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ORIGINAL ARTICLE

Effects of face-to-face and online yoga instruction on anxiety and flexibility

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ABSTRACT

A research study employing a non-equivalent pretest-posttest comparison group design was used to measure online and face-to-face (FTF) yoga instructional methods and their effects on anxiety, increased flexibility, and perceived behavioural intentions to practice yoga in the future. This study was conducted to discover if online yoga course instruction was just as effective as or more so than a course taught FTF. Findings suggest that online yoga instruction was significantly more effective in reducing the state anxiety of the students. However, there was no significant difference between groups on trait anxiety indicating that either method was equally effective. In contrast, the F2F course was significantly more effective in reducing the appearance anxiety of students when compared to the online yoga course. Students in FTF and online increased in flexibility with no significant difference between groups. Based on these results, online yoga can reduce certain types of anxiety and be just as effective at increasing flexibility. The findings show that online yoga can be just as effective as and sometimes more effective than FTF yoga in some aspects important for maintenance of health and wellness in individuals.
K**eywords**: Physical education, Video-based teaching, Physical exercise, Anxiety, Flexibility.

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INTRODUCTION

Yoga as a form of exercise has been found to prevent a variety of health problems and produce effects that helps individuals improve or maintain good health. In older adults, yoga has been found to strengthen balance (Jeter et al., 2014, Youkhana et al., 2016); aid in stroke rehabilitation (Lawrence et al., 2016); improve proprioception and balance function in individuals who have fallen (Wooten et al., 2018), and improve mobility, postural control, and gait speed (Kelley et al., 2014). Research has also shown improvements in a wide variety of health conditions when individuals practice yoga. Individuals with asthmas have had their quality of life and symptoms improved (Yang et al. 2016), patients with Parkinsen's disease have decreased lower back pain (Myers et al. 2020), and patients receiving chemotherapy and radiation and cancer survivors who practice yoga experience less sleep disruption, cancer-related fatigue, cognitive impairment, psychosocial distress, and fewer musculoskeletal symptoms (Lin et al. 2018). Yoga has been successful in helping those with depression, anxiety and PTSD (Meister and Becker 2018), relieving work-related stress among health workers (Maddux et al. 2018), and losing significantly more subcutaneous fat in obese women (Araneta et al. 2013). Other researchers (Amin and Goodman, 2014; Skowronek, Handler, and Mounsey 2014) found that yoga increased flexibility and decreased anxiety in their subjects.

Other research indicates that yoga can have preventative effects on a variety of conditions including diastolic blood pressure, HDL cholesterol and triglycerides, and uncertain effects on LDL cholesterol (Hartley et al. 2014); eating disorders (Borden and Cooke-Cottone 2020), and pulmonary function (Abel et al. 2013). Stahl et al. (2015) conducted a study of 4,000 patients from 2006-2014 whose doctors recommended treatment through mind-body techniques (e.g., Tai Chi, meditation, and yoga). These patients were compared to 13,000 patients whose doctors did not recommend mind/body techniques. Researchers were curious to see what effects the mind-body techniques would have on reducing healthcare use and costs. According to Stahl et al., "*Mind body medicine interventions are inexpensive relative to the cost of an emergency room visit, a hospitalization or even other complementary and alternative medicine (CAM) therapies... the cost savings from reduced emergency room visits alone in the treatment group relative to the control group, is on the order of $2360/patient/year*" (2015, p. 11).

Even though there is much research documenting the health benefits of yoga, there are factors that make people reluctant to practice yoga or to practice yoga more frequently including the cost of enrolling in a yoga course and the intimidation or embarrassment especially for individuals who are out of shape, overweight, or inflexible (Brems et al. 2015). Obesity as a result of poor eating habits and lack of exercise has raised concerns both in terms of individual health and public health. Healthcare costs have significantly increased as a larger numbers of Americans have become obese (Biener, Cawley, and Meyerhoefer 2017). According to Yashi (2022), almost 1 in 3 American college students were obese and that in 2021, 44% of college students in the US described their weight as either overweight or obese. She suggested that more physical activities such as yoga might help with this problem.

