



Brief Yoga Intervention for Dental and Dental Hygiene Students: A Feasibility and Acceptability Study

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Abstract

The present study investigated whether a brief yoga intervention would be feasible and acceptable for dental students. Based on empirical evidence about state mindfulness (SM), change in self-reported SM was assessed as a measure of the intervention's feasibility and acceptability. A repeated-measures within-subjects design was used. Participants were third- and fourth-year dental and dental hygiene students (76% female). The State Mindfulness Scale (SMS), a validated self-report measure of SM with 2 subscales, Mind and Body, was used. Students ($n = 132$) completed the SMS immediately prior to and following a 1-hour yoga intervention. Dispositional mindfulness, burnout, perceived stress, and depressive symptoms were also investigated as moderators of changes in state mindfulness to determine whether psychological variables had an effect on feasibility in this sample. Total SM significantly increased from pre- to post-intervention, $t(46) = 10.26, P < .001$. An analysis of covariance showed a significant interaction effect in the relationship between pre-/post-intervention SM of Mind ($\beta = 0.51, P = .048$), such that higher levels of stress saw greater increases in SM of Mind. No other psychological variables were significant moderators. A brief yoga intervention for dental students significantly increased SM, suggesting that yoga interventions may be feasible and acceptable in this population. The results of moderation analyses suggest that a brief yoga intervention may be especially effective at increasing SM for those with high levels of stress. Future research should use a randomized control group to test group differences in SM after a brief yoga intervention for dental students.

Keywords

yoga, dental students, perceived stress, state mindfulness, dental hygiene students

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The negative effects of work-related stress are increasingly documented and problematic in healthcare professional trainees.^{1,2} Stress and burnout in healthcare professionals is related to depression, suicide, poor patient outcomes, and increased health care costs.^{1,3-6} Recently, yoga-based interventions have been studied in interdisciplinary healthcare professional trainees and in medical and nursing students.⁷⁻¹⁰ Few studies have investigated effects in dental students alone, for whom burnout, stress, and depressive symptoms are reported at high rates¹¹⁻¹³; for example, one recent study found that 40% of dental and 38% of dental hygiene students met the criteria for burnout, which includes emotional exhaustion and depersonalization of patients.⁶ Dental students are also uniquely at risk for increased musculoskeletal pain, relative to other healthcare professions due to uncomfortable work postures held for long periods.^{14,15}

Yoga may be well-suited for reducing stress in dental students. It is a widely used practice for stress management and

health maintenance in both healthy populations and in clinical populations and settings.^{16,17} Yoga is considered to be a generally safe therapeutic intervention¹⁸ and is included in several evidence-based interventions, including mindfulness-based stress reduction,¹⁹ among others. Importantly, The American Dental Association has recommended stress management techniques, including yoga.²⁰

However, there is a limited amount of studies investigating yoga for dental students. One study found promising effects for a brief yoga session to reduce work-related anxiety relative to

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an active control group.²¹ This study was limited by several factors, including the lack of a manipulation check—there was no evaluation of whether yoga increased participants' experience of mindfulness.

Yoga interventions may improve state mindfulness, or the state of moment-to-moment nonjudgmental awareness. If so, yoga may be a way to combat the high levels of stress, burnout, and musculoskeletal pain prevalent in the dental student population. However, given the few number of studies in dental student samples - before investigating the efficacy of yoga on stress and pain reduction - feasibility, and acceptability studies are needed.

One method of investigating feasibility and acceptability of yoga, a mindfulness-based intervention, is to evaluate whether the intervention induces a state of mindfulness, as this would determine whether the participants reacted appropriately to the intervention²² and whether they report perceived improvements in their quality of mind. Furthermore, state mindfulness has been associated with several positive outcomes, including better communication in relationships,²³ less negative affect for up to 3 weeks,²⁴ more daily well-being, less daily ill-being, more adaptive coping, and less perceived stress,²⁵ and enhanced cognitive reappraisal.²⁶ State mindfulness has also been shown to predict increases in dispositional mindfulness following an 8-week mindfulness-based intervention.²⁷ This is important because dispositional mindfulness, or the tendency to be mindful in one's daily life, has been associated with a bevy of adaptive psychological and health outcomes and improvements in brain functioning (for a review, see Keng et al²⁸). Taken together, these studies provide evidence for state mindfulness' positive effects on psychological well-being and potential for stress reduction. Therefore, evaluation of state mindfulness could provide evidence of a mindfulness intervention's feasibility, or suitability, for future study as well as its acceptability in the intended population.²²

