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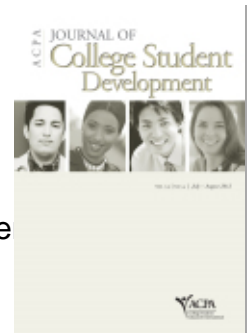
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Journal of College Student Development, Volume 53, Number 5, September/October 2012, pp. 742-749 (Article)

Published by The Johns Hopkins University Press  
DOI: 10.1353/csd.2012.0070



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## Biofeedback and Counseling for Stress and Anxiety Among College Students

Paul Ratanasiripong   Kevin Sverduk   Judy Prince   Diane Hayashino

*With the rise in stress and anxiety among college students, there is a need for more comprehensive and effective counseling options for counselors in college counseling centers. This study investigated the impact of using biofeedback and brief counseling in treating stress and anxiety in an ethnically diverse college student population. Results indicated that participants who received biofeedback training and counseling had greater reduction in anxiety symptoms than did participants who received counseling alone. Implications for augmenting biofeedback training to traditional college counseling model are discussed.*

Over the past decade an increase in the frequency and severity of psychological symptoms among college students has been documented (Benton, Robertson, Tseng, Newton, & Benson, 2003; Bishop, Bauer, & Becker, 1998; Hyun, Quinn, Madon, &

Lustig, 2006; Kitzrow, 2003). In addition, tragic events, such as the 2007 shootings on the campus of Virginia Tech, seem to have generated a new dialogue as to the importance of adequate mental health education and services being available to college students. Although violent and other antisocial behaviors should not be regarded as typical for those suffering from mental health disorders, the new attention to mental health issues on today's college campuses is greatly needed. Young adults in college today clearly face numerous pressures, and when students' resources to cope are taxed beyond their limits, the consequences can include stress, anxiety, depression, sleep disturbance, eating disorders, impulsive behaviors, and suicide (Kadison & DiGeronimo, 2004; Lee, Olson, Locke, Michelson, & Odes, 2009).

Of particular interest to the current study is the high level of stress and anxiety

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among college students (Abouserie, 1994; Dixon & Robinson Kurpius, 2008; Lucas & Berkel, 2005) and, specifically, the need for more comprehensive and effective treatment options for students with anxiety. According to the Anxiety Disorders Association of America (2012), anxiety disorders are the most commonly diagnosed of mental health conditions with more than 40 million Americans affected annually. College students are no exception to these trends. In a recent study conducted by the American College Health Association (2009), stress ranked as the number one health issue that impedes students' academic performance. In addition, the latest annual survey of college counseling center directors across the country indicated anxiety and depression as the top two presenting concerns for their student clients (Association for University and College Counseling Center Directors [AUCCCD], 2011).

Although traditional counseling approaches are often effective in helping college students when used alone, research has shown that counseling may be even more effective when combined with alternative forms of treatment such as biofeedback (Goodwin & Montgomery, 2006; Minkin, Prout, & Masterpasqua, 2009; Moss & Lehrer, 1998; Reiner, 2008). According to the Biofeedback Certification International Alliance (2012) biofeedback enables the user to alter physiological activity for the purpose of improving health and performance. Using specialized equipment, biofeedback methods measure and utilize various signals from the body including brain activity, blood pressure, muscle tension, heart rate, skin temperature, and sweat gland activity (Mayo Clinic, 2009). Further, biofeedback may be thought of as a three-step process, including (a) becoming aware of a physiological response, (d) learning to control the response, and (c) transferring control of the response to everyday life

(Calderon & Thompson, 2004).

Of particular relevance to the current study is research that combined biofeedback with other interventions such as counseling. Goodwin and Montgomery (2006) demonstrated the effectiveness of biofeedback as an adjunct to cognitive-behavioral techniques in the treatment of panic disorder with agoraphobia, comorbid with depression. Turner (1991) studied the effectiveness of combining biofeedback with didactic instruction for students enrolled in a university stress management course; results showed significant decreases in anxiety.