Other adverse health conditions related to a lack of exercise include reduced physical flexibility and increased psychological anxiety. Moreover, as individuals age and remain inflexible, they suffer from problems related to hip-joint mobility as well as lumbar spine degeneration. These conditions can cause pain, debilitation, and muscle weakness, and they also can contribute to falls among seniors (Iwamot et al. 2009), one-third of which lead to death within a year (Liu et al., 2015). Spruyt (2016) reported that anxiety is linked to heart disease, depression, gastrointestinal problems, headaches, and irritability. Hood (2015) estimated that more than 40 million people suffer from some form of anxiety, making it an equally troubling and significant health problem alongside obesity.

There are relatively few studies on the effects of yoga in adolescents or college students. However, one study found that yoga nidra helped to alleviate the life stress intensity level and increase the self-esteem in university students (Dol 2019). Gaskins et al. (2014) also found that yoga practice is associated with improvements in affect and stress in a young-adult college population. Similarly, college students experienced a reduction in stress and anxiety levels after completing a six-week yoga and meditation program before taking final examinations (Lemay and Buchanan, 2019). Also, Ju et al. (2019) found that yoga interventions were effective in reducing anxiety, depression, stress and heart rate among 763 college students who practiced yoga for just eight weeks. Likewise, He et al. (2018) found that just a single yoga session lasting 90 minutes among the college-aged population increased positive moods and decreased stress levels. Finally, LaSala et al. (2021) found that yoga increased flexibility in college students.

As a result of the COVID 19 pandemic, many places that once offered F2F yoga classes were shuttered. During this time, online yoga was a growing phenomenon used to offer continued practice to individuals during the pandemic. Brosnan et al. (2021) conducted a study during the pandemic that demonstrated online yoga classes were an acceptable alternative to F2F yoga across eight different studies. Arruda et al. (2018) found that a combination of F2F instructor-led yoga along with video-based yoga was an effective therapy for adolescents with inflammatory bowel disease. Patients reported reduced stress and improved ability to identify and manage physical symptoms. As these studies demonstrate, online yoga is becoming more mainstream and acceptable. Online yoga may offer a promising alternative to face-to-face (F2F) yoga that is more convenient, accessible, and accommodating for individuals with different needs. As a result of growth in online yoga offerings, related research has been on the rise. (Brosnan, Nauphal and Tompson, 2021). Particularly, as a consequence of COVID-19 there has been a growth in daily online yoga sessions offered on social media, which apparently prove useful in providing a feasible and accessible means of achieving mental as well as physical well-being (Sharma et al. 2020). According to Brosnan et al., this fairly new approach to delivering yoga will allow providers to include online yoga as a lower-cost, non-invasive intervention for a wide variety of physical and mental health disorders and allow individuals to practice yoga in the comfort of their homes with ease and security. Online yoga has the potential to reach a wider and more diverse audience, reduce the amount of poor health conditions and decrease the cost of healthcare.

MATERIAL AND METHODS

A quasi-experimental research study was conducted at a midsize Midwestern university in the United States to examine if there is a difference between face-to-face and online yoga on college students' anxiety (strait-trait and appearance), flexibility, and intentions to practice yoga long term. This research study used quantitative methods and a nonequivalent group design. A pretest-posttest comparison group design was used to compare the pre-intervention results and the post-intervention results of (a) a traditional F2F yoga course (comparison group) and (b) an online yoga course (treatment group). Research questions included the following:

RQ1: Is there a statistically significant difference between a face-to-face yoga course and an online yoga course in students' scores on the State-Trait Anxiety Inventory and the Appearance Anxiety Inventory Test?

RQ2: Is there a statistically significant difference between a face-to-face yoga course and an online yoga course in students' scores on the sit-and-reach test?

RQ3: Is there a statistically significant difference between a face-to-face yoga course and an online yoga course in student behavioural intensions towards yoga?

