student crises (Gallagher, 2015). Depression is one of the top reasons students are seeking help, with approximately one third of college students in the United States reporting that they were “so depressed that it was hard for them to function” (American College Health Assessment, 2014). Depression can profoundly impact an individual’s ability to perform simple daily tasks and often leads to low motivation, impaired concentration, fatigue, irritability, sleep difficulties, sadness, and apathy. Depression is also the biggest risk factor for suicidal ideation. Thirty percent of college students report that they have seriously considered suicide (American College Health Assessment, 2014), with suicide the second leading cause of death among college students. Depressed students are also more likely to drop out of college, have low self-esteem,

perform poorly academically, be at risk for substance abuse, and have an increased risk for developing mental health problems later in life (Merikangas et al., 2010).

Developing effective therapeutic approaches for depression among college students takes on an increased sense of urgency when considering these alarming trends. Although the number of students seeking mental health services on college campuses is increasing, there has not been a parallel increase in funding for these services. As a result, developing brief and cost effective interventions for college student depression is critical. One treatment that meets this criteria is light therapy, which for three decades has been repeatedly tested and employed as a means to treat some forms of depression, particularly Seasonal Affective Disorder (SAD) (Privitera, Moynihan, Tang, & Khan, 2010; Rastad, Ulfberg, & Lindberg, 2008; Reeves et al., 2012; Rohan et al., 2016). SAD is a type of recurring depression that presents during winter months with remission in the spring and summer. Symptoms of SAD include low energy levels, concentration difficulties, low sex drive, carbohydrate cravings, sleep problems, irritability, social withdrawal, and feelings of hopelessness. The age of onset for SAD is between the ages of 18 to 30 and it is estimated that 5% to 10% of the college population in the Northeast is affected by SAD (Cotterell, 2010).

Research on the efficacy of light therapy supports its capacity to treat milder forms of depression such as SAD (Privitera et al., 2010; Rastad et al., 2008; Reeves et al., 2012; Rohan et al., 2015). Other studies found that light therapy also helped participants with irregular sleep patterns and irritability (Altabet, Neumann, & Watson-Johnston, 2002) and resulted in a reduction in suicidal ideation (Lam et al., 2006). In a recent study, Knapen, Van De Werkm, Gordijn, and Meesters (2014) found that light therapy reduces depression in participants experiencing SAD, however, no significant differences in the overall duration of light therapy were demonstrated. These authors reported a more rapid reduction of depressive symptoms in the 1-week group (30 minutes each day for 5 days) compared to those in the 2-week group (30 minutes each day for 10 days) and suggested that expectations of therapy outcomes could “play a role in the speed of therapy response” (Knapen et al., 2014, p. 343).

In a direct comparison with antidepressant medication, light therapy has been shown to provide comparable results for the treatment of SAD (Lam et al., 2006). In addition, studies looking at a combination of cognitive behavioral therapy with light therapy compared to light therapy alone found that the combination was most effective, however, the light therapy alone group still showed reductions in their depression (Rohan et al., 2015, 2007). In a recent study, Rohan and colleagues (2015) found light therapy to be as effective as cognitive behavioral therapy in a sample of 177 adults with SAD. At the end of a 6-week treatment protocol, a remission rate of 47% for

participants in both the light therapy and cognitive behavioral therapy groups was found (Rohan et al., 2015).

Based on the success of light treatment for SAD, research efforts have now extended to examining the effectiveness of this intervention with nonseasonal depression (Terman, 2007). Further research into the effectiveness of light box therapy as a treatment for depressive mood disorders will provide stronger empirical support for its therapeutic use. At present, the research specifically targeting college students and light therapy is minimal.

The goal of this study is to examine the effectiveness of light therapy, utilizing a light box, in a sample of college students who suffer from depression. This study will look at changes in overall depression scores before and after the light box therapy treatment and also assesses for changes in sleep, appetite, pain, and concentration levels over the course of treatment.

## **Method**

### ***Participants***

Participants in this study were college students from a midsize public university in the Northeast. The study took place from October to March, which is when seasonal mood fluctuations are predominately found. A total of 95 students were screened for this study, of which four were excluded, 12 did not finish, and 79 completed the study. Of the four students who were excluded from the study, two were taking vitamins with a side effect of light sensitivity, one had a history of eye problems, and one had a long history of psychotic manic episodes. Of the 79 complete participants who finished the program, 61 were female (77%) and all participants ranged between the ages of 19 and 21. Ninety two percent of the participants were Caucasian. Of the 79 complete participants, 44% were in therapy at the university's Center for Counseling and Human Development.