## Present Study

The present study focused on exploring whether an alternative treatment model for treating stress and anxiety would yield a better outcome than the traditional brief counseling for college students at university counseling centers. The outcomes, specifically the reduction in anxiety symptoms, were compared between clients receiving both biofeedback training and brief counseling and those receiving only brief counseling. We hypothesized that clients who received both biofeedback training and counseling would have better outcomes than would clients who received only counseling.

The present study utilized both computer-based and portable biofeedback devices. Ease of use is an important factor to be considered in an effective treatment approach among college students. A relatively new method of biofeedback based on heart rate variability (HRV) has emerged in recent years and may in fact serve to make biofeedback more accessible and user-friendly. HRV can be defined as the beat-by-beat variations in one's heart rate (Schwerdtfeger & Friedrich-Mai, 2009). Although other methods of biofeedback training work by controlling the level of various physiological functions (i.e.,

blood pressure, finger temperature), HRV biofeedback training helps participants learn to control the variability in heart rate; because HRV biofeedback more directly targets the body's physiological control mechanisms, it is easier to learn than methods that approach the target physiological mechanism in a less direct manner (Lehrer, 2007). Siepmann, Aykac, Unterdorfer, Petrowski, and Mueck-Weymann (2008) utilized a form of HRV biofeedback and reported a decrease in depressive symptoms in patients with moderate to severe levels of depression as well as additional benefits of reduced anxiety levels.

Also relevant to the ease of use of biofeedback equipment is the portability of the devices being utilized in the treatment approach. Reiner (2008) examined the effectiveness of a portable biofeedback device combined with traditional counseling for addressing anxiety disorders in an outpatient population. Participants were assessed over a 3-week period with significant reduction in levels of anxiety found. Participants reported that they found the biofeedback device to be more helpful than other methods such as yoga, meditation, and breathing techniques.

## METHOD

### Participants

The current study was conducted at a large public university in the western United States that is a Hispanic-Serving Institution (HSI). The study's participants were 30 counseling clients from one university counseling center. Their age range was between 18 and 42 years ( $M = 24.43$ ,  $SD = 5.78$ ). The 20 women and 10 men in the study self-identified to one of four ethnic groups: African American (3%), Asian American (13%), Latino (47%), and White (37%). There were 5 freshmen, 1 sophomore, 7 juniors, 10 seniors, and 7 graduate students.

### Procedure and Measure

Participants were recruited from the university counseling center client. They were referred to the study based on presentation of stress and anxiety symptoms at the time of intake evaluation by staff psychologists and predoctoral interns at the counseling center. Each prospective participant met with one of the researchers for a research preview appointment which consisted of (a) a brief screening to ensure that all criteria for inclusion in the study had been met and (b) completion of the informed consent form, the demographic form, and the pretreatment Beck Anxiety Inventory (BAI).

The BAI (Beck, Epstein, Brown, & Steer, 1988) was used as a measurement of self-reported anxiety. The BAI was chosen because of its validity and wide usage with the counseling client population as well as the diverse college student population (Contreras, Fernandez, Malcarne, Ingram, & Vaccarino, 2004; Levy Berg, Sandell, & Sandahl, 2009; Pillay, Edwards, Sargent, & Dhlomo, 2001). The BAI is a 21-item scale developed with an adult clinical population to measure the severity of anxiety in adult and adolescents. Each answer is scored on a scale of 0 (*not at all*), 1 (*mildly*), 2 (*moderately*), or 3 (*severely*). Participants are instructed to rate each item according to how they have felt in the past week. A higher score on the BAI indicates higher level of anxiety. Beck et al. (1988) reported the Cronbach's alpha for the BAI to be .92 in their study with outpatient counseling clients. For the present study, the internal reliability (Cronbach's alpha) was .92 for the pretreatment BAI and .93 for the posttreatment BAI.

