Research Quarterly for Exercise and Sport

Vol. 66, No. 4, pp. 292–297

Exercise and Psychosocial Health

Stuart Biddle

Key words: exercise, psychosocial health

The rapidly expanding literature on exercise and health has always included psychological and psychosocial health, albeit initially at a rather anecdotal level of describing the "feel good effect" participants often report after exercise (Biddle & Mutrie, 1991). In reviewing the literature, exercise will not be strictly delimited. Habitual physical activity, exercise, aerobic fitness training, and sport will all be included where appropriate. Psychosocial health is also broadly defined to include psychological and social-psychological outcomes. However, there is no accepted definition in the field, although mental health usually includes positive characteristics, such as high self-esteem and positive mood (Mutrie & Biddle, 1995; Stephens, 1988), as well as reduced levels of negative affect, such as anxiety and depression (Martinsen & Stephens, 1994). More recently, as far as exercise is concerned, other aspects have also been studied (see Mutrie & Biddle, 1995), such as cognitive functioning and stress reactivity, as well as the potential negative psychological effects of exercise (e.g., dependence).

In the meta-analyses referred to below, trends are quantified across studies through the calculation of an effect size (ES) which represents the meaningfulness of exercise effects. It is calculated as the difference between experimental (treatment) and comparison (control) group means divided by the control group or pooled standard deviation (see Salazar, Petruzzello, Landers, Etnier, & Kubitz, 1993; Thomas & French, 1986). For the sake of interpretation, ESs below 0.39 will be classified as small, 0.40-0.69 as moderate, and above 0.70 as large (Thomas, Salazar, & Landers, 1991).

Anxiety and Reactions to Stress

An area that has received a great deal of attention in this area is the potential of exercise to reduce anxiety and influence stress reactivity. Petruzzello, Landers, Hatfield, Kubitz, and Salazar (1991) conducted a meta-analysis investigating state, trait, and psychophysiological measures of anxiety in relation to exercise. An overall ES for state anxiety of 0.24 (n of ESs = 207) was found. Few possible moderating variables showed strong effects. For example, there was no difference between acute and chronic exercise, between state anxiety measures taken immediately and 30 min after exercise, or between participants differing in health status or age. However, the positive effect was noted only for aerobic exercise, although the number of anaerobic studies was low (n = 13).

For trait anxiety, Petruzzello et al. (1991) found an overall ES of 0.34 (n = 62), suggesting a small effect for chronic exercise. Again, few moderating variables had a strong effect, although training programs greater than 10 weeks seemed to provide the stronger effects. Finally, using psychophysiological indicators of anxiety, Petruzzello et al. found an ES of 0.56 (n = 138), depicting a moderate effect for exercise. All psychophysiological measures had significant ESs, although blood pressure and heart rate showed smaller effects than skin, electromyographic, and central nervous system measures. All periods of exercise duration showed significant effects, although larger effects were noted for periods up to 30 min.

Overall, these results show that exercise is associated with small-to-moderate reductions in anxiety when anxiety was assessed by either physiological or self-report measures. This effect was largely independent of key moderator variables and thus leaves open the issue of underlying mechanisms of the anxiety-reducing effects of exercise.

McDonald and Hodgdon (1991) also performed a meta-analytic review, looking only at studies investigating aerobic fitness training, in contrast to Petruzzello et al. (1991) who included all types of exercise. Nevertheless, McDonald and Hodgdon's results are comparable to those of Petruzzello et al., with ESs of 0.28 for state anxiety (n = 13) and 0.25 for trait anxiety (n = 20). Both figures were derived from studies using the State-Trait

Stuart Biddle is with the School of Education at the University of Exeter in Exeter, Devon, United Kingdom.

Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970). Interestingly, when McDonald and Hodgdon investigated other measures of anxiety, the ESs were larger. For example, the tension subscale in the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971) had an ES of 0.32 (n = 20), and the anxiety subscale in the Multiple Affect Adjective Check List (MAACL; Zuckerman & Lubin, 1965) had an ES of 0.99 (n = 10). McDonald and Hodgdon also grouped psychological constructs on what they called "a rational basis" (p. 184), and one such group was an anxiety cluster from personality, anxiety, and mood scales. Here, the overall ES was 0.47. These meta-analytic results confirm those from narrative reviews (e.g., Martinsen & Stephens, 1994; Mutrie & Biddle, 1995) and recent consensus statements (International Society of Sport Psychology, 1992; Morgan & Goldston, 1987), as well as those from population surveys (Stephens, 1988).

Finally, Crews and Landers (1987) reported a beneficial effect for aerobic fitness on reactivity to psychosocial stressors. Using a meta-analysis, they found an overall ES of 0.48, but a number of methodological issues leave several key questions unanswered, such as the independent or joint effect of physical activity or physical fitness and the measurement of psychophysiological indicators of stress reactivity that are confounded with physiological measures used as independent variables. For example, it is common to use heart rate response in the calculation of aerobic fitness, yet it is also common to use heart rate as the physiological marker of stress reactivity.

Depression

Martinsen and Stephens (1994) reported that depression is reduced with exercise therapy in depressed patients, and similar results have been reported with nonclinical populations (Mutrie & Biddle, 1995). North, McCullagh, and Tran (1990) conducted a meta-analysis of exercise and depression. Their overall ES of 0.53 (n = 290) showed a moderate effect for exercise in reducing depression. In summarizing the effects, North et al. concluded that both acute (ES = 0.31, n = 26) and chronic (ES = 0.59, n = 226) exercise significantly decreased depression and that this effect was sustained through follow-up (ES = 0.50, n = 38). Those requiring medical or psychological care showed the greatest effect, but all participants also showed positive effects, including all age-groups (from high school students upwards), both women and men, and those differing in health status. All modes of exercise were effective, but the greater the duration of the exercise program, then the greater the antidepressant effect. Finally, exercise was as effective as psychotherapy, although exercise plus psychotherapy was a better antidepressant than exercise on its own (see Martinsen, 1995, for a review of exercise and depression in clinical populations).

McDonald and Hodgdon (1991) reported a meta-analysis on depression using studies investigating aerobic fitness training. Their overall ES for studies using standardized depression scales was 0.97 (n = 20), suggesting a strong antidepressant effect. McDonald and Hodgdon's depression cluster, including depression and related POMS measures, produced a mean ES of 0.55.

These meta-analytic findings are in broad agreement with narrative reviews (e.g., Morgan, 1994), as well as with population surveys (Stephens, 1988), and confirm the widely held view that physical activity has antidepressant properties, although the underlying mechanisms are still not clear (see Dunn & Dishman, 1991).

Self-Esteem and Self-Concept

Self-esteem is often seen to be the single most important measure of psychological well-being. McDonald and Hodgdon (1991) reported in their meta-analysis an ES of 0.56 (n = 41) for studies investigating the link between aerobic fitness training and self-concept (this term included most standard measures of self-perceptions, including self-esteem and self-efficacy). However, when they also included self-concept/esteem measures from personality tests to form a self-esteem cluster, the ES dropped to 0.35. In a meta-analysis of play and physical education programs for children, Gruber (1986) calculated an overall ES of 0.41 for self-esteem, suggesting a positive effect for physical activity on the self-esteem of youngsters.

Doan and Scherman (1987) analyzed the relationship between various personality measures, including self-esteem/concept, and exercise. Of 11 nonexperimental studies investigating self-concept/esteem, 7 showed a positive effect and 4 showed no effect; for quasi-experimental studies, 5 were positive and 3 showed no change, whereas of the 10 experimental studies, 5 were positive and 5 showed no change. No study reported a negative effect for exercise on self-esteem.

These findings confirm the reviews of McAuley (1994) and Sonstroem (1984) that exercise can have a positive effect on self-perceptions. Recent research (e.g., Fox & Corbin, 1989) suggests that it might be beneficial to investigate different subdomains of self-esteem, such as physical self-worth. These more specific self-perceptions are likely to be more amenable to influence through behavioral interventions (Sonstroem & Morgan, 1989).