RQ4: Is there a statistically significant difference within the face-to-face yoga course and the online yoga course in students' scores on the pre/post State-Trait Anxiety Inventory, Appearance Anxiety Inventory test, and flexibility scores on the sit-and-reach test?

Participants

Participants consisted of traditional college students ranging from 18 to 23 years of age but based on typical yoga class enrolments with 50 students enrolled in a F2F yoga class and 50 students enrolled in an online yoga class. This convenient sample was selected because both classes were taught by one of the authors at a Midwestern university. A non-random, convenience but purposeful sampling method was used to select participants. Participants were students who signed up for the online yoga class and the F2F yoga class, which was already offered at the university. The overall sample consisted of both males (*n* = 38, 42%) and females (*n* = 52, 58%).

In the online course there were 17 males (37%) and 28 females (62%). The F2F course, consisted of males (n = 21, 46%) and females *(n* = 24*,* 53%). The majority of online participants were between 18 and 26 years of age and the sample included participants of a variety of races including Caucasian (*n* = 28, 62%), African American (*n* = 10, 22%), Asian (*n* = 2, 4%), and other *(n* = 3, 7%). The F2F class had a racial makeup of Caucasian (*n* = 35, 78%) and African American (*n* = 10, 22%). The total racial make-up was as follows: Caucasian (*n* = 63, 70%), African American (*n* = 20, 22%), Asian *(n* = 2, 4%), and other *(n* = 3, 7%). About half of all online participants indicated they were active in some type of sports activity including basketball (*n* = 6, 13%) football *(n* = 3, 7%), baseball (*n* = 2, 4%), track (3, 7%), volleyball (*n* = 2, 4%, and soccer (*n* = 1, 2%).

In the F2F course, students participated in basketball *(n* = 1, 2%) football (*n* = 15, 33%), baseball (*n* = 2, 4%), track (0, 0%), volleyball (*n* = 2, 4%, soccer *(n* = 1, 2%), and swimming (*n* = 1, 2%), revealing additional evidence that the BMI in the F2F is skewed due to the larger number of football players. The average height of the online group was 5'7", and the average weight was 161 pounds making the average BMI for the online students 25.2, a BMI which is considered overweight. The students in the F2F course had an average height of 5'8" with an average weight of 175 pounds, making the BMI for this course 26.6 which is also considered as technically overweight.

Measures

Four self-report instruments were used to measure flexibility, anxiety, and perceived behavioural intentions. An additional questionnaire was used to collect information about the participants including demographics, physical characteristics (e.g., height, BMI) and exercise histories. The flexibility component was measured using the ruler-based, self-administered *sit-and-reach (SR) flexibility test*. The SR test was conducted twice by all members of both groups and was conducted once at the beginning and once at the end of the course by members of both the online and the F2F groups. The ruler-based, self-administered version of the SR required students to sit with a yardstick parallel to the ground between their legs, with the 40-cm mark aligned with the ankle. Students then reached as far past the 40-cm mark as they could. Students recorded their SR data in centimetres in negative units short of 40 cm or positive units beyond 40 cm. To help ensure accuracy and consistency in the measurement process, an in-class demonstration from the instructor was provided for F2F students, and an instructional video was made available to the students participating online. The SR flexibility test is used by the American College of Sports Medicine to measure the flexibility levels of hamstrings and is considered a safe, practical, and moderately accurate field test for flexibility (Baltaci et al. 2003).

The anxiety level of participants was measured using the *State-Trait Anxiety Inventory (STAI).* The STAI was administered before and after both the online yoga course (i.e., the treatment group) and the F2F yoga course (i.e., the control group). The STAI consisted of 40 items that each feature a 4-point Likert-type response scale: 20 questions to measure state anxiety, which is a type of anxiety that is felt at the present moment in

time; and 20 questions to measure trait anxiety, which is a type of anxiety that describes a person's tendency to become anxious. The STAI questionnaire items measured participants' overall anxiety levels, state and trait; and the higher the score on the STAI, the higher the level of anxiety (Ping et al., 2008).