Upon enrolling in the study, participants were randomly assigned to either the treatment group or the placebo control group. Those in the placebo control group received four sessions of individual counseling in 4 weeks.

Participants in the treatment group received four sessions of individual counseling plus four sessions of biofeedback training in 4 weeks. The timeframe of four sessions was chosen based on both this counseling center’s average number of sessions seen by clients per academic year as well as the national median number of sessions seen for 4-year public universities (AUCCCD, 2009). Counseling sessions were conducted by the university counseling center staff consisting of licensed psychologists and predoctoral interns; the treating therapists were not informed whether the participants were in the treatment or the placebo control group. Biofeedback sessions were conducted by the researchers.

During the weekly 30-minute biofeedback training session, participants were provided with a visual display of their heart rate variability and instructed to increase the

coherence of their heart rate pattern (reduce HRV) through breathing and visualization; lower HRV is associated with reduced anxiety-related psychological symptoms. After each biofeedback session, participants in the treatment group also received a portable biofeedback device for use at home between the biofeedback sessions. They were instructed to use the portable biofeedback device a few minutes per day and to maintain a daily log of these practice sessions.

Upon completion of the study, all participants met with one of the researchers for a poststudy debriefing session and completed the posttreatment BAI within 1 week after the fourth counseling session.

## RESULTS

There were no significant differences in the age, gender, and ethnicity between the treatment

TABLE 1.  
Demographics for the Treatment Group and Control Group

| Variable         | Treatment Group (n = 15) |      |    | Control Group (n = 15) |      |    | p  |
|------------------|--------------------------|------|----|------------------------|------|----|----|
|                  | M                        | SD   | n  | M                      | SD   | n  |    |
| Age              | 23.27                    | 4.25 |    | 25.60                  | 6.95 |    | ns |
| Gender           |                          |      |    |                        |      |    | ns |
| Female           |                          |      | 10 |                        |      | 10 |    |
| Male             |                          |      | 5  |                        |      | 5  |    |
| Ethnicity        |                          |      |    |                        |      |    | ns |
| African American |                          |      | 1  |                        |      | 0  |    |
| Asian American   |                          |      | 1  |                        |      | 3  |    |
| Latino           |                          |      | 7  |                        |      | 7  |    |
| White            |                          |      | 6  |                        |      | 5  |    |
| Class Level      |                          |      |    |                        |      |    | ns |
| Freshman         |                          |      | 3  |                        |      | 2  |    |
| Sophomore        |                          |      | 0  |                        |      | 1  |    |
| Junior           |                          |      | 3  |                        |      | 4  |    |
| Senior           |                          |      | 5  |                        |      | 5  |    |
| Graduate student |                          |      | 4  |                        |      | 3  |    |

Note. ns = not significant.

