

Processed: 11/8/2017 9:47:55 AM

University of Denver ILL



ILLiad TN: 326725

Journal Title: International journal of emergency mental health.

Volume: 7
Issue: 1
Month/Year: 2005
Pages: 49-57

Article Author: Manger, T. A., & Motta, R. W.

Article Title: The Impact of an Exercise Program on Posttraumatic Stress Disorder, Anxiety, and Depression.

Imprint: Ellicott City, MD : Chevron Pub. Corp., ©1999-

ILL Number: 183558749



Email: askill@u.library.arizona.edu
Odyssey: 150.135.238.6

Barcode: HC101040611D
Barcode: U186017522877

Call #: RC480.6 .J58 v.7-8 2005-06

Shelving Location: Hampden PER
AVAILABLE

Lending String: AZU

Requesting Library:
INTERLIBRARY LOAN
UNIVERSITY ARIZONA LIBRARIES

TO HAMPDEN FOR SCANNING



CHEVRON
PUBLISHING CORPORATION

5018 Dorsey Hall Drive, Suite 104
Ellicott City, MD 21042 USA
Telephone: (410) 740-0065
Fax: (410) 740-9213
office@chevronpublishing.com

Purpose and Scope

The International Journal of Emergency Mental Health provides a peer-reviewed forum for researchers, scholars, clinicians, and administrators to report, disseminate, and discuss information with the goal of improving practice and research in the field of emergency mental health.

The International Journal of Emergency Mental Health is a multidisciplinary quarterly designed to be the premier international forum and authority for the discussion of all aspects of emergency mental health.

The Journal publishes manuscripts (APA style) on relevant topics including psychological trauma, disaster psychology, traumatic stress, crisis intervention, emergency services, Critical Incident Stress Management, war, occupational stress and crisis, employee assistance programs, violence, terrorism, emergency medicine and surgery, emergency nursing, suicidology, burnout, and compassion fatigue. The Journal publishes original research, case studies, innovations in program development, scholarly reviews, theoretical discourse, and book reviews.

Additionally, the Journal encourages the submission of philosophical reflections, responsible speculations, and commentary. As special features, the Journal provides an ongoing continuing education series providing topical reviews and updates relevant to emergency mental health as well as an ongoing annotated research updates of relevant papers published elsewhere, thus making the Journal a unique and even more valuable reference resource.

© 2005
Chevron Publishing Corporation

In accordance with the American National Standard/National Information Standards Organization (ANSI/NISO), this journal is printed on acid-free paper.

INTERNATIONAL JOURNAL OF EMERGENCY MENTAL HEALTH

Founding Editor

George S. Everly, Jr., Ph.D.

Editor

Richard L. Levenson, Jr., Psy.D.
New York, NY

Legal Editor

Gary E. Jones, Ph.D., J.D., M.P.H.
University of San Diego

Book Review Editor

Patti R. White, Ph.D.
San Diego State University

Associate Editors

Bertram S. Brown, M.D.
Former Director
National Institute of Mental Health

Raymond B. Flannery, Jr., Ph.D.
Harvard Medical School
Boston, Massachusetts

Jeffrey M. Lating, Ph.D.
Loyola College in Maryland
Baltimore, MD

Charles R. Figley, Ph.D.
Florida State University
Tallahassee, Florida

Paul J. Rosch, M.D.
President, American Institute of Stress
Yonkers, New York

Raymond H. Rosenman, M.D.
Mount Zion Hospital and Medical Center
San Francisco, California