Few studies have evaluated whether a brief yoga intervention increases state mindfulness. One study found that yoga increased state mindfulness following 6 yoga classes that occurred over an 8-week period at 2 to 3 classes per week.²⁹ However, no study to date has investigated whether a brief yoga intervention targeted to beginners affects state mindfulness. Furthermore, interventions for dental students, similar to other healthcare professional students, are increasingly sought after to be brief and modular.^{30,31} Yoga can be practiced in a short amount of time with high potential to be self-administered following one group class. Most mindfulness-based interventions for healthcare professionals are 8 weeks with 2-hour meetings,^{32,33} even the shorter interventions require several meetings or an entire weekend.^{31,34} A single yoga class, if feasible and acceptable, could satisfy the need for brief intervention.

Another important question in determining the feasibility and acceptability of a brief yoga intervention is whether psychological functioning moderates changes in state mindfulness following a brief yoga intervention for dental students. Understanding whether psychological variables, like dispositional mindfulness, depressive symptoms, burnout, and stress have

an effect on the acquisition of state mindfulness will help determine characteristics of dental students for whom a brief yoga intervention could be most beneficial. Whether dispositional mindfulness moderates changes in state mindfulness is an important qualifier for the potential of yoga to benefit dental students. Similarly, whether depressive symptoms, burnout, and perceived stress interact with changes in state mindfulness will inform for which dental students brief yoga interventions should be targeted. These moderation questions can guide future intervention development in the dental student population.

The present study aimed to investigate whether feasibility and acceptability of a brief yoga intervention for dental students by evaluating changes in state mindfulness pre- and postintervention. It was hypothesized that state mindfulness would increase following the brief intervention. The secondary aim was to investigate whether psychological functioning would moderate changes in state mindfulness from pre- to post-brief yoga intervention for dental students. It was hypothesized that dispositional mindfulness would not moderate the increases in state mindfulness based on other studies investigating non-yoga mindfulness interventions that found no association between changes in state mindfulness and dispositional mindfulness.^{35,36} Furthermore, one of the potential benefits of yoga is that it may be a more accessible mindfulness practice for beginners or those naïve to mindfulness; therefore it was predicted that dispositional mindfulness will not moderate change in state mindfulness. It was also predicted that higher depressive symptoms, burnout, and perceived stress would be related to steeper increases in state mindfulness based on recently published data, suggesting that stress is an important factor in the acquisition and effects of brief mindfulness inductions.³⁷

Method

Procedure

All third- and fourth-year dental students along with all dental hygiene students were eligible to participate in this study (n = 249). Participation in the research study was voluntary, and all participants provided written consent for their participation. The Institutional Review Board at Virginia Commonwealth University approved the study. (HM20003780). Within 1 week prior to the brief yoga intervention, participants were asked to complete several questionnaires online, including a demographic questionnaire and measures of psychological functioning. Participants completed a measure of state mindfulness immediately prior to and following the intervention. Both administrations of the state mindfulness scale occurred in the same room as the brief yoga intervention.

Measures

Primary Outcome

State mindfulness. The State Mindfulness Scale (SMS) is a validated measure of state mindfulness, intended for use

immediately following a mindfulness practice.³⁸ The SMS measures perceived mindfulness following a mindfulness practice. If participants report increases in their state of mindfulness this suggests they are experiencing more nonjudgmental awareness of their body and mind in the present moment. The scale consists of 2 subscales, State Mindfulness of Body and Mind, as well as a total scale score. Respondents are asked to rate 21 items on a 5-point Likert-type scale ranging from “not at all” to “very well” on the degree to which the statements describe their experience for the past 15 minutes.

Secondary Outcomes

Dispositional mindfulness. The Five Facet Mindfulness Questionnaire–short form (FFMQ-sf) asks respondents to rate 24 items on a 5-point Likert-type scale from “never or rarely true” to “very often or always true.”³⁹ The FFMQ-sf is well-validated and adapted from the full version of the FFMQ⁴⁰ and consists of 5 subscales, Observe, Describe, Acting with Awareness, Nonjudging of Inner Experience, and Nonreactivity to Inner Experience.