### ***Procedures***

Students who participated in the study were either referred from faculty at the Center for Counseling and Human Development or from staff at the university's Health Services because they showed signs and symptoms of depression or SAD. Students were also self-referred after seeing advertisements throughout campus. For instance, flyers were posted, information was displayed on digital signage boards in high-traffic areas around campus, advertisements ran in the campus newspaper, and faculty in various departments promoted the project.

Potential participants completed brief medical and psychological screenings to rule out contraindications for inclusions. Potential participants with a

medical condition that makes the skin sensitive to light, eye problems, a history of skin cancer, pregnancy, psychotic disorder, and bipolar disorder with manic episodes were excluded from the study and treatment protocol. After passing both the medical and psychological screenings, the student was educated about light box therapy and told the best outcome is associated with committing to three 15–30-minute sessions a week for 4 weeks. A consent form was signed and measures were provided to obtain their current depression score and their expectations about light box therapy. Next, students were given instructions on how to use the light box to eliminate problems from misusage and scheduled for their first light box therapy session. In addition, they were notified that they may discontinue use of the light box at any time. Should it be discontinued, regular counseling center services will be available to the student, as appropriate.

Brief consultations with each participant occurred at every session to assess for any side effects and to ensure integrity of treatment. Our trained graduate assistant set up the light box for each student, position it in the same spot, and made sure the student was sitting in the appropriate seat and was aware of how to use it. A timer was set and participants were notified when their session was over. At the end of week one and again at the end of treatment a more thorough assessment was completed to assess side effects or other problems and to track changes in sleep, appetite, pain, and concentration levels. Students also provided us with feedback about their experience at these two assessments. In addition to assessing changes in somatic symptoms at the end of 4 weeks, surveys were also administered to assess participants' depression score and satisfaction with the light box therapy program. At this time the participants were provided with resource information about light boxes in case they would like to purchase one for themselves. Students were told that these resources are not intended to be all inclusive, nor are they intended to take the place of counseling. They were given the option for additional individual counseling services if desired.

### ***Light box therapy***

Light box therapy sessions were scheduled Monday through Friday between 8 a.m. and 11 a.m. for 4-week treatment protocols. Morning sessions were scheduled because research indicates that it is more effective to offer light box therapy in the morning hours. Participants utilized one of two available light boxes in a private office. Participants used the NorthStar 10,000-lux light box made by Alaska Northern Lights. The light box weighs ten pounds with dimensions of 12.5 inches high by 22.5 inches long by 4.5 inches deep and has two Broad spectrum biax bulbs without harmful ultraviolet rays. The light box was placed on top of a desk, standing horizontally, and placed 20 inches from the participant. During the light box therapy session, students were free to use their laptop computer or read a book.

All participants completed 15-minute light box therapy sessions for their first week and if there were no issues, the last 3 weeks consisted of 30-minute sessions. We had six students who did 15-minute sessions for the first 2 weeks due to headaches experienced during the first week. All of these students were able to advance to 30-minute sessions for the final 2 weeks without any side effects. Light box therapy sessions took place in one of two office spaces within the Counseling Center that are occupied by our graduate assistants. Participants checked in with our administrative assistant and would be walked back to their room by a therapist or trained graduate assistant, asked if he/she had any side effects since their last session, and instructed on proper use of the light box. The light box was turned on and positioned correctly for each participant. A timer was set and participants were notified when the session was completed.

## **Measures**

### ***Beck Depression Inventory Second Edition (BDI-II)***

The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report measure to assess depression symptoms in the past 2 weeks. The BDI-II has good test-retest reliability and convergent validity. The BDI-II uses a 4-point scale (range is 0–3) for each item. The two exceptions to this are question 16 which examines sleep patterns and question 18 which looks at appetite patterns. The scale for these two questions are as follows: 0, 1a, 1b, 2a, 2b, 3a, and 3b. The sum score is interpreted using the following: 0–13 = *minimal depression*; 14–19 = *mild depression*; 20–28 = *moderate depression*; and 29–63 = *severe depression* (Beck et al., 1996). This measure was completed before light box sessions started and after completion of the 4-week program.