Additionally, body image anxiety was also measured both pre-yoga intervention and post-yoga intervention (within both delivery methods) using the *Appearance Anxiety Inventory Test (AAIT).* The Appearance Anxiety Inventory Test is a valid instrument used to measure the degree to which individuals experience anxiety related to poor body image. The AAIT consists of 10 items and uses a 4-point Likert-type response scale. The questionnaire items measure overall anxiety levels that individuals may be experiencing related to their appearance. The higher the AAIT score, the higher the level of anxiety.

At the end of the six-week class, the researcher administered a *behavioural intentions questionnaire* to identify the extent to which participants plan to continue practicing yoga exercises, meditation techniques, and breathing techniques they learned in the class. The researcher-designed questionnaire consisted of seven items that feature a seven-point Likert-type scale. These items explore the extent to which participants agree with statements about their intentions to change their behaviours related to practicing the elements of yoga on a regular basis as a result of the course.

The *Personal Information Questionnaire* allowed the researcher to compare groups based on variables such as age, gender, BMI, and athletic involvement to determine whether differences existed among the two groups in the areas of flexibility, anxiety, and behavioural intentions.

Procedures

One of the authors, who taught both sections of the yoga course, had 18 years of experience teaching yoga. She had over 200 hours of yoga training and held a Personal Trainer certification through the American College of Sports Medicine (ACSM). **S**tudents who participated in the online yoga class practiced yoga asynchronously for one hour per week for a total of six-weeks. Students who participated in the F2F yoga class participated synchronously for one hour per week for a duration of six-weeks. Instruction in the online yoga class was made available in a video format through the college learning management system. Online students could access the course at their leisure. The F2F class was taught on campus at a specific time and place each week. Students in the online course uploaded videos of their weekly yoga practices as evidence of participation and flexibility measurements. Submitted videos provided fidelity of yoga practice and accuracy of measurements. Online students were then asked to describe their participation using video or online discussion forums. Discussions consisted of topics such as flexibility, anxiety, and how the course was affecting students personally. Feedback from the instructor was provided to all students on the discussion forum. Feedback was also provided to online students by sending them recorded videos and to F2F students by direct verbal feedback during class. The goals of the course in both formats were to increase flexibility and continued behavioural intentions to practice yoga beyond the semester, and to decrease straight, trait, and appearance anxieties.

Analysis

ANCOVA was used to compute the differences in the mean scores on the post STAI in order to determine if a statistically significant difference existed (a) between the post-assessment of the online yoga course and (b) between the post-assessment of the F2F yoga course, and to adjust for pre-test scores (RQ1). The AAIT was also used to determine if there was a change in appearance anxiety related to body image after completing either an online yoga course or a F2F yoga course. First, scores on the AAIT were analysed to identify whether students suffered from BDD. These data were analysed using a composite score of the total

points possible, which is 40. These composite scores were then matched to the benchmark score of 27, which is the cut-off score for BDD. That is, scores above 27 indicate the presence of BDD whereas scores below 27 indicate the absence of BDD (Roberts et al., 2018). Moreover, to answer RQ1, the ANCOVA was conducted to compare post mean scores between the two modes of delivery using pre-tests as a covariant. Also, the AAIT data were analysed using a paired sample *t*-test to compare pre and post-test mean scores in each group.

To find out if there was a difference between a F2F yoga course and an online yoga course in students' scores on the Sit-and-Reach Test (RQ2), the SR test was administered to participants in both groups before they began the yoga class and again after they completed the yoga class. ANCOVA was used to compute the differences in the mean scores on the post SR tests in order to determine whether a statistically significant difference existed (a) between the post-assessment of the online yoga class and (b) between the post-assessment of the F2F yoga class.

To examine differences between a F2F yoga course and an online yoga course in student behavioural intentions towards yoga (RQ3), scores from the researcher-designed questionnaire of behavioural intentions were quantitatively analysed using an independent sample *t*-test to determine which mode of delivery (online or F2F) was the most effective in eliciting behavioural intentions. The variables were measured at a continuous level using a Likert scale.

