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Psychosocial Correlates and Outcomes of Yoga or Walking Among Older Adults

JENNIFER M. KRAEMER
University of Massachusetts, Amherst

DAVID X. MARQUEZ
University of Illinois at Chicago

ABSTRACT. Few researchers have compared psychological correlates and outcomes of yoga with more traditional forms of exercise. The authors' primary aim was to compare changes in the psychosocial outcomes of mood and state anxiety produced by an acute bout of yoga or walking among older adults. The secondary aim was to compare selected psychosocial correlates of activity. Participants were 51 adults who were 50 years of age or older who walked for exercise or participated in a yoga class. Results revealed that yoga participants had significantly greater levels of depression and perceived barriers to exercise, and lower quality of life than did walkers. With control for these differences, yoga practitioners had improved levels of fatigue pre- to postsession, compared with walkers. With control for differences in demographic variables, these changes were no longer significant. It is possible that yoga practitioners seek out mindful-based exercise to cope with greater levels of depression and lower levels of quality of life.

Keywords: correlates, mood, older adults, physical activity, yoga

ADULTS WHO ARE OLDER THAN 65 YEARS OF AGE comprise the fastest growing populations in the United States (National Institute of Aging, 2002). Also, this population suffers from the greatest ratio of chronic diseases and disability (Berg & Casells, 1990; Hoffman & Rice, 1996). Impairments in function can begin as early as the age of 50 years (Huang et al., 1998). It has further been reported that almost 20% of the U.S. population of adults who are 55 years of age or older experience specific mental disorders (U.S. Department of Health and Human Services, 1999). Physical activity has been shown to improve mental and cardiovascular health (U.S. Department of Health and Human Services, 1996). Despite these findings, it has been reported that more than 70% of U.S. adults who are 45 years of age or older do not engage in the recommended amount of physical activity (Centers for Disease Control, 2005).

Address correspondence to David X. Marquez, University of Illinois at Chicago, Department of Kinesiology and Nutrition, 1919 West Taylor Street, Room 632, MC 994, Chicago, IL 60612, USA; marquezd@uic.edu (e-mail).

Although the importance of regular exercise toward the achievement of maintaining a healthy, independent lifestyle is universally established (Bauman, Sallis, Dzewaltowski, & Owen, 2002; Fiatarone Singh, 2002), there is uncertainty in the specific types of physical activities that would be most appropriate in supporting this aim (Astrand, 1992; Spirduso, 1995). For older adults, it has been argued that it is more important for functional abilities and quality of life to be maintained with exercise rather than with aspects of physical fitness (Pollock, Graves, Swart, & Lowenthal, 1994). Therefore, a well-rounded physical fitness program that focuses on multiple components of health may be more beneficial to older populations (Engels, Drouin, Zhu, & Kazmierski, 1998).

To date, the focus of many exercise interventions with older adults has been on improving aerobic fitness (Blumenthal et al., 1989), which does not address losses in strength and flexibility seen among older adults as they age. Decreased strength and flexibility (a) reduce mobility and the ability to perform activities of daily living and (b) prevent many older adults from participating in the physical activity needed to maintain general health (Buckwalter, 1997; Cohen-Mansfield, Marx, & Guralnik, 2003). These losses in physical function impair not only health but also quality of life (McAuley et al., 2000). Increasing physical activity has been shown to reduce the risk of disability and disease (Keysor, 2003) and improve quality of life among older adults (McAuley et al.; Rejeski, Brawley, & Shumaker, 1996).

Reductions in physiological functioning are only one of many health problems that appear with age. Anxiety disorder is one of the most prevalent mental health problems affecting older adults, with approximately 11.4% of adults 55 years of age and older meeting the criteria for this diagnosis (U.S. Department of Health and Human Services, 1999). Acute bouts of exercise have been shown to reduce state anxiety immediately following exercise performance (McAuley, Mihalko, & Bane, 1996; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991). Furthermore, these reductions have been found regardless of the duration and intensity of the exercise performed (Landers & Petruzzello, 1994). Depression is a prevalent health issue that has become a concern among older adults. It has been identified as a significant but preventable cause and result of disability among older adults. The use of exercise as an antidepressant among older adults is founded on the benefits outweighing the risks over traditional drug therapy (Singh, Clements, & Fiatarone, 1997).

