

## 1. YOGA PROGRAM ON A COLLEGE CAMPUS REDUCES STUDENTS' STRESS LEVELS

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Key words: Yoga, stress, minority, college students

**Objective:** An analysis of 2007 National Health Interview Survey Data presented at SYR2013 (Keosain, Lemaster, Chao, & Saper, 2013) highlighted the need to increase low-income minority groups' access to yoga and its benefits. Studies on the effects of yoga in the US focus on the middle-class Caucasian population. The Lehman College Counseling Center offered free yoga classes to predominantly low-income first-generation students of color to provide access to yoga and evaluate its benefits for this population. This mixed-methods study assessed the effects of yoga on students' perceived stress levels.

**Methods:** A 60-minute yoga class was offered twice a week for one semester. Before and after a class, students rated their stress level on a scale from 1 (lowest)-10 (highest). They commented on what accounted for the change, if any. A paired samples t-test was run on 65 pre- and post-questionnaires collected from 34 students to determine whether there was a statistically significant mean difference in stress level scores.

**Results:** Participants were 94% people of color (Latino/a, African American, Afro-Caribbean, and Asian), 85% female, 15% male. Stress level scores were lower after participating in a yoga class ( $M = 2.35$ ,  $SD = 1.28$  vs.  $M = 5.66$ ,  $SD = 2.10$ ); a statistically significant mean difference of 3.31 ( $t(64) = 14.19$ ,  $p < .001$ ) or a 58.5% decrease in stress levels was found. Students commented on the relaxing effects of stretching, breathing, and being in the moment. They reported observing relaxation, easing of tension and pressure, feeling connected with and aware of their body, breath, and the earth. They described their after-state as at peace, quiet, at ease, more grounded, taller, lighter, more loose, less stiff, relaxed, free, calm, happy, more positive and more comfortable. They noted that practicing yoga made doing homework easier and less stressful.

**Conclusion:** In our study, participating in a 60-minute yoga class affected a significant reduction in students' perceived stress levels. Students reported feeling more peaceful and positive and having an improved relationship with homework. These findings suggest that providing yoga programs on college campuses serving low-income minority first-generation college students may support students' success.

## 2. THE PRELIMINARY EFFECTS ON QUALITY OF LIFE OF INTRA-DIALYSIS YOGA AS COMPARED TO AN EDUCATIONAL GROUP FOR PATIENTS WITH END-STAGE RENAL DISEASE

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Key words: Yoga, end-stage renal disease, hemodialysis

**Objective:** The purpose of this study is to estimate the preliminary effects of intra-dialysis yoga as compared to an educational control on disease-related quality of life among patients with end-stage renal disease (ESRD) on maintenance hemodialysis.

**Methods:** Randomized clinical pilot study among patients with ESRD on hemodialysis. Patients were recruited who were 18 years or older, on hemodialysis for 3 or more months, and adequately dialyzed ( $Kt/V \geq 1.2$ ). Patients who had acute or chronic medical conditions that would make participation in exercise hazardous were excluded. The intra-dialysis yoga intervention consisted of up to 36 intra-dialysis yoga sessions over 12 weeks taught by a certified yoga teacher during dialysis. The comparison group consisted of an established educational curriculum, Kidney School, which was divided to match the yoga intervention. Randomization was performed by dialysis shift schedule. The primary outcome for the study was quality of life as measured by the Kidney Disease Quality of Life 36 questionnaire, with a priori focus on the SF-12 Physical Component. This pilot study was designed to estimate preliminary effects to inform future larger clinical trials, and not powered to measure differences among groups. Continuous data are reported as medians with interquartile ranges and categorical data as percentages.

**Results:** 18 patients were assigned to intra-dialysis yoga and 13 patients to the educational arm. Among patients in the yoga arm, 13 patients completed the 12-week yoga protocol, while all 13 patients in the educational arm completed the 12-week Kidney School protocol. For the primary outcome, the intra-dialysis yoga arm reported a median positive change of 6.38 (interquartile range (IQR) -2.28 to 12.81), as compared to the educational group which reported a change of -1.51 (IQR -5.64 to 2.17). Other positive changes in the KDQOL were observed among the yoga group including effects of kidney disease (yoga 9.37 (IQR -3.53 to 17.98) versus education -6.25 (-21.88 to 21.88); burden of kidney disease (yoga 6.00

(IQR 0.00-29.69) versus education 0.0 (IQR -21.88 to 12.50); and disease symptoms (yoga 2.09 (IQR -2.08 to 10.42) versus education 4.16 (-3.13 to 35.00). A slightly negative change was observed in the SF-12 mental health component of yoga (-0.06 (IQR -5.15 to 10.45) versus education (3.26 (IQR -4.39 to 14.89)).

**Conclusion:** Yoga positively affected kidney disease-related measure for quality of life.

### 3. BODY TRUSTING MODERATES THE RELATIONSHIP BETWEEN EMOTIONAL EATING AND BMI IN COLLEGE-AGED WOMEN

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Key words: Interoceptive awareness, eating behavior, obesity, yoga

**Objective:** Emotional eating has been linked to higher BMI and female gender in epidemiological research (e.g., Angle et al., 2009). Several studies have found that body awareness beneficially relates to healthier eating behaviors among female yoga practitioners (Martin et al., 2013; Dittman & Freedman, 2009), representing a potential mechanism through which yoga may facilitate weight loss or improved eating behaviors. One as-yet uninvestigated dimension of body awareness in relation to eating behavior is Body Trusting (i.e., the experience of one's body as safe/trusted, or home), shown higher in experienced vs. novice yoga practitioners (Mehling et al., 2012). This preliminary study sought to assess whether Body Trusting moderated the positive association between EE and BMI in college-aged women.

**Methods:** Participants were 395 college females (m. age=18.47+1.24; m. BMI=23.16+4.15). Measures included the Body Trusting subscale of the MAIA (Mehling et al., 2012), the Emotional Eating subscale of the TFEQ-R19 (Karlsson et al., 2000), and self-report BMI. Multiple regression and simple slopes analyses were performed to assess how Body Trusting (BT) was associated with Emotional Eating (EE) and BMI.

**Results:** BT significantly inversely predicted BMI ( $b=-.477$ ,  $SE\ b=.178$ ,  $p=.008$ ); EE did not significantly predict BMI ( $b=.010$ ,  $SE\ b=.008$ ,  $p=.221$ ); and BT significantly moderated the association between EE and BMI ( $b=-.017$ ,  $SE\ b=.006$ ,  $p=.003$ ),  $R^2=.050$ . Simple slopes analysis indicated no significant effect of EE on BMI at high ( $b=-.011$ ,  $SE\ b=.011$ ,  $p=.319$ ) and mean ( $b=.010$ ,  $SE\ b=.001$ ,  $p=.221$ ) levels of BT, but a significant effect of EE on BMI at low levels of BT

( $b=.030$ ,  $SE\ b=.010$ ,  $p=.004$ ).

**Conclusion:** These results identify BT as a strong inverse predictor of BMI in college-aged women. The simple slopes test indicates that women lowest in BT evidence steep increase in BMI as EE increases, relative to women at mean and high levels of BT. That is, BT appears to buffer the positive relationship between EE and BMI. Those at different levels of BT may differentially engage in EE behaviors (e.g., healthy vs. unhealthy foods) or engage in other healthy behaviors, thereby facilitating lower BMI. Alternately, BT may relate to beneficial physiological indices, impacting parameters that affect body weight. Future research should investigate these hypotheses, and assess the extent to which BT mediates or moderates the effects of yoga practice on BMI and eating behavior.

### 4. THE EFFECTS OF A REGULAR KRIPALU YOGA PRACTICE ON ANXIETY AND DEPRESSION IN WOMEN LIVING IN A WORKING CLASS TOWN IN MIDCOAST MAINE

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Key words: Yoga, depression, anxiety, women, social work

**Objectives:** Anxiety and depression have reached epidemic proportions throughout the world. A majority of sufferers are women, yet little mental health research is gender specific. A growing body of research has linked the benefits of a regular yoga practice to the reduction of symptoms in depression and anxiety. This study attempts to link a regular Kripalu Yoga practice (a hatha yoga system with a clear sequence, that is easily reproduced, and focuses on all layers of self: mind, body, emotion and spirit) to the reduction of symptoms in depression and anxiety. Participants of the study were women ages 18-54 living in or around Bath, Maine, a town with a high rate of poverty without a strong yoga presence. Most of the women participating in the study were experiencing gender-specific life stressors with varied rates of anxiety and depression. Given the increasing popularity of yoga, the noninvasiveness and accessibility of the therapy and the low incidence of adverse events, there is great potential in this research and in its applications in Social Work Practice.

**Methods:** A weekly one-hour Kripalu Yoga class was taught to 9 women ( $n=9$ ), from differing demographics, recruited from the Bath area for a period of 8 weeks. Before classes commenced initially, each woman was interviewed individually. Interviews consisted of a quantitative (Beck's assessment for

both anxiety and depression) and a qualitative baseline survey. This meeting and the measurements used were duplicated after the end of the 8 weeks. Additionally, two Profile of Mood States (POMS) surveys were placed on each woman's mat to be filled out before and after class.

**Results:** Measured by quantitative instruments, all women showed a decrease in symptoms of both depression and anxiety, those with the highest rates of anxiety and depression showed the highest rates of decline. 100% of the woman reported an increase in positive mood and a decrease in negative mood according to the POM scale measurement. 100% of the women reported a decrease in depression according to the Beck depression scale. 80% of the woman reported a decrease in anxiety according to the Beck anxiety scale. Furthermore, qualitative indicators showed profound impacts of yoga on quality of life.

**Conclusions:** A regular Kripalu Yoga practice can lower symptoms of depression and anxiety in woman of all ages, suffering differing levels of symptoms, regardless of knowledge of or experience with yoga.

### 5. MOBILE ELECTROENCEPHALOGRAPHY DURING YOGA: CAN IT BE DONE AND WHAT CAN IT TELL US?

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Key words: Mobile electroencephalography, yoga

**Objective:** It is proposed that a consistent and focused yoga practice quiets the mind, but how can this be measured? The aims of this study are 1) To assess the feasibility of collecting mobile EEG data during an asana (posture) based yoga practice; and 2) To create a process for understanding the psychophysiological state of the mind during both a seated kirtan kriya practice from the Kundalini tradition and an asana-based practice ending with pranayama from the Viniyoga tradition.

**Methods:** This is an observational prospective study of healthy yoga practitioners (n=28) participating in a Viniyoga teacher-training program. To answer aim 1, participants (n=28) of varying head sizes and abilities wore the headset during asana-based practices. To answer aim 2 we created a 6-minute EEG calibration, assessing brain reactions to a number of behaviors (breathing, repetitive sound, gross motor movements, etc.) and emotions (by viewing emotional-content pic-

tures, including emotionally neutral). Participants completed the calibration prior to either the seated (n=5) or asana-based practice (n=10). We collected data at baseline and 6 months where participants completed their practices daily in between. We applied an individual calibration to their EEG data collected during their practice and looked for common brain states shared by participants by regressing maximally predictive weighted sums representing the contribution of each electrode (14) in 4 commonly assessed frequency bands and then examined how the weighted sums of activities behaved during the yoga practices.

