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MOOD ALTERATION WITH YOGA AND SWIMMING: AEROBIC EXERCISE MAY NOT BE NECESSARY[1,2]

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Summary.—The mood benefits of Hatha yoga and swimming, two activities that differ greatly in aerobic training benefits, were examined. College students ($N = 87$) in two swimming classes, a yoga class, and a lecture-control class completed mood and personality inventories before and after class on three occasions. A multivariate analysis of variance indicated that both yoga participants ($n = 22$) and swimmers ($n = 37$) reported greater decreases in scores on Anger, Confusion, Tension, and Depression than did the control students ($n = 28$). The consistent mood benefits of yoga supported our earlier observation that the exercise need not be aerobic to be associated with mood enhancement. However, underlying and causal mechanisms remain uncertain. Among the men, the acute decreases in Tension, Fatigue, and Anger after yoga were significantly greater than those after swimming. Yoga may be even more beneficial than swimming for men who personally select to participate. The women reported fairly similar mood benefits after swimming and yoga. It seems that aerobic exercise may not be necessary to facilitate the mood benefits. Also, students with greater mood changes attended class more regularly than those who reported fewer psychological benefits. Maximizing the immediate psychological benefits of exercise might be one way to encourage adults to be physically active.

Exercise, along with diet, is an influence on the quality (e.g., Powell, 1988) and perhaps on the length of an individual's life (Paffenbarger & Hyde, 1988). In addition exercise, or more specifically jogging, is accompanied by a variety of psychological changes (see reviews by Berger, 1984a; Dishman, 1988; Morgan & Goldston, 1987; Sachs & Buffone, 1984). Jogging is as effective as other stress-reduction techniques such as Benson's relaxation response, quiet rest, stress inoculation, and group interaction (Bahrke & Morgan, 1978; Berger, Friedmann, & Eaton, 1988; Long, 1983, 1985; Raglin & Morgan, 1987; Wilson, Berger, & Bird, 1981).

Despite the well documented benefits of exercise, 40% of the American population do not exercise. An additional 40% do not exercise sufficiently to reap health benefits (Dishman, 1988). One problem in motivating people to be physically active may be the great focus on the benefits of jogging (e.g., Sachs & Buffone, 1984) and other types of high intensity exercise which recently has been moderated (American College of Sports Medicine, 1991). This study extends the research on jogging by focusing on mood al-

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teration associated with Hatha yoga and swimming. Such information would be useful for individuals who dislike running or find it physically difficult, for joggers who would like to vary their routines, and for injured runners who experience withdrawal symptoms.

Swimming and Mood Alteration

Berger and Owen (1983, 1987) found the psychological effects of swimming to be similar to those of jogging. Swimmers from a normal population reported significant acute reductions in scores on Tension, Depression, Anger, and Confusion, and increased Vigor immediately after swimming (Berger & Owen, 1983). A second study conducted during a brief five-week summer session showed no evidence of mood alteration after swimming (Berger & Owen, 1986). Since the air temperature (106°) and water in the swimming pool were uncomfortably warm on the day of test administration, they speculated that the mood enhancing benefits were sensitive to environmental conditions. Results of a third study supported the likelihood that extreme heat detracted from the mood benefits of swimming (Berger & Owen, 1987). Swimmers in the same 14-week and 5-week classes reported significant short-term reductions in state anxiety when measured on three occasions other than the unusually hot day.

The relationship between exercise and mood alteration seems to be more fragile than previously expressed. Swimmers who exercise in uncomfortably warm water and swimmers in high intensity exercise have reported either no short-term mood benefits or mood decrements (Berger & Owen, 1986, 1992; Morgan, Costill, Flynn, Raglin, & O'Connor, 1988). High intensity exercise on a bicycle ergometer also has been associated with increased tension/anxiety and fatigue (Steptoe & Cox, 1988). In the same study, increased vigor and exhilaration were associated only with low intensity exercise. The psychological benefits of exercise are not unconditional.