Exercise programs for older adults should place an emphasis on the use of stretching, range of motion, and muscle strengthening to prevent injuries that can occur during normal exercise (Buckwalter, 1997). As adults age, activities should have low impact, thereby reducing the amount of force on the musculoskeletal and joint structures (Fletcher, Froelicher, Hartley, Haskell, & Pollock, 1990). One form of exercise that may be highly beneficial to older adults in multiple areas of health and well-being is yoga.

Yoga has been shown to improve musculoskeletal flexibility, balance, strength, memory, endurance (Mahajan & Babbar, 2003), and quality of life

(Malathi, Damodaran, Shah, Patil, & Maratha, 2000). Physical positions of yoga called *asanas* provide a low-intensity exercise that improves muscle strength, flexibility, and body alignment (Parshad, 2004). Many studies on mind–body interventions, including yoga practices, have shown their effectiveness in treating stress-related mental and physical disorders (Becker, 2000; Jacobs, 2001). Yoga participants have reported significant short-term reductions in anxiety, tension, depression, anger, and confusion (Berger & Owen, 1992).

To date, there is limited research that has compared the psychological correlates and outcomes of yoga to more traditional forms of exercise. A 4-month intervention study of men and women who were 60 years of age and older illustrated that those who were randomized to a yoga group reported a perceived change in quality of life, including social, personal, and physical functioning, when compared with the sedentary control (Blumenthal et al., 1989). Also, improvements in quality of life in adults between the ages of 65 and 85 years were observed in a 6-month intervention of hatha yoga, when compared with a walking and control group (Oken et al., 2006). Last, an intervention among middle-aged women demonstrated that yoga participants had greater decreases in anxiety, increased subjective well-being, and enhanced mood, with a single session, compared with the dance aerobics and sedentary control groups (Netz & Lidor, 2003).

The benefits of yoga have been exhibited in younger populations. College-aged yoga participants reported having significantly greater short-term reductions in anxiety, tension, depression, anger, and confusion when compared with swimmers (Berger & Owen, 1992). In addition, an intervention for women between the ages of 27 and 55 years showed that those who were randomized to the yoga group had improved mood, greater levels of life satisfaction, and a greater ability to cope with stress when compared with a sedentary control group (Schell, Allolio, & Schonecke, 1994).

Previous research has provided vital information on the effects of a yoga intervention on psychological outcomes, compared with that of more traditional exercise such as walking or swimming. However, none of these studies has compared the effects of acute bouts of yoga (i.e., single sessions of yoga) and walking in a cross-sectional study design on psychosocial outcomes among adults older than 50 years of age. This design is beneficial because improvements in mood with single bouts of exercise may improve exercise adherence levels among participants (Berger & Owen, 1992). Moreover, previous research has not thoroughly examined the determinants of exercise for older adults who practice yoga or walking for exercise. Furthermore, results of interventions that randomized participants to a yoga or traditional exercise group cannot be examined in terms of whether there are differences among those individuals who choose to participate in yoga or walking groups.

Therefore, the primary aim of the present study was to compare mood and state anxiety changes produced by an acute bout of yoga or walking among older adults. The secondary aim was to compare depression, exercise barriers,

barriers self-efficacy, and quality of life among older adults who practice yoga or walking. We hypothesized that an acute bout of yoga would be more effective at improving mood and reducing state anxiety among older adults when compared with acute bouts of walking. We further hypothesized that older adults who practice yoga would have lower levels of depression and higher quality of life when compared with those who walk for exercise. We did not make direct hypotheses for exercise barriers and barriers self-efficacy because, to date, there is no research that has examined those variables in this population.

Method

Participants

Table 1 shows descriptive statistics of participants. We recruited a total of 51 participants (8 men, 43 women) through classes at local yoga studios and mall walking groups. The sample comprised primarily Caucasians ($n = 49$), with African Americans ($n = 2$) making up the remainder. Of the 24 yoga participants, 2 were men (8.3%) and 22 were women (91.7%). Of the 27 yoga participants, 6 were men (22.2%) and 21 were women (77.8%).

Measures

Demographics. The demographics questionnaire included items regarding age, weight, height, ethnicity, income, and education level. We asked questions on how long the participants had been walking or practicing yoga and how many days per week and hours per day they spent walking for exercise or practicing yoga.