**Results:** With respect to aim 1 we demonstrated mobile EEG can be used safely and comfortably to collect coherent EEG data. Interestingly, with respect to aim 2 our calibration process demonstrated the mind becomes more like that of conscious breathing with the daily seated practice and the asana-based practice ending with pranayama from the Viniyoga tradition overall was more like that of an emotionally neutral mind.

**Conclusion:** Mobile EEG is possible during yoga and our unique process is a promising tool for measuring the psychophysiological effects of yoga and supporting the tenet that the mind quiets in some fashion with a consistent and focused yoga practice.

### 6. YOGA IN U.S. SCHOOLS: AN INFORMAL SURVEY

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Key words: Yoga, school, education, programs

**Objective:** Substantial interest has begun to emerge around the implementation of yoga interventions in schools, with preliminary research suggesting that school-based yoga programs may improve several aspects of student mental and physical health and behavior. There are now numerous formal yoga programs that are focused on implementing yoga in educational settings. The purpose of the present study is to provide an informal survey of these programs in order to highlight this burgeoning movement that is taking place across the United States.

**Method:** From January 2013 to April 2014, extensive online, listserv, and database searches were conducted to identify formally established U.S.-based yoga in schools programs. We evaluated each program's scope of work, curriculum charac-

teristics, teacher certification and training requirements, implementation models, modes of operation, and primary geographical regions.

**Results:** Thirty-six formal programs were identified that are currently offering yoga in over 900 schools across the U.S., and more than 5,000 instructors have been trained by these programs to offer yoga in educational settings. Many of the programs surveyed have come into existence over a relatively short period of time, with most being in their first 5-10 years of service. Seventy-five percent of the organizations offer yoga programming that spans the range from kindergarten (or pre-school) through 12th grade. The majority of programs offer options for both in-classroom yoga (i.e. yoga at a desk or chair) and full yoga class instruction (i.e. mat-based yoga, yoga in a gym). Heterogeneity exists with regard to the certification and training requirements across the surveyed organizations, however 45% of the programs require instructors to have the basic 200-hour Yoga Alliance registered yoga teacher certification (RYT) prior to attending their specialized yoga in schools training program.

**Conclusions:** There are a substantial number of formal programs providing yoga within school settings in the United States. Despite some variability in the exact mode of implementation, training requirements, locations served, or grades covered, the majority of programs share a common goal of combining four basic elements of yoga (physical postures, breathing exercises, relaxation techniques, and mindfulness/meditation practices) with a variety of additional techniques to enhance students' mental and physical health and behavior.

## 7. ACUTE EFFECTS OF SCHOOL-BASED YOGA ON STUDENT MOOD

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Key words: Yoga, mindfulness, school, education

**Objective:** Very few studies have examined the efficacy of yoga in school settings. However, preliminary research suggests that school-based yoga programs may have beneficial effects on students' psychological health. The purpose of the present study was to directly compare the acute effects of participating in a single yoga class versus a single physical education (PE) class on student mood.

**Methods:** Forty-seven 9th- and 10th-grade students at a rural high school in Western Massachusetts completed self-report questionnaires assessing mood (Brunel University Mood

Scale; BRUMS) and positive/negative affect (Positive and Negative Affect Scale for Children; PANAS-C) immediately before and after participating in a single yoga class and a single PE class one week later. Both classes were approximately 35-minutes long and took place during regularly scheduled PE class time. The yoga class focused on the role of the physical body in self-regulation and involved a centering/check-in exercise, breathing exercises, physical postures, and relaxation/meditation techniques. For the PE class, students played an active game outdoors. Data were analyzed using paired-samples t-tests and Wilcoxon signed ranks tests. Results are reported as mean pre-post difference scores  $\pm$  SDs, with alpha set at  $p < .05$ .

**Results:** Participants reported significantly greater decreases in anger (yoga:  $-0.87 \pm 1.75$ ; PE:  $-0.45 \pm 1.80$ ), depression (yoga:  $-0.52 \pm 0.97$ ; PE:  $-0.19 \pm 1.44$ ), and fatigue (yoga:  $-2.02 \pm 4.05$ ; PE:  $-0.09 \pm 3.93$ ) from before to after participating in yoga compared to PE. After yoga, participants also reported significant reductions in negative affect ( $-1.55 \pm 3.76$ ), however this reduction was not significantly different from the non-significant change in negative affect after PE ( $-1.03 \pm 6.50$ ). In addition, after participating in both yoga and PE, participants reported significant decreases in confusion (yoga:  $-0.99 \pm 1.75$ ; PE:  $-0.80 \pm 2.08$ ) and tension (yoga:  $-0.92 \pm 1.56$ ; PE:  $-0.63 \pm 1.99$ ). Participants did not report significant changes in vigor or positive affect after either class.

**Conclusions:** These results suggest that school-based yoga may provide unique benefits for students above and beyond participation in standard PE, particularly with regard to improvements in anger, depression, fatigue, and possibly negative affect. In addition, it appears that yoga and PE may exert similar beneficial effects on student confusion and tension.

## 8. EFFECT OF YOGA ON NEUROCOGNITIVE, BIOCHEMICAL, AND MUSCULAR FITNESS VARIABLES IN HEALTHY ADULTS: A QUASIEXPERIMENTAL STUDY

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Key words: Healthy aging, neurocognitive, biochemical, muscular fitness, yoga

**Objective:** Neurocognitive, biochemical and muscular fitness efficiency decline gradually with advancing age and are associated with the symptoms of aging. Scientific evidence shows that it may differ in physically active and inactive individuals.

Yoga is a traditional-scientific approach of nurturing the mind-body system. The purpose of this study was to examine the effect of graded yogic training on neurocognitive, biochemical, and muscular fitness variables in healthy adults.

**Methods:** 45 healthy men and women in the age group 35 to 55 years volunteered for the study. They were divided into two groups, that is, yoga practicing group (experimental: male 15, age 42.80+7.43 yrs; female 8, age 44.75+8.40 yrs) and waitlisted control group (male 15, age 41.67+7.87 yrs; female 7, age 45.43+7.00 yrs). The experimental group underwent combined yogic practices daily in the morning for 6 days/week for 12 weeks, whereas the control group continued their usual routine activities. Standing height, body weight, body mass index, short-term memory, reaction time, cholesterol, triglycerides, cortisol, muscular strength, muscular endurance and flexibility were measured before commencement and after six and twelve weeks of yogic training period. The repeated measure ANOVA was used for data analysis.

**Results:** 12 weeks of yogic training produced a significant (least significant difference was set at  $p < 0.05$ ) increase in short-term memory, muscular strength, muscular endurance, flexibility and decrease in auditory and visual reaction time, cholesterol, triglycerides, cortisol for both male and female groups as compared to their baseline data, whereas no such changes were observed in the control group.

**Conclusion:** From the present study it can be concluded that a combined approach of graded yogic training will be beneficial for maintaining the neurocognitive, biochemical, and muscular fitness ability thus promote healthy aging.

### 9. A STRUCTURED AND COMBINED YOGA ASANA AND PRANAYAMA INTERVENTION FOR POST-TREATMENT BREAST CANCER SURVIVORS.

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Key words: Yoga intervention, breast cancer, exercise, yoga protocol, yoga postures

**Objective:** Report on the methodology of a 6-month yoga asana intervention for 20 post-treatment breast cancer survivors.

**Methods:** A Hatha yoga program was developed specifically for this study. It took into account the potential limitations of limb movement, higher body fatness, and lower levels of aerobic fitness and strength common to post-treatment breast cancer survivors. The protocol was developed by a licensed physical therapist, who is also a certified and experienced yoga instructor. (The program included an emphasis on breath awareness and practice [pranayama]; a modified Sun Salutation; standing, seated, quadruped, twisting/rotation, prone, supine postures and the transition used between postures; modified inversion; guided relaxation and resting postures.) The protocol and sequencing of postures were designed with a great deal of specificity to guarantee that subjects would receive the same instructions and perform the same routine, regardless of the instructor or class attended. Instructors received training in specific language to be used, as well as timing/pacing for the class to ensure consistency for the 60-minute program throughout the duration of the study. Yoga classes were taught at six different times each week so that each participant could attend a minimum of three classes a week. Participants received an audio CD and booklet containing the detailed yoga program with photographs and instructions that could be used at home when they were unable to attend class.

**Results:** Twenty randomized participants received the structured yoga intervention during the 6-month trial. There were no reported injuries. Significant physical and mental functioning was evidenced by scores on physical functioning tests and scoring on the Medical Outcomes Short Form - SF-36® Survey. Participants lost % body fat, (-3.00%,  $p = .001$ ); increased: (a) sit to stand leg strength repetitions, (+2.05 reps,  $p = .003$ ); (b) forward reach, (+3.59 cm,  $p = .01$ ); (c) right arm sagittal range of motion (ROM), (+6.50 °,  $p = .05$ ); (d) aggregate score on Mental Component Scale (MCS) of the Medical Outcomes Short Form 36® scale (+7.3,  $p = .005$ ).

**Conclusion:** This program, proven to be safe and effective for post-treatment breast cancer survivors, resulted in significantly improved physical and mental functioning. This methodology, as designed, should be replicated for effectiveness with other cancer survivor populations.

## 10. YOGA AS AN INNOVATIVE ADJUNCTIVE TREATMENT FOR STRESS AND ANXIETY REDUCTION IN COLLEGE STUDENTS

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Key words: Yoga, college students, mental health, stress/anxiety

**Objective:** Given the recent increase in anxiety disorders, a pilot study was conducted to determine whether yoga is efficacious for reducing college student's stress. We propose that yoga can show added benefits to clinical outcomes beyond standard treatment (individual therapy, group therapy, medications). We aimed to explicate and expand on the research currently being conducted in the areas of stress, coping, and college mental health by assessing students who are already seeking treatment for their distress.

**Methods:** Student clients (n=14) enrolled at UConn Counseling and Mental Health Services who self-identified anxiety/stress as a primary presenting concern were offered the chance to participate in an adjunctive treatment, yoga. If students chose not to participate, they were offered the chance to participate in the control group (standard treatment). Measures of demographics, frequency of treatment modalities, psychological symptoms (62-item Counseling Center Assessment of Psychological Symptoms; CCAPS), resilience (30-item My Resiliency Factors; MRF), and perceived stress (10-item Perceived Stress Scale) were collected at baseline and at the conclusion of the 8-week yoga program/standard treatment.