Psychological Benefits Associated with Hatha Yoga

We have proposed a tentative exercise taxonomy for maximizing stress reduction (Berger & Owen, 1988). This taxonomy included an over-all requirement for the exercise to be (1) pleasing and enjoyable. In addition, there were exercise mode and training guidelines. Briefly, the suggested mode characteristics were that the exercise be (2) "aerobic" or facilitate abdominal breathing, (3) noncompetitive, (4) temporally and spatially certain, and (5) repetitive and rhythmical. Suggested training requirements included (6) a frequency of at least two to three times a week, (7) moderate intensity, and (8) at least 20 to 30 minutes in duration. See Berger (1984a, 1984b), Berger and McInman (in press), and Berger and Owen (1988) for in-depth examinations of these mode and practice requirements.

When we compared the mood benefits of four types of exercise to test this taxonomy, the stress-reduction benefits of Hatha yoga were similar to

those previously reported for jogging and swimming (Berger & Owen, 1988). Hatha yoga is the exercise form of yoga and is a gentle form of stretching, balancing, and breathing routines. Hatha yoga met seven of the eight stress-reduction taxonomy requirements with the exception of aerobic exercise. Yoga participants reported significant short-term reductions in scores on Anxiety, Tension, Depression, Anger, and Confusion. These results supported the claims of relaxation for Hatha yoga swamis and other yoga experts (e.g., Lysebeth, 1971; Patel, 1984). The psychological benefits possibly associated with yoga need further study in view of the widespread presumption that exercise needs to be aerobic to be associated with stress reduction (e.g., Blumenthal, Williams, Needels, & Wallace, 1982; Hayden & Allen, 1984; Long, 1983, 1985; Long & Haney, 1988; Sinyor, Golden, Steinert, & Seraganian, 1986; Steptoe & Cox, 1988).

Present Study

This study was the first to compare the relative mood benefits of swimming and Hatha yoga. Hatha yoga is the physical exercise form of yoga. The various body positions or asanas help students increase their flexibility and static muscle strength through a series of stretching exercises and static poses. Hatha yoga participants systematically strengthen and relax major muscle groups that may have been contracted as a result of stress and/or faulty posture. Relaxing tense muscles is thought to free "the energy bound up in rigid musculature making it available for other uses" (Rama, Ballentine, & Ajaya, 1976, p. 10). Yoga participants tune inward to physical sensations to be able to stretch their muscles as far as possible and yet avoid reaching a point of painfulness. This turning inward and the separate breathing exercises of yoga are thought to increase one's awareness of internal physical and mental states (Rama, *et al.*, 1976; Kabat-Zinn, 1990). Despite the commonly accepted stress-reducing benefits of Hatha yoga, there are few experimental data concerning its psychological effects.

Comparing the mood benefits of the two exercise modalities facilitated an examination of the aerobic requirement in the taxonomy proposed by Berger and Owen (1988). Exercise may not have to be aerobic to be associated with the psychological benefits (Doyne, Ossip-Klein, Bowman, Osborn, McDougall-Wilson, & Neimeyer, 1987; Martinsen, Hoffart, & Solberg, 1989). Examining the psychological benefits associated with swimming and yoga provided direct information about the relative importance of aerobic exercise in contrast to rhythmic, abdominal breathing. Swimming is high in aerobic conditioning, but Hatha yoga which is a series of gentle stretching exercises is not. Both Hatha yoga and swimming, however, facilitate abdominal breathing which is included in many stress-reduction techniques (Rama, *et al.*, 1976; Woolfolk & Lehrer, 1984). Swimming met all eight of the taxonomic requirements; yoga met all except the aerobic requirement.

[See Berger and Owen (1988) and Berger and McInman (in press) for additional discussion of the taxonomy.] We decided to measure short-term mood changes on three days throughout a semester to discern whether there was a relationship between expertise in the activities or physical conditioning and mood change.

We also examined the individual mood benefits of each exercise mode. Clear evidence of mood alteration after swimming has been produced in only two (Berger & Owen, 1983, 1987) of five studies (Berger & Owen, 1986, 1988, 1992). Thus, the mood benefits associated with swimming need clarification. The impressive stress-reduction benefits of yoga that were produced in a single study also needed further substantiation (Berger & Owen, 1988). Because of the absence of stress on weight-bearing joints, both swimming and yoga appeal to many people. Documentation of the mental health benefits associated with these two activities might encourage more people to exercise.