State anxiety. We measured state anxiety using the State-Trait Anxiety Inventory (Speilberger, Gorsuch, & Lushene, 1969). It comprises 20 questions rated on a 4-point Likert-type scale ranging from 1 (*not at all*) to 4 (*very much so*). The items were summed to produce a total score ranging from 20 to 80 in which higher scores are related to greater state anxiety. Internal consistency in the present study was excellent (for presession, $\alpha = .88$; for postsession, $\alpha = .90$).

Mood. We measured mood using the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988). It comprises two 10-item mood scales assessing positive and negative feeling states. Each scale consists of 10 adjectives describing different feelings and emotions. Respondents were asked to indicate to what extent they felt this way in that moment and indicate their responses on a 5-point Likert-type scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). The responses to all 10 items were then summed to arrive at total positive and negative affect scores with a possible range of 10–50. These scales are highly internally consistent, largely uncorrelated, and stable at appropriate levels over a 2-month time period (Watson & Clark, 1994; Watson et al.). In the present study, internal consistency was good for the positive (for presession, $\alpha = .80$; for postsession, $\alpha = .89$) and negative (for presession, $\alpha = .79$; for postsession, $\alpha = .82$) subscales.

Well-being, fatigue, and psychological distress. We measured well-being, fatigue, and psychological distress using the Subjective Exercise Experiences Scale (SEES; McAuley & Courneya, 1994). The SEES is a 12-item, three-dimensional scale that assesses three general categories of affective responses to exercise: positive well-being (e.g., *great*), psychological distress (e.g., *miserable*), and fatigue (e.g., *tired*). For each item, participants were asked to indicate how strongly they were experiencing the feeling state at that time. Items were scored on a 7-point Likert-type scale ranging from 1 (*not at all*) to 7 (*very much so*). Each subscale ranges from 4 to 28, with a higher score showing greater fatigue, positive well-being, or psychological distress. The SEES has been shown to have high internal consistency across a variety of populations, including older adults (McAuley & Courneya). In the present study, internal consistency was good for the positive well-being (for presession, $\alpha = .86$; for postsession, $\alpha = .89$) and fatigue (for presession, $\alpha = .88$; for postsession, $\alpha = .88$) subscales. In addition, internal consistency for the psychological distress subscale was poor for premeasurements ($\alpha = .32$) and postmeasurements ($\alpha = .58$); thus, we did not include it in our analyses.

Physical activity. The Godin Leisure-Time Exercise Questionnaire (GLTEQ; Godin & Shephard, 1985) comprises two questions. The first question had three open-ended items that measured the frequency of strenuous (e.g., jogging), moderate (e.g., fast walking), and mild (e.g., easy walking) exercise for more than 15 min during an individual's free time in a typical week. The weekly frequencies of strenuous, moderate, and mild activities were multiplied by nine, five, and three metabolic equivalents, respectively, and summed to form a measure of total leisure-time physical activity. High total scores reflect high levels of physical activity. Data from the second question assessing regular activity long enough to work up a sweat were not reported because yoga does not frequently result in sweating. The 2-week test–retest reliability of total leisure activity has been estimated to be .74 (Godin & Shephard).

Depression. We measured depression levels using the Center for Epidemiological Studies of Depression (CES-D; Radloff, 1977). The CES-D is a valid and reliable 20-item self-report scale of depressive symptoms widely used in research with adults of all ages. Participants rate each of the statements on a 3-point Likert-type scale ranging from 0 (*not at all*) to 3 (*very much*). Scores ranged from 0 to 60, with higher scores indicating depression. The CES–D has both discriminant and construct validity among older adults (Radloff; Radloff & Teri, 1986). Internal consistency in the present study was good ($\alpha = .81$).

Exercise barriers. The Exercise Barriers Questionnaire (King et al., 2000) consists of 10 often-reported personal barriers to exercise, including lack of time and feeling too tired to exercise. The frequency with which each barrier occurred

is rated on a 5-point Likert-type scale ranging from 1 (*never*) to 5 (*very often*). We omitted one item (i.e., caregiving duties) and added several items to the scale (i.e., lack of transportation, lack of facilities) that represented common environmental exercise barriers. A total of 11 barriers were listed, with a total possible score ranging from 11 to 55. In the present study, internal consistency was acceptable ($\alpha = .68$).