Mood and Well-Being

Measures of mood in exercise studies that have been reported in the English language have typically involved the POMS and, in German language studies, the Befindlichkeitsskalen (BFS; Abele & Brehm, 1993). McDonald and Hodgdon (1991) also located studies using the MAACL for the study of exercise and mood. Although initially validated for use in clinical populations, the POMS has been used extensively in exercise investigations with nonclinical groups, despite it having only one positive mood subscale and not conforming to the typical two-dimensional aspects of mood of evaluation or hedonic tone (e.g., pleasant/unpleasant) and activation/arousal (see Steptoe, 1992). Abele and Brehm's (1993) use of the BFS does take into account these two dimensions. Nevertheless, allowing for these limitations, McDonald and Hodgdon reported the following ESs for POMS studies in their meta-analysis of aerobic fitness training studies (all *n*s = 20 unless stated otherwise): tension *ES* = -0.32, anger *ES* = -0.18 (*n* = 21), depression *ES* = -0.28, vigor *ES* = 0.40, fatigue *ES* = -0.27, and confusion *ES* = -0.40. The MAACL scores were much higher: anxiety *ES* = -0.99 (*n* = 10) and depression *ES* = -1.12 (*n* = 8) but may be prone to response biases (see McDonald & Hodgdon, 1991). All these figures suggest a clear relationship between exercise and positive mood, and this concurs with Abele and Brehm's review.

In addition to the more defined area of postexercise mood, other studies have investigated psychological well-being. Typically these have included many of the measures already reviewed, such as anxiety, self-esteem, and mood as well as self-confidence/efficacy. Using this broad approach, McAuley (1994) reviewed 27 studies and found that 69% supported a positive relationship between physical activity and psychological well-being.

Personality and Adjustment

McDonald and Hodgdon (1991) reported a meta-analysis of aerobic fitness training and trait personality measures from three inventories: Cattell's 16 Personality Factor Questionnaire (16PF; Cattell, Eber, & Tatsuoka, 1970), the Eysenck Personality Inventory (EPI; Eysenck & Eysenck, 1963), and the Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943). No significant effects were found for aerobic fitness training for the extraversion and neuroticism subscales of the EPI, but increased scores on the 16PF were found for intelligence (*ES* = 0.38) and self-sufficiency (*ES* = 0.30) and reduced scores for insecurity (*ES* = -0.18) and tension (*ES* = -0.38). These results are consistent with changes reported elsewhere in the literature, as well as in this paper, with regard to changes in cognitive functioning (intelligence), anxiety, mood, and psychological well-being (tension, insecurity, self-sufficiency).

Studies using the MMPI mainly involved clinical groups, so generalizing to other populations is not possible. However, 6 of the 10 clinical scales in the MMPI showed favorable changes. In addition, McDonald and Hodgdon's (1991) adjustment cluster of hypochondriasis (-), social introversion (-), intelligence (+), schizophrenia (-), and hysteria (-) yielded an overall ES of 0.33, suggesting a small positive effect for aerobic fitness training on personality and adjustment.

Doan and Scherman (1987) listed 16 studies that clearly focused on personality outcomes and found that 6 of 8 nonexperimental studies showed positive effects, but that only 3 of 6 quasi-experimental studies and 1 of 2 experimental studies showed positive effects. None showed negative effects. This area, however, is plagued with measurement and definitional problems, and caution is advised in interpreting these data. Nevertheless, within these limitations, data are supportive of favorable changes in personality and psychological adjustment, and these are largely consistent with the psychosocial changes reported elsewhere in this paper.