Editorial Board

David Alexander, Ph.D., University of Aberdeen, Aberdeen, Scotland • Fahad Al-Naser, Ph.D., Director General, Social Development Office, Amiri Diwan, State of Kuwait • Joseph A. Boscarino, Ph.D., MPH, The New York Academy of Medicine, New York, NY • Gilbert Burnham, M.D., Ph.D., Johns Hopkins School of Hygiene and Public Health, Baltimore, MD • Lauren A. Dwyer, Psy.D., Yonkers, NY • Atle Dyregrov, Ph.D., Director, Center for Crisis Psychology, Solheimsvik, Norway • Murray N. Firth, Canadian Critical Incident Stress Foundation, Creemore, Ontario, Canada • Michael G. Gelles, Psy.D., U.S. Naval Criminal Investigative Service, Washington, DC • Mark Goodman, Ph.D., University of Medicine and Dentistry of New Jersey, S.O.M., West Orange, NJ • Melvin Gravitz, Ph.D., George Washington University School of Medicine, Washington, DC • Russell J. Hibler, Ph.D., Union Memorial Hospital, Baltimore, MD • A. MacNeill Horton, Jr., Ed.D., Psych. Associates, Towson, MD • Col. Richard L. Jaehne, University of Illinois Fire Service Institute, Champaign, IL • Kendall Johnson, Ph.D., San Antonio High School, Claremont, CA • Terence M. Keane, Ph.D., National Center for PTSD and Boston University School of Medicine, Boston, MA • Gerry Larsson, Ph.D., Swedish Defense College, Karlstad, Sweden • Jörg Leonhardt, M.S.W., Dipl., German Air Traffic Control, Langen, Germany • Jen Lowry, Ph.D., Loyola College in Maryland, Baltimore, MD • O. Lee McCabe, Ph.D., Johns Hopkins Medical Institution, Baltimore, MD • Margaret McEntee, R.N., Ph.D., University of Maryland School of Nursing, Baltimore, MD • Paul J. Meller, Ph.D., Department of Psychology, Hofstra University, Hempstead, NY • Theodore Millon, Ph.D., D.Sc., Harvard Medical School & University of Miami, Miami, FL • Jeffrey T. Mitchell, Ph.D., University of Maryland, Baltimore, MD • Shannon G. Mitchell, Ph.D., Johns Hopkins University, Baltimore, MD • Robert W. Motta, Ph.D., Department of Psychology, Hofstra University, Hempstead, NY • Ralph Piedmont, Ph.D., Loyola College in Maryland, Columbia, MD • Stanley Platman, M.D., University of Maryland Medical School and Helix Health System, Baltimore, MD • Albert R. Roberts, Ph.D., Rutgers University, Piscataway, NJ • Robyn Robinson, Ph.D., Director, Trauma Support Consultants, North Carlton, NSW, Australia • Glenn R. Schiraldi, Ph.D., University of Maryland, College Park, MD • SSA Donald Sheehan, FBI Academy, Quantico, VA • Martin Sherman, Ph.D., Loyola College in Maryland, Baltimore, MD • Beth Hudnall Stamm, Ph.D., Dartmouth Medical School, Hanover, NH • Susan Villani, M.D., Kennedy Krieger Institute, Baltimore, MD • Mary Beth Williams, Ph.D., LCSW, Warrenton, VA • Amos Zeichner, Ph.D., University of Georgia, Athens, GA

International Journal of Emergency Mental Health (ISSN 1522-4821) is published quarterly by Chevron Publishing Corporation, Inc., 5018 Dorsey Hall Drive, Suite 104, Ellicott City, MD 21042 USA. Fourth class postage rates paid at Ellicott City, Maryland.

- **SUBSCRIPTION PRICES:** 2005 (four issues): Institutions: \$375.00 (Foreign: \$450.00); Individuals \$73.00 (Foreign: \$100.00) payable in U.S. funds through a U.S. bank. Credit card orders may be placed by calling (410) 740-0065.
- **SINGLE ISSUES:** Available from the publisher for \$25.00 per issue.
- **CHANGE OF ADDRESS:** Please inform the publisher at least six weeks prior to any change. If possible, include old mailing label.

The Impact of an Exercise Program on Posttraumatic Stress Disorder, Anxiety, and Depression

Theresa A. Manger
Hofstra University

Robert W. Motta
Hofstra University

ABSTRACT: This preliminary study assessed the impact of a 12-session aerobic exercise program on symptoms of Posttraumatic Stress Disorder (PTSD), anxiety, and depression. Overall results show no symptom reduction during baseline phases but significant reductions in PTSD, anxiety, and depression following the exercise intervention. Reductions were maintained during a 1 month follow-up. Results suggest that exercise programs may be valuable resources for managing treatment-resistant participants with PTSD and may also have a beneficial effect on anxiety and depression. [International Journal of Emergency Mental Health, 2005, 7(1), pp. 49-57.]

KEY WORDS: exercise, posttraumatic stress disorder, anxiety, depression, PTSD, aerobic, physical exercise

There is a substantial body of research showing that physical exercise can reduce anxiety (e.g., Altchiler & Motta, 1994; Leith, 1994; Pertuzzello, Landers, Kubits, & Salazar, 1991) and depression (e.g., Fremont & Craighead, 1987; Klein et al., 1985; Mulcahy, 1998; Stein & Motta, 1992). Given that PTSD is an anxiety disorder that occurs comorbidly with depression, the purpose of this study was to determine whether physical exercise would have the beneficial effect of reducing PTSD-related symptoms and also reduce symptoms of depression and anxiety.

Symptoms of PTSD have been found to overlap symptoms of depression and generalized anxiety (Green, 1993; Kulka et al., 1990). Green, who reviewed several disaster studies, found that PTSD is often comorbid with affective

disorders. In light of this comorbidity, it is not surprising to find high rates of Major Depressive Disorder, Generalized Anxiety Disorder (GAD), and substance abuse to be common features in most disaster population studies (Kulka et al.). At times, depression and anxiety are so severe in PTSD that their diagnosis as separate disorders is warranted. The association of depression and anxiety with PTSD was so strong in one study (Smith, North, & McCool, 1989) that PTSD was occurring four times more frequently with GAD or depression than occurring by itself.

Various studies report high percentages of depressive and anxious features among those with stress-related syndromes (Horowitz, Wilner & Alvarez, 1980; Wilkinson, 1983). In terms of depressive symptoms, Horowitz et al. report that 97% of their clinical sample with PTSD felt blue and worried, 92% felt lonely, 91% reported low energy, and 89% blamed themselves. With regard to anxiety, 95% felt tense or keyed-up, 94% were nervous or shaky, and 75% felt fearful. Peterson, Prout and Schwarz (1991) note that anxiety responses have been observed by "all patient populations with PTSD symptoms" (p. 37).