The STAI, AAIT, and SR tests were all analysed using a paired sample *t*-test to compare each group on its pre-test and post-test mean scores for both online and F2F deliveries to examine if there was a significant difference from pre to post mean test scores. This would uncover any differences within the face-to-face yoga course and the online yoga course in students' scores on the pre/post State-Trait Anxiety Inventory, Appearance Anxiety Inventory test, and flexibility scores on the sit-and-reach test (RQ4).

For four of the measures (i.e., state anxiety, trait anxiety, appearance anxiety, and flexibility), ANCOVA was used to examine the differences between the means of two independent groups while adjusting for variability in the pre-test scores.

For the last measure, the paired samples *t*-test is suitable for examining within group differences on two variables (i.e., pre/post-test mean scores) for the same subject, separated by time. The paired sample *t*-test is an ideal analysis for the SR flexibility test as well as the STAI because administration of these questionnaires was separated by six weeks.

RESULTS

State anxiety

An ANCOVA was conducted to compare student scores on state anxiety between the F2F and online yoga groups and to control for any variation in pre-test. The pre-test score was loaded into the model as a covariate and after adjusting for it, there was a significant difference between the two groups on the post state anxiety score, with state anxiety being lower for students in the online course, $F(1,86) = 6.45$, $p < .05$, partial eta squared = .52, indicating a large effect size. Eta squared measures the proportion of the total variance in a dependent variable that is associated with the membership of different groups defined by an independent variable. Partial eta squared is a measure in which the effects of other independent variables and interactions are partialled out.

Trait anxiety

An ANCOVA was conducted to compare student scores on trait anxiety between the F2F and online yoga groups and to control for any variation in pre-test. The pre-test score was loaded into the model as a covariate and after adjusting for it, there was not a significant difference between the two groups on the post trait anxiety score, F (1,86) = .57, p = .453. There was a strong relationship between the pre trait and post trait anxiety score, as indicated by the partial eta squared value of .30.

Appearance anxiety

An ANCOVA was conducted to compare student scores on appearance anxiety between the F2F and online yoga groups and to control for any variation in pre-test. The pre-test score was loaded into the model as a covariate and after adjusting for it, there was a significant difference between the two groups on the post appearance anxiety score, with appearance anxiety being lower for students in the F2F course, F(1,87) = 5.34, p < .05. There was a strong relationship between the pre and post appearance anxiety scores, as indicated by a partial eta squared of .54.

Sit and reach flexibility

An ANCOVA was conducted to compare student scores on flexibility between the F2F and online yoga groups and to control for any variation in pre-test. The pre-test score was loaded into the model as a covariate and after adjusting for it, there was no significant difference between the two groups on the post sit and reach flexibility test scores, F (1,87) = 480, p = .49. There was a strong relationship between the pre sit and the post sit score, as indicated by a partial eta squared value of .84.

Behavioural intentions

An independent sample t-test was calculated to determine if there was a significant change in behavioural intentions as a result of participating in the online or F2F courses, comparing the mean scores of the post-test online and F2F yoga courses. An examination of Levene's Test was not significant, and therefore, equal variances were assumed. A significant difference was not found between the means of the two groups. The F2F group reported a mean of 40.82 (SD = 5.84) and the online group reported a mean of 38.80 (SD = 7.74), t(88) = 1.12, p = .26.

Paired sample T-Tests

State anxiety

A paired sample t-test was calculated to compare the state anxiety of the participants, comparing the mean pre-test score to the mean final post-test score of the students who participated in the F2F yoga course. The mean score for the pre-test was 45.27 (SD = 5.79), and the mean for the post-test score was 46.82 (SD = 6.23). There was no significant decrease in state anxiety from pre-test to post-test, t(44) = -1.79, p = .080. Also, a paired sample t-test was calculated to compare the state anxiety of the participants comparing the mean pre-test score to the mean final post-test score of the participants who participated in the online yoga course. The mean score for the pre-test was 44.09 (SD = 6.92) and the mean score for the post-test was 43.55 (SD = 6.63). However, this result was not a significant decrease from pre-test to post-test, t(44) = 1.06, p = .29.