Cognitive Functioning

Narrative reviews on the effect of exercise on cognitive functioning, although providing some support for the benefits of exercise, conclude that the area is still unclear (Chodzko-Zajko & Moore, 1994; Tomporowski & Ellis, 1986). Thomas, Landers, Salazar, and Etnier (1994), however, reported some findings from their unpublished meta-analysis of over 100 studies, yielding nearly 700 ESs. No overall ES is reported, but results are given for several different measures of cognitive functioning. Only three are thought to be reliable because their 95% confidence interval excludes zero. These are measures of mathematical performance (*ES* = 0.48, *SD* = 1.37, *n* = 28), acuity (*ES* = 0.36, *SD* = 0.47, *n* = 59), and reaction time (*ES* = 0.15, *SD* = 0.58, *n* = 200). Greater ESs were noted for chronic exercise (*ES* = 0.32) in comparison to acute exercise (*ES* = 0.16) and for females (*ES* = 0.47) in comparison to males (*ES* = 0.15). In contrast, Kavale and Mattson's (1983) meta-analysis of perceptual-motor training and academic performance of school children showed no effect for this physical activity intervention (*ES* = 0.08). Overall, these data suggest some possible influence of exercise on selected measures of cognitive functioning, but more robust results are required to confirm this.

Negative Outcomes

Interest has recently grown in the possible negative psychosocial effects of exercise. Two areas have been studied: exercise dependence, or addiction, and exercise and eating disorders. Veale (1987) has proposed diagnostic criteria for exercise dependence and distinguishes between primary dependence, where the individual is free of eating disorders that are associated with compulsive exercising, and secondary dependence, where the individual is dependent on exercise in association with their eating disorder. In a review of exercise dependence, Polivy (1994) located only 11 studies on negative addiction and concluded that exercise could indeed be a compulsive behavior for some individuals. This could be viewed as unhealthy because the outcomes may include physical injury, excessive fatigue, and psychological ill health.

Prosocial and Moral Behaviors

"Sport builds character" is one of the oldest assertions in the sport literature. This approach to socialization through sport (Coakley, 1993) is also one of the most contentious. Unfortunately, most studies are correlational in nature and are further weakened by strong selection biases and other methodological inadequacies. Also, the definition of character is rarely standardized. However, the following summary points can be made. First, the relationship between sport participation and prosocial behaviors is not clear because both positive and negative effects have been found (see Shields & Bredemeier, 1995). For example, cooperative game structures with young children have generally been found to be beneficial in promoting prosocial behavior (e.g., Orlick, 1981), whereas classic studies in social psychology have also revealed the potential for competition to increase feelings of out-group rejection and hostility (Sherif, Harvey, White, Hood, & Sherif, 1961). Second, there appears to be a negative correlation between involvement in sport and delinquent behavior (MacMahon, 1990; Segrave, 1983; Shields & Bredemeier, 1995), although a number of competing explanations can be offered that may be unrelated to the sport or exercise context. However, MacMahon's (1990) results, showing beneficial effects for aerobic exercise on adolescent delinquents, could be explained through the positive mental health effects of exercise, particularly changes in self-esteem. Third, there is support for the view that sport legitimizes aggressive behavior, particularly in contact sports, although this may be a function of the participant's moral maturity (see Shields & Bredemeier, 1995). The relationship between sport aggression and aggression in other areas of life is not clear.

However, any relationship between physical activity and prosocial behaviors is likely to be dependent on the quality of the experience and the social climate prevailing, such as leadership behaviors. Physical activity, therefore, can be viewed as a vehicle for the development of prosocial behaviors, but the determinants of such outcomes cannot yet be delineated.

Conclusions

Contemporary sport and exercise literature supports a relationship between exercise and psychosocial health. Within the limitations of measurement, definitions, and methodology, the following conclusions can be made:

1. Exercise has a small beneficial effect on self-reported state and trait measures of anxiety.

2. Exercise has a moderate beneficial effect on psychophysiological indices of anxiety.

3. Psychophysiological reactivity to psychosocial stressors has a small-to-moderate negative association with aerobic fitness.

4. Exercise has a moderate-to-large beneficial effect on depression.

5. Exercise has shown a consistent relationship of moderate magnitude with measures of mood, self-esteem, and other indices of psychological well-being.

6. Exercise has been shown to be associated with positive changes in selected aspects of personality and psychological adjustment.

7. For some aspects of cognitive functioning, exercise may be associated with small-to-moderate beneficial effects.

8. Some individuals are compulsive about exercise and this may be viewed as psychologically or physically unhealthy; however, this may or may not be related to eating disorders.