Theresa A. Manger, Psy.D., Department of Psychology, Hofstra University, Hempstead, NY. Robert W. Motta, Ph.D., APBB, Professor and Chair, Department of Psychology, Hofstra University. This study is based upon the doctoral dissertation of the first author under the supervision of the second author. Correspondence concerning this article should be addressed to Theresa A. Manger, Ph.d., 8820 20th Avenue, Brooklyn, NY 11214.

The above literature and numerous other studies have provided substantial documentation for the beneficial effects of exercise on anxiety and depression. The rationale for the present study was derived from the belief that PTSD is viewed as an anxiety disorder and that anxiety and depressive disorders share a good deal of variance. Again, given the overlap between PTSD, anxiety, and depression, and given the utility of exercise in reducing both anxiety and depression, this study examined the potential impact of exercise on reducing symptoms of PTSD.

METHOD

Participants

Participants were recruited through advertisements and flyers seeking individuals willing to participate in a study investigating the relationship between trauma-related stress and exercise. A total of 26 (7 males and 19 females) met the following study inclusion criteria:

- obtain a score of at least 20, indicating mild PTSD symptoms, on the Clinician-Administered PTSD Scale for DSM-IV: Current and Lifetime Diagnostic Version (CAPS-DX; Blake et al., 1997)
- not have engaged in regular, physical exercise for more than one time a week for 30 minutes for 1 month prior to the study
- agree to not participate in any form of sustained exercise or treatment for stress (e.g., psychotropic medication, psychological treatments) during the study other than as indicated
- obtain written medical approval from a physician to participate in an exercise program so as to assure that exercising would not potentially compromise physical health.
- be willing to participate in a 10 week exercise program
- be between the ages of 18 and 65
- not be actively suicidal, exhibit psychosis or gross psychopathology such as schizophrenia
- not be an active substance abuser.

Of the initial pool of 26 participants, 9 met and were fully compliant with the research requirements. Full compliance was defined as exercising at least 12 times during the study,

refraining from exercise during follow-up, completing assessment measures at beginning of baseline, end of baseline, postintervention, and at 1-month follow-up. The most common reason for non-compliance was scheduling and transportation problems that interfered with exercise sessions.

The average ages of those who met full criteria and those who did not were both 48.1 years of age. Traumatic events provided by those meeting full criteria included having experienced a tragic death of a relative or friend, sexual or physical assault, severe accident (most common were automobile accidents), combat, severe illness or disease, injury, and other. Study participants reported experiencing between two and six traumatic events. Although time since the experience of the traumatic event varied among participants, for purposes of this study, the trauma had to have occurred at least 3 months prior to its having been reported to the experimenters.

Measures

Posttraumatic Diagnostic Scale (PDS; Foa, 1995). The PDS is a 49-item self-report scale that assists in the diagnosis of PTSD using DSM-IV (American Psychiatric Association (APA, 1994) criteria. A checklist of 11 categories of traumatic situations and one residual (other) category is used to assess Criterion A. The 17 symptoms of PTSD (Criteria B, C, and D) are assessed using a 4-point scale. Criterion E, the duration of symptoms, and Criterion F, which is relevant to impairment in a variety of life areas, are also assessed. Scores less than or equal to 10 indicate "mild" severity. Scores greater than 10 but less than 20 indicate "moderate" severity. Scores greater than 20 but less than 35 indicate "moderate to severe" severity. Scores greater than or equal to 36 indicate "severe severity." Internal consistency for the PDS and its subscales range from .78 to .92. In terms of validity, there was adequate overall agreement (79.4%-82%) between the Structured Clinical Interview for DSM-III-R (SCID; Spitzer, Williams, Gibbon, & First, 1992) and the PDS (Foa, Cashman, Jaycox, & Perry, 1997).

The Clinician-Administered PTSD Scale for DSM-IV: Current and Lifetime Diagnostic Version (CAPS-DX; Blake et al., 1997). The CAPS-DX is a structured clinical interview used to diagnose PTSD and consists of 30 items based on DSM-IV criteria for PTSD. The CAPS-DX assesses current and lifetime status of symptoms and severity over the "past

month." Seventeen core DSM-IV symptoms and eight associated symptoms of PTSD are assessed. The CAPS-DX provides frequency and intensity ratings for each symptom on a 5-point (0-4) continuum. A frequency rating of at least one and an intensity rating of at least two, together indicate that a symptom is present. Test-retest reliability ranges from .77 to .96 (Weathers et al., 1992a; 1992b). The scale has excellent sensitivity (.84-.95) and demonstrates convergent validity with the SCID ($\kappa = .78$) and other indices of PTSD as well (.77-.91).

