



Do Culturally Sensitive Psychological Support Interventions Reduce Stress in Black and Hispanic Professional Health Science Students: A Pilot Study

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Abstract

Stress is a transactional process affected by psychological traits that commonly affect the performance of college students independent of nationality and race. However, Hispanic and Black students tend to perceive more stress in the academic context as a result of many factors, especially institutional oppression. Many students, including minorities, lack sufficient stress management and coping skills. High levels of stress impact not only mental health, but can lead to physical complications for which a student may seek medical care through a family physician. Long-term stress can contribute to chronic health conditions such as heart disease, stroke and diabetes, especially in ethnic minorities. With this study, we sought to evaluate specifically whether a single multi-cultural stress management intervention and follow-up would lead to a reduction in perceptions of stress, salivary alpha-amylase (SAA) biomarker levels and improve the academic performance of Hispanic and Black students in a professional health program within a Hispanic-serving institution. The questionnaire and standardized measures revealed that 60% of the participants had experienced nervousness, hopelessness, restlessness, depression, worthlessness and/or feeling tired affecting their ability to function within the 30 days prior to the study. We observed that salivary amylase biomarker levels decreased in all participants in the period following stress management intervention, suggesting that psychological stress levels may be impacted by this intervention. Although we cannot draw definitive conclusions that the decreased salivary alpha-amylase levels we observed were due specifically to the effects of the intervention, the data suggest that further studies to determine whether associations exist between our stress management intervention and decreased stress and SAA levels are warranted.

Keywords: Stress management, Academic outcomes, Minority, First-generation, Health science, Student, Intervention

Introduction

The percentage of college students presenting with depression and anxiety are higher than observed within the general US population: 15.6% for undergraduate and 13.0% for graduate students

[1]. Students reporting financial worries, those who have not been socialized to maneuver the college system, and those that have limited emotional support are at greater risk of suffering from depression- and anxiety-related disorders.

Stress is widely known to affect the quality of educational performance in college students, likely through altering perceptions of being able to complete complicated or complex tasks that may be beyond what one perceives capable, or negatively impacting relationships between peers and faculty [2]. Furthermore, simultaneous exposure to chronic stressors such as interfamilial stress, residing with family members during the college experience, dating outside one's racial group, perceived or legitimate problems with financial aid and internalization of negative group stereotypes have also been shown to negatively impact academic achievement in minorities [3,4]. Stress associated with academics, such as a more demanding schedule and higher academic requirements are likely to elevate stress levels, particularly in students who have not developed or employ adequate stress management skills. High levels of chronic stress also negatively impact physical well-being and can result in physical and psychological manifestations that may progress to illness [2]. Individuals often find it easier to contact family medicine doctors to address physical complaints of illness caused by chronic stress rather than seeking counseling services from mental health professionals, challenging the physician to distinguish legitimate medical conditions from psychosomatic disorders [5]. An extremely common source of stress in college students is examination anxiety which substantially heightens stress levels, reduces immune system efficacy against inflammation and infection, and promotes increased levels of SAA, a sensitive biomarker for psychological stress [6,7].

Hispanic and Black students are often less prepared and less likely to succeed in college because of discrimination and other factors, along with experiencing an impaired sense of academic well-being [4,8]. As of 2012, the National Science Foundation reported that a significantly lower percentage of Blacks and Hispanics successfully completed college (9.5% and 9.8%, respectively) [9]. Negative self-appraisal following internalization of culturally-based stressors as personal

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deficits can create significant levels of distress along with emotional and psychological pain that may lead to negative academic outcomes [10]. Inadequate family or social support networks and feelings of marginalization or alienation within the learning environment can also be a source of significant stress for these students [11,12]. Exposure to substantial sources of stress caused by these factors can lead to academic achievement gaps amongst races which manifest as poor retention rates, increased timespans toward degree completion or decreased academic performance rates [4,13-15].

Students in close proximity to the US-Mexico border, Latino(a) students in particular, have been exposed to a unique narrative framed by a long standing history of bi-culturalism and bi-directional migration between the US and Mexico. As such, many of these students continue to have many strong connections between the US and Mexico, leading to added pressures associated with acculturation. Acculturation stress has been shown to associate with an increased psychosocial and physical complications [16]. The environmental and psychological stressors associated with acculturation often manifest as physical health problems for which a student may seek medical care.