### ***Survey of expectations***

This 10-item self-report instrument was developed by the authors to measure participant expectations about the light box therapy program. It uses a 7-point Likert scale ranging from *strongly agree* to *disagree strongly*. This survey was given to participants before they started the light box therapy program.

### ***Survey of satisfaction***

This 10-item self-report instrument was developed by the authors to measure participant satisfaction with the light box therapy program. It uses a 7-point Likert scale ranging from *strongly agree* to *disagree strongly*. This survey was given to participants when they finished the light box therapy program.

### ***Somatic symptoms check-in***

At the end of week 1 and again at the completion of treatment, participants were asked to “please rate changes in sleep consistency, somatic aches and pains, difficulties in concentration, and appetite changes.” The 5-point Likert scale was as follows: 1 = *significant decrease*, 2 = *mild decrease*, 3 = *no change*, 4 = *mild increase*, 5 = *significant increase*. In addition, participants were asked to write in the average number of hours they were sleeping each night.

## **Results**

For this study, 95 students were screened, of whom 91 (96%) were eligible to participate. There were no eligible students who refused to take part in the study. Over the course of treatment, 12 participants (13%) completed only the pretreatment surveys, dropping out before the completion of 4 weeks. For eight participants the reason for drop out was unknown ( $n = 8$ ) as these participants did not respond to a phone call or e-mail attempting to reschedule them. The other reasons cited were “I am too busy” ( $n = 3$ ) and a health concern unrelated to light box therapy ( $n = 1$ ). A paired  $t$ -test was conducted to assess pretreatment depression scores between those who completed the treatment program ( $n = 79$ ) and those who dropped out ( $n = 12$ ) and no significant differences were found, indicating that both groups had similar prevalence and intensity of depression symptoms.

To examine changes in depression, a paired sample  $t$ -test was done looking at total depression score change from predepression to postdepression scores overall significantly decreased from pre to post [ $M(\text{post} - \text{pre}) = -18.85$ ;  $N = 79$ ;  $p < .0001$ ]. The overall mean BDI-II score before treatment was 30.6 ( $SD = 4.0$ ) which is in the severe range. After treatment, it decreased to 11.8 ( $SD = 3.4$ ) which is in the minimal range. Since several  $t$ -tests were being performed on the BDI-II, a Bonferroni correction was used to reduce the chances of a type I error (false-positive results). The Bonferroni correction was obtained by dividing the  $p$ -value by the number of comparisons (.05/21) which makes the probability rate .002 for this analysis. Results found all but two variables significantly decreased at the  $p = .002$  level (sadness, pessimism, past failure, loss of pleasure, guilt, punishment, self-criticalness, suicide thoughts, crying, agitation, irritability, loss of interest, indecisiveness, worthlessness, loss of energy, changes in sleep, concentration, fatigue, and loss of interest in sex). Changes in self-dislike ( $p = .013$ ) and appetite ( $p = .16$ ) were not significant.

In order to compare mean differences between groups, two-way analysis of variances (ANOVAs) were conducted. The first two-way ANOVA examined differences between time (pretreatment depression scores versus posttreatment depression scores) and gender. There was no main effect for gender but there was a significant interaction between gender and time ( $F(1,$



77) = 12.70,  $p = .001$ ) In order to better understand this interaction, a Tukey post hoc test ( $\alpha = .05$ ) was used to compare males and females separately before and after light box therapy sessions. At pretreatment, the sample means were 28.35 for males and 31.47 for females, indicating a significantly lower pretreatment depression score for males. At posttreatment the depression mean for males is 12.25 and the depression mean for females is 11.69, indicating no difference after the completion of light box treatment. Please refer to [Table 1](#) for pretreatment and posttreatment depression means before and after treatment for each of the subgroups.

Two-way ANOVAs were also performed to assess differences between time (pretreatment depression scores versus posttreatment depression scores) and age (19 and younger and 20 and older) and therapy status (in therapy or not in therapy). Results found no main effect for age or therapy status and no significant interaction between age and time ( $F(1, 77) = 0.46$ ,  $p = .500$ ) and therapy status and time ( $F(1, 77) = .19$ ,  $p = .662$ ). There was a significant main effect for time which was proven by the  $t$ -tests showing much higher pretreatment depression scores compared to posttreatment depression scores. Please see [Table 2](#).