Depressive symptoms. The Patient Health Questionnaire–9-item (PHQ-9) is a well-validated measure of depressive symptoms over the past 2 weeks.⁴¹ It asks respondents to rate 9 items on a 4-point Likert-type scale ranging from “never” to “nearly every day.” Scores range from 0 to 27 with scores ≥ 9 indicating moderate depressive symptoms and scores ≥ 20 indicating severe depressive symptoms.

Burnout. The Maslach Burnout Inventory–Human Services (MBI) is widely used in healthcare professional populations.⁴² It is a 22-item questionnaire with a 7-point Likert-type scale and 3 subscales: Depersonalization, Emotional Exhaustion, and Personal Accomplishment. Research in large samples of healthcare professionals has validated single-item proxies for the former 2 subscales to reduce participant burden.⁴³ These 1-item measures for the Depersonalization and Emotional Exhaustion subscales were used in the present study. The Personal Accomplishment subscale is typically not considered central to burnout and was therefore not administered in the present study.^{44,45}

Perceived Stress. The Perceived Stress Scale (PSS) is a 10-item measure asking respondents to rate symptoms of stress on a 5-point Likert-type scale ranging from “never” to “very often.”⁴⁶ The PSS is well-validated.

Intervention

The yoga intervention was a 60-minute movement practice designed for beginners conducted in a large conference hall ($n = 132$) by a volunteer yoga teacher and peer to the dental students (a fellow healthcare professional student). Participants were provided with towels from the dental school as a proxy for yoga mats. The yoga teacher was certified through Yoga Alliance with more than 4 years of experience teaching yoga to beginners and those with mobility limitations or chronic pain.

The first 5 minutes included a brief description of the breathing practice, *ujjayi*. In addition to physical alignment cues for each pose, participants were instructed to place awareness on the breath and body and to approach the practice nonjudgmentally throughout. For 10 to 15 minutes, participants were led through a gentle warm-up sequence followed by 10- to 15-minutes of standing poses and a slightly quicker pace of breath-linked poses, often called *vinyasa*. For the final 10 minutes, participants were guided through a cool-down sequence consisting of seated and supine poses. Final relaxation was done lying down for 8 minutes with a guided body-scan. A seated meditation followed in which participants were instructed to place attention on the breath for 5 minutes. The intervention ended with a brief discussion on the importance of returning to the breath, awareness of the body, and a nonjudgmental attitude throughout the day.

Statistical Methods

To test for significant changes in SMS Total, SMS Mind, and SMS Body a paired *t* test was used. Univariate analysis of covariance (ANCOVA) models, adjusting for pre-intervention SMS value, were used to determine whether dispositional mindfulness, depressive symptoms, burnout, or perceived stress scores moderated changes in SMS. A significance level of .05 and SAS EG v6.1 were used for all analyses.

Results

Change in State Mindfulness

Of the 249 eligible participants, a total of 132 individuals completed both the pre- and post-intervention SMS questionnaire (53% response rate). A smaller subset ($n = 47$) completed demographics and secondary outcomes. Sample demographics are given in Table 1 from this smaller subset of 47 participants. Of the larger sample of 132 students, 66% demonstrated an increase in SMS total, 65% SMS Mind and 67% SMS Body. Specifically, there was an average of an 18.4-point increase in SMS Total, 11.9 in SMS Mind, 6.6 in SMS Body ($P < .0001$ for all metrics; see results in Table 2).

Interaction Effects

Baseline data (demographics and moderators) were collected from 47 participants prior to intervention on psychological functioning including dispositional mindfulness (FFMQ-sf), depressive symptoms (PHQ-9), burnout (MBI), and perceived stress (PSS). ANCOVA models were used to determine if any of these baseline measures modified the change in SMS Mind, Body, or Total (see Table 3). For all models, baseline SMS (Mind, Body, or Total) was a significant predictor of change in SMS ($P < .0001$ for all models). None of the psychological variables were found to be significant modifiers of the change in SMS Body. Perceived stress was associated with a significant increase in SMS Mind ($\beta = 0.51$; $P = .0476$), even after adjusting for baseline SMS Mind. These results indicate that for every unit

Table 1. Sample Demographics.^a

Variable	n (%)
Year in school	
DH 1	6 (13)
DH 2	5 (11)
DDS 3	22 (47)
DDS 4	14 (30)
Gender	
Male	12 (26)
Female	35 (74)
Race/ethnicity	
White (non-Hispanic)	36 (77)
Asian	7 (15)
Other	4 (9)
Marital/Partner status	
Single/divorced	30 (64)
Married/partnered	17 (36)
Have children	8 (17)
Currently exercise	30 (64)

Abbreviations: DH 1, dental hygienist student, year 1; DH 2, dental hygienist student, year 2; DDS, dental student, year 3; DDS 4, dental student, year 4.

