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RESEARCH ARTICLE

Evaluation of a Behavioral Self-Care Intervention for Public Health Students

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ABSTRACT

Background: Postgraduate education is recognized as a time of intense stress. Rates of anxiety and depression are elevated among graduate students, and longitudinal studies have documented increases in clinical symptoms over the course of training. **Purpose**: The current study was to evaluate whether an academically sponsored self-care intervention would increase engagement in health promotion activities. The primary goal was to determine whether self-care behaviors completed in the midst of a challenging academic program would prevent the worsening of student mental health. **Methods**: The self-care intervention included behavior change projects designed to increase health-promoting behaviors within 4 domains (nutrition, physical activity, mental health, social support). Students received incentives in the way of bonus points for maintaining health behaviors for the duration of the 12-week semester. **Results**: Results revealed significant increases in health-promoting behaviors. Importantly, mental health symptoms did not worsen over the course of the semester. **Discussion**: The study provides preliminary support for the utility of a brief self-care intervention for students in the health sciences. **Translation to Health Education Practice**: Future studies should examine the applicability of this intervention to students in other fields of study and through online education formats.

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Background

Postgraduate education is known to be a stressful experience.[1-5] Indeed, graduate and medical students exhibit elevated levels of anxiety and depressive symptoms compared to those observed in the general population.[3,4,6] Longitudinal investigations have provided complementary findings, showing that professional students experience a gradual worsening of psychiatric symptoms over the course of training.[5,7] Consequently, research has begun to identify individual and systemic factors contributing to increases in clinical symptoms to inform prevention efforts to mitigate the negative effects of graduate school on psychological well-being.[8-10]

Putative mechanisms of the relationship between postgraduate school and psychological difficulties include chronic stress and engagement in unhealthy behaviors such as poor diet, sleep deprivation, substance and alcohol misuse, sedentary lifestyle, and social isolation.[11-14] The occurrence of these risk factors is fairly normative among professional and graduate students[15-17] and, importantly, there is a growing body of empirical research linking these factors to increased risk for psychopathology.[18-21] Given the convergence of multiple risk factors within such a finite period of time, postgraduate school may represent a particularly vulnerable time for the worsening of mental health. It is therefore imperative to create prevention methods that aim to decrease lifestyle risk factors and mitigate risk for psychological difficulty, an approach that is consistent with the public health model of risk reduction.[22]

Purpose

The current study examined the effectiveness of a behavioral health promotion intervention—implemented as part of the course curriculum—on student health behaviors. The ultimate goal was to encourage engagement in self-care behaviors as a means of mental health wellness activities. As part of a graduate course on the social and behavioral foundations of health, students implemented a series of personal health behavior change projects. The course curriculum aligned with these behavior change modules and taught the epidemiology and health relevance of specific health behaviors. Students learned specific empirically supported behavior change techniques (eg, positive reinforcement, environmental manipulation) and established individual behavior modification goals relevant to 4 domains: nutrition, mental health, physical activity, and social support. Although behavioral goals spanned multiple

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domains, the primary outcome of interest was mental health—specifically, anxiety and depression days. The primary behavior change technique was reinforcement for meeting and sustaining behavioral goals: students opting to maintain health behaviors for the duration of the 12-week semester were given extra credit.

Methods

Participants

Participants were 91 graduate students in public heath who consented to participate in a research study "designed to examine common health behaviors and choices … general health status, attitudes towards public health interventions, and your personal health behaviors." Participants were recruited through enrollment in a core course in social and behavioral sciences. The study and purpose were described in the introductory lecture, and the extra credit assignments were framed as a semester-long health intervention. Links to assessments, behavior goal setting, and behavior monitoring forms were provided through the course canvas site, which is a university-held learning management system. The course enrolled 96 students; however, some students opted not to participate in the research study (n = 1) or did not complete both the baseline and post assessments (n = 4). The majority (>93% of the sample) opted to describe their race and gender for reporting purposes. The class was predominantly female (74%) and represented multiple race/ethnicities: 42% Asian, 5% African American/black, 6% Hispanic/Latino, 37% Caucasian/white, 10% multiple/other.

Procedure

The study was granted an exemption from institutional review board review under federal regulation 45 CFR 46.101(b)(1) by the Human Subjects Review Board. After providing informed consent, students completed an anonymous survey during the first week of class and again during the last week of the semester (approximately 12 weeks later). The goal was to determine whether the health behavior interventions applied during the semester led to behavior change.