Trait anxiety

A paired sample t-test was calculated to compare the trait anxiety of the participants comparing the mean pre-test score to the mean final post-test score of the students who participated in the F2F yoga course. The mean for the pre-test was 46.40 (SD = 5.30) and the mean for the post-test score was 45.62 (SD = 6.40). There was no significant decrease found from pre-test to post-test, t(44) = -.920, p = .36. Similarly, a paired

sample *t*-test was calculated to compare the trait anxiety of the participants comparing the mean pre-test score to the mean final post-test score of the students who participated in the online yoga course. The mean for the pre-test was 43.59 (*SD* = 5.95*)* and the mean for the post-test score was 42.82 (*SD* = 7.17). There was no significant decrease found from pre-test to post-test, $t(44) = .82$, $p = .42$.

Appearance anxiety

A paired sample *t*-test was calculated to compare the appearance anxiety of the participants comparing the mean pre-test score to the mean final post-test score of the students who participated in the F2F yoga course. The mean for the pre-test was 7.56 (*SD* = 5.53*)* and the mean for the post-test score was 6.13 (*SD* = 4.51). There was no significant decrease found from pre-test to post-test, $t(44) = 1.83$, $p < .05$. Likewise, a paired sample *t*-test was calculated to compare the appearance anxiety of the students comparing the mean pre-test score to the mean final post-test score of the students who participated in the online yoga course. The mean for the pre-test was 10.49 (*SD* = 7.96*)* and the mean for the post-test score was 10.44 (*SD* = 8.15). There was no significant decrease from pre-test to post-test, $t(44) = .065$, $p = .95$.

Sit and reach flexibility

A paired sample *t*-test was calculated to compare the *sit and reach flexibility* of the participants comparing the mean pre-test score to the mean final post-test score of the participants who participated in the F2F yoga course. The mean for the pre-test was 17.58 (*SD* = 3.64*)* and the mean for the post-test score was 18.84 (*SD* = 3.93). There was a significant increase found in scores from the pre-test to the post-test for the F2F yoga group, $t(44) = -.462$, $p < .05$. Additionally, a paired sample *t*-test was calculated to compare the sit and reach flexibility of the participants comparing the mean pre-test score to the mean final post-test score of those who participated in the online yoga course. The mean for the pre-test was 16.13 (S*D* = 4.03*)* and the mean for the post-test score was 17.22 (*SD* = 4.09). There was a significant increase in scores from the pre-test to the post-test for the online yoga group, $t(44) = -5.24$, $p < .05$.

ANCOVA analyses

When ANCOVA analyses were employed to control for variability between groups on the pre-test, only two dependent variables were found to be significant: state anxiety and appearance anxiety. State anxiety was lower for participants in the online course while appearance anxiety was lower for students in the F2F course, No statistically significant change was reported between the two dependent variables in the area of trait anxiety.

In the area of flexibility, when the ANCOVA was administered it was determined that when pre-test scores were used as a covariate, there was no significant difference between the groups in terms of flexibility, when comparing post-test scores for both the online and F2F deliveries. However, the paired sample *t*-tests showed that from pre to post both the F2F and online groups had significant increases in flexibility post test scores. In the area of behavioural intentions, there was no significant difference between groups.

When comparing the online and F2F courses individually using the paired sample *t*-test, for pre and post mean scores, it was discovered that in the area of state anxiety, students in neither course demonstrated a significant decrease in the area of state anxiety. With respect to appearance anxiety, the paired sample *t*-test also determined that there was no significant reduction within either method of course delivery.

Within the area of flexibility, however, it was determined that the paired sample *t*-test demonstrated a statistically significant increase in flexibility of the hamstrings for the students in both the F2F and the online yoga courses.