Finally, this study investigated the possibility that students who reported greater mood changes would find the activities more rewarding and thus would attend class more regularly than those who experienced fewer psychological benefits. Conscious or unconscious perception of mood enhancement may motivate exercisers to return for more benefits. Since 80% of the American population do not exercise sufficiently to reap health benefits (Dishman, 1988), insight into factors promoting exercise adherence is crucial when encouraging people to exercise.

In summary, the three hypotheses were (1) swimmers and yoga participants together will report significantly greater pre-postclass mood changes than the lecture-controls. These acute effects of exercise include greater reduction in scores on Anxiety, Tension, Depression, Anger, and Confusion as well as greater increases in Vigor than from a control activity. (2) The acute effects of the aerobic activity of swimming and Hatha yoga which has few aerobic benefits will be similar to one another. (3) Exercisers' changes in mood will be inversely correlated with their absences from class.

METHOD

Subjects

College students ($N = 101$) were voluntarily enrolled in two coeducational beginning swimming classes ($ns = 22$ and 17), a yoga course ($n = 26$), or a lecture-control course ($n = 36$). Students were excluded from the study if they chose not to participate or were absent from more than one day of testing. This resulted in students being dropped, namely, 2 in the first swimming class, 0 in the second swimming class, 4 in the yoga class, and 8 in the health science lecture-control class. Given the naturalistic setting of the study, students occasionally were absent on testing days. Rather than

eliminate all subjects with missing data, we were willing to estimate data using BMDPAM (Frane, 1981) for a single day of testing if two other days were available. After estimation, subjects with complete scores for the baseline and three days of pre-, postexercise testing ($N = 87$) were as follows: swimming classes $ns = 20$, 17; yoga, $n = 22$; and control class, $n = 28$. The adherence rate averaged 86%. In the exercise classes, the adherence rate was 91%. Participants were treated in accordance with the "Ethical Principles of Psychologists" (American Psychological Association, 1990).

Students enrolled in a health science lecture course served as an experimental control. The control class helped to distinguish between the effects of exercise on mood and those of being in a group situation and those occurring naturally throughout the semester. In addition, the age, gender, and initial preclass mood and anxiety scores of the controls and exercisers were compared to discern possible idiosyncracies of students selecting physical activity classes.

Use of intact classes limited the interpretation of the data. However, as noted by Thayer (1987), the naturalistic setting reflected every-day conditions that occur in most exercise classes and provided a more accurate view of the subtle relationship between mood and exercise than is possible in a laboratory setting. Randomly assigning sedentary individuals to exercise is nearly impossible in a study such as this. However, it has been done (e.g., Berger, *et al.*, 1988; Long, 1983; Long & Haney, 1988), and the results have been similar to those from use of intact groups. Practical considerations such as locating a sufficient number of students who exercise regularly in a single activity and repeated testing of the same individuals during a 12-week period necessitated this form of subject selection.

Procedure

The first author taught the three exercise classes. On the first day of class, she described the study and collected statements of informed consent. Students then completed a demographic screening inventory and the Lie Scale (Eysenck & Eysenck, 1968) as a measure of social desirability. These responses, along with initial mood inventory scores, provided some information about initial class equivalence.

Swimmers and yoga participants exercised for approximately 60 minutes per week in class settings. Swimmers met for 40 minutes of instruction two days a week for 14 weeks. Within the 40-min. class session, they swam at a moderate rate for 25 to 30 minutes. The yoga class met in an 80-min. session one night a week that included approximately 60 minutes of exercise. We encouraged yoga participants and swimmers to exercise on their own in between class meetings to maximize their progress and to meet the requirements of the proposed taxonomy. The lecture-control class met in 50-minute class sessions three days a week.