Measures

Students completed a self-report questionnaire about personal health behaviors. Questionnaire items were drawn from national longitudinal health surveys.[4-25] The questionnaire took approximately 5 min to complete.

Key items

Questionnaire questions included items specific to nutrition, mental health, physical activity, and social support. The majority of items queried frequency of specific behaviors, such as "In the past week, during how many days did you exercise or engage in rigorous physical activity for at least 20 minutes" and "During the past month, how many days have you felt sad or depressed?"

Sad or depressed days

Depression was evaluated through a single item drawn from the Behavioral Risk Factor Surveillance System. Prior research[26,27] has established that this item has acceptable psychometric properties (reliability and criterion validity) and is associated with lengthier measures of mental health.

Worried, tense, or anxious days

Anxiety was measured via a single item of the Health Related Quality of Life Assessment[24] and has demonstrated acceptable psychometric properties and correlates with lengthier measures of mental health.[27] General health status was evaluated by the single item, "In general, would you say your health is … (excellent, very good, good, fair, poor)?" This question is first item of the Medical Outcomes Study general health survey (Short Form-36), which has been shown to be a valid assessment of health status and correlates with objective physical health outcomes including physician visits and disability days.[28]

Exploratory variables

Several exploratory items were developed by the researchers and assessed nontargeted health and risk behaviors, including bike helmet use, use of sunscreen, cigarette smoking, and alcohol consumption. Additional items assessed personal health values, such as personal importance of consuming healthy foods. These variables, which were generated for the purpose of the current study, were pilot-tested for readability but were not subjected to psychometric analysis.

Posttreatment behavioral adherence measure

Additional questions evaluated adherence to the individually chosen behavioral goals—for example, "Considering each of the behavior change goals, on approximately what percentage of days did you achieve your goal?"

Anonymous data collection

All data were collected anonymously via an online self-report questionnaire. The questionnaire link was posted to the course website and was e-mailed directly to all students. To allow for matching of data at baseline and

post, each student created a unique identifier. No information was gathered that could allow for identification of any participant. Demographic information (age, sex, race/ethnicity) was collected in a separate online survey that was not traceable to any individual participants' responses to the health behavior survey.

Course description and content

The educational setting was a large survey course taught in the Yale School of Public Health. The course taught the fundamentals of behavioral theory and sociobehavioral factors as they apply to health promotion and interventions. The course involved 4 distinct modules, focusing on nutrition, mental health, physical activity, and social support and social capital. Within each module, students established individual health behavior change goals, which they chose after completing anonymous assessments.

Curriculum

The course content aligned with the health behavior change modules. The introductory unit taught the fundamentals of behavior change, as applied to health behaviors. Behavior modification techniques (eg, reinforcement, prompting, response cost) were described, and clinical and public health interventions utilizing each technique were reviewed. For example, lectures included descriptions of randomized controlled trials for obesity and lifestyle interventions for physical activity, with emphasis on the specific behavior change techniques employed. Following the foundational unit on behavior change techniques, the course covered 4 modules.

The nutrition module provided an overview of nutrition and preventable disease, focusing primarily on the World Health Organization/Food and Agriculture Organization expert panel report on the prevention of chronic disease.[29] Additional topics included the obesity epidemic, the "toxic" food environment, and specific clinical and public health interventions aimed at obesity reduction and improved nutrition. The mental health unit provided an overview of the prevalence and key features of mental disorders, with particular emphasis on depression and anxiety and the role of risk behaviors and chronic stress in mental health. The mental health unit included a description of empirically supported treatments and a discussion of mental health stigma. The physical activity unit paralleled the nutrition unit with respect to the World Health Organization/Food and Agriculture Organization report on chronic disease prevention[29] and included descriptions of randomized controlled trials and school- and community-based intervention studies. The final unit, social support and social capital, focused on social learning theory, self-efficacy, and the role of social support in wellness behaviors and with respect to disease progression.

Each unit was accompanied by readings and assignments focusing on the specific domain and included case work. For example, students developed mock grant proposals to fund an intervention to promote physical activity among graduate students. Additional information regarding lecture material, course assignments, and readings are available from the first author upon request.

