

DOSSIER

PSYCHOLOGICAL BENEFITS OF EXERCISE AND PHYSICAL ACTIVITY*

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ABSTRACT. This paper reviews contemporary literature on the psychological benefits of regular involvement in physical activity and exercise. Despite methodological problems, the evidence points towards favourable effects for physical activity for reducing anxiety, depression and reactivity to stress, as well as enhancing aspects of self-esteem. However, the mechanisms underpinning such effects are still unresolved and future research is required on the motivational effects of affective changes from exercise.

RESUMEN. Este artículo revisa la literatura contemporánea sobre los beneficios psicológicos de la práctica regular de actividad física y ejercicio. A pesar de los problemas metodológicos, la evidencia apunta a unos efectos favorables de la actividad física en la reducción de la ansiedad, depresión y reactividad al estrés, así como a una mejora de la autoestima. Sin embargo, todavía no se conocen bien los mecanismos subyacentes a tales efectos y se requiere una mayor investigación sobre los efectos motivacionales de los cambios afectivos derivados de la práctica del ejercicio físico.

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There is considerable interest in the promotion of health through physical activity (PA) and a more recent behavioural emphasis has led to the growth of research in exercise and health psychology (Biddle & Mutrie, 1991; Dishman, 1988). The purpose of this paper, therefore, is to review selected aspects of the literature dealing with the psychological issues of exercise, and specifically mental well-being.

Traditionally, exercise psychology has been concerned with the psychological determinants or correlates of exercise, such as predictors of adherence, motivational or attitudinal differences between participants and non-participants, and behavioural interventions to change exercise behaviour. Also, exercise psychology has investigated the psychological *outcomes* of PA and exercise, such as changes in mood and personality thought to be associated with involvement in PA. This paper will address the latter issue with reference to the relationship between exercise and positive mental health outcomes. For the purposes of this paper, exercise is defined as structured PA of at least moderate intensity likely to maintain or enhance physical fitness. PA refers to all other types of physical movement, such as unstructured activity (e.g. walking to work), or low intensity activity (e.g. gardening). The evidence on the psychological effects of PA is less clear than for exercise.

Exercise and positive mental health

The human interest in the interrelationship between mind and body is nothing new and ancient civilisations were known to advocate the therapeutic use of exercise for both physical and psychological purposes.

If the anecdotal evidence that exercise has beneficial emotional effects can be supported by more substantial studies, then this in itself may provide an important impetus to the promotion of exercise. The American National Institute of Mental Health concluded that:

- a) exercise is associated with reduced state anxiety;
- b) exercise has been associated with a decreased level of mild to moderate depression.
- c) long-term exercise is usually associated with reductions in traits such as neuroticism and anxiety;
- d) exercise may be an adjunct to the professional treatment of severe depression;
- e) exercise results in the reduction of various stress indices;
- f) exercise has beneficial emotional effects across all ages and in both sexes (Morgan & Goldston, 1987).

Similarly, Stephens (1988) analysed four large population surveys in the United States and Canada. From these surveys, approximately 56,000 people were investigated and Stephens specifically analysed the data on physical activity and mental health indices. Six different measures of mental health were used across the surveys.

Stephens (1988) conducted 32 analyses - eight mental health measures (two were used in two surveys and analysed separately) for each of the two sexes and two age groups split at 40 years. 25 of these analyses demonstrated a positive association between physical activity and mental health, with the remaining 7 showing no association. Stephens (1988) concluded as follows:

“the inescapable conclusion of this study is that the level of physical activity is positively associated with good mental health in the household population of the United States and Canada,

when mental health is defined as positive mood, general well-being, and relatively infrequent symptoms of anxiety and depression. This relationship is independent of the effects of education and physical health status, and is stronger for women and those age 40 years and over than for men and those under age 40. The robustness of this conclusion derives from the varied sources of evidence: four population samples in two countries over a ten years period, four different methods of operationalising physical activity and six different mental health scales" (pp. 41-42).

The question remains, of course, whether good mental health precedes or is a consequence of physical activity. Stephens (1988) suggests that while good mental health may be a necessary condition for activity, it is not a sufficient condition in itself. However, poor mental health in the form of low self-esteem and depression may well predict low activity levels.

The problem of direction of influence was also addressed in the Allied Dunbar National Fitness Survey (ADNFS, 1992). This survey assessed various physical and psychological indices associated with exercise, PA and health in over 4000 adults in England. Psychological well-being was assessed by means of a 10-item mood scale with respondents being requested to state how they felt in the past few weeks.