Students completed the Profile of Mood States (McNair, Lorr, & Droppleman, 1971) immediately before and after class on three different days: the second day of class, Week 6, and Week 12 in a 14-wk. semester. Testing on three occasions provided information about a possible relationship between mood alteration and skill proficiency and/or fitness level. To reduce the number of tests, students completed the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970) on only a few of the days that the Profile of Mood States was administered. Students completed the anxiety inventory immediately before the second day of class, and before and after class during Week 12.

We protected students' identity on the inventories to encourage honesty and objectivity in completing the tests. To avoid expectancy effects, the mood inventories were presented as an opportunity for students to obtain objective information about their individual, possibly idiosyncratic reactions to exercise. To negate demand characteristics, we asked students to record their true feelings rather than how they might think they were "supposed" to feel. The incentive for participating in the study was direct information on their individual mood states before and after exercising presented via a computer printout. This was provided each student at the end of the semester.

Social desirability and mood measures.—A nine-item Lie Scale of the Eysenck Personality Inventory was reported to be valid and reliable in detecting individuals who "fake good" (Eysenck & Eysenck, 1968). The Lie Scale was used primarily to examine initial equivalence of the classes. Social desirability served as a check on an expectancy set by allowing us to determine whether the scores were randomly distributed across the four classes.

The 65-item Profile of Mood States was the measure of mood (McNair, *et al.*, 1971). It has sound psychometric properties and has been employed successfully in other studies of exercise and psychological well-being (e.g., Berger & Owen, 1983, 1988; Berger, *et al.*, 1988; Blumenthal, *et al.*, 1982; Morgan, *et al.*, 1988; Steptoe & Cox, 1988). The Profile contains 65 adjectives which are rated on a 5-point scale ranging from "not at all" to "extremely" like me. Use of the Profile facilitated cross-study comparisons. The six subscales measured Tension-anxiety, Depression-dejection, Anger-hostility, Vigor-activity, Fatigue-inertia, and Confusion-bewilderment. Students responded according to how they felt "right now." See Berger and Owen (1983) for additional discussion of the Profile.

The State-Trait Anxiety Inventory provided information about the initial equivalency of the exercise and control classes and the relationship between mood change and exercise adherence. In the 20-item Trait-Anxiety Inventory, students described the way they *generally feel* on a 4-point scale which ranged from "not at all" to "very much so." In the 20-item State-Anxiety Inventory, test-takers indicated the extent to which items described themselves *at this moment.*

RESULTS

Initial Equivalence of the Classes

One-way analyses of variance and a chi-squared analysis were conducted to examine the initial equivalence of the intact classes on 11 variables. Classes did not differ in social desirability ($F_{3,86} = 0.53$, $p > .66$), gender [$\chi_3^2(N = 101) = 5.08$, $p > .16$], or trait ($F_{3,75} = 2.54$, $p > .06$) and state ($F_{3,83} = 1.06$, $p > .37$) anxiety. Classes also did not differ on four of the six initial preclass Profile scores: Tension ($F_{3,75} = 1.46$, $p > .24$), Depression ($F_{3,75} = 1.38$, $p > .25$), Fatigue ($F_{3,75} = 1.66$, $p > .18$), or Confusion ($F_{3,75} = 1.42$, $p > .24$). They did differ on Anger ($F_{3,75} = 3.79$, $p < .02$) and Vigor ($F_{3,75} = 4.02$, $p < .02$). Pairwise t tests with a Bonferroni adjustment among the classes indicated that swimmers and yoga participants did not differ from one another ($p > .05$). Exercisers were higher on Vigor than members of the health-science lecture class; yoga participants were higher on Anger than the health-science class. There were no other differences among any of the four classes. Together, these results suggest that students in the activity and control classes initially were similar on the measures employed.

Students in the classes differed in age ($F_{3,95} = 18.28$, $p < .0005$). Members of the yoga class were older than the swimmers and controls ($p < .05$ with the Bonferroni adjustment). The yoga class met in the evening, and many were part-time students who tended to be older than the daytime students. Mean age in the evening yoga class was 28.4 yr. Ages in the other three classes ranged between a mean of 20.3 in one swimming class to 21.1 in the other swimming class.