Chronic stress can lead to negative health outcomes which can be reduced by the integration of stress moderation and improved physical and mental wellness behaviors into one's daily routine. Strategies such as mindfulness-based stress management programs are beneficial for reducing perceived levels of stress, anxiety and mental distress while increasing mindfulness and feelings of self-efficacy, all of which are important in academic success [17,18]. Culturally competent stress management programs capable of meeting the unique needs of minority students are of vital importance, especially for minority-serving universities whose populations are composed primarily of students of color. Universities have traditionally been more reactive than proactive when providing student services for stress management, focusing primarily on counseling support rather than prevention services. Furthermore, the institution in which this study was conducted is unique in that the demographic profile of the student body is primarily Hispanic (over 80%) of which approximately half are first-generation college students. Arguably, this unusual demographic profile provides an interesting context to examine the experiences of Black and Hispanic students in a stressful professional program to better understand the challenges they face pursuing academic success. The use of stress management programs to help students cope with the stressors associated with higher education is not novel; programs are commonly offered over a defined time period and provide additional support such as incentives and/or ongoing training. In this study, we were interested in learning how students would integrate information gained from a single seminar with one follow-up intervention into their lives as a mechanism to respond to stressors encountered in their daily lives. To explore this further, we sought to evaluate whether exposure to a single 2 hour stress management intervention course, designed using techniques obtained from a multi-cultural, holistic self-awareness program promoting general health and wellness, would be effective in helping Hispanic and Black students attending an atypical U.S. minority-serving university located on the US-Mexico international border. We hypothesized that this intervention would reduce SAA levels and improve the academic performance of students in a professional health science program.

Materials and Methods

Participant demographics

A total of 1 male and 4 female (n = 5) undergraduate Clinical Laboratory Science students ranging in age from 18-32 years volunteered to participate in the study. Four students self-identified as Hispanic and one as Black. These five students represent approximately 20% of the total study population comprised of 96% ethnic minorities, 88% of which are Hispanic. The racial profile of the region and the University was reflected in the sample population demographics of the Hispanic-serving institution in this study. Four were not employed and 1 worked part-time, four out of the five reported being single and one reported living with a partner, and three out of the five reported

no religious connections. All of the participants reported having no children, and each reported having emotional support from someone in their lives.

Student recruitment

Students were recruited into the study by trained research team members or the faculty member from the department of Social Work who would at no time be an instructor of the students. The instructor of record was not present during the recruitment process. Questionnaires, standard measures and saliva samples collected from subjects who had volunteered to participate were fully de-identified using randomly assigned alpha-numeric codes and was reported in such a manner as to protect confidentiality. Multiple attempts were made to recruit additional students into the study but they were unsuccessful.

Academic measures, questionnaire and standardized measures

Participants were asked to complete a general health and wellness questionnaire, the Adult Hope Scale (AHS), the Depression Anxiety Stress Scale (DASS 21) and the K6 at the onset of the study. The general health and wellness questionnaire was designed to collect demographic data as well as basic information regarding physical and mental wellness that could impact stress levels such as sugar, caffeine and drug intake, stress exposure and coping skills and a basic disease history. All data within the questionnaire was based on self-report only. The AHS is a 12-item scale that measures hope amongst adults who answer questions using an 8-point Likert scale [19]. Babyak et al. found acceptable construct validity and reliability within this instrument, making it acceptable for use in this study [20]. The DASS 21 is a 21-item measure consisting of three sub-scales that measure depression, anxiety and stress levels amongst adults [21]. Reliability and validity of the DASS-21 was assessed by calculating Chronbach's Alpha and through using standardized regression analysis. The study found good overall reliability for depression ($\alpha = 0.90$), anxiety ($\alpha = 0.83$) and stress ($\alpha = 0.86$) as well as identifying statistically relevant associations between the three constructs represented in the DASS-21 and maladaptive coping [22]. The K6 is a 6-item measure utilized to assess the clinical presentation of serious mental illness among adult respondents [23]. The psychometric properties of the K6 were examined by Cornelius, Groothoff, JL van derKlink and Brouwer found internal consistency with $\alpha = .882$. The areas under the curve (AUC) for the K6 were assessed at .796 (CI .737 - .854) suggesting overall good validity [24]. Grades from exams that administered on Mondays throughout the evaluation period were obtained as de-identified scores for each of the subjects using the appropriate alpha-numeric code.