Behavior change interventions. The initial didactic content included instruction on behavior change techniques, as are utilized in behavioral interventions for mental health disorders and other health behaviors such as dietary interventions. Lectures were developed by the senior author and professor of the course (MAW), who has conducted multiple randomized controlled trials on behavioral interventions and has published widely in the area of behavioral health interventions. Reading materials were drawn from published texts on health behavior change[30,31] and included published research papers of clinical trials utilizing these techniques. Instruction focused on the importance of establishing specific, measurable, attainable, relevant, and time-bound behavioral goals (ie, SMART goals), as widely utilized in clinical practice. Following instruction on these behavioral techniques, students were tasked with applying these principles to modify their own health behaviors.

Each student established personal behavior change goals within the 4 course units of nutrition, mental health, physical activity, and social support. The pacing of the goals was sequential, with the nutrition goal setting occurring during week 2 of the semester, mental health during week 5, physical activity during week 8, and social support during week 11. The assignment was to attempt to achieve the behavior change goals for 5 consecutive days. Using a variety of specialized strategies informed by behavioral theory (eg, reinforcement, response cost, negative reinforcement), students chose contingencies for the completion of their targeted behavior. However, students were offered a variety of extra credit/bonus point incentives (ie, reinforcement strategy) for sustaining health behaviors for the duration of the semester. Students adhering to their goals for >90% of the days of the semester were given 10 bonus points to their grade, which amounted to an increase in a full letter grade for the term. A summary of the most commonly chosen health behaviors and examples of the person-level behavior change strategies appear in Table 1. It should be noted that students were

Table 1. Behavioral goals within each of the 4 modules and sample behavioral contingencies.

Nutrition	Mental health	Physical activity	Social support	Behavioral contingencies
Consume 5 servings of fruits/ vegetables	Scheduled mindfulness practice or yoga/meditation	20–30 min per day of cardiovascular activity	Scheduled social events with friends or peers	Token system (reward/ gift following completion of goals)
Reduce intake of added sugars/ sugar sweetened beverages	Gratitude journal	Strength training (eg, push-ups, weights, planks)	Random acts of kindness	Response cost (donation to despised charity)
Increase water intake	Sleep-specific goals (aim for consistent bedtime, 7–8 h of sleep)	7-min workout app	Removal from social media in favor of face-to-face interactions	Premack (specialized reinforcement technique)
Reduce intake of red/processed meats	Pleasurable events scheduling (eg, study breaks, humor, pleasure reading)	Standing breaks while studying	Calling/video calling long-distance friends or family	Prompting
Mindful eating (scheduled meal times, no competing activities during meals)	Prayer	Walking instead of taking the bus/stairs instead of elevator	Texting a distant friend or family member daily	Environmental manipulation

encouraged to add health behaviors (eg, increase vegetable intake) rather than to restrict or reduce intake of specific foods (eg, to reduce calorie intake).

Behavioral tracking

As is commonly utilized in behavioral interventions for health behaviors, students completed behavior tracking records for all targeted behaviors and submitted these on a weekly basis. Links to the behavioral tracking measure were posted on the course website and were e-mailed to students on a weekly basis. The behavioral tracking measure required reporting of the specific goal and a daily record of whether or not the goal had been achieved. Scores on this measure could range from 0 (*achieved goal on no days*) to 7 (*achieved goal every day*). Final scores were calculated as the percentage of days achieving the goals within each specific domain.

Statistical analysis. Data were downloaded directly from the survey collection service (Qualtrics.com) and analyzed with SPSS (v24., Armonk, NY: IBM Corp.). Missing data were excluded from analysis. Dependent *t* tests were conducted to evaluate change in continuous measures (eg, depression days). Chi-square tests for independence evaluated changes in categorical outcomes. Correlation was used to test associations among health behaviors and general health perception. Alpha of .05 was used to determine statistical significance.

Results

Behavioral adherence

On average, students reported sustaining their behavioral goals for the majority of the semester. The average number of days meeting the behavioral goals was, respectively, 82% of days (range 10%–100%) for nutrition; 81% for mental health (range 10%–100), 79% (range 0%–100%) for physical activity, and 87% (range 5%–100%) for social support. It should be noted that the values reported here are estimates provided by students in their postassessments. Because these data were collected anonymously, it is not possible to match them to the behavioral records collected during the semester. However, in aggregate, the values align with the records collected through behavioral tracking records.