Profile of Mood States

Short-term mood changes were examined with a multivariate analysis of variance. Within factors were (a) pre- and postclass mood scores and (b) day (beginning, middle, and end of semester). Between-group factors were (c) sex and (d) class (swimming-1, swimming-2, yoga, and health science lecture). Three contrasts between the classes were of primary interest. Contrast one (C_1) compared the three activity classes to the lecture-control class. The second contrast (C_2) compared the two swimming classes to the yoga class. Finally the remaining contrast (C_3) examined possible differences between the two swimming classes. The pre- and posttest effect was significant ($F_{6,73} = 9.52$, $p < .00005$).[3] However, pre-post appeared in several significant interactions: pre-posttest × C_1, pre-posttest × C_2, pre-posttest × C_3, and possibly pre-posttest × day.

Short-term mood changes for exercisers.—As hypothesized, the size of the

[3]Unless otherwise indicated, Rao's transformation on Wilk's Lambda (Λ) to an approximate F distribution.

difference between pre- and posttest mood score vectors of the exercisers (swimmers and yoga participants combined) was larger than that of the students in the lecture-control class (C_1 × pre-posttest $F_{6,73} = 5.26$, $p < .0002$). Univariate[4] analyses on this effect indicated that the exercisers reported greater reductions on Anger ($F_{1,78} = 24.29$), Confusion ($F_{1,78} = 13.35$), Tension ($F_{1,78} = 11.05$), and Depression ($F_{1,78} = 6.67$) than did the lecture-controls. Since these preclass scores were below T scores of 50, the significant postclass decreases did not reflect a regression toward the mean. See the mean scores in Table 1. Exercisers and controls did not differ from one another in Vigor ($F_{1,78} = 3.35$) or on Fatigue ($F_{1,78} = 0.48$). However, all pre- to posttest changes among the exercisers were in the expected direction and larger than those for the controls.

TABLE 1
MEANS ON PROFILE OF MOOD STATES FOR EXERCISERS AND CONTROLS BEFORE AND AFTER DAILY CLASS SESSIONS

Profile of Mood States	Exercisers, $n = 59$				Controls, $n = 28$			
	Pretest		Posttest		Pretest		Posttest	
	Raw	T	Raw	T	Raw	T	Raw	T
Tension[a]	8.98	43	5.41	39	9.99	45	8.74	43
Depression[b]	7.91	44	4.04	41	8.42	44	6.78	44
Anger[c]	7.55	48	4.15	42	5.61	45	6.06	45
Vigor	16.13	51	18.11	54	12.11	44	12.52	44
Fatigue	6.61	44	4.93	41	8.26	46	6.94	45
Confusion[d]	6.87	42	4.58	38	7.19	43	6.84	43

Note.—Exercisers versus controls (C_1) × pre-post multivariate analysis of variance $F_{6,73} = 5.26$, $p < .0002$.
[a]Univariate $F_{1,78} = 11.05$. [b]Univariate $F_{1,78} = 6.67$. [c]Univariate $F_{1,78} = 24.29$. [d]Univariate $F_{1,78} = 13.35$.

Both swimmers and yoga participants reported benefits.—The interaction of pre- and posttest with the second contrast provided information about the similarity of the short-term mood benefits in swimming and yoga. However, the two-way interaction of C_2 × pre-posttest was embedded in a significant three-way interaction between C_2, pre-posttest, and sex ($F_{6,73} = 2.98$, $p < .012$). Therefore we looked at the simple effects for each gender.

Women swimmers and yoga participants benefitted differentially [women's simple C_2 × pre-posttest interaction ($F_{6,77} = 3.89$, $p < .002$)]. The univariate tests indicated that the interaction appeared primarily on Vigor and Fatigue. Women swimmers reported greater increases on Vigor than did yoga

[4]The multivariate analysis of variance significance test provides a correct probability level. As in all such analyses, however, there is no agreed-upon follow-up test. We provide univariate Fs for the purpose of rank ordering the relative contributions of the six subscales in the Profile of Mood States.

participants ($F_{1,82} = 5.14$). Women yoga participants reported greater decreases on Fatigue than did the swimmers ($F_{1,82} = 4.10$). See Table 2 for the mean scores which are all below a T score of 50.