The results showed that there was a small but consistent difference between more and less active individuals on well-being scores across all age groups, with well-being higher in those above a predetermined 'activity threshold'. The same trends were evident when only those below a 'health threshold' were considered. This means that the trend for higher well-being scores was also located among the more active individuals even for those considered to be in 'poor health'.

The conclusions reached by Morgan and Goldston (1987), Stephens (1988), the ADNFS (1992), and others using narrative review techniques (e.g. Biddle & Mutrie, 1991; Mutrie & Biddle, in press) appear to show that a link between exercise and well-being is viable. However, recent advances in research integration, particularly through meta-analytic procedures, also allows for a quantitative summary of the literature.

A Summary of Recent Meta-Analytic Reviews of Exercise and Mental Health

There have been four recent meta-analyses in the field of exercise and mental health, two of which will be summarised here (see Biddle, 1992a). These can act as validity checks for the conclusions drawn from other reviews and surveys.

Exercise and Depression

Petruzzello, Landers, Hatfield, Kubitz, and Salazar (1991) conducted a meta-analysis on exercise and anxiety for 104 studies between 1960 and 1989. They looked at the effect on state anxiety, trait anxiety, and psychophysiological correlates of anxiety. For state anxiety, the overall effect size (ES) was 0.24, showing that exercise is associated with a small reduction in state anxiety. Whether the exercise was short -or long- term did not affect this result. Exercise was found to be no better than other anxiety-reducing treatments. Aerobic exercise was shown to have a stronger effect on state anxiety than nonaerobic exercise.

An Es of 0.34 was found for trait anxiety, suggesting a moderate reduction in trait anxiety after a long-term exercise programme. Exercise compared favourably with other treatments, and, as with state anxiety, aerobic exercise was superior in its effect compared with nonaerobic. However,

only two nonaerobic studies were located. The Es for psychophysiological indices was 0.56, thus showing the largest effect. McDonald and Hodgdon (1991), in their meta-analysis of aerobic fitness training and anxiety also found an overall ES of 0.47.

Petruzzello et al. (1991) concluded that exercise is associated with anxiety reduction, and that this appears to be independent of age and health status. No conclusion could be reached on gender differences because most studies combined samples. However, moderating variables did not generalise across the three measures of anxiety, suggesting that researchers still have some way to go before they can identify underlying mechanisms of the anxiety-reduction effect.

Exercise and Depression

A meta-analysis of the effects of exercise on depression was conducted on 80 studies by North McCullagh and Tran (1990). The overall ES of 0.53 showed that exercise did have a positive effect on depression reduction. Trait measures of depression (ES=0.91) showed stronger effects than state measures (ES=0.45). McDonald and Hodgdon (1991) calculated an overall ES of 0.55 across different measures of depression in aerobic fitness training studies. North et al. also reported that all age and sex groups showed positive effects, but with stronger effects for older and male subjects. The finding on gender contradicts Stephens (1988), so further work is required here to clarify the nature and extent of gender differences. The anti-depressant effects were found to be independent of health status and initial depression levels. Both aerobic and nonaerobic forms of exercise were found to have positive effects on depression, although only two nonaerobic studies were analysed.

Measurement Concerns

The internal validity of studies designed to investigate the link between exercise and depression have been limited. First, few studies have included a no-treatment control group which would allow the hypothesis of spontaneous remission, without treatment, to be considered. Second, most designs have not provided comparison placebo conditions. Third, studies have rarely controlled the contact time between therapist and patient, or exercise leader and client, in exercise and no exercise conditions. Similarly, the optimistic conclusion that anxiety is positively altered by exercise has rarely been convincingly demonstrated by true experimental research. Similarly, there remains the problem of clarifying the relationship between different forms of exercise and neuromuscular tension reduction, and self-reported trait, somatic and cognitive anxiety.

Exercise Intensity

Is it possible to identify the optimal intensity of exercise needed for positive mood changes? Steptoe and co-workers have investigated the influence of exercise intensity on mood.

Steptoe and Cox (1988) investigated 32 female students who participated in four exercise trials -high and low exercise intensity with and without music. Subjects were requested to pedal cycle ergometers at 50 rpm for 8 minutes with 0.5 kg (25 W) load in the low intensity condition and 2 kg (100W) in the high intensity condition. The subjects received either music or a recorded metronome through headphones.