Primary outcomes

The primary outcomes were the frequency of experiencing depressed or anxious mood during the prior 30 days. Additional variables of interest were engaging in specific health behaviors relevant to the behavioral goal domains—that is, nutrition and physical activity behaviors. Baseline and postintervention scores are provided in Table 2.

From baseline to postintervention, there were no reported changes in frequency of depressed mood or anxiety. Students reported significant improvements in self-reported nutrition and physical activity, as assessed via multiple questions drawn from existing epidemiologic surveys. Specifically, students reported increased fruit, vegetable, and whole grain intake. They also reported increased physical activity. There were no reported changes in satisfaction with social life.

Exploratory analyses

A variety of general health promotion and risk behaviors were also assessed and are included in Table 2. With respect to general health perception, students reported no change in their overall health or in their perception of their physical health compared to the year prior. Students reported no change in sunscreen use or in seat belt usage but did report increased use of bike helmets. There was no change in alcohol consumption or in frequency of binge drinking episodes. Students reported significant decreases in cigarette smoking.

Table 2. Baseline and postintervention engagement in health behaviors.

	Baseline		Postintervention (week 12)				
	M	SD	M	SD	*t*	*p*	*d*
Nutrition							
Vegetable servings per week	10.27	(7.42)	14.58	(8.21)	5.28	.000	0.55
Fruit servings per week	8.78	(7.12)	12.58	(8.10)	4.36	.000	0.46
Sweets/fast food per week	4.85	(5.22)	4.90	(5.30)	0.87	.931	0.01
Whole grain servings per day	1.22	(1.20)	1.69	(1.36)	3.08	.003	0.33
Mental health							
During the past month, how many days have you felt sad or depressed?	4.11	(3.84)	4.62	(4.71)	1.10	.272	0.12
During the past month, how many days have you felt worried, tense, or anxious?	7.84	(6.50)	8.98	(7.28)	1.82	.072	0.19
Physical activity							
Considering the typical week, how many days do you exercise?	3.77	(1.72)	4.62	(1.64)	4.35	.000	0.46
Rigorous physical activity (times past week)	2.79	(2.05)	3.31	(2.23)	2.14	.035	0.22
Social							
Social life satisfaction (1 = *very satisfied*; 4 = *not satisfied*)	1.82	(0.68)	1.81	(0.70)	−0.16	.877	0.02
Exploratory variables							
General health perception (1 = *excellent*; 5 = *poor*)	2.38	(0.84)	2.31	(0.09)	−0.98	.330	0.10
Change in general health (1 = *much better*; 5 = *much worse*)	2.77	(0.87)	2.68	(0.92)	−0.78	.436	0.08
Sunscreen use (1 = *rarely*; 4 = *always*)	2.34	(.98)	2.37	(1.01)	0.34	.734	0.04
Bike helmet use (1 = *always*; 5 = *never*)	2.35	(1.47)	1.98	(1.28)	−2.40	.021	0.33
Seat belt use (1 = *always*; 4 = *seldom*)	1.25	(0.61)	1.24	(0.58)	−0.19	.849	0.02
Number days/week consuming alcohol	1.38	(1.20)	1.40	(1.50)	0.18	.857	0.02
Number days consuming 5+ drinks	1.33	(3.27)	0.63	(1.40)	−1.99	.050	0.21
Smoking (1 = *daily*; 4 = *never*)	5.5% Current smoking		1.1% Current smoking		χ^2 = 17.4	.000	0.44

Note. *d* = Cohen's d effect size for paired t-tests; phi for χ^2 analysis.

Postintervention associations

At post, perception of general health was significantly correlated with intake of vegetables, $r(89) = 0.28$, $P = .008$, and whole grains, $r(88) = 0.27$, $P = .010$, and with daily exercise, $r(89) = 0.33$, $P = .001$. Perception of general health was inversely related with depressed days, $r(89) = -0.21$, $P = .040$. Depression days and anxiety days were inversely associated with fruit intake, such that greater fruit consumption was associated with lower levels of depression, $r(89) = -0.29$, $P = .006$, and anxiety, $r(89) = -0.24$, $P = .020$.