The simple $C_2 \times$ pre-posttest effect for men also indicated that swimmers and Hatha yoga participants benefitted differentially ($F_{6,77} = 4.02$, $p < .002$). Male yoga participants reported greater benefits than swimmers on three subscales: Tension ($F_{1,82} = 14.22$), Fatigue ($F_{1,82} = 9.34$), and Anger ($F_{1,82} = 6.79$). Except for Anger, all of these scores were below a T score of 50 as noted in Table 2. Even on Anger, regression toward the mean did not account for the benefits. Swimmers' pre- and postexercise mean T scores on Anger were 50.5 and 46.0, respectively. Yoga participants' mean Anger T scores were 51.5 and 40.5.

TABLE 2
MEANS ON PROFILE OF MOOD STATES OF SWIMMERS AND YOGA PARTICIPANTS BEFORE AND AFTER EXERCISE SESSIONS

Profile of Mood States	Swimming, $n = 37$				Yoga, $n = 22$			
	Pretest		Posttest		Pretest		Posttest	
	Raw	T	Raw	T	Raw	T	Raw	T
				Women				
Tension	8.44	42	5.94	40	9.00	43	3.78	36
Depression	5.22	42	2.69	40	8.78	45	3.38	40
Anger	5.20	44	3.72	42	6.99	47	2.40	40
Vigor[a]	15.29	49	19.12	55	14.93	49	14.89	49
Fatigue[b]	4.56	41	4.18	40	8.05	46	5.01	41
Confusion	6.04	41	3.96	37	7.41	45	4.43	40
				Men				
Tension[c]	8.23	42	6.99	41	11.99	48	3.28	35
Depression	9.94	46	6.56	44	8.96	46	3.10	40
Anger[d]	9.76	50	6.80	46	10.55	52	2.41	40
Vigor	18.31	54	19.05	55	15.75	50	20.12	57
Fatigue[c]	6.84	44	6.47	44	9.18	48	2.90	38
Confusion	6.83	42	5.23	39	8.42	45	5.19	39

Note.—Multivariate analysis of variance: Swimmers versus Yoga participants (C_2) x pre-post x sex $F_{6,73} = 2.98$, ($p < .01$). Women's $C_2 \times$ pre-post $F_{6,77} = 3.89$ ($p < .002$). Men's $C_2 \times$ pre-post $F_{6,77} = 4.02$ ($p < .002$).
[a]Univariate $F_{1,82} = 5.14$. [b]Univariate $F_{1,82} = 4.10$. [c]Univariate $F_{1,82} = 14.22$. [d]Univariate $F_{1,82} = 6.79$.

A third contrast compared the two swimming classes. As expected, the $C_3 \times$ pre-posttest interaction was not significant. There were no differences in the psychological benefits between the two swimming classes ($F_{6,73} = 1.43$, $p < .22$). In addition, none of the interactions were significant.

Exercisers' changes in mood were inversely related to absences from class.—To examine the possibility that exercisers with greater mood changes would have fewer absences from class, we computed a mean change score by

subtracting the postclass score from the preclass score for each Profile subscale and the State-Anxiety Inventory on each day. Adding these difference scores across all of the days resulted in a single difference score for each scale. Using multiple regression, we were able to predict the number of absences from the seven differences scores ($R = 0.49$; $F_{7,50} = 2.20$, $p < .05$). The directions of the zero-order correlations supported the hypothesis that exercisers who reported greater mood benefits had fewer absences.

Discussion

Aerobic Exercise Is Not Required to Facilitate Mood Alteration

Both Hatha yoga participants and swimmers from a "normal" population reported significant, short-term mood benefits on three days. In addition, yoga participants and swimmers together reported greater decreases on Anger, Confusion, Tension, and Depression than did lecture-control students. The significant mood benefits associated with swimming in this study suggest that exercise conditions such as unusually warm water temperature (Berger & Owen, 1986) and high intensity swimming (Berger & Owen, 1992; Morgan, *et al.*, 1988) can negate the psychological benefits. The mood effects of swimming, and quite likely other types of exercise (e.g., Steptoe & Cox, 1988), do not occur automatically.