The results showed that the sound manipulation was unrelated to post-exercise mood, but exercise intensity was. Specifically, the high intensity condition produced elevated levels of tension-anxiety, while the low intensity condition produced elevated levels of vigour and

exhilaration. These mood changes were largely unaffected by the physical fitness levels of the participants.

Similar results were shown by Steptoe and Bolton (1988) in a study of 40 women. Again subjects were requested to cycle on an ergometer, this time for 20 minutes, at both high (100 W) and low (25 W) exercise intensities. Mood state measures were taken at the beginning, during and immediately after exercise, as well as at 5 and 15 minutes after exercise.

The anxiety-tension results of Steptoe and Cox (1988) were replicated with high intensity exercise being associated with elevated scores on this factor. This elevation subsided during the recovery period. For feelings of vigour there was an interaction between fitness level and exercise intensity such that positive changes in vigour were found in the high intensity condition for high fitness subjects only. This contradicts Steptoe and Cox (1988). The relationship between exercise tolerance, exertional preferences and mood states requires further study and may hold some important answers to the issue of exercise adherence.

Mechanisms of the Exercise-Mental Health Interface

The proposed psychological benefits of physical activity and exercise have been reviewed in brief. However, it is unlikely that a single cause for this effect can be identified. Indeed, researchers are still struggling to agree on the underlying mechanisms at all, although three types of explanations are possible: biochemical, physiological, and psychological.

Biochemical mechanisms

The popular notions of a 'runner's high' and 'exercise addiction' have fuelled speculation that there may be drug-like properties associated with exercise that can be explained biochemically. The neuropeptides of interest here, and that are produced by the brain, pituitary and other tissues, are referred to as 'endogenous opiates', or substances with opiate/morphine-like properties that are produced naturally. These include 'enkaphalins' (weak opiodes), 'endorphins' ('endogenous morphine') which have stronger psychological effects, the most commonly measured and one of the strongest being beta-endorphin, and the 'dynorphins', which are the strongest but least well understood (see Dunn & Dishman, 1991; Hatfield & Landers, 1987; Sforzo, 1988; Steinberg & Sykes, 1985).

Acute bouts of exercise have been reported to elevate plasma endorphin levels and this has been implicated in mood elevation. This 'endorphin hypothesis' (Morgan & O'Connor, 1988) has received popular support, but is still far from clear from research. Although studies have reported that exercise-induced endorphin production may have analgesic properties, it has been inconsistent in finding associated mood elevation.

Several research problems exist in this area. First, although exercise has been shown to increase *plasma* levels of beta-endorphin, mood elevations occur within the central nervous system (CNS) yet are claimed to be related to changes in opiate activity. Sforzo (1988) concludes that while evidence does exist that enkaphalins may cross the blood-brain barrier, this "is probably not true of endorphins" (p. 110). However, plasma levels may be markers of CNS levels.

The second criticism is that the research has focussed on the role of beta-endorphins almost to the exclusion of other endogenous opiodes. Mood alteration may be related to these substances more than to endorphins.

Many of the studies have involved small samples in quasi-experimental designs. The reactivity of self-report data when administered in close proximity to each other may be a problem, and indeed such instruments may not be sensitive enough to mirror the affective changes that may be occurring (Hatfield & Landers, 1987).

In addition to the explanation based on opiod activity, it has also been suggested that the mental health effects of exercise are related to neurotransmitter function. Research has been reported whereby two of the brain monoamines (noradrenalin and serotonin) increase with fairly intense levels of exercise (Riggs, 1981), but that this response is reduced with increased levels of fitness.

Physiological mechanisms

It is difficult to separate potential physiological mechanisms from either biochemical or psychological explanations for the mental health effects of exercise. However, changes in muscle tension have been reported after acute bouts of exercise and this in itself may produce desirable affective changes (deVries, 1987). Similarly, mental health may result from participation in muscle strengthening exercise programmes which, directly or indirectly, may affect body attitudes and self-worth (Tucker, 1983).

A third physiological mechanism relates to work capacity. If exercise increases fitness and work capacity it is likely that participants will also be able to participate in extra leisure time activities and may experience feelings of reduced fatigue and lethargy. This could lead to feelings of vigour and improved mental health.

Psychological mechanisms

So far it has been concluded that the biochemical hypotheses, whilst plausible, remain largely unresolved. Similarly, mood elevations after exercise have not been linked in a consistent way with physiological changes. Such conclusions suggest that psychological mechanisms may account, at least in part, for the exercise-mental health relationship.