**Results:** The yoga group showed statistically significant reductions from baseline to end-program relative to the control group ( $p < .01$ ; pre-post mean change scores  $\pm$  SDs) on the generalized anxiety CCAPS subscale (yoga =  $-.82 \pm .63$ , control =  $-.04 \pm .27$ ), social anxiety CCAPS subscale (yoga =  $-.82 \pm .63$ , control =  $-.04 \pm .27$ ), and statistically significant gains on the life skills MFS subscale (yoga =  $+.48 \pm .21$ , control =  $+.16 \pm .17$ ). Yoga group participants demonstrated marginally significant reductions compared to the control group ( $p < .10$ ) on the depression CCAPS subscale (yoga =  $-.59 \pm .52$ , control =  $-.07 \pm .40$ ) and increased overall MRF (yoga =  $+.35 \pm .22$ , control =  $+.17 \pm .13$ ). Further, dosage of yoga was correlated with generalized anxiety ( $r = -.64$ ,  $p < .02$ ) and social anxiety ( $r = -.64$ ,  $p < .02$ ).

**Conclusions:** These data suggest that yoga as an ancillary treatment to traditional psychological treatments can decrease students' relief from anxiety and depressive symptoms and suggests that practicing yoga may strengthen resilience to better manage stress. Development of yoga programs within college counseling centers has significant clinical value and could encourage young people to explore mind-body approaches to mental health.

## 11. THE EFFECTIVENESS OF YOGIC BREATHING INTERVENTION ON QUALITY OF LIFE OF SUBSTANCE USERS

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Key words: Substance use, quality of life, yogic breathing program, effectiveness, India

**Objectives:** Drug dependence being a relapsing disorder, its pharmacological treatment seeks to promote abstinence or reduction in substance use. The use of complementary therapies with conventional pharmacotherapy has not been fully evaluated for substance users in India. The present study aimed to study specific role of yoga in treating or preventing addiction in Indian settings and to evaluate the effectiveness of standard treatment plus yogic breathing program (SKY) as compared to standard treatment alone on the quality of life of treatment seeking male opioid dependent users.

**Methods:** Using a prospective randomized controlled intervention study design, Opioid dependent users (n=84) were recruited from a community based outreach clinic located in an urban resettlement colony, east Delhi run by a large hospital. They were randomized into study (n=55) and control group (n=29) using 2:1 randomization based on pre-study pilot results. The control group received standard treatment using buprenorphine, a partial agonist while the study group besides standard treatment underwent a 12 hour yogic breathing program (SKY [Sudarshan Kriya Yoga]) program. The Quality of life using WHO QOL- BREF questionnaire were carried out at 3 and 6 months follow-up.

**Results:** In the study group 35 completed the yoga intervention. The three-month assessments were carried out in 34 and 27 users and six-month assessments were carried out in 32 and 27 users in the study and control group respectively. Demographics of study and control groups as well as those who completed the SKY program and non-completers showed no significant differences. Between group comparisons showed an improvement among study (SKY) group in the overall quality of life and physical ( $p < .05$ ); psychological ( $p = .001$ ) and environment domains at 6 months follow-up. Within group comparisons showed improvement in scores at 3 and 6-month follow-up in the study group compared to control group which showed no changes. Urine screening results were found negative at six-month follow-up indicating no drug use (opioid use) for all in SKY group.

**Conclusions:** The SKY program holds promise and can be a potentially beneficial, low-risk adjunct for the treatment of substance abuse and improving quality of life. Treatment providers need to play a role in making appropriate referrals and in encouraging patients to maintain their yoga practices

## 12. THE BENEFITS OF YOGA FOR CHILDREN AGED 3–6: A QUALITATIVE INQUIRY

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Key words: Children, schools

**Objective:** A growing number of schools are beginning to adopt yoga programs for their students. Many students have focuses at risk youth in high school or middle school. However, little research has been conducted on very young children (pre-elementary school). This study explores the benefits of yoga for Montessori students aged 3-6.

**Methods:** Children aged 3 to 6 years of age completed an eight-week yoga program in their Montessori school (n = 32). After the yoga program was completed students, parents, teachers, and school administrators were interviewed regarding effects yoga has on their children in this Montessori school. The yoga program consisted of 20-minute yoga classes given twice a week by a yoga teacher or their school teacher. The yoga class combined asana, pranayama, stories about characters from yoga history, and yoga coloring and workbook activities. Also, students could practice yoga on their own each day by spending time at the yoga station in the classroom.

**Results:** Interviews of parents of children who participated in the yoga program showed that parents strongly supported their children to learn and practice yoga. Parents had a desire to have more knowledge of the yoga program and learn ways to increase the amount of time and opportunities their children could practice because of the improved behavior of children after they practice yoga. Teachers and school administrators also reported that children were better behaved and able to regular their emotions when they were angry or sad. Teachers were able to suggest a yoga pose to a student when they were upset and if the student practiced the yoga pose their anger would subside. Students reported that yoga was fun and they liked all the activities and stories that accompanied their yoga class.

**Conclusion:** Qualitative data indicates that children aged 3-6 are potentially able to learn yoga poses and breathing techniques within an 8 week period. Children can then use these

techniques to help regulate their emotions and improve their behavior at home and also in the classroom. Future study should include a control group and quantitative/biometric measures.

## 13. IMPACT OF YOGA ON FUNCTIONAL OUTCOMES IN BREAST CANCER SURVIVORS WITH AROMATASE INHIBITOR-ASSOCIATED ARTHRALGIAS

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Key words: Yoga, aromatase inhibitor, arthralgia, quality of life, function, breast cancer

**Objective:** Arthralgia affects postmenopausal breast cancer survivors (BCS) receiving aromatase inhibitors (AI), which may result in reduced function and long term wellbeing. While there is evidence for yoga to improve subjective report of Quality of Life (QOL) in various cancer populations, no studies reported objective functional improvement associated with yoga. This study aims to establish the feasibility of studying the impact of yoga on objective functional outcomes for AI-associated arthralgia (AIAA).

**Methods:** Postmenopausal women with stage I-III breast cancer who reported AIAA were enrolled in a single arm feasibility trial. Yoga was provided twice a week for 8 weeks and participants were instructed to do a home-based yoga program thrice weekly. An Iyengar yoga program was specifically developed with emphasis on postures, breathing and meditation while attending the safety concerns for individuals with musculoskeletal pain. Certified instructors led the yoga sessions for 1.5 hours with a 15-minute check-in period to assess progress and function. The Sit and Reach (SR), and Functional Reach (FR) were evaluated by trained physical therapists and served as the primary outcomes. Self-reported Patient Specific Functional Scale (PSFS) and FACT-B were secondary outcomes. Paired-t tests were used for analysis.

**Results:** Among the 10 BCS with AIAA, mean age 58 (SD 6.23), 9 were Caucasian, 1 African American and 90% provided data for assessment at the end of the yoga intervention. From baseline to the end of intervention, participants had significant improvement in flexibility measured by SR (22.90 to 30.10) and in balance measured by FR (25.36 to 39.19), both  $p < .01$ . The PSFS also improved from 4.55 to 7.21, as well as

QOL measured by FACT-B (89.33 to 106.05), both  $p < 0.05$ . No adverse events nor development or worsening of lymphedema was observed. Eighty percent of participants adhered to the home based program of 15 minutes 3 times per week.

**Conclusion:** Preliminary data suggests that yoga may improve flexibility and balance in breast cancer survivors who experience AIAA. A randomized controlled trial is needed to establish the definitive efficacy of yoga for objective functional improvement in BCS with AIAA.

## 14. SAFETY AND FEASIBILITY OF MODIFIED CHAIR-YOGA ON FUNCTIONAL OUTCOME AMONG ELDERLY AT RISK FOR FALLS

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Key words: Yoga, balance, seniors, fear of falling

**Objective:** Falls are among the most common serious problems affecting older adults. At least 30% of those over the age of 65 and 50% of those over the age of 80 fall annually. The goal of this pilot was to assess the safety and feasibility of structured yoga in an elderly population with fall risk through a mixed-methods approach.

**Methods:** Seniors at risk for falls were identified in an assisted living facility and enrolled in a single arm pilot trial. A yoga program was provided twice a week for 8 weeks. The yoga program was designed from previous published pilot data and was predominantly chair based. The Hospital Anxiety and Depression Scale (HADS) was used to screen participants prior to participation in the yoga sessions. Measures completed at baseline and 8 weeks included the Short Physical Performance Battery (SPPB), the Berg Balance Scale (BBS), and Timed Up and Go (TUG). The Functional Reach Test (FR) and Modified Sit and Reach (SR) were additional measures of balance and flexibility. Tinetti's Falls Efficacy Scale (FES) and Fear of Falling (FOF) and expectancy were also measured. After each of the 16 sessions participants were asked to respond to questions and thoughts about the yoga experience and were recorded via journal.

**Results:** SPSS 18.0 was used to generate descriptive statistics. Among the fifteen seniors with a previous history of falls,

mean age 87.8 (68- 97 years) all were Caucasian and provided data for assessment at the end of the intervention. Participants demonstrated gains in the TUG (22.58 to 19.85). Improved trends were noted in FOF (5.27 to 3.0) and the anxiety subscale of the HADS (6.1 to 4.86) reduced after the intervention. There were no adverse events during yoga sessions. Qualitative frequency of response revealed participants enjoyed the sessions and found them to be useful in enhancing their balance, flexibility and strength. They noted increase in confidence, especially as it relates to fear of falling. Group yoga as an activity helped with motivation for physical exercise and practice.

**Conclusion:** Preliminary descriptive trends suggest that a yoga-based program may improve mobility and impact fear of falling and anxiety. The TUG was most sensitive to change in this small cohort. This small pilot is the first to demonstrate that yoga is a feasible and a safe intervention for elderly seniors who may be at risk for falls in their eighth and ninth decades of life.

## 15. A QUALITATIVE EXPLORATION OF THE IMPACT OF YOGA ON BREAST CANCER SURVIVORS WITH AROMATASE INHIBITOR-ASSOCIATED ARTHRALGIAS

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Key words: Yoga, aromatase inhibitors, arthralgia, breast cancer, qualitative

**Objective:** Arthralgia affects postmenopausal breast cancer survivors (BCS) receiving aromatase inhibitors (AI) which may result in reduced function and long term wellbeing. While there is evidence for yoga to improve subjective report of quality of life (QOL) in various cancer populations, few studies are qualitative in nature. The aim of this study is to capture the experience of subjects' perceived quality of life through a yoga program. A qualitative approach was taken since there is no research exploring treatment interventions for AI associated arthralgia (AIAA).