State-Trait Anxiety Inventory (STAI-Form Y; Spielberger, Goruch, Lushene, Vaggs, & Jacobs, 1983). The STAI is a widely used self-report measure for assessing anxiety. The STAI consists of two scales, the S-Anxiety Scale (STAI-Form Y-1) and the T-Anxiety Scale (STAI-Form Y-2) that use a Likert-type (4-point) format. The S (state) scale evaluates how a person feels "right now, at this moment," while the T (trait) scale assesses how a person "generally feels" and therefore reflects more stable individual differences in anxiety-proneness. Spielberger reports high test-retest reliability for the T scale (.70 to .77) and low test-retest reliability for the S scale (.16 to .62). Low test-retest reliability here reflects the transitory nature of state anxiety. The T-Anxiety Scale correlated highly (.73-.85) with known measures of trait anxiety and has also shown good divergent validity.

The Beck Depression Scale-Second Edition (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item self-report instrument that assesses the presence and severity of depression in psychiatrically diagnosed adults and adolescents. The inventory asks respondents to choose one statement in a group of statements that best describes the way they have been "feeling during the past two weeks, including today" using a 4-point severity scale (0-3). Internal consistency, coefficient alphas of .92 and .93 were reported for outpatients and college students, respectively. Test-retest reliability was adequate ($r = .93$). Content validity was demonstrated in that the BDI-II correlated highly with the original BDI ($r = .92$) and other valid measures of depression.

Procedure

Prior to initiating the program, cooperation from local YMCAs was obtained whereby these facilities allowed participants to utilize their rooms and exercise equipment and to have all exercise supervised by YMCA staff. Individuals who responded to the advertisement for the study were tele-

phoned and read a brief statement that the purpose of the study was to investigate the relationship between physical exercise and trauma-related stress. During this contact, participants were asked about the nature of their traumatic experience and the extent to which they felt the experience(s) had interfered with their lives. If during this phone contact it appeared that a traumatic event (as defined by DSM-IV) had been experienced, participants were invited for a face-to-face interview.

During this second interview, participants were asked to provide a signed informed consent and were then administered the CAPS-DX to assess whether they had, in fact, experienced a traumatic event and to determine that they had at least a "mild" degree of PTSD. Mild PTSD is defined as a score of between 20 and 39 on the CAPS-DX. All participants were asked to have a Medical Clearance Form from the YMCA signed by their physician, to complete a demographic questionnaire, and to have a physician consent form signed to rule out any medical conditions that might restrict a person from participating in an exercise study and to approve regular exercise. Qualified participants who met inclusion criteria were then alternately assigned to either a 5 week or 10 week baseline period and were then administered the dependent measures described earlier, at the beginning and end of baseline.

Following the second baseline, participants began and engaged in an exercise program administered by YMCA staff. Both YMCA staff and study participants were provided with a manual detailing the exercise program to ensure treatment consistency. The manual required that exercisers warm up for 10 minutes (5 minutes of bicycling and 5 minutes of stretching). They then walked or jogged on a treadmill at moderate intensity for 30 minutes and then cooled down for 10 minutes (stretching and bicycling). Moderate intensity exercise was defined as engaging in treadmill activity that maintained 60 to 80% of maximum heart rate for half an hour. Participants were taught how to maintain exercise at a moderate intensity by monitoring heart rates manually or by a Polar Heart Rate Pacer Monitor, Model #1902061, which was provided on request. Participants agreed to exercise two to three times per week for 10 weeks. Participants were required to exercise a minimum of 12 sessions over 10 weeks. Assessment measures were administered at the beginning baseline, end of baseline, end of exercise intervention, and follow-up.

Participants recorded the date of their attendance, length of work-out, types of exercises in which they engaged and also recorded resting, midpoint, ending exercise, and recovery heart rates on a workout card. Participants were also asked to record on their workout card how long they spent exercising with others in order to control for social contact. Workout cards were regularly monitored to control for accuracy so as to insure treatment integrity. After 10 weeks, exercise sessions were discontinued and dependent measures were re-administered and were re-administered 1 month later as a follow-up. Participants were asked to refrain from exercising during baseline and follow-up. They were asked to inform the first author of any other outside exercise activity lasting more than 15 minutes. All participants, including dropouts, were debriefed and offered a list of referrals for more formally recognized treatment for posttraumatic stress, should they wish to seek treatment.

RESULTS

The primary study data were based on the 9 adherent participants who exercised at least 12 times over the course of 10 weeks; completed assessments at beginning and ending baselines, at postintervention and at a 1-month follow-up; and did not exercise during the follow-up period. Although the original design utilized a staggered baseline, analyses between 5 and 10 week baselines of dependent variables could not be conducted because there were only 2 participants in the final sample who were assigned to the 10 week baseline. The other 7 participants were from the 5 week baseline group. Independent sample analyses indicated that there were no significant differences, $p < .05$, on any of the dependent measures at beginning and ending baseline for the two baseline groups. Therefore, data from the two baseline groups were combined into one sample.

To determine the clinical significance of exercise on posttraumatic stress using the CAPS, the means for each assessment period were examined and matched to symptom categories provided by Weathers, Schnurr, and Ruscio (1998). Cutoff scores and symptom categories for the CAPS are as follows: scores of 0 to 19 indicate asymptomatic/few symptoms, scores 20-39 indicate mild/subthreshold PTSD, scores 40-59 indicate moderate PTSD/threshold, scores 60-79 indicate severe PTSD, and scores > 80 indicate extreme PTSD symptomatology.