9. There is evidence for both positive and negative effects for physical activity on prosocial behaviors, although the environment of sport and exercise has the potential for making a significant positive impact on participants.

References

Abele, A., & Brehm, W. (1993). Mood effects of exercise versus sports games: Findings and implications for well-being and health. *International Review of Health Psychology, 2,* 53-80.

Biddle, S. J. H., & Mutrie, N. (1991). *Psychology of physical activity and exercise: A health-related perspective.* London: Springer-Verlag.

Cattell, R. B., Eber, H., & Tatsuoka, M. (1970). *Handbook of the 16PF Questionnaire.* Champaign, IL: Institute of Personality and Ability Testing.

Chodzko-Zajko, W. J., & Moore, K. A. (1994). Physical fitness and cognitive functioning in aging. *Exercise and Sport Sciences Reviews, 22,* 195-220.

Coakley, J. (1993). Sport and socialization. *Exercise and Sport Sciences Reviews, 21,* 169-200.

Crews, D., & Landers, D. M. (1987). A meta-analytic review of aerobic fitness and reactivity to psychosocial stressors. *Medicine and Science in Sports and Exercise, 19*(Suppl. 5), S114-S120.

Doan, R., & Scherman, A. (1987). The therapeutic effect of physical fitness on measures of personality: A literature review. *Journal of Counseling and Development, 66,* 28-36.

Dunn, A. L., & Dishman, R. K. (1991). Exercise and the neurobiology of depression. *Exercise and Sport Sciences Reviews, 19,* 41-98.

Eysenck, H. J., & Eysenck, S. (1963). *Manual of the Eysenck Personality Inventory.* San Diego, CA: Educational and Industrial Testing Service.

Fox, K. R., & Corbin, C. B. (1989). The physical self-perception profile: Development and preliminary validation. *Journal of Sport & Exercise Psychology, 11,* 408-430.

Gruber, J. J. (1986). Physical activity and self-esteem development in children: A meta-analysis. In G. Stull & H. Eckert (Eds.), *Effects of physical activity on children: The Academy Papers No. 19* (pp. 30-48). Champaign, IL: Human Kinetics and American Academy of Physical Education.

Hathaway, S., & McKinley, J. (1943). *Minnesota Multiphasic Personality Inventory.* New York: The Psychological Corporation.

International Society of Sport Psychology. (1992). Physical activity and psychological benefits: A position statement. *The Sport Psychologist, 6,* 199-203.

Kavale, K., & Mattson, P. (1983). "One jumped off the balance beam": Meta-analysis of perceptual-motor training. *Journal of Learning Disabilities, 16,* 165-173.

MacMahon, J. R. (1990). The psychological benefits of exercise and the treatment of delinquent adolescents. *Sports Medicine, 9,* 344-351.

Martinsen, E. (1995). Exercise and mental health in clinical populations. In S. J. H. Biddle (Ed.), *European perspectives on exercise and sport psychology* (pp. 71-90). Champaign, IL: Human Kinetics.

Martinsen, E., & Stephens, T. (1994). Exercise and mental health in clinical and free-living populations. In R. K. Dishman (Ed.), *Advances in exercise adherence* (pp. 55-72). Champaign, IL: Human Kinetics.

McAuley, E. (1994). Physical activity and psychosocial outcomes. In C. Bouchard, R. J. Shephard, & T. Stephens (Eds.), *Physical activity, fitness, and health* (pp. 551-568). Champaign, IL: Human Kinetics.

McDonald, D. G., & Hodgdon, J. A. (1991). *Psychological effects of aerobic fitness training.* New York: Springer-Verlag.

McNair, D. M., Lorr, M., & Droppleman, L. F. (1971). *Manual for the Profile of Mood States.* San Diego, CA: Educational and Industrial Testing Service.

Morgan, W. P. (1994). Physical activity, fitness, and depression. In C. Bouchard, R. J. Shephard, & T. Stephens (Eds.), *Physical activity, fitness, and health* (pp. 851-867). Champaign, IL: Human Kinetics.

Morgan, W. P., & Goldston, S. E. (Eds.). (1987). *Exercise and mental health.* Washington, DC: Hemisphere.