Discussion

The current study tested the effectiveness of a behavioral self-care intervention implemented as part of a class assignment on student health behaviors. Students were encouraged to engage in targeted health behaviors for 5 days, and graded assignments hinged on the written descriptions of the behavior change technique. Students were given the opportunity to earn extra credit points by continuing to meet behavior change goals for the duration of the semester. Anonymous assessments administered at the beginning and end of the semester were analyzed for change in health behaviors. Significant improvements in nutrition and physical activity behaviors were observed. There was no change in the frequency of days experiencing depression and anxiety.

The results of this study are consistent with risk models for the onset of mental disorders, which postulate that poor self-care behaviors heighten the vulnerability for depression and anxiety.[32] That rates of depression and anxiety did not increase over the course of the semester is counter to published longitudinal reports showing a worsening of mental health symptoms corresponding with graduate school matriculation.[10]

The observed relationships among nutrition and physical activity behaviors and general and mental health are consistent with previous research.[33-35] For example, the finding that fruit intake was associated with reduced depression and anxiety is consistent with reports utilizing large-scale health surveys.[36,37] This suggests that classroom interventions designed to encourage student health behaviors may have beneficial effects for student mental health as well. If confirmed by additional research, this could provide a novel site of intervention to support student well-being.

The outcomes examined in this study were based solely on anonymous self-report measures, rather than approaches such as continuously collected behavior tracking or using informants. Self-report of health information is subject to bias and reporting errors; however, information reported anonymously is more likely to be candid.[38] Furthermore, in aggregate, the postassessment data were similar to the behavior tracking data collected throughout the semester. It should also be noted that in the spirit of reducing participant burden, the self-report measures used in the current study were quite brief and in many cases relied on a single item as the outcome variable subjected to analysis. Future studies should utilize lengthier and broader measures of mental health outcomes, especially those that have been determined to be sensitive to clinically significant changes in anxiety and depression. Subsequent work would be strengthened by the inclusion of measures relevant to health behavior change, including measures of self-efficacy, self-esteem, and perceived stress.

A limitation is the absence of a control group, which may have highlighted the positive effects of the intervention on maintaining mental health during stressful periods and limits our ability to conclusively attribute the observed effects to the intervention. Further, without a control group we are unable to protect against history as a possible confounder of the intervention. Specifically, the outcome of the 2016 presidential election, which occurred approximately mid-semester—may have influenced the emotional well-being of students at a predominantly liberal campus.[39] A second limitation is that the survey measures may not have been sensitive to clinically significant changes in mental health. Additionally, the sample consisted of medical residents and public health graduate students whose coursework and research tend to focus on health behaviors. This may have resulted in a sample of graduate/professional students that is already highly aware of and engages in the types of behaviors targeted by the intervention, artificially inflating baseline estimates of engagement and leaving the sample prone to the ceiling effect. Finally, the selection of intervention techniques by students was not necessarily done based on proven effectiveness. Instead, students chose the techniques that they felt would work best for them based on their values, routines, and goals. In practice, this methodology may have actually promoted adherence to a student's selected goal. Despite these limitations, we observed significant improvements across multiple health behavior domains.

In summary, this study suggests that behavioral self-care interventions implemented as part of a class assignment may be effective at promoting health behaviors among graduate students. This strategy may help prevent deteriorating mental health among graduate students across academic semesters. Future versions of this course-based intervention should employ a control group, use measures that are more sensitive to clinically significant improvements in health, extend to student populations in departments other than public health, and examine how student values may relate to engagement in behavior change goals. Future versions of this course could also test whether the intervention is disseminable via online or distance-learning platforms. Integration of behavioral self-care interventions in academic courses may be a valuable approach to promoting well-being in higher education.

Translation to Health Education Practice

The intervention tested here has the potential to be successful in courses at the undergraduate level or outside a health curriculum. Although the 4 distinct modules of behavior change assignments were heavily integrated with the course content, it would be possible to provide a similar health behavior change assignment within the context of a variety of courses or as a university-wide campaign. The critical factor in initiating behavior change in this paradigm (and in many clinical settings) is the application of external incentives—that is, reinforcement for health behavior change. In the current study, the primary reward was extra credit points. Assuming administrative and faculty endorsement of a policy that rewards students in the way of grade improvements, it would be possible to assign health improvement behavior change projects in a variety of courses or curricula. Though the didactics surrounding behavioral theory were potentially helpful for students in this course, it was not expected that students become expert in applying behavioral theory to motivate change. Rather, we stipulate that the externally applied reward of extra credit was the primary factor motivating behavior change, at least in the initial phases of the intervention. It is likely, however, that the continued practice of these health behaviors became internally rewarding and that students began to feel physical and/or mental health benefits with sustained goal achievement. Future work is planned to examine the effectiveness of this intervention in undergraduate, non-health, and distance-learning courses.