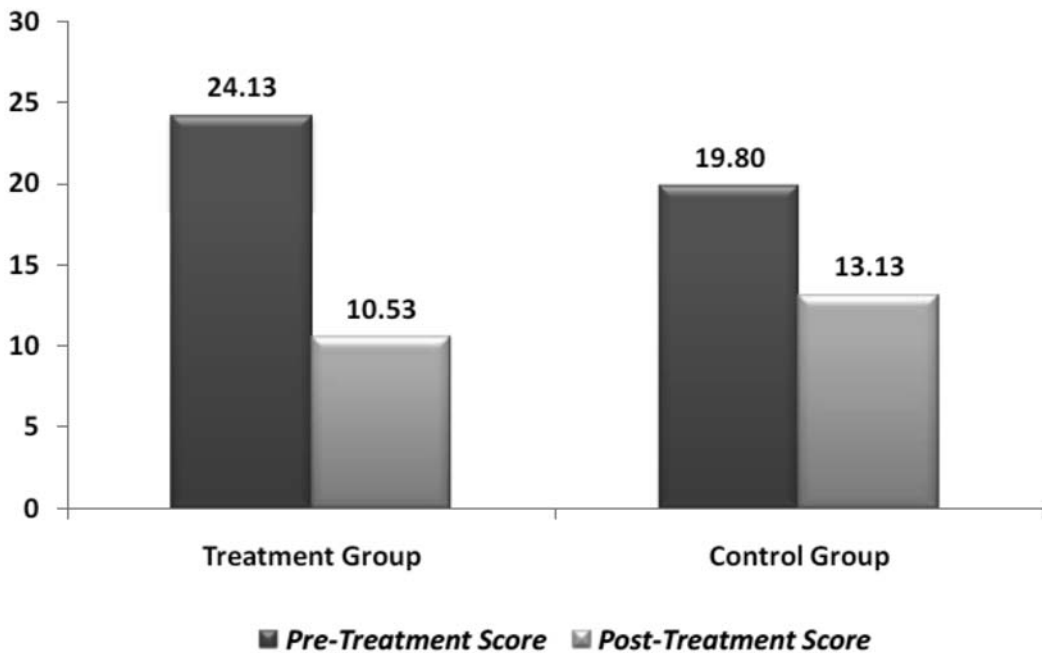


FIGURE 1. Mean Pretreatment and Posttreatment Beck Anxiety Inventory Scores

group and control group (see Table 1). There were also no significant differences in the BAI scores for the different treating therapists, including licensed psychologists and interns.

Both the treatment group and the placebo control group participants showed significant reduction in anxiety symptoms (see Figure 1). For the treatment group, the mean posttreatment BAI score ( $M = 10.53$ ,  $SD = 8.08$ ) was significantly reduced from the mean pretreatment BAI score ( $M = 24.13$ ,  $SD = 10.71$ ). A paired-samples  $t$  test showed significance beyond the .05 level,  $t(14) = 5.28$ ,  $p < .001$ . Cohen's  $d$  was 1.43, which is a large effect. For the control group, the mean posttreatment BAI score ( $M = 13.13$ ,  $SD = 11.38$ ) was significantly reduced from the mean pretreatment BAI score ( $M = 19.80$ ,  $SD = 11.70$ ). A paired-samples  $t$  test showed significance beyond the .05 level,  $t(14) = 3.31$ ,  $p < .01$ . Cohen's  $d$  was 0.58, which is a medium effect. Even though the mean pretreatment BAI score for the treatment group is higher

than the control group, the difference was not statistically significant.

In comparing the outcome between the treatment and control group conditions, the mean improvement score for the treatment group ( $M = 13.60$ ,  $SD = 9.98$ ) was significantly higher than the mean for the control group ( $M = 6.67$ ,  $SD = 7.81$ ),  $t(28) = 2.12$ ,  $p < .05$ . Cohen's  $d$  was 0.77, a medium effect size. The results confirmed the hypothesis that participants who received both weekly counseling and weekly biofeedback sessions showed significantly greater reduction in anxiety symptoms than did participants who received weekly counseling alone.

## DISCUSSION

The results of this study found that the group of participants who received biofeedback training in conjunction with counseling reported significantly greater reduction in anxiety symptoms than did the group of participants

who received counseling alone. Although both groups dropped from a moderate to mild anxiety level based on the BAI interpretation guideline (Beck & Steer, 1990), the treatment group had a significantly greater decrease in anxiety symptoms, both statistically and clinically. The findings suggest that biofeedback training enhances the effectiveness of counseling for the treatment of stress and anxiety among college students.

One unique aspect of the study is that it was conducted within a college counseling center and participants were recruited from the actual pool of students seeking counseling services. Staff psychologists from the college counseling center were involved in counseling students in both the treatment and control conditions of the study. It was an aim of the study not only to explore the effectiveness of biofeedback training as an adjunct to the treatment of stress and anxiety for college students but also to assess the practicality of its use within a college counseling center. The biofeedback equipment was very easy to use for the researchers and, based on participants' comments in the debriefing sessions, participants found the equipment noninvasive and easy to use as well.