**Methods:** Ten postmenopausal women with stage I-III breast cancer who reported AIAA were recruited for the study. Yoga was provided twice a week for 8 weeks and participants were instructed to continue in a home-based yoga program. A yoga program was specifically developed with emphasis on postures, breathing and meditation while attending the safety

concerns for individuals with musculoskeletal pain. Certified instructors led the yoga sessions for 90 minutes with a 15-minute check-in period to assess progress and function. After each class and home session, participants completed a journal reflecting on their experience. Weekly phone calls were provided for each woman to address issues, facilitate compliance and ascertain the impact of yoga in their lives. Data was collected and analyzed using qualitative methods. Member checks were completed and emergent themes were explored and agreed upon by the research team to ensure reliability and validity of data.

**Results:** Several emergent themes were discovered during journal analysis: Empowerment: Importance of Camaraderie, Community, and Sharing, Pain Relief, Increased Physical Fitness (Energy, Flexibility and Function), Relieved Stress/Anxiety and Transferability of Yoga through Breathing. These themes were corroborated with reflective memos from the weekly phone call contacts with the participants.

**Conclusion:** Participants experienced yoga as an effective support group which allowed them to participate in yoga movement exercises to reduce joint pain and improve quality of life. Weekly phone calls helped develop a personal rapport between the subjects and the researchers, which further confirmed the results from journal entries. These themes support social cognitive theory and provide a potential non-pharmacological intervention for management of AIAA.

## 16. YOGA FOR CHILDREN: CONCEPT MAPPING EXPERIENCES IN NAIROBI, KENYA

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Key words: Yoga, children, concept mapping, tools for the mind, Africa Yoga Project

**Objective:** The Africa Yoga Project (AYP) is a yoga outreach program intended to enhance health and life skills in children by training Kenyans to offer free yoga outreach classes throughout Nairobi. Anecdotal evidence and preliminary research suggested that AYP yoga outreach positively impacted the children receiving yoga classes in outreaches and schools. This study was a larger scale investigation of the perceived effects of teaching and/or practicing yoga with the AYP.

**Methods:** Concept mapping was used to collect, analyze and illustrate students' perceptions of the AYP. First, participants brainstormed ideas about how practicing yoga changed them. They then sorted brainstormed statements into self-defined

piles and rated each statement in terms of perceived importance. Multidimensional scaling (MDS) analysis of sort data calculated coordinates for statements and mapped them in a 2-dimensional space. Hierarchical cluster analysis (HCA) of this data identified concepts among statements. Interpretive decisions were facilitated by bridging analysis and researchers' conceptual understanding of yoga and the literature. Cluster average importance ratings were used to give the concept map depth.

**Results:** Of the AYP's 108 students, 56 girls and 52 boys aged 8-14 participated in brainstorming and sorting/rating activities, respectively. Students brainstormed 85 unique statements about how they changed since practicing yoga. The resultant MDS statement map had a stress value of .29, indicating adequate validity. HCA and interpretive data resulted in a 6-cluster solution composed of the following concepts of perceived change: Finding Steadiness and Ease (Sthira and Sukha) - highest importance); Increased Wellness (reduced somatic complaints); Improved Physical and Emotional Health; Gratitude for Yoga Community and Practice; Neurological and Interpersonal Integration; and Experience of Efficacy and Possibility (lowest importance).

**Conclusions:** Students reported positive perceptions of the AYP and perceived practicing yoga as facilitating change across physical, mental, and spiritual domains. Additional research is needed to quantify this change and compare the AYP outcomes to those of other health and skill based promotion programs.

## 17. PILOT TRIAL OF A YOGA PROGRAM FOR PEOPLE WITH MODERATE DISABILITY DUE TO MS: DESIGN OF THE YOGA PROGRAM, PHYSICAL EFFECTS AND MENTAL EFFECTS

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Key words: Yoga, multiple sclerosis, quality of life, physical performance

**Objective:** To design a yoga program for people with moderate disability due to MS using a modified Delphi process, assess feasibility, and assess physical, mental and biological effects.

**Methods:** A modified Delphi process with a panel of experts from across health care fields and yogic training, and people with MS who have taken yoga, was utilized to design the yoga program. Data was collected at baseline (W0), after 8 weeks of two 1.5-hour yoga classes/week and home practice (W9), and after 8 weeks of home practice (W16). Fourteen women (ages 34-64, mean=53.5 years), with scores between 3 and 6 (mean=4.67) on the self-report of MS disease severity, completed the study. Repeated-measures ANOVAs were conducted to examine within-subjects differences on validated measures of physical and cognitive function, and quality of life, with planned pairwise comparisons between weeks 0, 9 and 16.

**Results:** The Delphi panel and study team designed a standardized integrative program with yoga philosophy, breathing, asanas, relaxation, and meditation, specifically tailored to address the needs of individuals with moderate MS-related disability. The program utilized scalable difficulty to meet and enhance the heterogeneous capabilities of the class, and was feasible for use in this sample. Attendance was high, and classes were well tolerated. Significant improvements ( $p < .05$ ) were found between weeks 0 and 9 in these tests: 25-Foot Timed Walk (25TWT), 9-Hole Peg Test-Dominant Hand (9HPT-D), 5-Times Sit-to-Stand (5STS), Multi-Directional Reach Test-Backward (MDRT-B), the 12-Item MS Walking Scale, Modified Fatigue Impact Scale, Mental Health Inventory (MHI), and in several subscales of the SF-36: Mental Component Summary, Social Functioning, Vitality, Role Emotional and Mental Health. Significant improvements from baseline ( $p < .05$ ) persisted at week 16 in the 25TWT, 9HPT-D, 5STS, MDRT-B, and MHI.

**Conclusions:** This integrative yoga program specifically developed for persons with moderate MS-related disability was feasible and well tolerated. Improvements were found in a number of mental, physical and quality of life outcomes. Physical performance improvements were, in general, more persistent than those that were self-reported. A larger, randomized, controlled trial will be necessary to determine intervention-specific results.

## 18. EFFECT OF A SIX-MONTH YOGA EXERCISE INTERVENTION ON FITNESS OUTCOMES FOR BREAST CANCER SURVIVORS.

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Key words: Fitness, yoga-exercise, breast cancer survivors

**Objective:** The irrefutable physical and mental benefits for properly designed exercise for post-treatment breast cancer survivors continue to be documented, including reduced risk for recurrence and improved quality of life. Yoga exercise has been practiced for centuries, and has proven to have many physical and mental benefits for consistent practitioners. However, few yoga programs have been designed specifically for post-treatment breast cancer survivors. Here we report on the physical fitness and functioning improvement for 20 post-treatment breast cancer survivors who completed participation in a 6-month structure yoga-focus exercise trial.

**Methods:** We conducted comprehensive physical fitness/functioning and assessments for the 20 post-treatment breast cancer survivors. The comprehensive fitness assessments included anthropometric measures of body mass index (BMI) and body fat; cardiorespiratory capacity (sub-maximal cycle ergometry); and, physical functioning (strength, flexibility, balance). Descriptive statistics were calculated for all measures. . Dependent sample t tests were conducted "pre" and "post" on all outcome measures. To supplement interpretation of the results, effect sizes [(("post" mean-"pre" mean)"/"pre" standard deviation)] were calculated as well.

**Results:** Participants improved in all outcome measures in the expected direction with the exception of weight and cardiorespiratory capacity. Significant improvements were seen in % body fat, (-3.00%,  $d = -0.44$ ,  $p = .001$ ); increased sit to stand leg strength repetitions, (2.05,  $d = 0.48$ ,  $p = .003$ ); forward reach, (3.59 cm,  $d = 0.61$ ,  $p = .01$ ); and, right arm sagittal ROM, (6.50- $\infty$   $d = 0.92$ ,  $p = .05$ ). Though not reaching statistical significance, small to moderate effects (effect sizes) occurred for arm and torso strength; sit and reach flexibility; and, for right arm lateral and left arm sagittal ROM.

**Conclusion:** The 20 post-treatment breast cancer survivors participating in this 6-month, structured yoga-focused exercise trial realized physical fitness and functioning improvements. Our results suggest that structured yoga-focused exercise specifically modified for post-treatment breast cancer survivors is not only safe but extremely effective. Larger-scale studies are warranted to determine optimal exercise protocols for specific cancer survivor populations.

## 19. EXPLORING THE BENEFITS OF YOGA AND MINDFULNESS IN TRAUMA RECOVERY FOR WOMEN

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Key words: Mindfulness, trauma

**Objective:** A growing evidence-base supports the connection between trauma and disease. Research suggests that mindfulness practices, such as yoga and meditation, can lead to neurological and physiological changes that may counter the impact of trauma, and promote health and well-being. The current study examines the effectiveness of a trauma-informed gender-responsive integrative mindfulness curriculum for women.

**Methods:** Adult women trauma survivors participated in a 16 session curriculum based on three components: (1) thematic discussion and pranayama, (2) asana, and (3) guided meditation. Program implementation took place in group settings. Participants were recruited from substance abuse treatment facilities, hospitals, outpatient mental health facilities, and community program settings. Program participants engaged in assessment pre and post program implementation. Validated measures examined symptoms of depression, anxiety and traumatic stress and explored levels of self-compassion. Outcomes were statistically analyzed. Women were also asked to respond to open-ended qualitative questions regarding their experience.

**Results:** For participants, a history of abuse was common. The majority of women had experienced physical or sexual violence. After completion of the program, symptoms of depression, anxiety and trauma (PTSD) were significantly lower. Women scored significantly higher on a measure of self-compassion. The women used more tools on average to manage emotions post-programming and there was a significant increase in utilization of yoga practice, meditation and self-talk. For example, while only 37% of women reported practicing yoga prior, 82% cited use of yoga post-programming. The rate of meditation doubled and while only 22% of women reported using self-talk prior to programming, all utilized this tool post-programming. Participants also indicated willingness to share tools with others, including their children when applicable; all participants indicated sharing tools with other women and 43% sharing tools with men. Feelings of mutual-ity and compassion for others were also common outcomes.

**Conclusions:** To date, results are promising and indicate the benefit of integrative mindfulness programming to increase coping strategies as well as to significantly decrease the experience of symptoms of depression, anxiety and traumatic stress. The program produces sustained, generalizable results and is accessible to all populations.

## 20. YOGA INCREASES THE SENSORY CONTRIBUTION TO BALANCE IN VISUALLY IMPAIRED PERSONS AT RISK FOR FALLS AS MEASURED BY THE WII BALANCE BOARD (WBB)

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Key words: Yoga, balance, vision loss

**Objective:** Balance is regulated by 3 sensory systems: somatosensory, vestibular, and visual. Individuals with visual impairment (VI) have irreparable damage to the visual input contributing to balance, thus increasing the risk of falls. Yoga may aid in developing the remaining sensory systems as a compensation for vision loss. The present pilot study evaluated the effects of an Ashtanga-based Yoga Therapy (AYT) program on balance in those with VI.