The effect size (Cohen's  $d$ ) for this study using the Beck Depression score as the main response variable is 4.4. This was calculated by dividing the mean difference of 18.85 by the standard deviation of the differences which was 4.28. An overall effect size of 4.4 is huge.

Next,  $t$ -tests were completed to look at gender differences versus the change in each of the BDI-II variables (post – pre). As with earlier analysis, we used an adjusted alpha of .002 to reduce the chances of a type I error. Here, the results were varied. Females exhibited a significantly greater decrease in guilty feelings, self-criticalness, agitation, worthlessness, loss of energy, and change in sleeping

**Table 1.** Pretreatment Versus Posttreatment Depression Means.

| Variable                         | BDI-II Mean  |               |
|----------------------------------|--------------|---------------|
|                                  | Pretreatment | Posttreatment |
| Males ( $n = 18$ )               | 28.35        | 12.25         |
| Females ( $n = 61$ )             | 31.47        | 11.69         |
| In therapy ( $n = 35$ )          | 30.14        | 11.05         |
| Not in therapy ( $n = 44$ )      | 31.11        | 12.45         |
| Ages 19 and younger ( $n = 32$ ) | 31.59        | 12.20         |
| Ages 20 and older ( $n = 47$ )   | 30.06        | 11.61         |

**Table 2.** Somatic Symptoms.

| Variable                      | Mean  | N  | SD   | Effect Size | p value |
|-------------------------------|-------|----|------|-------------|---------|
| Average hours of sleep        | 0.73  | 79 | 1.42 | 0.51        | <.001   |
| Sleep consistency             | 0.66  | 79 | 0.66 | 1.00        | <.001   |
| Somatic aches and pains       | −0.24 | 79 | 0.58 | 0.41        | <.001   |
| Difficulties in concentration | −0.53 | 79 | 0.68 | 0.79        | <.001   |
| Appetite changes              | −0.18 | 79 | 0.78 | 0.23        | 0.047   |



patterns at  $p = .002$  compared to males. Although the decrease in the aforementioned feelings and behaviors was greater for females than males, both groups had a reduction in symptoms, which is the desired outcome. On the other hand, males exhibited a significantly greater decrease at  $p = .002$  with respect to irritability and tiredness or fatigue compared to females.

### ***Paired t-test for changes in somatic symptoms over treatment***

The analysis of the results from the *Somatic Symptoms Check-In* indicated significant changes for sleep consistency, somatic aches and pains, difficulties in concentration, and number of hours of sleep from pretreatment to posttreatment at the  $p < .01$  level or lower (see Table 2). A probability rate of .01 was used for this analysis based on the Bonferroni correction. A paired  $t$ -test was done on the pretreatment and posttreatment data. The average number of hours of sleep increased significantly from pretreatment to posttreatment ( $t = 4.52, p < .001$ ). Similarly, sleep consistency increased significantly from pretreatment to posttreatment ( $t = 8.80, p < .001$ ). Somatic aches/pains ( $t = 3.64, p < .001$ ) and difficulties in concentration ( $t = 5.97, p < .001$ ) showed significant decreases. There were no significant changes in appetite.

A  $t$ -test with gender as the classification variable was performed, with the differences (posttreatment minus pretreatment) as the response variable. Using the probability rate of  $p < .01$ , there was no significant differences between males and females for sleep consistency, somatic aches and pains, difficulties in concentration, appetite changes, and sleep hours. A  $t$ -test with therapy versus no therapy as the classification variable was also completed. Again, there were no significant differences between therapy and nontherapy participants for sleep consistency, somatic aches and pains, difficulties in concentration, appetite changes, and sleep hours. Lastly, to examine the data comparing participant expectations prior to starting the light box therapy program and actual satisfaction after completing treatment, a paired  $t$ -test analysis was performed where the differences (posttreatment minus pretreatment) were calculated for each subject and the null hypothesis that the differences were zero (indicating no change). The results clearly show that satisfaction exceeded expectations for all 10 questions; in fact, the changes were all highly significant at the  $p < .001$  level or higher. Some questions included: “I am satisfied with my participation in Light Box Therapy (LBT) program”; “My therapist answered my questions about LBT”; “I had a positive experience with LBT”; and “My therapist showed me how to use the light box device.”