Salivary Alpha-Amylase (SAA) testing

On Monday and Friday through the evaluation period, subjects were asked to provide an unstimulated saliva sample in a sterile, 15 mL polystyrene tube between 8:45 and 9:00 am. Subjects were asked to fast for 1-2 hours prior to saliva sample collection. The saliva samples were immediately placed on ice following collection and were transported to the laboratory for processing. Samples were centrifuged at 3000 rpm for 15 minutes to remove particulates, then either aliquoted and stored at -80°C until analysis or allowed to come to room temperature. Room temperature samples were diluted to a final titer of 1:200 in sample dilution buffer, then analyzed according to the manufacturer's suggested protocol with the exception that 4 μL of samples or controls (low and high) and 160 μL of substrate were used in the assay (Salmetrics, LLC, State College, PA).

Stress management intervention

Subjects were invited to participate in a single 2 hour stress management training where they were instructed how to perform techniques including deep breathing, reflexology, acupressure, self-awareness training, and mild stretching exercises by a certified stress management program leader at the beginning of the study, and had a

brief follow-up regarding the techniques approximately one week after the start of the study. The intervention model used as the basis for this study was originally developed in Latin America as an intervention for the treatment of stress in victims of war trauma and violence, making it culturally sensitive to the needs of a primarily Hispanic population. In addition, the program was designed by incorporating wellness techniques originating from various regions throughout the world, including Asia and Latin America, and is currently utilized in countries with extremely diverse cultural groups on 5 continents throughout the world.

Study design

Students from the Clinical Laboratory Sciences program were recruited for participation in the study by verbal request. Those subjects choosing to participate were assigned a randomly generated alpha-numeric code that was used for the duration of the study. Because only 5 subjects chose to participate, all were placed into the experimental group and trained in stress management techniques by a certified trainer at the beginning of the study. Participants were asked to utilize these techniques when they began to feel stress or experience a stressful situation. To enhance recall of the procedures, the experimental group engaged in a brief follow-up regarding the techniques approximately one week after the beginning of the study. Participants were asked to complete a general health and wellness questionnaire, along with the DASS, K6 and the Adult Hope Index as detailed above at the beginning of the study. Throughout the duration of the study, subjects were asked to provide a bi-weekly saliva sample on Monday and Friday for evaluation of SAA levels. In addition to the psychological outcome measures and saliva samples, students were asked to release their exam grades for the duration of the evaluation period.

Data analysis

Due to limitations in subject recruitment, a control group and randomization of the participants were not possible. Thus, data analysis was primarily limited to descriptive and qualitative methods due to the lack of power caused by an extremely small sample size. Where appropriate, means and standard deviations or medians with interquartile ranges were reported.

Results

Student stress and wellness management

Evaluation of the wellness questionnaire indicated that study participants were not experiencing any significant health complications at the time of the study. Table 1 outlines the mechanisms that students would use to manage daily stress and general wellness and the frequencies in which they engaged in those activities. All of the participants reported using at least one or more of the stimulants and/or depressants such as alcohol, with caffeine and sugar being the most common. Of interest was that all participants reported using some form of stress management technique at least 1 time a week, with exercise being the most prominent technique. Surprisingly, 40% (2/5) of the participants reported using stress management techniques such as exercise greater than 5 times per week. All the participants denied the use of prescription medications, illegal drugs, or nicotine.

Psychological Outcome Measures

Participants were queried whether they had experienced a crisis

Table 1: Participant's frequency of use for sugar, caffeine, alcohol, stress management techniques and exercise.

Frequency (Times per week)				
	0	1-2	3-5	+5
Caffeine	1	2	1	1
Sugar	0	4	1	0
Alcohol	2	3	0	0
Stress management techniques	0	1	1	3
Exercise	2	1	0	2

Table 2: DASS 21 outcome measures for depression, anxiety and stress.