**Methods:** Seventeen legally blind participants were randomized to an 8-week AYT program (n = 9, mean (SD) age = 54.7(13.2); 3 M) or waitlist control (n=8, mean (SD) age = 53.13 (9.63), 3 M). AYT subjects convened for one group session per week with an instructor and were asked to perform two home-based practice sessions per week using an audio CD for a total of 8 weeks. Subjects completed outcome measures at baseline and post-8 weeks of AYT. Center of Pressure (COP) was derived from 4 force plate sensors in the WBB in 4 sensory conditions: firm surface, eyes open (EO); firm surface, eyes closed (EC); foam surface, EO; and foam surface, EC. Sensory input ratios (SR) were computed in order to determine the visual (SR<sub>firm</sub>, SR<sub>foam</sub>), somatosensory (SREO, SREC) and vestibular contributions (SRV) to balance. This study was not powered to detect between group differences, so significance of pre-post changes was assessed by paired samples t-tests within each group.

**Results:** There were no significant differences at baseline between groups for all variables (all p > 0.05). A significant increase in the somatosensory contribution to balance was found in the AYT group in the SREO condition (t(8) = -2.42, p = 0.04) and a marginal improvement in the SREC condition (t(8) = -2.15, p = 0.06). In contrast, there were no significant changes in the control group (all p > 0.05). A trend for increased SRV was observed (p = 0.12) in the AYT group. As expected, reduced visual contribution to balance was present

in VI and no significant pre-post changes were found for either group (all  $p > 0.05$ ).

**Conclusion:** These preliminary results establish the potential for the AYT to increase the sensory contribution to balance in a VI population. The AYT group's results suggest an increase in postural reaction strategies to maintain balance. Future studies with a larger sample size, longer intervention and follow-up are needed to determine the full potential of the AYT program as an intervention to reduce risk factors for falls.

## 21. AN ELECTROMYOGRAPHIC ANALYSIS OF SELECTED ASANA IN EXPERIENCED YOGIC PRACTITIONERS

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Key words: Electromyography, yoga, unilateral, bilateral

**Objective:** The purpose of this study was to assess electromyographic (EMG) output of the anterior tibialis (TA), medial head of the gastrocnemius (GA), rectus femoris (RF), biceps femoris (BF), and gluteus medius (GM) in experienced yogic practitioners during selected yoga asana. A secondary purpose was to examine the differences in EMG output in unilateral v. bilateral standing yoga asana.

**Methods:** The study was a single occasion descriptive design. Thirteen healthy yoga practitioners (1 male, 12 females, average age of 37.5) with more than five years of experience were recruited. Electromyographic (EMG) activity was recorded during maximum voluntary isometric contractions (MVIC) of the TA, GA, RF, and BF using the Biodex Multijoint System®, and GM using manual muscle testing position. Subjects then performed the following yoga asana while EMG activity was recorded: downward facing dog (DD), half-moon (HM), tree (TR), chair (CH), and warrior three pose (WR). Each asana was held for fifteen seconds and performed three times. EMG data was band pass filtered and the root mean square was obtained. Asana data were then normalized with the subjects' MVIC data. Integrated EMG was calculated for TA, GA, RF, BF and GM, in each asana. A multilevel, multivariate regression analysis was performed, and peak EMG data was compared.

**Results:** The study revealed significant output of peak EMG in the GA in HM, TR, and WR, when compared to CH and DD respectively. Both the GA and GM peak mean EMG were most active in single leg stance poses HM, WR, and TR. Significant output of the GM was noted in HM, and WR as compared to CH and DD respectively.

**Conclusion:** In conclusion, there were differences in frontal and sagittal plane muscle activation between single limb and double limb poses in experienced yogic practitioners. Both the GA and GM contribute a significant amount of the lower extremity stability needed to maintain unilateral poses such as HM, WR and TR. Further study is needed to establish the contribution of the core muscles in these advanced poses.

## 22. AN ELECTROMYOGRAPHIC ANALYSIS OF SELECTED ASANA: MALES VS. FEMALES

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Key words: Electromyography, yoga, unilateral, bilateral

**Objective:** The purpose of this study was to use surface electromyography (EMG) to examine the muscle activation of the anterior tibialis (TA), gastrocnemius (GA), rectus femoris (RF) and biceps femoris (BF) muscles during various yoga poses (asana). Muscle activation was then compared between poses and between males and females.

**Methods:** The study was a single occasion descriptive design. Twenty healthy yoga practitioners (10 males, 10 females) with less than five years of experience were recruited. Subjects participated in a one time only visit for data collection. EMG activity was recorded during maximum voluntary isometric contractions (MVIC) of the TA, GA, RF, and BF using the Biodex Multijoint System®. Subjects then performed the following yoga asanas while EMG activity was recorded: downward facing dog, chair pose, half-moon pose, and tree pose. Each asana was held for fifteen seconds and performed three times. EMG data was band pass filtered and the root mean square was obtained. Asana data was then normalized with the subjects' individual MVIC. Integrated EMG was calculated for RF, TA, HS, GS, in each asana. A factorial linear mixed models regression analysis was performed.

**Results:** Significant differences were noted for males v. females for the RF (all poses) and the BF (half moon only,  $p = .000$ ). Significant differences between poses were also noted in the TA for selected comparisons.

**Conclusions:** The study revealed differences in males v. females for some, but not all muscles depending upon the asana chosen. The study revealed the greatest GA activity in unilateral poses (HM and TR) and the greatest RF activity in CH pose. Females have greater RF activity when compared to males in CH pose. Further study is warranted.

## 23. PILOT TRIAL TO ASSESS CHANGES IN BIOMARKERS IN PERSONS WITH MULTIPLE SCLEROSIS AFTER A FOUR-WEEK YOGA PROGRAM

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Key words: Yoga, multiple sclerosis, cytokines

**Objective:** We have reported improvements in physical performance and quality of life (QOL) measures in a pilot trial of an integrated yoga program designed for people with moderate disability due to MS. This aspect of the study investigated changes in biomarkers related to immune status.

**Methods:** Fourteen women, ages 34-64 (M=53.5), 2-26 years since MS diagnosis (M=13.9), and a score of 3-6 (M=4.67) on the self-report of MS disease severity, completed the study. Plasma and serum were collected at baseline (W0), after 8 weeks of two 1.5 hr yoga classes/week and home practice (W9), and after 8 weeks of home practice (W16), and stored at -80C. Cytokines and C reactive Protein (CRP) levels were assessed with Luminex and high sensitivity magnetic bead kits (EMD Millipore, Billerica, MA). Because data were not normally distributed, Friedman's test was used to examine within-subjects differences between W0, W9 and W16, with planned pairwise comparisons between time points using Wilcoxon rank tests.

**Results:** Most cytokines were present at very low or undetectable levels, and did not significantly change between time points. Exceptions included: IL-6, decreased from W0 to W16 (p=0.003); IL-7, increased from W0 to W9 (p=0.004), and decreased from W9 to W16 (p=0.013); IL-8, increased from W0 to W9 (p=0.002) and from W0 to W16 (p=0.009). CRP decreased from W0 to W16 (p=0.001) and from W9 to W16 (p=0.005).

**Conclusions:** Major mediators of inflammation and cell mediated immunity either remained stable and low (e.g. GM-CSF, IFN- $\gamma$ , IL-1b, IL-2, IL-12p70, IL-13, IL-17A, and TNF- $\alpha$ ), or decreased (CRP and IL-6). IL-7, important in hematopoiesis, with some inflammatory activity, increased then decreased. IL-8, which attracts and activates innate immune cells and promotes extravasation, increased during the 16 weeks. Regulatory and humoral immunity-supporting cytokines (IL-4, 5, and 10) remained stable. Participants were

stable on medications (except one pre-planned change) and had no recent or concurrent MS exacerbations. Along with the physical and QOL improvements, and only minor related adverse events, these findings indicate the feasibility and potential safety of this yoga protocol in persons with moderate disability due to MS. A larger, randomized, controlled trial will be needed to determine whether these results are truly indicative of intervention-related changes or are due to individual fluctuations in our small sample or other variables.

## 24. THE NATIONWIDE SURVEY ON ADVERSE EVENTS OF YOGA IN JAPAN

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Key words: Yoga, adverse event, nationwide survey

**Objective:** Yoga is accepted as a mind/body therapy to improve health and practiced worldwide including in Japan. However, little information is available on the safety of yoga especially when patients with physical or psychiatric diseases or old people practice it.

**Methods:** Therefore, we conducted nationwide survey to investigate adverse events by practicing yoga in 2508 yoga students (58.5 $\pm$ 12.6 years old) from 224 yoga classes. We also investigated if 271 yoga instructors had experienced some critical adverse events in their careers. Furthermore, we investigated adverse events described in medical literature.

**Results:** 28% of students experienced some adverse events in yoga classes, including myalgia (5%), arthralgia (5%), dizziness (4%), and coughing (3%). Most of them were mild and therefore, they could continue practicing yoga. 2% of students had to stop practicing yoga due to adverse events. 57% students had some physical or psychiatric diseases and 44% of them were on medication. The frequency of adverse events in subjects who had diseases were higher than that in healthy subjects (odds ratio, 1.5). Eight yoga instructors had an experience to call ambulance because of severe adverse events, including bone fracture, dislocation, subarachnoid hemorrhage or hyperventilation attack.

**Conclusions:** Practicing yoga is basically safe. However, special attention is necessary when teaching people who have physical or psychiatric diseases. Acknowledgements: Health and Labour Sciences Research Grant for integrative medicine (H24-Iryo-Ippan-025 to TO). We deeply appreciate Department of Psychosomatic Medicine, Graduate School of Medical Sciences, Kyushu University.

## 25. THE AFRICA YOGA PROJECT: A PARTICIPANT-DRIVEN CONCEPT MAP OF KENYAN YOGA TEACHERS' REPORTED EXPERIENCES

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Key words: Yoga, concept mapping

**Objective:** The Africa Yoga Project (AYP) is a health-promotion program intended to enhance wellbeing by training and funding Kenyans to offer yoga classes throughout Kenya. Earlier anecdotal evidence and preliminary research suggested the AYP positively impacted teachers trained. This study was a larger scale investigation of the perceived effects of teaching and/or practicing yoga with the AYP.

**Methods:** Concept mapping methodology was used to collect, analyze and illustrate teachers' perceptions of the AYP. First, participants brainstormed ideas about how practicing/teaching yoga changed them. They then sorted brainstormed statements into self-defined piles and rated each statement in terms of perceived importance. Multidimensional scaling (MDS) analysis of sort data calculated coordinates for statements and mapped them in a 2-dimensional space. Hierarchical cluster analysis (HCA) of this data identified concepts (i.e., themes) among statements. Interpretive decisions were facilitated by bridging analysis and researchers' conceptual understanding of yoga and the literature. Cluster average importance ratings were used to give the concept map depth.