Another unique aspect of this study is the diversity of the sample; 63% of the participants were students of color, including 47% who identified as Latinos. Given the increasingly diverse college campus population, it is important that the services provided to students are culturally congruent to the students' needs. Despite efforts to improve sensitivity to diversity issues on college campuses, recent studies still found that students of color have negative attitudes toward seeking counseling services on college campuses (Kearney, Draper, & Baron, 2005; Spivey-Mooring, 2008). Given that the research on the efficacy of biofeedback with students of color is limited, the results of this study provide a promising

alternative to students of color who would not otherwise seek counseling services. Biofeedback can be seen as a nonthreatening and less culturally stigmatizing adjunct or alternative to traditional college counseling. Biofeedback training does not require self-disclosure; participants are given instructions to practice breathing and imagery while they watch a computer screen. Psychosomatic symptoms such as headaches or stomach distress tend to be more common among ethnic minority populations, and thus, treatment that is more holistically based may be more culturally congruent. Additionally, it has been found that Asian American and Latino college students tend to report higher levels of distress at intake than do White students (Kearney et al., 2005), and thus, biofeedback training may be a useful adjunct to counseling in reducing symptoms.

## Implications and Future Research

There are several implications and research recommendations from the findings of this study. The reality of many college counseling centers is an inadequate number of psychologists to meet the mental health needs of the student population. If biofeedback or other alternative approaches can enhance outcome and more effectively address the individual students' needs and strengths, then students can be better served by the college counseling center. With increasing demands for counseling services on college campuses and limited resources available, biofeedback training is an easy and cost-effective augmentation to traditional counseling approaches that college counseling centers could implement within a very short timeframe.

Several studies have illustrated the negative impact of stress and anxiety on the adjustment, academic performance, and retention of college students (Friedlander, Reid, Shupak, & Cribbie, 2007; Hyun et al., 2006; Kerr, Johnson, Gans, & Krumrine, 2004; Lee et al.,



2009). The results of this study demonstrated that, within a 4-week timeframe, a combination of weekly counseling and weekly biofeedback session could significantly reduce the symptoms of anxiety for students, which could help to improve student success and retention.

The benefit to the biofeedback program tested for this research is that the provider of biofeedback training does not need to be a licensed therapist, therefore, freeing up the time for licensed therapists to provide the needed counseling services while other trained personnel (including student assistants or peer counselors) provide the augmented weekly biofeedback sessions. Although there are twice as many contacts for students who receive biofeedback sessions, the biofeedback session is a different type of contact from the counseling session and it is provided by a less costly provider. This situation is analogous to an English professor sending her student to the campus writing tutor to help with the student's writing skills. The campus writing tutor is a cost-effective alternative to the English professor meeting with all her individual students who needed help with writing skills.

Furthermore, the HRV biofeedback equipment used for the study is currently sold at the retail price of only \$229 for the portable biofeedback unit and \$249 for the computer-based unit (compared with the traditional biofeedback equipment that generally costs between \$1,500 and \$6,000). Ratanasiripong, Sverduk, Hayashino, and Prince (2010) provided additional details on biofeedback equipment comparison and program set up.

College administrators could invest minimal additional resources to the counseling center biofeedback program to help students reduce their stress and anxiety symptoms at a faster rate than traditional counseling alone.

Future research may examine the effectiveness of biofeedback and counseling for the treatment of depression. More specific studies may wish to explore the influence of ethnicity and gender as they relate to acceptance of and effectiveness of biofeedback training. It would also be beneficial to include measures or qualitative data that assess possible changes in the management of symptoms with the use of biofeedback.

A promising result of the study was the effectiveness and acceptance of biofeedback training as an adjunct to traditional counseling within a college counseling center. Given the number of students seeking mental health services for anxiety and stress-related issues, this study may provide a rationale for greater implementation and allocation of biofeedback training services to be provided within college counseling centers. As clinical practitioners are becoming more open and knowledgeable about mind–body health, studies such as this contribute to better preparation to meet the individual needs of the students served.

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