DISCUSSION

With the growth of online education, virtual yoga may offer a promising alternative to F2F yoga since it is generally regarded as more convenient, more accessible and more accommodating for individuals with different needs than F2F yoga. This present study showed that *trait anxiety* did not change for students in either group. However, there was a significant decrease of *state anxiety* in online students and a significant decrease in *appearance anxiety* for F2F students. Even so, within group analysis showed no significant reduction in any of three areas of anxiety for either form of course delivery. This finding is in contrast to that of other research (Bhosale, 2016) showing that yoga can decrease anxiety. It may be that with a larger and truly random sample more could be learned about the relationship between different types of anxiety among online yoga students. The F2F class in the present study consisted of a larger than normal population of football players who participated in the yoga class immediately after practice. The anxiety tests were administered after practice and aligned closely with the beginning of the season. The fact that these athletes are not guaranteed scholarships and can be cut from the team, may be a possible indicator as to why the yoga was not helpful for their state or trait anxiety. Furthermore, the present study may have been skewed because of the gender of participants between the two modes of course delivery. The online class consisted of 62% females and 37% males, while the F2F class consisted of 53% females and 46% males. There is research supporting the belief that females struggle more with appearance anxiety more so than males (Aderka et al., 2014; Wisting et al., 2018). If students in the online course had higher anxiety levels due to body image than students in the F2F class, it could be concluded that the online class would naturally have lower post-test scores than the F2F class, a class that was more evenly divided between male and female.

Both modes of course delivery increased *flexibility*, a finding that is consistent with that of another research (Tracy and Hart 2013). However, no significant difference occurred between groups indicating that F2F and online course delivery is equally effective in increasing flexibility. Since the only area that demonstrated any significant change was the flexibility in students in both modes of delivery, ensuring that such a component is available in any course may be beneficial to several groups of people, including seniors, physical education teachers, athletes, and patients of chiropractors and physical therapists. This concurs with previous research on the benefit of yoga for flexibility (Halder et al. 2015; Polsgrove et al., 2016).

There was no significant change in students' *behavioural intentions* towards exercise and yoga in either group. There was a slight difference in behavioural intentions between the two delivery modes with F2F students reporting a slightly higher mean score (M = 40.82) than the online students (M = 38.80). It should be noted that the total maximum score for the behaviour assessment was 49 points, indicating that both delivery methods had moderately high scores related to perceived behavioural intentions. It is possible that the reason for the slightly higher behavioural intention in the F2F course could be due to the fact that the instructor was physically present and thereby, was able to offer more immediate positive reinforcement to F2F students.

CONCLUSIONS

With the results from prior research and the current research study suggesting that online yoga may be equally as effective as F2F yoga, by offering more opportunities for college students and other populations to take online yoga courses, the same benefits may result. Particularly because an online form of delivery is less intimating and more attractive for individuals who are obese, out of shape, physically challenged, etc., online yoga may be a promising method for reducing and preventing long-term health concerns that plague our nation. Additionally, flexibility is a key component to living a healthy lifestyle (Bradley, 2011) so fall-

prevention programs have become perceived as essential in order to reduce the number of falls among seniors. With both formats (i.e., online and F2F yoga) demonstrating an increase in flexibility, the online yoga option could potentially help seniors who are not as mobile as others, and/or who live in colder climates where winters can create challenges for attending F2F yoga course. As well, F2F courses might also be offered at senior centres in order to help seniors avoid falls, and generally, live longer and healthier lives. More research is key to understanding the impact that online yoga has and will have on obesity, flexibility and anxiety, as well as making yoga more accessible to individuals who need to increase flexibility and decrease anxiety. Further research also might examine more specific populations such as athletes or seniors to see which modes of deliveries are more effective and why.

AUTHOR CONTRIBUTIONS

Judy Lambert is responsible for the supervision and writing the first draft; Robyn Miller is responsible for conceptualization, methodology, performing the experiments, and data collection. All authors discussed the results and contributed to the final manuscript.

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DISCLOSURE STATEMENT

We acknowledge that the experiments comply with the current laws of the United States where they were performed. We certify that Bowling Green State University approved the protocol for this investigation and that all experimentation was conducted in conformity with ethical and humane principles of research.

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