**Results:** Of the AYP's 72 teachers, 52 and 48 teachers participated in brainstorming and sorting/rating activities, respectively. Teachers brainstormed 93 unique statements about how they changed. The resultant MDS statement map had a stress value of .29, indicating adequate validity. HCA and interpretive data resulted in a 12-cluster solution comprised of the following concepts of perceived change: Identity as a Yoga Teacher; Prosocial Development; Existential Possibility; Genuine Positive Regard; Value and Respect for Others (highest importance); Presence, Acceptance and Competence; Service and Trust; Non-judgment and Emotion Regulation (lowest importance); Engagement and Connection; Interpersonal Effectiveness; Psychosocial Functioning; and Physical Competence and Security.

**Conclusions:** Teachers reported positive perceptions of the AYP and perceived practicing/teaching yoga as facilitating change across physical, mental, and spiritual domains. Additional research is needed to quantify this change and compare the AYP outcomes to those of other health promotion programs.

## 26. A PILOT STUDY: THE EFFECT OF A 6-WEEK YOGA INTERVENTION ON QUALITY OF LIFE IN CANCER PATIENTS

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Key words: Yoga, cancer patients, quality of life

**Objective:** The intent of this pilot study was to introduce yoga to the Lifespan Comprehensive Cancer Center and to assess the feasibility of implementing this program. A secondary goal was assessment of quality of life using a cancer-specific, quality of life questionnaire.

**Methods:** The investigators recruited individuals over the age of 18 who had received a cancer diagnosis with 12 months. Eight individuals were screened and six individuals enrolled. The median age was 52.5 years of age. Participants completed a survey at week 0 and at week 6. The Functional Assessment of Cancer Therapy - General (FACT-G) is a generic, well-validated, 27-item questionnaire of health-related, cancer-specific quality of life. A higher score indicates better quality of life. The yoga intervention consisted of a 60-minute class held weekly for six weeks on Monday evenings. The classes was taught by Elizabeth Ko, a resident physician in internal medicine and certified yoga instructor. Based on Kripalu yoga techniques, the classes incorporated three key components: physical postures (asana), breathing exercises (pranayama) and meditation. Upon completion of the surveys, participants were given a Kripalu Gentle Yoga DVD. Participants were encouraged to continue with conventional cancer treatment as prescribed by their oncologist. This study was approved by The Miriam Hospital Institutional Review Board [497120-4] and was supported by a Kripalu Teaching for Diversity grant.

**Results:** The mean pre-intervention FACT-G score was 77 compared to the post-intervention FACT-G score of 89. This value was statistically significant ( $p = 0.01$ ). Additional analysis was performed using the four subscale scores of the FACT-G, with improvement in mean scores in all four domains: physical 18.3 vs. 23 ( $p = 0.04$ ), social 21.3 vs. 23.8 ( $p = 0.01$ ), emotional 17.3 vs. 21.2 ( $p = 0.01$ ) and functional 20 vs. 21.3 ( $p = 0.15$ ). All of these values, with the exception of functional domain, were statistically significant. Data analysis was performed using a one-tailed, paired t-test. Attendance rate was 75%, although when corrected for illness (hospitalization, complications regarding treatment) the attendance rate was 88.8%. No participants dropped out and there were no adverse events.

**Conclusion:** This pilot study suggests that a 6-week yoga intervention can improve quality of life, particularly in physical, social and emotional domains, for newly diagnosed cancer patients.

## 27. LEUKOCYTE TELOMERE LENGTH IS PRESERVED IN YOGA PRACTITIONERS AND IS RELATED TO OXIDATIVE STRESS AND HOMOCYSTEINE.

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Key words: Pranayama, meditation, total antioxidant status, malondialdehyde, cellular senescence.

**Objective:** Yoga is mind-body technique that combines sets of asana in sync with breathing techniques (pranayama), relaxation and meditation. Yoga technique produces a variety of beneficial effects on various diseases including cardiovascular, endocrine, psychological, neurological etc., However, the molecular basis of mechanism of action is not clear. Hence, this study was designed to study the leukocyte telomere biology and its relation with homocysteine and oxidative stress in yoga practitioners.

**Methods:** Participants in the yoga group (YG) aged 30 to 40 years with minimum of 2 years yoga practice were recruited from a yoga center (n=15). Age, gender and BMI matched controls were recruited for the control group (CG). Leukocyte telomere length (LTL) was measured by using qPCR, fasting plasma homocysteine was measured by a rapid high-performance liquid chromatography assay and the oxidative stress was assessed with total antioxidant status (TAOS), malondialdehyde (MDA) measured by calorimetry. The performer of the above parameters was blinded to the groups.

**Results:** The LTL was shorter in CG than in YG ( $p < 0.001$ ). The TAOS was more in YG when compared to CG ( $P < 0.001$ ), MDA and homocysteine was high in CG when compared to YG ( $p < 0.001$ ). Further, the LTL was positively correlated with TAOS and negatively correlated with MDA and homocysteine.

**Conclusion:** These results are consistent with the hypothesis that sedentary lifestyle enhances, whereas habitual yoga practice inhibits, replicative cellular senescence.

## 28. THE CHAUTARI STUDY: TRAUMA-INFORMED YOGA THERAPY TO REDUCE GENERALIZED PAIN AND PSYCHOLOGICAL DISTRESS IN BHUTANESE REFUGEE WOMEN

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Key words: Yoga, refugees, pain management

**Objective:** Refugees often experience chronic pain, psychological distress, poor social participation and impaired acculturation. Interventions to improve these outcomes among refugees are lacking. We developed and pilot tested an intervention to improve these outcomes in Bhutanese refugees.

**Methods:** This pre-post pilot intervention study was set in a community center serving refugees. Participants were 17 Bhutanese women who reported generalized pain that had been medically treated without improvement. Participants initially were presented with a choice of yoga vs. other physical exercises. Participants unanimously chose yoga; thereafter, they met weekly for one hour with a yoga therapist, who provided trauma-sensitive group classes based on T.K.V. Desikachar's teachings, and encouraged daily practice at home. Measures were administered in the refugees' language (Nepali) pre- and post-intervention. Significance of pre- vs. post- intervention changes was calculated using the signed-rank test.

**Results:** Participants' mean age was 47 years [standard deviation (SD) 13 years]. All were non-literate. Most (94%) initially rated their health as "poor," and 23% had symptoms of post-traumatic stress disorder. They arrived on average 19 months before enrollment (SD 10.5 months). Mean participation in the intervention was 43 weeks (SD 6.6 weeks). Participants reported post- vs. pre-intervention reduction in pain [McGill Pain Scale, range 11-45, higher=worse; mean pre 32.7 (SD 9.5), mean post 19.5 (SD 8.7),  $p = 0.0015$ ]; pain interference with daily activities [range 2-5, higher=worse; mean pre 4.17 (SD 1), mean post 3.5 (SD 1.2)  $p = 0.04$ ]; anxiety [Hopkins Symptom Checklist (HSC) anxiety scale, range 5-29, higher=worse; mean pre 19.4 (SD 7.8), mean post 8.1 (SD 5.6),  $p = 0.0001$ ]; and depression [HSC depression scale, range 13-40, higher=worse; mean pre 29 (SD 8.4), mean post 18 (SD 7.8),  $p = 0.001$ ]. Acculturation improved significantly [Multicultural Assessment Instrument, range 28-96, higher=better; mean pre 66.7 (SD 16), mean post 92.5 (SD

28),  $p=0.005$ ], as did participation in social activities compared to 1 year earlier [range 2-5, lower=better; mean pre 4 (SD 1.1), mean post 2.8 (SD 1)  $p=0.02$ ]. Resilience (Connor-Davidson Resilience scale) did not change significantly.

**Conclusion:** This pilot intervention improved pain, psychological distress, social participation and acculturation. A randomized trial confirming these results among refugees with chronic pain is warranted.

## 29. YOGA HELPS PUT THE PIECES BACK TOGETHER: A QUALITATIVE EXPLORATION OF A COMMUNITY-BASED YOGA PROGRAM FOR CANCER SURVIVORS.

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Key words: Yoga, cancer, community, qualitative

**Objective:** A qualitative research methods approach was used to explore the subjective experiential factors underpinning participation in an ongoing community-based yoga program for cancer survivors and their support persons (Yoga Thrive).

**Methods:** 25 participants [Mean Age = 52.53 (13.02) years] took part in semi-structured focus groups post-yoga program completion (7-weeks) and at 3- and 6-month follow-ups. Interviews were transcribed verbatim and analyzed using NVivo 9. Using a process of inductive thematic analysis, raw data quotes were identified, labeled, and organized into key themes.

**Results:** The group was comprised of 20 cancer survivors who were on average 25.40 (20.85) months post-diagnosis, and 5 support persons. Participants had completed the 7-week yoga program an average of 3.35 (3.66) times previously. Participants remarked the Yoga Thrive program had always met them where they were at in the cancer survivorship continuum: that yoga provided respite during active treatment and grew with them as they recovered and returned to life and work. Many participants suggested they initially attended the program for the relaxation benefits of yoga practice. Participants also indicated coming to a yoga class comprised of other cancer survivors provided a feeling of safety and shared understanding of the cancer experience. Participants appreciated the Yoga Thrive instructors had received specific training in working with cancer survivors, and that classes

were progressive and tailored based on individual needs. Participants suggested yoga practice aided them in their ability to concentrate, regulate emotion, and manage fatigue, pain and sleep difficulties. Participants attributed achieving these benefits to heightened awareness of the mind-body connection, improved breath regulation, taking the time to stop and slow down, and increased confidence as they developed their yoga practice and progressively improved and healed over time.

**Conclusions:** Ongoing participation in the Yoga Thrive program is a function of the perceived benefits both cancer survivors and their support persons experience from tailored yoga practice, the therapeutic relationships they develop with the instructors, and the support they receive from fellow class members. Qualitative research provides unique insights into the yoga experience and contributes to a better understanding of the process by which change via yoga practice is achieved.

## 30. YOGA VERSUS CBSM FOR HEALTHCARE PROVIDERS' PHYSICAL AND MENTAL HEALTH

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Key words: Yoga, CBSM, intervention, health

**Objective:** The need for brief, low-cost, easily disseminable and effective interventions to promote healthy lifestyles in the general US adult population is high. This is especially true for health providers, who are prone to mental and physical health. There is a myriad of empirical support for Cognitive Behavioral Stress Management (CBSM) programs in increasing health, and building evidence for yoga. However, no one to date has compared the relative effectiveness of these different types of interventions. We developed a study to compare the impacts of CBSM and Yoga interventions for healthcare professionals.

**Methods:** We recruited 40 healthcare professionals (mental healthcare and emergency department providers) and randomly assigned them to YBSM and CBSM groups for an 8 week intervention. The CBSM intervention was adapted from Antoni 2005 and the Yoga intervention was created at Kripalu.