Interested faculty should note that there are certain risks associated with this approach. Some students may feel that encouragement to improve health is overly paternalistic and thus they may resent such interventions. It is therefore recommended that instead of basing graded assignments on the completion of goals, faculty should consider utilizing a system of extra credit. In this manner, students who would feel that the goal of health improvement is overly value laden may opt out of the intervention. It is also suggested that the teaching faculty engage in health behavior change goals alongside the students. As has been recommended by workplace health change initiatives,[40] leaders of any health improvement campaign are responsible for setting the culture and must "buy in" to the proposed initiative. Clinical education surrounding health behavior change has also documented the role of social modeling in promoting health behavior change.[41] In this spirit, the teaching fellows and professor of this course reserved time during every class meeting to briefly discuss their own progress and obstacles to achieving the personal health behavior change goals. It is recommended that leaders of academically sponsored interventions similarly engage in health behavior change activities to further promote a culture of wellness.

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References

1. Arnold C. Paying graduate school's mental toll. *Science*. http://www.sciencemag.org/careers/2014/02/paying-graduate-schools-mental-toll. Published February 4 2014; accessed April 1, 2017.
2. Dahlin M, Nilsson C, Stotzer E, Runeson B. Mental distress, alcohol use and help-seeking among medical and business students: a cross-sectional comparative study. *BMC Med Educ*. 2011;11:92. doi:10.1186/1472-6920-11-92.
3. Dahlin M, Joneborg N, Runeson B. Stress and depression among medical students: a cross-sectional study. *Med Educ*. 2005;39:594–604.
4. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. *Acad Med*. 2006;81:354–373.
5. Rosal MC, Ockene IS, Ockene JK, Barrett SV, Ma Y, Hebert JR. A longitudinal study of students' depression at one medical school. *Acad Med*. 1997;72:542–546.
6. Casey D, Thomas S, Hocking DR, Kemp-Casey A. Graduate-entry medical students: older and wiser but not less distressed. *Australas Psychiatry*. 2015;24:88–92.
7. Silverstein ST, Kritz-Silverstein D. A longitudinal study of stress in first-year dental students. *J Dent Educ*. 2010;74:836–848.
8. Myers SB, Sweeney AC, Popick V, Wesley K, Bordfeld A, Fingerhut R. Self-care practices and perceived stress levels among psychology graduate students. *Train Educ Prof Psychol*. 2012;6:55–66.
9. Mane A, Krisnakumar M, Niranjan P, Hiremath S. Differences in perceived stress and its correlates among students in professional courses. *J Clin Diagn Res*. 2011;5:1228–1233.
10. Dahlin ME, Runeson B. Burnout and psychiatric morbidity among medical students entering clinical training: a three year prospective questionnaire and interview-based study. *BMC Med Educ*. 2007;7:6. doi:10.1186/1472-6920-7-6.
11. Wyatt T, Oswalt SB. Comparing mental health issues among undergraduate and graduate students. *Am J Health Educ*. 2013;44:96–107.
12. Oswalt S, Riddock C. What to do about being overwhelmed: graduate students, stress, and university services. *College Student Affairs Journal*. 2007;27:24–44.
13. Erevik EK, Torsheim T, Vedaa Ø, Andreassen CS, Pallesen S. Alcohol use among business students: demographic, personality, and social correlates of increased consumption. *Scand J Educ Res*. 2017;e1–e11. doi:10.1080/00313831.2017.1307277.
14. Ahmed I, Banu H, Al-Fageer R, Al-Suwaidi R. Cognitive emotions: depression and anxiety in medical students and staff. *J Crit Care*. 2009;24(3):e1–e7.
15. Dahlin M, Joneborg N, Runeson B. Performance-based self-esteem and burnout in a cross-sectional study of medical students. *Med Teach*. 2007;29:43–48.
16. Newbury-Birch D, Walshaw D, Kamali F. Drink and drugs: from medical students to doctors. *Drug Alcohol Depend*. 2001;64:265–270.
17. Kernan W, Bogart J, Wheat ME. Health-related barriers to learning among graduate students. *Health Educ*. 2011;111:425–445.
18. Adams DR, Meyers SA, Beidas RS. The relationship between financial strain, perceived stress, psychological symptoms, and academic and social integration in undergraduate students. *J Am Coll Health*. 2016;64:362–370.
19. Munoz RF, Mrazek PJ, Haggerty RJ. Institute of Medicine report on prevention of mental disorders. Summary and commentary. *Am Psychol*. 1996;51:1116–1122.
20. World Health Organization. *Risks to Mental Health: An Overview of Vulnerabilities and Risk Factors*. Geneva, Switzerland: World Health Organization; 2012.
21. Paro HB, Morales NM, Silva CH, et al. Health-related quality of life of medical students. *Med Educ*. 2010;44:227–235.
22. Haggerty RJ, Mrazek PJ. Can we prevent mental illness? *Bull N Y Acad Med*. 1994;71:300–306.
23. Centers for Disease Control and Prevention. *Behavioral Risk Factor Surveillance System Survey Questionnaire*. Atlanta, GA: U.S. Department of Health and Human Services; 2014.
24. Centers for Disease Control and Prevention. *Measuring Healthy Days*. Atlanta, GA: Centers for Disease Control and Prevention; 2000.
25. Centers for Disease Control and Prevention. *National Health and Nutrition Examination Survey Questionnaire*. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2015.
26. Kobau R, Safran MA, Zack MM, Moriarty DG, Chapman D. Sad, blue, or depressed days, health behaviors and health-related quality of life, Behavioral Risk Factor Surveillance System, 1995–2000. *Health Qual Life Outcomes*. 2004;2:40.
27. Newschaffer CJ. *Validation of Behavioral Risk Factor Surveillance System (BRFSS) HRQOL Measures in a Statewide Sample*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; 1998.
28. Ware JE Jr, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36). I. Conceptual framework and item selection. *Med Care*. 1992;30:473–483.
29. World Health Organization. Interventions on Diet and Physical Activity: What Works: Summary Report; 2009. www.who.int/dietphysicalactivity/summary-report-09.pdf
30. Spiegler MD. *Contemporary Behavior Therapy*. Boston, MA: Cengage Learning; 2015.
31. Martin L, Haskard-Zolnierek K, DiMatteo MR. *Health Behavior Change and Treatment Adherence: Evidence-Based Guidelines for Improving Healthcare*. Oxford, UK: Oxford University Press; 2009.
32. Lopresti AL, Hood SD, Drummond PD. A review of lifestyle factors that contribute to important pathways