Barriers self-efficacy. We measured barriers self-efficacy using the Barriers Self-Efficacy Scale (McAuley, 1992), which is designed to examine participants' perceived capabilities to exercise four times per week during the next 2 months in the face of commonly identified barriers to participation. Barriers included the following: bad weather, difficulty getting to an exercise location, and schedule conflicts. For each of the 13 items, participants indicated their confidence to execute the behavior on a 100-point percentage scale with 10-point increments ranging from 0% (*not at all confident*) to 100% (*highly confident*). Scores for the scale were calculated by summing the confidence ratings for each item and dividing by the total number of items in the scale, resulting in a maximum possible efficacy score of 100. In the present study, internal consistency was excellent ($\alpha = .93$).

Quality of life. We measured quality of life using the Satisfaction With Life Scale (SWLS), which is a 5-item scale developed to assess global life satisfaction in various age groups (Diener, Emmons, Larsen, & Griffin, 1985). Each scale item is rated on a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Total scores ranged from 5 to 35, with higher scores representing greater life satisfaction. The SWLS has demonstrated adequate internal reliability and validity in research on older populations of people (Diener et al.; Pavot, Diener, Colvin, & Sandvik, 1991). In the present study, internal consistency was good ($\alpha = .88$).

Filler questionnaires. We used the Fear of Falling (Tinetti, Richman, & Powell, 1990) and Physical Importance Profile (Fox, 1990) questionnaires as filler questionnaires in the pre- and postsession packets to help disguise the main focus of the study and prevent respondent bias in answering questions.

Procedure

We obtained written informed consent from each individual before participation in the research. Participants were asked to arrive at least 10 min before their normal yoga or walking session. Participants completed a preexercise packet, which included informed consent, demographics, filler questionnaires, as well as a measure of state anxiety and two measures of mood. A postexercise packet was given immediately after exercise and comprised the same questionnaires as those in the preexercise packet, with the exception of the informed consent and the

demographic information. We assessed heart rate at the wrist immediately before and after the exercise session for a measure of exercise intensity. A third packet was then given to the participants that detailed their depression, physical activity, quality of life, exercise barriers, and barriers self-efficacy. The first author was present for the completion of the pre- and postsession packet, but participants were given the option to complete the final packet at home and return it the following week. This third packet could be completed at the participant's leisure because the traits being measured would not be affected by a single bout of exercise. The first author's contact information was given to each participant in case of questions or difficulties completing the final packet.

Data Analysis

We collected and analyzed data through SPSS (Version 14.0) statistical software program and computed frequencies and descriptive statistics on the demographic data. We then performed a one-way analysis of variance (ANOVA) for psychosocial correlate questionnaires (i.e., barriers self-efficacy, depression, quality of life, and exercise barriers), demographics, and change in heart rate to determine whether there were any differences in the scores of the yoga and walking groups. Because of the small number of men in the study and consequently low statistical power for analysis by gender, we decided against conducting these comparisons. We then performed Pearson correlations (data not shown) between both change in heart rate and length of session with changes in mood and state anxiety to examine whether the intensity or length of the exercise session had an effect on the pre- to postsession changes recorded. Also, we computed further correlations (data not shown) between the months of regularly practicing exercise (i.e., yoga or walking) and the psychosocial factors to determine whether level of experience had an effect on any pre- to postsession measures or psychosocial correlates.

We conducted a repeated-measures multiple analyses of variance (MANOVA) for change across the pre- and posttime points and for differences between the yoga and walking groups. Last, we conducted two separate multivariate analyses of covariance (MANCOVAs), covarying for factors shown to be significantly different between those participating in the yoga and walking groups. We performed a MANCOVA, covarying for depression level and quality of life. In addition, we used another MANCOVA to covary for demographics including age, income, and education level.

Results

As noted, Table 1 displays the descriptive statistics computed on the demographic data. A one-way ANOVA (Tables 1 and 2) indicated that individuals in the yoga and walking groups significantly differed in age, $F(1, 49) = 26.56$, $p <$

.01; income level, $F(1, 35) = 12.40$, $p < .01$; and education, $F(1, 48) = 24.53$, $p < .01$. The walking group was significantly older, less educated, and less wealthy than was the yoga group. We found no significant differences between groups in body mass, $F(1, 47) = 0.72$, $p = .40$; months of practice, $F(1, 48) = .001$, $p = .97$; or leisure-time physical activity, $F(1, 49) = 0.04$, $p = .85$ (see Table 2). However, we found significant differences between groups for average hours, $F(1, 49) = 7.25$, $p < .05$, and days per week of practice, $F(1, 49) = 25.19$, $p < .01$, with the yoga group reporting statistically longer sessions, whereas the walking group exercised more days per week. Differences in change in heart rate from pre- to postexercise sessions were statistically significant, $F(1, 49) = 12.59$, $p < .01$, with the walking group showing greater changes in heart rate from pre- to postsession. On average, participants in the yoga group had an increase in heart rate of fewer than 1 beat per min from pre- to postsession. We found the length of the exercise session used for data collection to be significantly longer, $F(1, 49) = 207.86$, $p < .01$, for the yoga group. However, we found that this had no effect on any of the outcome measures.