## **Discussion**

The primary goal of this study was to examine whether light therapy, using a light box, could demonstrate a significant decrease in depression and somatic

symptoms among a sample of college students. Results were promising, with significant improvements in overall depression, sleep consistency, somatic aches and pains, difficulties in concentration, and appetite. Even more remarkable is that the average pretreatment depression score for all students indicated severe depression and the average posttreatment depression score was in the minimal depression range. Results comparing the somatic symptoms assessment completed after weeks 1 and 4, found that students had a more stable diet comprised of healthier foods, less bingeing, better concentration, and healthier sleep patterns posttreatment. In fact, the average hours of sleep per night went from 5 to 7 hours which is a much healthier and adequate amount of sleep. Sleep deprivation is a problem for many college students who often juggle classes, a job, and social/recreational responsibilities. Not enough sleep can lead to weight gain, mood disorders, poor concentration, and poor academic performance. Normal sleep can positively impact memory, learning, and academic performance. Students also reported increased energy as one of the major benefits from light box therapy which may be correlated with increased sleep. Previous research shows gender differences in rates of depression and SAD. In this study, females exhibited a greater decrease in total depression scores than males, however, their pretreatment scores were higher so their greater improvement was not too surprising. Overall, both males and females reported great benefit from the light therapy in their relief from depression and somatic symptoms.

Ninety eight percent of students were “highly satisfied with their experience with light therapy.” In fact, 35% ( $n = 28$ ) reported purchasing a light box after completing this program. Given the financial constraints of students, to have a third of participants purchase a light box is meaningful. All participants were encouraged to continue with light therapy but since many college students are stressed and pressed for time, it is unclear if they will make light therapy a daily habit. We asked for feedback from students after their completion of the light box therapy program and some of the comments include: “Light therapy made such a big difference in my mood. It allowed me to concentrate more and gave me more energy. My depression was definitely better after treatment.” “I appreciated being able to do a natural treatment that actually helped my depression.” “This was a great option for me. I wanted to find help without having to use medication.” “I thought the process was easy and I was able to study while doing the light therapy. My sleeping patterns improved and I also noticed that I did not have cravings for sugar and fast food.” “It is nice to have exposure to light in the winter. This was helpful for my mood and I plan to buy one.”

Overall, light box therapy may be a beneficial adjunct to talk therapy for students struggling with depressive disorders. The cost of each light box was about \$250 and two were purchased for our Center. The office of Student Affairs provided our Counseling Center with a grant to purchase

the light boxes so it did not directly affect our center's budget. As previously mentioned, students were either self-referred or referred by a faculty member of the Counseling Center. Beginning in October, the faculty members of the Counseling Center were instructed to refer clients who either presented with depression, had a previous diagnosis of SAD, noted that their mood worsened with darker days and colder weather, or reported a family history of SAD. All therapists who referred students used this as an adjunct to therapy unless a student had reached their five-session therapy limit at our Center. In these cases, students were using the light box as a stand-alone treatment. Limitations to this study include the lack of a measure that specifically identifies SAD. Our questionnaire, while highly reliable and displaying good internal consistency with adolescents and young adults with depression, does not assess mood alterations based on seasonal changes. A future study should examine response to light therapy for seasonal versus nonseasonal depression among college students. We did not account for participants taking final exams in December, and the possible associated heightened stress, anxiety, and depressed mood. It is unclear how much this psychosocial stressor impacted mood and response to treatment. An improvement for this study would be to ask about psychotropic medication so we can rule that out as a potential confounding variable. Another limitation was the design of the study. Students were not randomly assigned to a treatment or a control group so we were not able to account for any placebo effect. Lastly, since our study was implemented in a University Counseling Center there was a break in services on weekends.

Given the impact of light therapy on this sample of college students, more research is warranted. As this study took place in the Northeast, results may not generalize to college populations at different latitudes. Longitudinal studies are needed to examine the pattern of symptoms with participants treated with light therapy over time. It would be important to look at long term use of light therapy and how that influences depressive symptoms the following fall/winter season. For students with SAD, focus on prevention is important since it recurs each year. Regular use of light therapy, even during summer months, may mediate symptoms for the following year. According to Rohan and colleagues (2007), light therapy is considered a palliative treatment which means it will relieve symptoms and improve quality of life but it will not cure the disorder. In regards to SAD, this means the symptoms will reappear each fall/winter and students must take a preventative stance on this disorder. Future studies should examine whether college students using light therapy in the mornings have better improvements than those using light therapy in the evenings, as well as the best use of light therapy to prevent severe symptoms in the fall/winter.

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