^aDemographics were collected from the larger sample of students ($n = 132$) who completed the online survey within 1 week prior to the intervention. However, only 47 were included due to a matching identifier to link to the state mindfulness measures completed pre- and postintervention. Therefore, demographics are reported here for $n = 47$ participants.

increase on the PSS, an individual's SMS Mind score increased by 0.51 points more than someone with less perceived stress (see Figure 1). Figure 1 demonstrates 2 hypothetical subjects with same baseline SMS Mind score but different PSS10 levels. The subject with higher PSS10 is predicted to have a greater improvement in SMS Mind at the follow-up. This relationship is true for any level of PSS10, but 15 and 17 were chosen arbitrarily. For SMS Total, this relationship was marginally, but not statistically significant ($P = .0720$).

Discussion

A brief yoga intervention for dental students increased state mindfulness, suggesting an intervention of this kind is feasible and acceptable for this sample of dental students. Findings support the suitability of yoga interventions for dental students. Several factors contribute to the feasibility and acceptability. The intervention was brief, low cost, and findings suggest it increased state mindfulness. The brevity and inexpensiveness of the intervention contribute to the potential for yoga to be integrated easily into dental school departments with few resources needed. Furthermore, few psychological variables moderated the increase in state mindfulness in this sample of dental students suggesting that the increase was robust and not susceptible to differences in dispositional mindfulness, depressive symptoms, or burnout. When considering the lack of moderation based on dispositional mindfulness scores, this would suggest regardless of one's tendency to be mindful prior to the intervention, a brief yoga intervention increased the state of mindfulness similarly across participants. This finding is

similar to previous research in mindfulness interventions not specific to dental students.^{35,36} This speaks to the promising potential for brief yoga interventions to be beneficial for beginners and mindfulness-naïve participants. Neither depressive symptoms nor burnout moderated state mindfulness changes, which supports this intervention for dental students across the continuum of depressive symptoms and burnout.

Perceived stress did moderate state mindfulness of the mind, not state mindfulness of the body or a total comprised of both subscales. Our findings suggest that those reporting higher perceived stress had steeper increases in state mindfulness of the mind when compared with those reporting less perceived stress. It is possible that this reflects a tendency for those with higher levels of perceived stress to be more susceptible to the effects a brief yoga intervention on state mindfulness of the mind. This is especially likely given that this relationship was significant even when controlling for pre-intervention SMS Mind scores. Findings may be interpreted to suggest that a brief yoga intervention was helpful in improving awareness and nonjudgment of thoughts and emotions in this sample of dental students. Future research should build on these findings.

This study is limited by a lack of a comparison group, which presents a risk for uncontrolled threats to validity. However, our inclusion of pre-intervention state mindfulness scores and the administration of pre- and post-intervention assessments of state mindfulness in the same location, increases our ability to conclude that, at least preliminarily, a brief yoga intervention may produce state mindfulness in dental students and therefore warrants future investigation. Future studies with a randomized control group, preferably an active control group, are necessary to validate these findings in dental students. Furthermore, without measuring the potential positive benefits of state mindfulness on stress or pain reduction in this population, these findings are limited. However, the strong basis of literature assessing the benefits of a state of mindfulness supports the likelihood of the positive effects of state mindfulness.²³⁻²⁵

The present study represents a beginning step toward establishing efficacy of yoga-based interventions for dental students. The findings presented here are qualified as preliminary and should be used as a foundation for future hypothesis testing and intervention development. Based on these results several recommendations can be made regarding future work. First, considering the extremely brief nature of this intervention and documented increases in state mindfulness—a state associated with positive health outcomes—future interventions for prevention of dental student burnout and musculoskeletal pain should include brief yoga practices and measure psychological and health functioning as main outcomes. Second, research should investigate whether increases in state mindfulness following yoga practices are associated with improvements on psychological and health outcomes to evaluate state mindfulness as a mechanism of yoga-based interventions. Third, efforts should be made to identify dental students with high perceived stress and then investigate whether a brief yoga intervention is effective in reducing their stress.