	Depression	Outcome measure Anxiety	Stress
Normal	3	3	5
Mild	2	1	0
Moderate	0	1	0
Severe	0	0	0
Extremely Severe	0	0	0

in the past month, then were asked how they managed the crisis. Of the participants, only 1 of 5 (20%) reported having experienced a crisis, and they stated that they used family and professional support to respond. Although results from the Hope Scale Index indicated that all of the students experienced similar levels of hope, several of the participant's scores on the DASS 21 suggested signs of depression and anxiety (Table 2). Stress scores on the DASS 21 prior to the intervention were all within the "normal" range, providing a baseline for comparison over the duration of the study. Mean scores of the DASS-21 subscales were 7.0 ± 6.8 for depression, 5.2 ± 5.17 for anxiety and 9.2 ± 6.1 for stress. Given that this study did not include a control group, analysis was limited to descriptive statistics alone. Participants reported having feelings of nervousness, hopelessness, restlessness, depression, worthlessness and/or feeling tired over the past 30 days, with 60% (3/5) reporting that these feelings impacted their ability to function. Analysis of subjects' responses on the K6 indicated that all of the participants believed physical health complaints they had experienced caused feelings such as feeling tired, restless and nervous, which led to impaired daily functioning.

Salivary Alpha-Amylase (SAA) levels and exam scores following stress management training

Median SAA levels appeared to drop slightly in students from baseline values after the stress management intervention which took place on 7-16. Median SAA values were 41.0, 36.2, 22.9, 38.1, 109.1 and 58.45 IU/ml for each of the respective collection periods from the baseline on 7-16 (Figure 1A). Figure 1 indicates the SAA measurements for each of the subjects (left Y axis). Some of the participants demonstrate slight to more pronounced decreases in SAA. Amylase levels spiked on 7-31, likely because of anticipatory stress due to the cumulative nature of the final exam which occurred on 8-3. Notably, subject 4 in figure 1B showed the greatest decrease in amylase levels between 7-16 and 7-20 also rated the highest on both the DASS 21 and K6, suggesting more pronounced symptoms of depression and anxiety. Unfortunately, because of limitations due to participation, we could not demonstrate association between the intervention and changes in SAA levels. Subject 3 in figure 1B who scored low on the DASS 21 and K6 that reported a history of practicing stress management strategies likely had the highest level of psychological functioning amongst the participants. In addition, this participant also experienced low variability in SAA levels throughout the duration of the study. No significant differences were observed in mean exam scores before or after the evaluation period. Prior to the intervention, the mean exam score for exam 1 was $86.2 \pm 6.3\%$. Following the intervention, the mean scores were 90.6 ± 4.6 , 91.2 ± 5.5 and $83.6 \pm 8.5\%$ for exams 2 through 4, respectively. Exam scores did not appear to correlate with salivary amylase values in this cohort, remaining consistent throughout the study period.

Discussion

This pilot study was designed to assess the potential of a model incorporating culturally-sensitive stress reduction training with biomarker assessment as a method to reduce stress and to improve stress management skills, academic retention and performance in students within a university college consisting primarily of students of color. This demographic presents exceptional challenges for finding suitable culturally-sensitive stress management programs well-adapted for use in minority populations. We found mixed results on the psychological outcome measures. Notably, we observed that subjects' were generally hopeful based on the scores from the AHI, whereas, two of 5 participants scored in the mild range for depression,