The results of the ANOVA further revealed that levels of depression, $F(1, 49) = 5.38$, $p < .05$, and perceived barriers to exercise, $F(1, 49) = 16.75$, $p < .01$, were statistically greater, and satisfaction with life was significantly lower, $F(1, 49) = 6.60$, $p < .05$, in the yoga group. The most common barriers perceived by yoga practitioners included lack of time, feeling too tired to exercise, and lacking the energy to exercise. The most common barriers for walkers included self-consciousness of physical appearance, lack of time, and poor weather.

Pearson correlations conducted on demographic data and the psychosocial outcomes indicated that change in heart rate from pre- to postsession and the length

TABLE 1. Demographic Data for Yoga and Walking Groups

	Yoga (n = 24)		Walking (n = 27)	
Variable	*M*	*SD*	*M*	*SD*
Age**	60.80	7.25	71.50	7.47
Body mass index	25.10	3.69	25.30	3.39
Heart rate change**	0.75	14.70	15.30	14.70
Months of practice	74.90	92.40	75.70	70.80
Hours per session*	1.50	0.90	1.02	0.37
Days per week**	2.30	1.46	4.48	1.58
College or university degree or higher (%)**	74.90	—	19.20	—
Income less than $30,000 (%)**	95.50	—	66.70	—

Note. Regarding income, $n = 22$ for the yoga group and $n = 15$ for the walking group.
*$p < .05$. **$p < .01$.

TABLE 2. Physical Activity and Psychosocial Correlate Data for Yoga and Walking Groups

	Yoga (n = 24)		Walking (n = 27)	
Variable	*M*	*SD*	*M*	*SD*
Exercise	33.6	16.4	34.6	19.6
Life satisfaction*	25.9	5.3	29.9	5.8
Depression*	10.0	6.9	6.3	4.5
Barriers**	19.1	5.1	14.4	2.9
Self-efficacy	41.7	21.7	48.2	29.9

Note. For exercise, the Godin Leisure-Time Exercise Questionnaire (G. Godin & R. J. Shephard, 1985) was used; for life satisfaction, the Satisfaction With Life Scale (E. Diener, R. A. Emmons, R. J. Larsen, & S. Griffin, 1985) was used; for depression, the Center for Epidemiological Studies of Depression Scale (L. S. Radloff, 1977) was used; for barriers, the Exercise Barriers Questionnaire (A. C. King et al., 2000) was used; and for self-efficacy, the Barriers Self-Efficacy Scale (E. McAuley, 1992) was used.
*$p < .05$. **$p < .01$.

of the session did not significantly correlate with changes in positive or negative affect, positive well-being, fatigue, or state anxiety (ps = .09 to .99). One exception to this was that the length of session significantly correlated with change in fatigue in the walking group ($r = -.45$, $p < .05$). Also, total months of experience had no significant correlation with any pre- to postsession changes or levels of depression, satisfaction with life, exercise barriers, or barriers self-efficacy (ps = .19 to .99).

The repeated-measures MANOVA of the pre- to postsession data including positive well-being, fatigue, state anxiety, and positive and negative affect demonstrated a significant interaction between time and group, $F(5, 42) = 4.5$, $p < .01$. Follow-up univariate analyses revealed that fatigue decreased significantly more in the yoga group compared with the walking group, $F(1, 46) = 17.04$, $p < .01$, and changes in state anxiety, $F(1, 46) = 3.75$, $p = .06$, and positive well-being, $F(1, 46) = 3.04$, $p = .09$, approached significance, with the yoga group demonstrating greater increases in positive well-being and decreases in state anxiety.