Table 2. Average SMS Measures and Standard Deviations for All Participants and Rate of Improvement (N = 132).

	α	Preintervention Score, Mean (SD)	Postintervention Score, Mean (SD)	Difference, Mean (SD)	P^a	Rate of Improvement, n (%)
SMS Total	0.95	71.3 (15.3)	89.7 (12.1)	18.4 (15.6)	<.0001	115 (87)
SMS Mind	—	51.4 (11.1)	63.3 (9.1)	11.9 (11.7)	<.0001	112 (85)
SMS Body	—	19.9 (4.8)	26.4 (3.4)	6.6 (5.0)	<.0001	117 (89)

Abbreviation: SMS, State Mindfulness Scale.

^aP-value from paired t test.

Table 3. Analysis of Covariance Results (n = 47).

Psychological Measure	α	P^a		
		SMS Body	SMS Mind	SMS Total
MBI EE Proxy	—	.5235	.4638	.4544
MBI DP Proxy	—	.3152	.0763	.1059
FFMQsf DS	0.88	.3045	.9151	.7846
FFMQsf NR	0.78	.6698	.1966	.2966
FFMQsf NJ	0.81	.9009	.6796	.7677
FFMQsf OB	0.86	.0642	.2950	.1471
FFMQsf AA	0.85	.1272	.0716	.0761
PSS10	0.86	.2767	.0476 ^b	.0720
PHQ9	0.87	.3760	.3341	.3106

Abbreviations: SMS, State Mindfulness Scale; MBI, Maslach Burnout Inventory; EE, Emotional Exhaustion subscale; DP, Depersonalization subscale; FFMQsf, Five Facet Mindfulness Questionnaire—short form; DS, describe; NR, nonreactivity to inner experience; NJ, nonjudging of inner experience; OB, observe; AA, acting with awareness.

^aAdjusting for baseline SMS Body, Mind, or Total as appropriate.

^bStatistically significant modifier, $P < .05$.

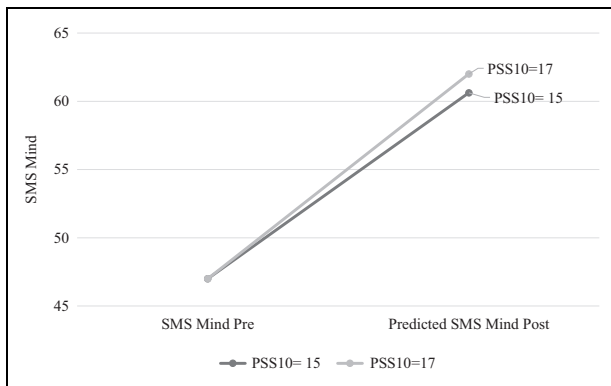


Figure 1. Visual demonstration of effect of perceived stress on change in SMS Mind. Visual demonstration of the interaction between PSS10 and SMS. If 2 subjects have the same baseline SMS Mind score but one has a 2-point higher PSS10 score, the subject with the higher PSS10 is predicted to have a greater improvement in SMS Mind at the follow-up. n = 47; SMS, State Mindfulness Scale; PSS, Perceived Stress Scale.

Conclusion

These results provide preliminary acceptability and feasibility for a brief yoga intervention. Participants reported increases in state mindfulness, regardless of dispositional mindfulness,

depressive symptoms, and burnout at baseline. Furthermore, dental students with higher perceived stress had steeper increases in state mindfulness of mind, suggesting a brief yoga intervention may be beneficial to dental students even when stress levels are high. These findings are promising for dental and dental hygiene students given the high prevalence of musculoskeletal disorders and the well-documented physical benefits of yoga practice.⁴⁷ Although, not formally explored, positive support and positive feedback from dental faculty and administrators speaks further to the feasibility and acceptability of this intervention.

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Ethical Approval

The Institutional Review Board at Virginia Commonwealth University approved the study (HM20003780). All participants provided written consent.

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