Self-Esteem

One such psychological effect that could be improved through physical activity is self-esteem. Gruber (1986) conducted a meta-analytic review of the literature on self-esteem and exercise in children and concluded that children in studies experiencing physical activity interventions displayed self-esteem scores nearly one-half of a standard deviation above children in control groups. The greatest effects were found for children with disabilities. As far as the type of physical activity was concerned, all of those studied showed positive effects, although aerobic fitness activities showed the most positive effect. It is likely that the type of activity is a subsidiary factor to the quality of the experience itself which, with children, may be heavily reliant on the teacher, coach or leader in structured activity and sport programmes.

In a review of exercise and self-esteem research, Sonstroem (1984) concluded that the methodological problems of the majority of studies prevented clear conclusions although the results do point towards the positive effects of exercise programmes on self-esteem scores.

Recent developments in the multidimensional measurement of the physical aspects of self-perception in American (Fox & Corbin, 1989) and British (Biddle et al., 1993; Page, Ashford, Biddle & Fox, 1993) populations should assist in the identification of the nature and extent of the effect of exercise on self-esteem.

Mastery

Feelings of satisfaction and mastery from the exercise experience are a plausible explanation for the mental health effects of exercise (Robbins & Joseph, 1985; Sonstroem, 1984). The development of feelings of depression, helplessness and hopelessness have been associated with failure experiences in conjunction with perceived lack of control and self-blame. Conversely, if an exercise programme allows the individual to set personal goals that are challenging and realistic, and these goals are then achieved, feelings of mastery and competence may result. Objective feedback of positive changes in fitness or activity levels, or associated health parameters may also provide appropriate mastery perceptions, particularly if such changes are attributed to personal strategies that are repeatable.

Distraction Effects

Research into exercise and mental health has rarely controlled for the possible effects of distraction from stress-inducing conditions. In other words, exercise may merely be functioning as a 'time out' strategy from day-to-day stresses and not offer any unique stress reducing property (Morgan & O'Connor, 1988).

Raglin and Morgan (1987) found that indices of stress can be reduced with exercise and quiet rest, but that the experience is a qualitatively different one with the positive effects from exercise being longer lasting.

Lifespan developmental issues

It is widely believed that people are not physically active as they might be from the standpoint of health. This has also been suggested for children - a sector of society often thought to be the fittest and most active. However, whether it is for children or adults, those promoting exercise and well-being must take into account the importance of psychological outcomes of involvement for present and future motivation. Too often it has been suggested that if children are 'inactive' then the solution is to provide them with moderate to vigorous activity, such as exercise or sport. This approach is fundamentally flawed since it assumes that such exercise will be enjoyable and will be pursued long-term. The critical issue for children is to allow them to experience activities that create positive feelings, whether it be mastery, self-esteem, enjoyment, or sense of achievement (Biddle, 1993; Goudas & Biddle, in press). The physical outcomes should be secondary since negative experience in the short-term may create inactivity in the future (Fox, 1991).

As far as adults are concerned, much has been said already. However, in understanding the motivation of adults in exercise, a process model must be adopted (Sallis & Hovell, 1990). This suggests that different factors will influence activity at different phases of the exercise process. These phases include adoption, maintenance, dropout and resumption (see Biddle, 1992a, 1992b; Biddle & Smith, 1991). Again, emphasis on the psychological outcomes may be important for understanding motivation, and this may be more important during the phases of maintenance and dropout than at other times (Ashford, Biddle & Goudas, 1993).

Promoting physical activity and quality of life

In conclusion one must not forget that one of the reasons for studying the interface between exercise and mental health is to be able to offer guidelines for the promotion of physical activity. The two major areas of exercise psychology - adherence and mental health - have for too long been considered independent issues. Humans are essentially pleasure-seekers and the longer-term health messages of exercise will ultimately be seen to be a poor second behind the more immediate physical and psychological sensations of the exercise experience in motivating physical activity across the epidemiologic spectrum.

Such a proposition suggests two major areas for intervention, future research and public health planning. First, more is needed to be known about the prescription of exercise from the point of view of mental health promotion and adherence. Second, effective short-term intervention strategies are required to sustain physical activity levels at the beginning of a programme and prior to when the possible reinforcement through improved mood and mental health may occur. This requires a reorientation of the education and training of exercise leaders and promoters. These remain challenges for sport and exercise scientists from all disciplines.

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