The repeated-measures MANCOVA covarying for depression levels and quality of life found the significant time by group interaction previously revealed, $F(5, 40) = 4.20$, $p < .01$. Again, follow-up univariate analyses showed that fatigue decreased significantly more in the yoga group than in the walking group, $F(1, 44) = 15.04$, $p < .01$ (see Table 3). The repeated-measures MANCOVA covarying for age, income, and education status revealed no significant interactions or main effects between groups and pre- to postsession measures. Thus, after control for specific demographic variables, there was no significant difference in changes in psychosocial outcomes from pre- to postsession (see Table 4).

TABLE 3. Pretest and Posttest Measures Between Groups, Controlling for Depression and Satisfaction With Life

	Yoga (n = 23)				Walking (n = 25)			
	Pretest		Posttest		Pretest		Posttest	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Well-being	18.5	3.9	21.9	4.4	22.3	4.9	23.6	4.9
Fatigue*	10.7	5.2	7.0	2.9	6.8	3.6	6.9	4.8
Anxiety	32.9	8.7	27.9	6.0	28.4	8.4	27.1	7.3
Positive affect	32.5	5.7	33.4	6.7	36.0	7.0	36.4	8.0
Negative affect	12.2	3.7	11.0	2.7	10.9	1.2	10.5	0.9

Note. For well-being, the positive well-being subscale of the Subjective Exercise Experiences Scale (SEES; E. McAuley & K. Courneya, 1994) was used; for fatigue, the fatigue subscale of the SEES (E. McAuley & K. Courneya) was used; for anxiety, the State-Trait Anxiety Inventory (C. D. Speilberger, R. L. Gorsuch, & R. E. Lushene, 1969) was used; for positive affect, the PANAS Positive Affect Schedule (D. Watson, L. A. Clark, & A. Tellegen, 1988) was used; and for negative affect, the PANAS Negative Affect Schedule was used (D. Watson et al., 1998).
*$p < .05$.

TABLE 4. Pretest and Posttest Measures Between Groups, Controlling for Age, Income, and Education

	Yoga (n = 21)				Walking (n = 14)			
	Pretest		Posttest		Pretest		Posttest	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Well-being	18.5	4.1	21.9	4.6	24.1	3.5	25.9	2.6
Fatigue	11.1	5.3	7.1	3.0	7.6	4.3	7.1	5.5
Anxiety	33.8	8.6	28.6	5.8	27.9	8.2	25.7	6.1
Positive affect	32.5	6.0	33.2	7.0	36.0	7.2	37.1	6.9
Negative affect	12.3	3.8	11.0	2.8	10.7	1.3	10.0	0.3

Note. For well-being, the positive well-being subscale of the Subjective Exercise Experiences Scale (SEES; E. McAuley & K. Courneya, 1994) was used; for fatigue, the fatigue subscale of the SEES (E. McAuley & K. Courneya) was used; for anxiety, the State-Trait Anxiety Inventory (C. D. Speilberger, R. L. Gorsuch, & R. E. Lushene, 1969) was used; for positive affect, the PANAS Positive Affect Schedule (D. Watson, L. A. Clark, & A. Tellegen, 1988) was used; and for negative affect, the PANAS Negative Affect Schedule was used (D. Watson et al., 1998).

Discussion

We attempted to observe the effects of an acute bout of walking or yoga on mood and state anxiety in adults who were 50 years of age and older. Also, we examined levels of depression, exercise barriers, quality of life, and barriers self-efficacy among those who regularly participated in yoga or walked for exercise to determine whether there were differences between those who choose to practice yoga and those who walk for exercise on a regular basis. To date, there is no cross-sectional data comparing yoga practitioners with walkers.

In the present study, results indicate that change in heart rate from pre- to postexercise session had no correlation with changes in mood or state anxiety for either group, which adds to previous research that suggests high-intensity exercise may not be needed to see improvements in mood (Berger & Owen, 1992). When comparing levels of depression, exercise barriers, quality of life, and barriers self-efficacy, we found that walkers had significantly lower levels of depression and higher levels of quality of life compared with yoga participants. Comparisons of depression and quality of life between those practicing yoga and those walking have not been previously reported. However, there is evidence that has shown that frequent practice of yoga improves quality of life (Impett, Daubenmier, & Hirschman, 2006). Furthermore, previous research has shown that yoga may be an option for the treatment of depressive disorders (Pilkington, Kirkwood, Rampes, & Richardson, 2005). In the present study, changes in depression and satisfaction with life could not be examined as it was cross-sectional in design. However, it is possible that in this particular sample, the yoga practitioners were depressed and less satisfied with life before participating in an exercise program and were drawn to yoga as a form of exercise.