The significant mood benefits associated with yoga strongly supported previous observations that exercise beneath one's aerobic training zone could be mood enhancing (e.g., Berger & Owen, 1988; Doyne, *et al.*, 1987; Martinsen, *et al.*, 1989; Thayer, 1987). Both aerobic exercise and Hatha yoga facilitate deep, rhythmical, diaphragmatic breathing. Since this type of breathing is a common element in many stress-reduction techniques (e.g., Rama, *et al.*, 1976; Woolfolk & Lehrer, 1984), it is possible that rhythmical, diaphragmatic breathing which is a by-product of aerobic training facilitates mood alteration. We caution readers that the present study is only an initial attempt to elucidate the underlying mechanisms of the complex, multifaceted relationship between exercise and mood. Slow, diaphragmatic breathing may be one underlying factor. There are many other possibilities, and these may change from one exercise modality to another. Other aspects of Hatha yoga that may affect mood include stretching and relaxing large muscle groups in the body (McGuigan, 1984), an internal awareness (Kabat-Zinn, 1990), finding time for oneself and a focus on the present with an exclusion of inward cognitive chatter (Kabat-Zinn, 1990; Rama, *et al.*, 1976).

In summary, participants in the gentle stretching sequences and breathing routines of Hatha yoga reported the same mood elevation, if not more, as swimmers who were participating in a vigorous aerobic activity. This information is particularly important for the elderly, obese, and arthritic who find strenuous exercise unpleasant and/or impossible. As swamis attest (Lysebeth, 1971; Patel, 1984; Rama, *et al.*, 1976), yoga was associated with the

reduction of psychological stress indices such as tension, depression, anger, and confusion.

Sex Differences: Men Reported Even Greater Mood Benefits After Yoga Than After Swimming

A sex difference emerged when comparing the benefits of yoga and swimming. Physical activity still seems to have different meanings for American men and women (e.g., Birrell, 1988; Hall, Durborow, & Progen, 1986). This difference in meaning may be related to differing psychological benefits.

The mood effects of swimming and yoga for women were fairly similar. Women participants in each reported less Anger, Tension, Depression, and Confusion. Women swimmers, however, reported greater increases in Vigor than did yoga participants. Swimming at a moderate intensity was associated with increased energy or activation immediately after exercising. Swimmers may have more Vigor after exercise than yoga participants as a result of the increased heart rate and flow of blood to the muscles during exertion. Women yoga participants reported greater decreases in Fatigue than the swimmers and so were feeling more relaxed and calm than energized. Initially, Fatigue scores of both men and women yoga participants were higher than the swimmers'. This could reflect the number of evening yoga students who held full-time jobs and came from work to the 6 P.M. class. Since the less intense exercise in yoga is not as physically demanding as that of swimming, the participants might feel more refreshed or less fatigued after participating. These subtle mood changes between the two types of exercise need further investigation.

Male yoga participants reported significantly greater decreases on Tension, Fatigue, and Anger than did the swimmers. This result was unexpected. Yoga has been classified as an activity that is more socially acceptable for women than for men (Csizma, Wittig, & Schurr, 1988). If mood benefits are associated with gender-role continuity, male yoga participants would be expected to report fewer benefits than swimmers. Swimming is an activity that falls in the "neutral" gender category (Csizma, *et al.*, 1988). Since the students in this study participated in self-selected activities, it is possible that only males who were psychologically comfortable with yoga enrolled in the course. Yoga may be even more stress reducing than swimming for men who personally elect to participate.

Enhanced Mood Associated with Better Class Attendance

The significant multiple correlation between mood alteration and class attendance provided preliminary evidence for an association between mood enhancement and exercise adherence. One possible explanation is that increased class attendance may cause improvement in mood. Another possibility, though, is that the immediate "feeling good" sensation after exercis-

ing may be an important motivator in encouraging people to exercise frequently. While the direction of causality is not clear, people who reported that they "felt better" after exercising seemed to be more likely to return for more. Maximizing the psychological benefits of exercise may be a key factor in encouraging a larger portion of the population to be physically active.

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