**Results:** We used Linear Mixed Modeling to examine, time, group, and time by group interactions. There were no signifi-

cant changes between groups in sleep quality, BMI, or anxiety. Both groups improved significantly ( $p < .05$ ) in physical (fruit and vegetable intake,  $F = 6.77, 38.28$ ; heart rate,  $F = 4.07$ ; alcohol consumption,  $F = 2.86$ ) and mental health (relaxation and awareness,  $F = 9.93, 8.35$ ; professional quality of life  $F = 4.35$ ; compassion satisfaction  $F = 5.38$ ; burnout  $F = 3.84$ ; depression  $F = 7.83$ ; stress  $F = 6.79$ ) levels. There was a group by time effect for coping confidence (CBSM increased more,  $p < .05, F = 4.34$ ), physical activity (YBSM increased more,  $p < .05, F = 3.47$ ), overall mental health (YBSM increased more,  $p < .10, F = 5.32$ ), and secondary traumatic stress (YBSM decreased more,  $p < .10, F = 4.89$ ).

**Conclusions:** Both interventions appear to be useful for healthcare professionals' mental and physical health. It appears as though each intervention shows some relative benefit. Importantly, yoga demonstrates some benefit above and beyond the extremely well-studied and empirically supported CBSM, including increased physical activity, overall mental health, and decreased secondary traumatic stress benefits.

## 31. A WORK-BASED YOGA INTERVENTION FOR MENTAL HEALTH PROFESSIONALS

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Key words: Yoga, intervention, health, wellbeing, workplace

**Objective:** Given the high levels of stress and mental and physical health complaints reported by US employees (Kivimaki et al., 2006), the need for brief, low-cost, easily disseminable and effective interventions to promote mental and physical health in the workplace is high. This study examines the implementation and efficacy of a brief yoga intervention for employees on a set of mental and physical health indices.

**Methods:** Clinical and Support Options (CSO) is a multi-site mental health center with locations throughout the Berkshires of Massachusetts, were recruited and enrolled. CSO has several hundred employees, mostly mental health workers and administrative staff. The CSO ran a wellness program, including yoga sessions. Enrolled program participants were sent an email and were contacted to ask if they would like to participate in a research study, which involved completing online surveys about physical and psychological wellbeing before and after the intervention. Participants over 18 were eligible. There was no control group. The CSO offered 4 rounds of this 8-week yoga intervention as part of their wellbeing program. A total of 41 people agreed to be a part of the research study, 37 of whom completed at least one survey (pre- or

post-), 25 of whom filled out both pre- and post- intervention surveys.

**Results:** For preliminary efficacy, we examined changes from pre-intervention to post-intervention on all measures. We used repeated measures t-tests for all comparison within subjects. Analyses showed a statistically significant ( $p < .05$ ) increase in relaxation, coping confidence, self-kindness, self-compassion, general mental health, general physical health, and mindfulness. Similarly, depression, anxiety, stress, impulse control difficulties, and limited access to emotion regulation strategies all decreased. There was no change in affect, assertiveness, self-judgment, isolation, lack of emotional awareness, or lack of emotional clarity pre- to post- intervention. See Table 1.

**Conclusions:** This study provides support for the notion yoga can be efficacious in improving a range of mental and physical wellbeing indices in a workplace-based intervention for mental health professionals. It also demonstrates that a yoga intervention can successfully be implemented into a wellness program in a mental healthcare system. Study limitations include lack of a control group and short-term follow-up.

## 32. EXERGAME DEVELOPMENT STUDY OF KINECT FOR YOGA POSTURES

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**Objective:** We intend to utilize smart and connected technologies to assist yoga-based therapeutic intervention for clinic or home settings. For this we assessed the 3-D room sensor built into the Microsoft Kinect for qualitative analysis of capturing yoga postures. This low cost hardware/software gaming platform could be used to supplement and enhance yoga training in therapeutic settings as a downloadable Exergame.

**Methods:** We captured whole body positions of a certified yoga instructor demonstrated in front of a Kinect sensor attached to a PC. Using the Kinect SDK version 1.8 and a version of KinectExplorer- D2D software, we captured skeleton image streams composed of 20 X,Y,Z coordinates at 20 frames per second. The yoga instructor performed a series of 17 hatha yoga postures, including a variety of standing and supine positions. Inaccuracy of capture was measured by the number of imputed joint positions in the skeleton stream. Two-sample equal variance t-test was used.

**Results:** We positioned a yoga mat two meters in front of the Kinect sensor in both perpendicular and frontal view orienta-

tions. The accuracy of skeleton capture for the sampled yoga postures was heavily dependent on the yoga practitioner view orientation and the particular yoga posture. Perpendicular view orientation was slightly more accurate than frontal, but not significantly different. Standing poses were significantly more accurate than seated or supine body orientations. This is presumably why no commercial Exergame exists for any target audience that has a full range of postures. Instability of joint positions in the skeleton stream was more severe for seated poses as evidenced by large fluctuations between image frames that resulted in visible displacements of joints that are described as jitter. Assessment of positional accuracy in a therapeutic Exergame would be hampered in these situations, so a more robust algorithm is needed. Others have used a state model algorithm to correctly predict body positions for classifications. Such a method is needed here to open the full range of yoga poses to motion capture analysis.

**Conclusions:** The skeleton algorithm embedded in the Kinect is not appropriate for body positions that deviate far from mountain pose. Therefore, to utilize the Kinect in self-guided yoga therapies will require state-aware software using the raw depth data stream. We acknowledge the support of G12 and RCENTER.

### 33. INTEGRATED BRAIN FUNCTIONING WITH YOGIC PRACTICES: ENHANCING ACADEMIC PERFORMANCE

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Key words: Yoga, brain functioning, student

**Objective:** A student under optimal stress does bring out his or her best. However, extreme stress can result in stress related disorders deteriorating academic performance (AP). It is now well established that an integrated brain functioning (IBF) is essential for enhancing AP. With growing scientific evidence, yoga is emerging as a science of holistic living. The present study was designed to investigate the immediate effect of different yogic practices such as Nadi Shuddhi Pranayama (NSP), Bhramari Pranayama (BP), Om Meditation (OM), Pranic Energization Technique (PET) and Mind Sound Resonance Technique (MSRT) on brain wave coherence (BWC) in university students.

**Methods:** Two hundred thirty four students (male) from 18 to 30 years of age with mean age  $21.63 \pm 3.60$  (mean  $\pm$  SD)

years were selected from a university at Bangalore, India. They were divided into two groups: 117 students for yogic practices (NSP=15, BP=30, OM=29, PET=27 and MSRT=16) and 117 students for control with matched age and gender. The yogic practices group was given pre recorded session of 24 minutes in NSP, BP, OM, PET and MSRT. The control group students sat quietly with their eyes closed for the same duration. The BWC data were collected immediately before and after the intervention for both the groups using Brain Master (Model: 2E Part # 390-001), Michigan, USA.

**Results:** When compared with control, significant increase in delta BWC was observed in BP ( $p < 0.001$ ), OM ( $p = 0.028$ ), PET ( $p = 0.001$ ) and MSRT ( $p = 0.002$ ). Similarly, significant increase in theta BWC was also observed in BP ( $p < 0.001$ ) and PET ( $p = 0.033$ ). Moreover, significant increase in alpha BWC was found in BP ( $p = 0.010$ ) and OM ( $p = 0.004$ ) whereas significant increase in beta BWC was noted in BP ( $p = 0.007$ ). Furthermore, there was significant increase in gamma BWC in NSP ( $p = 0.001$ ), BP ( $p < 0.001$ ) and MSRT ( $p = 0.012$ ). No significant changes were observed in control group. An increase in BWC is directly related with IBF. The data analysis revealed that BP was the most effective practice to enhance IBF as compared with other yogic practices.

**Conclusion:** The present study's innovative intervention design suggests that NSP, BP, OM, PET and MSRT are useful in increasing IBF and may enhance AP in university students. Additional well-designed studies are needed before a strong recommendation can be made.

### 34. BE MINDFUL TO LOWER DEPRESSION AND ANXIETY: RESULTS FROM A LONGITUDINAL STUDY

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Key words: Yoga, mindfulness, depression, anxiety

**Objective:** Yoga has become a popular subject for mental health research. However, the mechanism supporting yoga's effects is often not tested. Principles of yoga suggest that its ability to increase mindfulness may play an important role.

We examined the effect of mindfulness on depression and anxiety in this longitudinal study.

**Methods:** Data for this analysis are from an on-going randomized controlled trial examining the efficacy of yoga as an adjunct to cognitive behavior therapy (CBT) for smoking cessation. Participants were randomized to 8 weeks of group based CBT for smoking cessation and twice weekly yoga or wellness classes. Baseline and 8-week data aggregated by group was used to examine the association of mindfulness with depression and anxiety. Mindfulness was assessed using the 15-item Five Facet Mindfulness Questionnaire. Anxiety was assessed using the 20-item State-Trait Anxiety Inventory and depressive symptoms were measured using the 10-item Centers for Epidemiological Studies Depression Scale. Data were analyzed using Spearman rank correlations for unadjusted comparisons and generalized linear regression models to test associations over time after adjusting for age, gender, race/ethnicity and education.

**Results:** Seventy-nine participants completed the baseline and 8-week surveys. Mean age of participants was 46 years (SD=13.10). About half (50.6%) were females, 89.9% were White, and 77.2% had completed some college education. The mean mindfulness score at baseline was 52.04 (SD=7.95), mean depression score was 8.01 (SD=6.02), and mean anxiety score was 1.92 (SD=0.53). Higher level of baseline mindfulness was significantly associated with lower depression at 8 weeks after controlling for baseline value and potential confounders ( $b=-0.17$ ,  $SE=0.07$ ,  $p=0.02$ ). There was no association between baseline mindfulness and anxiety at 8 weeks. However, increase in mindfulness from baseline to week 8 was significantly correlated with decreases in anxiety over the 8 weeks (spearman's  $\rho=-0.345$ ,  $p=0.002$ ,  $N=79$ ).

**Conclusion:** In this study with smokers, being mindful was associated with low levels of depression and anxiety. Yoga by increasing mindfulness has the potential to ameliorate symptoms of depression and anxiety and improve smokers' ability to quit. Mindfulness should be examined as a potential mechanism in the effect of yoga on these mental health conditions.

### 35. WALTER REED NATIONAL MILITARY MEDICAL CENTER: THE DEVELOPMENT AND IMPLEMENTATION OF AN INPATIENT PSYCHIATRY THERAPEUTIC YOGA PROGRAM

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Key words: Yoga, military, psychiatric, mental health

**Objective:** The purpose of this program was to design and implement a therapeutic yoga program on the inpatient psychiatry ward of a major military medical center, to serve active-duty military, retirees, and their family members.