Results also show that yoga practitioners perceived a greater amount of barriers to exercise but had no difference in the amount of leisure time physical activity when compared with the walkers. It is possible that participants who practice yoga enjoy being active or see the value of activity more than do walkers. It is also possible that participants who practice yoga are more determined to participate in physical activity. Before the present study, no research had examined exercise barriers or barriers self-efficacy among yoga practitioners, and further research of this topic is warranted.

The significant decrease in fatigue seen in the yoga practitioners when we controlled for psychosocial factors is supported by previous research that reported scores on the multidimensional fatigue inventory to significantly decrease in a 1-month yoga intervention (Latha, 2003). Decreases in fatigue, as seen with a single session of yoga, may be useful to those adults who have jobs or lives that are physically or emotionally taxing. Also, in most analyses, the yoga group showed greater improvement on all scales from pre- to postsession, compared with the walking group. The walkers' lack of improvement on the fatigue scale is likely because of a floor effect whereby there was little room for improvement.

Differences found between the yoga and walking groups may be explained by the form of exercise itself and by demographic factors. In the present study, we found the yoga group to be significantly younger, have a greater yearly income, and to be more educated when compared with the walking group, which may account for their choice of exercise. Yoga participants may be more open to new methods of exercise because they are younger, more educated, and have greater financial means. Anecdotally, many of the participants in the yoga group cited their use of yoga for its calming and stress-reducing effects rather than for its physical benefits. It is related that some of the yoga participants cited having stressful and time-consuming jobs, whereas most of the walking group participants were retired.

Despite the present study's ability to extend previous research, several limitations deserve attention. Limitations include the time at which we collected data. It is possible that the walkers exhibited fewer changes in mood because we collected their data early in the morning, whereas most of the yoga group's data was collected in the evening when they may have had more potential for change because of longer waking hours. Another limitation to the study is that we did not measure social support because it has been shown to influence mood (McAuley, Jerome, Marquez, Elavsky, & Blissmer, 2003). However, these effects were minimized because all participants walked or participated in a yoga class with at least one person. Another limitation of the study was the cross-sectional design, and any chronic changes or improvements because of the practice of yoga were not captured in this research. Furthermore, our sample was small in size (which likely influenced the lack of significant results) and comprised primarily Caucasian women, and thus it was not representative of the entire population. Last, we did not collect the health status of participants, and the extent to which this could have influenced results is unknown.

In the future, researchers may include investigation of the differences in the perceived barriers between yoga practitioners and walkers and the specific traits that enable yoga practitioners to overcome their barriers. When comparing yoga groups with walking groups, one approach is to match participants on age, income, and educational level. Optimally, data collection should occur at the same time of day for all participants as that may have affected the results of the present study. Future researchers may include longitudinal and cross-over study designs. A longitudinal study design would help to clarify the extent to which yoga can improve psychosocial outcomes and determinants over a greater period of time. A cross-over study design would be useful to better understand the true differences between yoga and other forms of traditional exercise by reducing variability between participants.

Although most hypothesized changes in psychosocial outcomes between pre- and postbouts of yoga and walking were not supported, this research contributes to the overall knowledge of the benefits of mindful-based exercise. Although not all findings were statistically significant, those adults who participated in yoga did see greater improvements in all psychosocial areas after a

single bout of physical activity compared with those who participated in walking for exercise. It is highly possible that yoga participants specifically seek out mindful-based exercise to deal with higher levels of stress and depression. The present study indicated that yoga practitioners perceive significantly more barriers to exercise, but that they may be better able to overcome these barriers than those who practice more traditional forms of exercise.

As older adults continue to suffer from psychological and physiological ailments, new ways to healthily improve their overall quality of life are necessary. Although there is still much to be learned about the psychosocial effects of yoga, it is clear that there are benefits associated with this form of physical activity. Future research should continue to bring a greater understanding and awareness of this ancient form of physical activity to the Western world.

AUTHOR NOTES

David X. Marquez is an assistant professor at the University of Illinois at Chicago. His research interests focus on disparities in physical activity, disease, and disability among Latinos and in using physical activity interventions toward the prevention of disability and the maintenance of cognitive functioning and quality of life among older adults. **Jennifer M. Kraemer** recently completed her master's degree in kinesiology from the University of Massachusetts, Amherst. Her research interests include physical activity in traditional and nontraditional forms and their influence on mental health among older adults.

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