Using these cutoff scores and categories, the beginning and ending baseline means of 63.67 and 59.67, respectively, indicate severe PTSD symptomology; the postintervention mean of 36.67 indicated mild PTSD/subthreshold; and the follow-up mean of 40.56 indicated moderate PTSD/threshold. At both baselines, 6 (66.7%) participants met full criteria for PTSD and 3 (33.3%) did not. At postintervention only 2 (22.2%) participants met full criteria and 7 (77.7%) no longer met full criteria. At follow-up, 4 (44.4%) met full criteria for PTSD and 5 (55.6%) did not.

It had been hypothesized that participants with at least mild levels of posttraumatic stress symptoms would show significant decreases in posttraumatic stress symptoms on the CAPS and PDS. It was found that while there were no beginning-to-end baseline differences on the CAPS, $t(8) = 1.06, p = .320$, there were significant differences between beginning baseline scores to postintervention, $t(8) = 3.49, p = .008$ and between beginning baseline and follow-up scores $t(8) = 3.30, p = .011$. Additionally, significant reductions in posttraumatic stress were revealed comparing ending baseline with postintervention and follow-up scores $t(8) = 3.40, p = .009$ and $t(8) = 3.34, p(8) = .010$, respectively (see Table 1). No significant differences were observed in comparing postintervention and follow-up scores using the CAPS, $t(8) = -.817, p = .438$.

Paired sample t-tests were also conducted for the PDS. No significant differences in posttraumatic stress comparing beginning and ending baseline scores were found $t(8) = .586, p = .574$. Significant differences were revealed indicating a reduction in posttraumatic stress comparing the beginning baseline score with postintervention and follow-up scores, $t(8) = 3.01, p = .017$ and $t(8) = 2.57, p = .033$, respectively. Additionally, a significant reduction in posttraumatic stress was revealed comparing ending baseline with follow-up $t(8) = 2.32, p = .049$. However, no significant differences between ending baseline and postintervention were found, $t(8) = 2.16, p = .063$. No significant differences were observed comparing postintervention and follow-up scores for posttraumatic stress, $t(8) = .514, p = .621$.

The author of the PDS suggests that cutoff scores "be used only to roughly estimate the relative symptom severity manifested by a given individual compared to other trauma victims" (Foa, 1995, p.10). The symptom severity rating categories and corresponding cutoff scores for the PDS are as follows: scores of 10 or lower are mild, scores between 11 and

Table 1.
Means and Standard Deviations and Symptom Category Rating for the Clinician Administered PTSD Scale for DSM-IV (CAPS-DX) Total Symptom Severity Score and Posttraumatic Stress Diagnostic Scale (PDS) (N=9)

Time	CAPS			PDS		
	Total Symptom Severity Score			Total Symptom Severity Score		
	M	SD	Category	M	SD	Category
Beginning baseline	63.67 _a	25.95	Severe PTSD	34.44 _a	16.85	Mod./Severe
Ending baseline	56.67 _a	22.51	Severe PTSD	32.67 _a	18.03	Mod./Severe
Postintervention	36.67 _b	16.52	Mild PTSD	18.89 _b	9.24	Moderate
Follow-up	40.56 _b	10.52	Mild PTSD	20.56 _b	10.24	Mod./Severe

Note:

Conditions with similar subscript are not significantly different from each other.

Conditions with dissimilar subscripts are significantly different from each other.

Statistically significant findings ($p < .05$) for CAPS: Beginning Baseline vs. Postintervention; Beginning Baseline vs. Follow-up; Ending Baseline vs. Postintervention; Ending Baseline vs. Follow-up.

Statistically significant finding ($p < .05$) for PDS: Beginning Baseline vs. Postintervention; Beginning Baseline vs. Follow-up; Ending Baseline vs. Follow-up.

20 are moderate, scores between 21 and 35 are moderate to severe, and scores > 35 are severe. Using these cutoffs and categories, the beginning baseline means of 34.44 and 32.67, respectively, were in the moderate to severe category. The postintervention mean of 18.89 was in the moderate category and the follow-up mean of 20.56 was at the lowest limit of the moderate to severe range.

It was expected that study participants would show significant reductions in depressive and anxiety symptoms following the exercise intervention. Table 2 shows beginning and ending baseline, postintervention, and follow-up data for depression and anxiety measures. No significant differences were found between beginning and ending baseline scores. On the BDI-II, beginning baseline scores were significantly different from postintervention and follow-up scores, indicating a reduction in depressive symptoms: $t(8) = 4.26, p = .003$ and $t(8) = 3.05, p = .016$, respectively. The ending baseline score was significantly different from the score at postintervention, supporting a reduction in depression: $t(8) = 2.56, p = .034$. However, the ending baseline score

was not significantly different from the follow-up even though there was a downward trend in the scores $t(8) = 2.21, p = .059$. Postintervention and follow-up scores were not significantly different from each other.