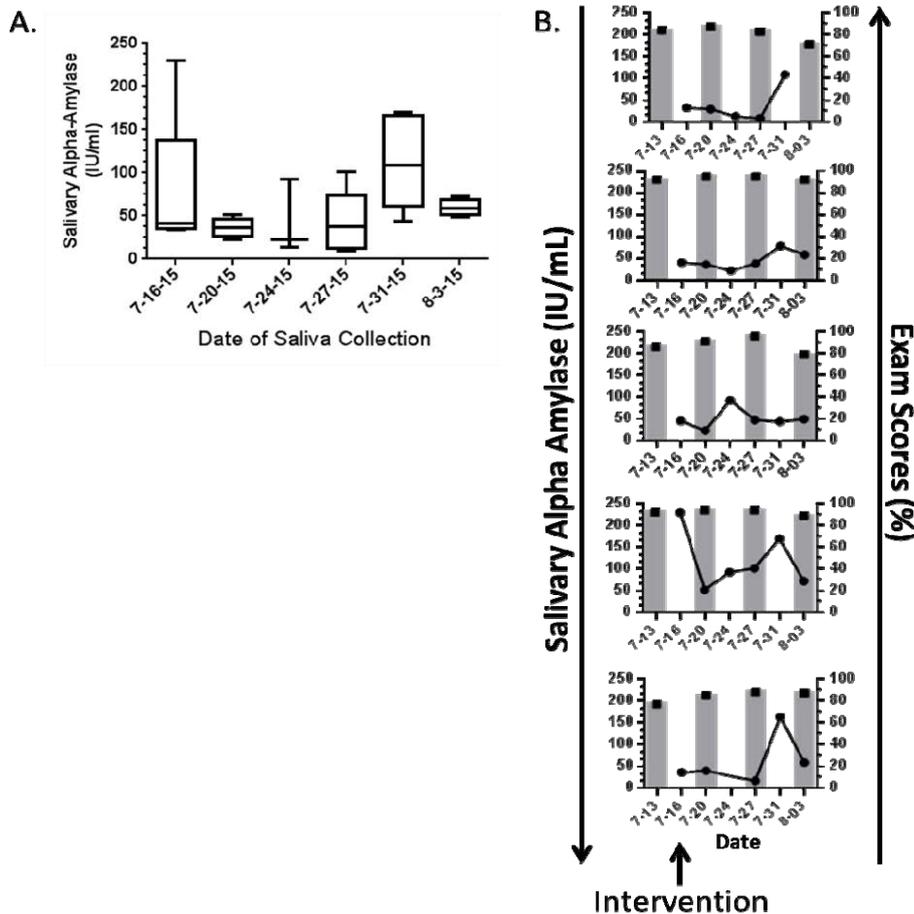


Figure 1: Salivary alpha-amylase levels do not associate with improvement in exam scores in Clinical Laboratory Science students. A) Salivary amylase levels were measured in students on Mondays and Fridays. Median student salivary amylase levels with the 25% and 75% interquartile ranges were plotted for all students by date. B) Salivary amylase levels (Left axis, lines) and exam scores (right axis, bars) were documented through the evaluation period and are indicated by date (X axis). The stress management intervention training occurred on 7-16-2015 as indicated by the arrow.

one scored in the mild and one in the moderate range for anxiety. Analysis of the K6 found that 3 of 5 participants reported negative feelings that they believe impacted their daily functioning. We observed that most of the SAA analyte values decreased immediately after the intervention. Three participants showed a steady decrease in SAA values over 7 days post-intervention, while values for two participants increased after four days.

A major limitation of the study was our inability to perform a randomized control trial because of insufficient recruitment. We observed that students' salivary amylase levels appeared to decrease, some significantly, in the period just following the two hour intervention but they subsequently increased as the assessment period progressed. Because a control group lacking the intervention is absent, we cannot definitively state that the observations we had regarding the decreasing SAA levels were due to the effects of the intervention. The study does suggest to us, however, that further studies to determine whether there is an association between the intervention and decreased stress and SAA levels are warranted. In this study, one of the participants who reported the highest levels of depression and anxiety also used health care services at the highest frequency, demonstrating that there is a critical need for studies that identify stress management programs to train students how best to manage their mental and physical wellness. The research literature provides strong evidence to support the connection between physical wellness and mental health. Students are more likely to seek care for physical or psychosomatic issues related to stress through a family medicine provider. This study suggests that the physician and student should discuss academic issues and concerns that may be at the core of the physical and psychological complaints to enable the physician to identify and manage the legitimate source of the medical complications. We found one example epitomizing this connection within the study, which reinforces findings from

other researchers regarding the importance of the family physician in identifying psychological and emotional issues of stress that may manifest as physical ailments, requiring follow-up to help the student seek appropriate treatment. Arguably, this pilot study supports that students who manage their stress more effectively will perform better academically and experience an improved quality of life.

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Ethical Statement

The study was approved by the Institutional Review Board of the University prior to data collection in compliance with the Declaration of Helsinki. All subjects provided written informed consent to participate in the study and signed an authorization for the release of educational records according to requirements outlined in the Family Education Rights and Privacy Act of 1974.

Conflict of interest statement

The authors have no conflicts of interest to report.

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