**Methods:** The program was started in September 2011 by a ward social worker, with the assistance of Red Cross volunteer yoga teachers. Classes have expanded from twice weekly to a daily class 7 days per week. Ongoing consultation with the ward leadership, education of staff, and support for the Red Cross teachers have been an integral part of developing the program, and focus on interruptions during yoga, utilization of space, and staff reinforcement of attendance. Patients are given a choice of attending a 60-minute "relaxation and go at your own pace" gentle yoga class or another group. Initially chair yoga was taught; yoga mats and standing poses were gradually incorporated. Classes generally consist of meditation, breathing, warm-ups, poses, and relaxation. Certain teachers focus on providing the locus of control to the patient, by using phrases such as "when you are ready."

**Results:** Recently patients were asked 2 questions at the conclusion of the class: what they liked about the class, and what they would have liked to have seen done differently. Twenty patients responded and 10/20 stated that being able to relax was what they liked. The remaining 10 patients made similar positive comments such as the class was peaceful. For the 2nd question, 9 patients responded that there was not anything that they would have liked to have seen done differently. The remaining 11 patients responded that they would have liked more stretches, louder music and aromatherapy.

**Conclusion:** The results have been very positive with highly favorable feedback. Attendance is presently about 35% of the ward population on a given day. Many patients who are new to yoga become regular attendees. The design and implementation of the program at WRNMMC may serve as an example of how successful a yoga program can be for an inpatient psychiatric population. Results from this study will assist in developing a design for a larger clinical trial to further measure the effects of yoga on an inpatient psychiatric population.

### 36. YOGA AFTER STROKE LEADS TO IMPROVEMENTS IN MOBILITY, LANGUAGE, FAMILY ROLES, AND ENERGY DOMAINS OF QUALITY OF LIFE

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Key words: Rehabilitation, yoga, stroke, quality of life

**Objective:** Assess the impact of therapeutic-yoga on quality of life domains for people with chronic stroke.

**Methods:** Forty-seven individuals with chronic stroke (>6 months) were randomized to yoga (n=37) or wait-list control (n=10). A yoga therapist taught yoga one-hour, twice a week, for 8 weeks. The yoga intervention included modified physical postures, in seated, standing, and supine positions, yoga breathing, and relaxation. Assessments were completed at baseline and after 8 weeks of yoga. Assessments included self-reported demographics, stroke characteristics, and the Stroke-Specific Quality of Life scale (SSQoL). The SSQoL has 12 domains: self-care; vision; language; mobility; work; thinking; personality; UE function; mood; family roles; social roles; and energy. Normality of data was assessed with the Shapiro-Wilks test. Independent t-tests (or Mann Whitney U non-parametric tests) were used to compare QoL domain scores between groups. We used paired t-tests (or Wilcoxon non-parametric tests) to compare baseline and 8-week data for yoga and control groups. Due to looking at many variables of interest and a limited data set, alpha was set at .10.

**Results:** The average age of participants in the yoga group was 64 and 60 for the wait-list group; 81% were male and 60% were white. There were no differences in demographics or stroke characteristics between the two groups. People who engaged in yoga significantly improved QoL scores ( $33.41 \pm 9.199$  vs  $35.74 \pm 9.052$ ,  $p=0.036$ ) compared to people who were in the control ( $p=.763$ ). Scoring in multiple domains significantly improved after 8 weeks of yoga, domains included: mobility ( $p=.076$ ), language ( $p=.059$ ), family roles ( $p=.054$ ), and energy ( $p=.078$ ). Mobility was the only domain of the QoL scale to be significantly different between yoga and control groups at 8 weeks ( $20.555 \pm 5.72$  vs  $25.517 \pm 3.9$ ,  $p=.007$ ).

**Conclusion:** Research findings suggest that overall quality of life significantly improved after 8 weeks of therapeutic-yoga. When looking at each domain individually, mobility, language, family roles, and energy significantly improved in the yoga group compared to the wait-list control group, who showed no improvements. The changes in the yoga group indicate change to the whole person (mind and body) and may be due to an increase in flexibility, increased body awareness, increased mind-body connection, or an increase in strength. Further testing, however, is warranted, as these findings are preliminary.

## 37. YOGA MAY INCREASE TIME ON TASK FOR CHILDREN WITH AUTISTIC SPECTRUM DISORDER

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Key words: Yoga, children, autism

**Objective:** Yoga is a complementary and alternative medical treatment for Autistic Spectrum Disorder (ASD). The overall estimated prevalence of ASD is 1 in 68 (CDC survey, 2010). Yoga has been reported to help children develop self-calming skills through specific breathing exercises, visualizations, and postures (Behar, 2006). Through these self-calming techniques, yoga therapy may help individuals increase their time on task in goal-directed activities, a common issue for children with ASD. Yoga has been integrated into the multi-disciplinary treatment of children (ages 5-18) with ASD in day treatment and inpatient care since 2007. This observational evaluation study was designed to 1) understand staff perceptions of short and long-term benefits of yoga for patients with ASD, and 2) assess time on task for patients with ASD.

**Methods:** This was a mixed methods observational evaluation study with two objectives: 1) Assess staff perceptions using a 6-item, semi-structured interview conducted with thirteen milieu staff; 2) Assess patient benefit through 44 structured observations of eleven patients in two conditions: during yoga class and during a life-skills group or playground time. Subjects were rated as either "on task" or "not on task" at one-minute intervals for each of the 20-30 minute interventions. The research assistant (SW) coded observational behaviors for each minute of each type of intervention, yoga or non-yoga in June and July 2012.

**Results:** Objective 1: 84.6% (11 out of 13) staff interviewed reported that yoga has a calming or relaxing effect on patients with ASD. The other 15.4% (2 out of 13) observed that yoga provides a good source of stimulation for the children. Objective 2: A significant difference ( $p = 0.0017$ ) was found for yoga and non-yoga groups for inpatient and day treatment combined, in which subjects' attention to task was greater in the yoga condition versus the non-yoga conditions.

**Conclusion:** Milieu staff perceives that yoga benefits children with ASD primarily for calming and relaxation. For children hospitalized with ASD, 20-30 minute structured yoga session seems to support sensory time on task more than non-yoga activities (such as life skills or playground time).

### 38. YOGA, FATIGUE, AND REGULAR PHYSICAL ACTIVITY AMONG JAPANESE BREAST CANCER SURVIVORS.

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Key words: Yoga, breast cancer survivors, fatigue, physical activity

**Objective:** Research highlights the importance of maintaining pre-diagnosis physical activity levels for breast cancer survivors post-treatment. However, many survivors have difficulty engaging in physical activity due to cancer-related fatigue. The aim of this study was to explore how participation in a 12-week yoga intervention impacted fatigue and physical activity.

**Methods:** 20 individuals with breast cancer diagnosis participated in a 12-week yoga intervention. The yoga intervention included modified hatha yoga postures and consisted of 10 min. of warm-up, 45 min. of yoga postures, 10 min. of breath work, and 10 min. of supine resting pose (savasana), for a total of 75 min. Assessments were administered at 3 time points: pre (T1), post (T2) yoga intervention and at a 12-week follow-up (T3). Measures included self-reported fatigue (Cancer Fatigue Scale) and physical activity (accelerometer step counts). Paired t-tests were used to compare fatigue scores and steps counts at T1, T2, and T3. In addition, one-way ANOVA adjusted by baseline fatigue level, with time as the within-subjects and group as the between-subjects factors, were used to investigate how step counts changed over the course of the intervention.

**Results:** Significant improvements in physical fatigue ( $p < 0.05$ ,  $d = -0.76$ ) and cognitive fatigue ( $p < 0.01$ ,  $d = -0.88$ ) were seen at T1-T2. No significant changes were seen in psychological fatigue. 12 participants (65%) had high fatigue levels at T1, which decreased to 5 participants (27.8%) at T2. 12 participants (66.7%) increased daily steps at T2 and 8 participants (44.4%) continued to increase their physical activity at T3. There were negative correlations between fatigue scores and step counts at all time points ( $r = -0.39$  to  $-0.51$ ). Two groups were categorized by baseline fatigue levels (clinical cut-off over or under 19 points). More highly fatigued subjects demonstrated increased step counts post-intervention, but total step counts were more likely to decrease at T3. Participants with lower fatigue levels showed a significant increase of steps at T2 and continued to increase at T3.

**Conclusion:** Participation in a 12-week yoga intervention potentially helps to improve fatigue and increase daily physical activity in breast cancer survivors. Baseline fatigue level may be an important predictor of physical activity maintenance. Fatigued subjects may require a longer-term yoga program to maintain physical activity.

### 39. THE IMPACT OF A SINGLE YOGA SESSION UPON MOOD DISTURBANCE IN JAPANESE BREAST CANCER SURVIVORS.

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Key words: Yoga, mood, breast cancer survivors, single session

**Objectives:** Over 50,000 women are newly diagnosed with breast cancer in Japan each year. In recent years, there are an increasing number of reports about the positive effects of yoga practice on psychological distress among breast cancer survivors. Despite the proposed beneficial effects of regular yoga practice, there is little research that has examined the role of a single yoga session on mood states in cancer survivors. The present study examined whether a single yoga session improved mood states among Japanese breast cancer survivors.

**Methods:** Participants included 19 breast cancer survivors who were a minimum of 3-months post-treatment (except hormonal therapy) and had no additional concerns in health status. The yoga session consisted of 10 minutes of warm-up, 45 minutes of yoga postures, 10 minutes of breath work, and 10 minutes of supine resting pose (savasana), for a total of 75 minutes. The Profile of Mood States (POMS) - Brief Form (Japanese) consisting of 30 items was adapted to assess participant mood states pre- and post-yoga session. Demographic and medical characteristics of participants were also collected. Paired t-tests were used to assess the subscale and Total Mood Disturbance (TMD) score differences pre and post yoga session. For this analysis,  $\alpha$  was set in  $p < 0.05$ , and Cohen's  $d$  was computed for effect sizes. All data was analyzed using the Statistical Package for the Social Sciences (SPSS) Version 21.

**Results:** Participants were all female breast cancer survivors, 46.6  $\pm$  5.3 years old. 14 participants (73.7%) were still having hormonal therapy at that time of the intervention. 18 participants (94.8%) were over 1 year post-diagnosis. Significant reductions in the Tension-Anxiety ( $p < .001$ ,  $d = -1.04$ ), Depression ( $p = .003$ ,  $d = -0.80$ ), Anger-Hostility ( $p = .004$ ,  $d = -0.88$ ), Fatigue ( $p = .001$ ,  $d = -1.14$ ) and Confusion ( $p = .013$ ,  $d = -0.52$ ) subscales were exhibited pre-post yoga session. Only the Vigor subscale showed no statistically significant differences ( $p = 0.232$ ,  $d = -0.21$ ). In addition, there was an overall clinically significant reduction in TMD over the course of the yoga session ( $p = .001$ ,  $d = -0.80$ ).

**Conclusions:** The present study aimed to examine the impact of a single yoga session on mood change among Japanese breast cancer survivors. Study findings suggest a single yoga session improves breast cancer survivors' negative mood.