To determine the clinical significance of exercise on depressive symptoms, the means for the BDI-II were converted into a level of depression specified by Beck et al. (1996) with 0-13 indicating minimal depression, 14-19 indicating mild depression, 20-28 indicating moderate depression and 29-63 indicating severe depression. The beginning and ending baseline means indicated a mild level of depression of 17.33 and 16.33, respectively, whereas at postintervention and at 1 month follow-up means for the BDI-II were 7.5 and 8.6, indicating a minimal level of depression.

Regarding trait anxiety (see Table 2), no significant differences were shown between beginning and ending baseline on the STAI-T, $t(8) = 1.23, p = .252$. Significant differences indicating reduced trait anxiety were revealed when comparing beginning baseline scores with postintervention and follow-up scores: $t(8) = 3.07, p = .02$, and $t(8) = 2.31, p = .050$,

respectively. However, no significant differences were revealed comparing ending baseline with postintervention and follow-up scores: $t(8) = 2.29, p = .051$ and $t(8) = 1.88, p(8) = .097$, respectively. No significant differences were observed when comparing postintervention and follow-up scores for trait anxiety $t(8) = -.274, p = .80$.

In terms of clinical relevance, the standardization sample means for working female (34.79) and male adults (34.89) were more similar to the present study means at postintervention (34.44) and follow-up (35.00) and were less comparable to the present study's means at beginning (43.00) and ending baseline (40.33). Additionally, the present study's means at baseline were more comparable to a mean of 41.33 for a general medical and surgical population without psychiatric complications for trait anxiety as reported by Spielberger et al. (1983).

Table 2 also shows the data from the paired sample t-tests comparing scores taken for state anxiety at the beginning and ending of baseline, at postintervention, and

follow-up. Paired sample t-tests revealed no significant differences in state anxiety comparing beginning and ending baseline scores, $t(8) = -2.26, p = .827$. No significant differences were revealed when comparing beginning baseline scores with postintervention and follow-up scores $t(8) = 1.77, p = .114$, and $t(8) = 1.84, p = .104$, respectively. No significant difference were revealed comparing ending baseline with postintervention scores as well, $t(8) = 1.334, p = .219$, and $t(8) = 1.17, p = .276$.

Means for working female (35.20) and male adults (35.72) (Spielberger, 1983) were comparable to this study's sample means. Present study beginning (32.33) and ending (33.11) baseline, postintervention (28.22) and follow-up (25.00) means for state anxiety were much lower than the mean of 42.68 for a general medical and surgical population. Present study means were also lower than the mean of 49.02 observed for a population of male neuropsychiatric patients with an anxiety reaction (Spielberger).

Table 2.
Means and Standard Deviations, for the Beck Depression Inventory-II and the State-Trait Anxiety Scale ($N=9$)

Time	BDI-II			STAI-T		STAI-S	
	M	SD	Category	M	SD	M	SD
Beginning baseline	17.33 _a	9.68	Mild	43.00 _a	10.54	32.33 _a	11.75
Ending baseline	16.33 _{a,c}	11.90	Mild	40.33 _{a,d}	9.57	33.11 _a	15.29
Postintervention	6.66 _b	4.21	Minimal	34.44 _b	6.86	28.22 _a	8.48
Follow-up	7.78 _b	3.27	Minimal	35.00 _b	7.44	25.00 _a	4.21

Note:

For BDI II :

Similar subscripts are not significantly different from each other.

Dissimilar subscripts are significantly different from each other.

"c" indicates that ending baseline did not differ significantly from follow-up.

For STAI-T:

Similar subscripts are not significantly different from each other.

Dissimilar subscripts are significantly different from each other.

"d" indicates that there were no significant differences between ending baseline and postintervention or follow-up.

For STAI-S:

Similar subscripts are not significantly different from each other.

DISCUSSION

The results of the present study provide preliminary and promising support for the position that aerobic exercise may be an effective intervention or treatment component for post-traumatic stress. The rationale for the present study was partially based on previous research that found improvements in emotional states associated with physical exercise, e.g., depression (e.g., Doyne et al., 1987; Fremont & Craighead, 1987; Leith, 1994; Mulcahy, 1998; Plante, 1996) and anxiety (Dishman, 1994; Fremont & Craighead, 1987; Leith, 1994; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991). The efficacy of exercise in reducing anxiety and depression is relevant to PTSD, because of overlap, comorbidity, and strong relationships among these emotional states (e.g., Foa, 1995; Green, 1993; Kukla et al., 1990; Muran & Motta, 1993). The limitations inherent in this study (such as the size and nature of the sample and the lack of a placebo control or alternative treatment comparisons) suggest caution in interpreting the results.

The present study recruited persons who were not necessarily seeking mental health treatment of PTSD symptoms, who were willing to exercise, and who were not receiving traditional treatment. The sample was recruited from the community at large primarily via advertisements placed in local newspapers. The willingness to volunteer for the study may be a limiting factor in its generalizability. It is possible that those who are involved in traditional psychotherapeutic and medical treatments would be less willing to exercise and thereby derive less benefit from it. Nevertheless, current findings do show exercise to have the potential to be a useful adjunct to more traditional forms of intervention for PTSD.