Mutrie, N., & Biddle, S. J. H. (1995). The effects of exercise on mental health in nonclinical populations. In S. J. H. Biddle (Ed.), *European perspectives on exercise and sport psychology* (pp. 50-70). Champaign, IL: Human Kinetics.

North, T. C., McCullagh, P., & Tran, Z. V. (1990). Effect of exercise on depression. *Exercise and Sport Sciences Reviews, 18,* 379-415.

Orlick, T. (1981). Positive socialization via cooperative games. *Developmental Psychology, 17,* 126-129.

Petruzzello, S., Landers, D., Hatfield, B., Kubitz, K., & Salazar, W. (1991). A meta-analysis on the anxiety-reducing effects of acute and chronic exercise: Outcomes and mechanisms. *Sports Medicine, 11,* 143-182.

Polivy, J. (1994). Physical activity, fitness and compulsive behaviors. In C. Bouchard, R. J. Shephard, & T. Stephens (Eds.), *Physical activity, fitness, and health* (pp. 883-897). Champaign, IL: Human Kinetics.

Salazar, W., Petruzzello, S., Landers, D., Etnier, J., & Kubitz, K. (1993). Meta-analytic techniques in exercise psychology. In P. Seraganian (Ed.), *Exercise psychology: The influence of physical exercise on psychological processes* (pp. 122-145). New York: Wiley.

Segrave, J. O. (1983). Sport and juvenile delinquency. *Exercise and Sport Sciences Reviews, 11,* 181-209.

Sherif, M., Harvey, O. J., White, B. J., Hood, W. R., & Sherif, C. (1961). *Intergroup conflict and cooperation: The Robbers Cave experiment.* Norman, OK: University of Oklahoma Press.

Shields, D. L. L., & Bredemeier, B. J. L. (1995). *Character development and physical activity.* Champaign, IL: Human Kinetics.

Sonstroem, R. J. (1984). Exercise and self-esteem. *Exercise and Sport Sciences Reviews, 12,* 123-155.

Sonstroem, R. J., & Morgan, W. P. (1989). Exercise and self-esteem: Rationale and model. *Medicine and Science in Sports and Exercise, 21,* 329-337.

Spielberger, C. D., Gorsuch, R., & Lushene, R. (1970). *Manual for the State-Trait Anxiety Inventory.* Palo Alto, CA: Consulting Psychologists Press.

Stephens, T. (1988). Physical activity and mental health in the United States and Canada: Evidence from four population surveys. *Preventive Medicine, 17,* 35-47.

Steptoe, A. (1992). Physical activity and psychological well-being. In N. Norgan (Ed.), *Physical activity and health* (pp. 207-229). Cambridge, United Kingdom: Cambridge University Press.

Thomas, J. R., & French, K. E. (1986). The use of meta-analysis in exercise and sport: A tutorial. *Research Quarterly for Exercise and Sport, 57,* 196-204.

Thomas, J. R., Landers, D. M., Salazar, W. J., & Etnier, J.

(1994). Exercise and cognitive function. In C. Bouchard, R. J. Shephard, & T. Stephens (Eds.), *Physical activity, fitness, and health* (pp. 521-529). Champaign, IL: Human Kinetics.

Thomas, J. R., Salazar, W., & Landers, D. M. (1991). What is missing in $p < .05$? Effect size. *Research Quarterly for Exercise and Sport, 62,* 344-348.

Tomporowski, P. D., & Ellis, N. R. (1986). Effects of exercise on cognitive processes: A review. *Psychological Bulletin, 99,* 338-346.

Veale, D. (1987). Exercise dependence. *British Journal of Addiction, 82,* 735-740.

Zuckerman, M., & Lubin, B. (1965). *Manual for the Multiple Affect Adjective Check List.* San Diego, CA: Educational and Industrial Testing Service.

Author's Note

Correspondence concerning this article should be addressed to Stuart Biddle, PhD, School of Education, University of Exeter, Exeter, Devon EX1 2LU, United Kingdom.

E-mail: s.j.h.biddle@exeter.ac.uk