associated with major depression: diet, sleep and exercise. *J Affect Disord*. 2013;148:12–27.
33. Loprinzi PD, Lee H, Cardinal BJ. Dose response association between physical activity and biological, demographic, and perceptions of health variables. *Obes Facts*. 2013;6:380–392.
34. Oddy WH, Robinson M, Ambrosini GL, et al. The association between dietary patterns and mental health in early adolescence. *Prev Med*. 2009;49:39–44.
35. Milte CM, Thorpe MG, Crawford D, Ball K, McNaughton SA. Associations of diet quality with health-related quality of life in older Australian men and women. *Exp Gerontol*. 2015;64:8–16.
36. McMartin SE, Jacka FN, Colman I. The association between fruit and vegetable consumption and mental health disorders: evidence from five waves of a national survey of Canadians. *Prev Med*. 2013;56(3–4):225–230.
37. Payne ME, Steck SE, George RR, Steffens DC. Fruit, vegetable, and antioxidant intakes are lower in older adults with depression. *J Acad Nutr Diet*. 2012;112:2022–2027.
38. Lavender JM, Anderson DA. Effect of perceived anonymity in assessments of eating disordered behaviors and attitudes. *Int J Eat Disord*. 2009;42:546–551.
39. Markowitz J, Zhang J, Liu Y, Sun L, Hao Q, Wang D, Guo L, Zhang B, Shimura A, Takaesu Y, Nakai Y. Anxiety in the Age of Trump. *Comprehensive Psychiatry*. 2017 Apr 1;74:A3.
40. Quintiliani LM, Sattelmair J, Sorensen G. The workplace as a setting for interventions to improve diet and promote physical activity. Geneva, Switzerland: World Health Organization; 2007.
41. Bandura A. Health promotion by social cognitive means. *Hlth Educ Behav*. 2004;31(2):143–164.