Ochberg (1995) stated that community resources and nontraditional approaches such as exercise are important to consider because victims of trauma usually do not seek professional help to deal with the psychological effects of trauma. Reasons for this may include stigma toward psychological and psychotropic interventions, concern about side effects, and fear of incurring costs. An additional reason for avoiding treatment for PTSD is that those with this disorder show characteristic avoidance symptoms that interfere with seeking out intervention. Psychological interventions often involve talking with a professional about one's trauma(s), and this can trigger uncomfortable emotional and physical reactions that victims typically guard against. This was observed during the screening and interview process

with some of the participants in the present study. Some were guarded or adamant about seeking traditional treatment or rationalized why they did not do so. Additionally, some of the participants who reported having entered into psychotherapy at some point after their trauma denied any benefit or were uncomfortable during therapy, preferring to cope on their own.

Results of the present study suggest the need for investigations comparing traditional treatments for PTSD to exercise. Like the present study which used a pre- and postbaseline assessment in order to evaluate no-treatment changes, Foa, Hearst-Ikeda, and Perry (1995) did not find improvements in PTSD symptoms in wait-list controls. Despite the lack of improvement in symptoms without intervention, those with PTSD are generally resistant to intervention. It is possible that resistance to exercise interventions might not be as powerful as resistance to traditional treatments. If this is the case, then comparisons of the comparative efficacy of exercise and traditional treatments appear to be called for.

Theoretical explanations as to why exercise improves emotional and cognitive states are speculative (e.g., Biddle & Fox, 1989; Folkins & Sime, 1981; Greist et al., 1979; Hays, 1999). Yet, some of the nonspecific effects of exercise and proposed mechanisms can be reasonably supported in the present study. Nonspecific factors such as expectancy and demand characteristics do not appear plausible in that no significant changes occurred for state anxiety. If nonspecific factors were involved, one would expect across the board changes on all measures. In addition, if current results were due to expectancy effects it would seem unlikely that participants would expect that postintervention improvements should be maintained at follow-up. Also, scores were not inflated at baselines and this would tend to rule out a regression to the mean interpretation of the results. It is also unlikely that participants would plan and execute the "slight back slide effect" pattern observed for means at follow-up. Additionally, overall findings were consistent for both self-report and clinician-administered measures.

Social interaction confounds do not seem to account for effects as gains were maintained at follow-up after participants stopped going to the YMCA. Social interaction during exercise was generally discouraged and study participants were encouraged to focus on and monitor their own progress.

Participation in an exercise program is reminiscent of graded mastery skills training with built in positive self-evaluations and self-reinforcements for progress made along the way. Those engaged in exercise often feel that they are taking positive steps to improve their health or appearance and this view can lead to enhancement of self-esteem, self-efficacy, and sense of accomplishment.

The purpose of this study was not to provide an explanation for the beneficial psychological effects associated with exercise. Rather, the focus was on whether physical exercise could be of benefit in reducing or helping in the management of PTSD. Current findings, while preliminary, do suggest that physical exercise may be of benefit in managing PTSD symptoms and also suggest the need for further research in this area.

REFERENCES

- Altchiler, L. S. & Motta, R. W. (1994). Effects of aerobic and nonaerobic exercise on anxiety, absenteeism, and job satisfaction. *Journal of Clinical Psychology, 50*, 829-840.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *The Beck Depression Inventory II* (2nd ed.). San Antonio, TX: Harcourt Brace.
- Biddle, S. J. H. & Fox, K. R. (1989). Exercise and health psychology: Emerging relationships. *British Journal of Medical Psychology, 62*, 205-216.
- Blake, D. D., Weathers, F. W., Nagy, L. M., Kaloupek, D. G., Charney, D. S., & Keane, T. M., et al. (1997). *National center for PTSD clinician-administered PTSD scale for DSM-IV: CAPS-DX, current and lifetime version*. Boston: National Center for PTSD.
- Doyne, E. J., Ossip-Klein, D. J., Bowman, E. D., Osborn, K. M., McDougall-Wilson, I. B., & Neimeyer, R. A. (1987). Running versus weight lifting in the treatment of depression. *Journal of Consulting and Clinical Psychology, 55*, 748-754.
- Foa, E. B. (1995). *PDS: Posttraumatic Stress Diagnostic Scale manual*. Minneapolis, MN: National Computer Assessments.
- Foa, E. B., Cashman, L., Jaycox, L., & Perry, K. (1997). The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment, 9*, 445-451.
- Foa, E. B., Hearst-Ikeda, D. E., & Perry, K. J. (1995). Evaluation of a brief cognitive-behavioral program for the prevention of chronic PTSD in recent assault victims. *Journal of Consulting and Clinical Psychology, 63*, 948-955.
- Folkins, C. H. & Sime, W. E. (1981). Physical fitness training and mental health. *American Psychologist, 36*, 373-389.
- Fremont, J. & Craighead, L. W. (1987). Aerobic exercise and cognitive therapy in the treatment of dysphoric moods. *Cognitive Therapy and Research, 11*, 241-251.
- Green, B. L. (1993). Disasters and posttraumatic stress disorder. In J. R. Davidson & E. B. Foa (Eds.). *Posttraumatic Stress Disorder: DSM-IV and Beyond* (pp. 75-97). Washington DC: American Psychiatric Press.
- Greist, J. H., Klein, M. H., Eischens, R. R., Faris, J., Gurman, A. S., & Morgan, W. P. (1979). Running as a treatment for depression. *Comprehensive Psychiatry, 20*, 41-54.
- Hays, K. F. (1999). *Working it out: Using exercise in psychotherapy*. Washington, DC: American Psychological Association.
- Horowitz, M. J., Wilner, N. K., & Alvarez, W. (1980). Signs and symptoms of posttraumatic stress disorder. *Archives of General Psychiatry, 37*, 85-92.
- Klein, M. H., Greist, J. H., Gurman, A. S., Neimeyer, R. A., Lesser, D. P., Bushnell, N. J., et al. (1985). A comparative outcome study of group psychotherapy vs. exercise treatments for depression. *International Journal of Mental Health, 13*, 148-177.
- Kulka, R. A., Schlenger, W. E., Fairbank, J. A., Hough, R. L., Jordan, B. K., Marmar, C. R., & Weiss, D. S. (1990). *Trauma and the Vietnam War generation*. New York: Bruner/Mazel.
- Leith, L. M. (1994). *Foundations of exercise and mental health*. Morgantown, WV: Fitness Information Technology.
- Mulcahy, K. (1998). Beck's cognitive therapy and aerobic exercise for the treatment of depression. (Doctoral dissertation, Hofstra University, 1998) *Dissertation Abstracts International, 59-01B*.
- Muran, E. M., & Motta, R. W. (1993). Cognitive distortions and irrational beliefs in posttraumatic stress, anxiety, and

- depressive disorders. *Journal of Clinical Psychology*, 49, 166-176.
- Ochberg, F. M. (1995). Posttraumatic therapy. In G. S. Everly, Jr. & J. M. Lating (Eds.). *Psychotraumatology: Key Papers and Core Concepts in Posttraumatic Stress* (pp. 245-264). New York: Plenum Press.
- Peterson, K. C., Prout, M. F., & Schwarz, R. A. (1991). *Post-traumatic stress disorder: A clinician's guide*. New York: Plenum Press.
- Petruzzello, S. J., Landers, D. M., Hatfield, B., Kubitz, K. A., & Salazar, W. (1991). A meta-analysis on the anxiety-reducing effects of acute and chronic exercise: Outcomes and mechanisms. *Sports Medicine*, 11, 143-182.
- Plante, T. G. (1996). Getting physical: Does exercise help in the treatment of psychiatric disorders? *Journal of Psychosocial Nursing*, 34, 38-43.
- Smith, E. M., North, C. S., & McCool, R. E. (1989). Acute post-disaster psychiatric disorders: Identification of those at risk. *American Journal of Psychiatry*, 147, 202-206.
- Spielberger, C. D., Gorsuch, R. L., Lushene, R. E., Vagg, P. R., & Jacobs, G. A. (1983). *The State-Trait Anxiety Inventory for adults: Sampler manual, test, set scoring key*. Palo Alto, CA: Mind Garden.
- Spitzer, R. L., Williams, J. B., Gibbon, M., & First, M. B. (1992). The Structured Clinical Interview for DSM-III-R (SCID): History, rationale, and description. *Archives of General Psychiatry*, 8, 624-629.
- Stein, P. N., & Motta, R. W. (1992). Effects of aerobic and nonaerobic exercise on depression and self-concept. *Perceptual and Motor Skills*, 74, 79-89.
- Weathers, F. W., Blake, D. D., Krinsley, K. E., Haddad, W., Huska, J. A., & Keane, T. M. (1992a, November). *The Clinician-Administered PTSD Scale reliability and construct validity*. National Center for PTSD. Paper presented at the Association for Advancement of Behavioral Therapy (AABT) Annual Convention, Boston, MA.
- Weathers, F. W., Blake, D. D., Krinsley, K. E., Haddad, W., Huska, J. A., & Keane, T. M. (1992b, October). The Clinician-Administered PTSD Scale Diagnostic Version (CAPS-1): Description, use, and psychometric properties. In D. D. Blake (Chair), *An update on the Clinician-Administered PTSD Scales (CAPS-1 and CAPS-2)*. Symposium conducted at the meeting of the Traumatic Stress Studies, Los Angeles, CA.
- Weathers, F., Schnurr, P., & Ruscio, A. M. (n. d.) [CAPS Symptom Categories]. Unpublished raw data from the National Center for PTSD in Boston, Mass.
- Wilkinson, C. B. (1983). Aftermath of a disaster: The collapse of the Hyatt Regency Hotel skywalks. *American Journal of Psychiatry*, 140, 1134-1139.