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## The Psychological Effects of Exercise

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Thousands of businesses in the United States have implemented programs to promote physical fitness among their employees (Falkenberg, 1987). The programs range from company-paid memberships at private health and fitness clubs to complete work site fitness facilities. These programs have been developed not only to improve and maintain employee health but also to promote psychological well-being and productivity and to reduce absenteeism, insurance claims, and stress. Recent research focusing on the use of employee fitness programs to improve work-related behaviors suggests that these programs may improve absenteeism, job satisfaction, tenure, and health care costs, especially among female employees (Baun, Bernacki, & Tsai, 1986; Bernacki & Baun, 1984; Browne, Russell, Morgan, Optenberg, & Clarke, 1984; Der-Karabetian & Gebharp, 1986; Tsai, Baun, & Bernacki, 1987).

If cost-effective outcomes result from the implementation of corporate fitness programs, it becomes important to identify the psychological and physiological changes that produce these effects. This paper reviews recent data considering possible psychological benefits of exercise.

Numerous articles have been published in the professional and popular presses extolling the virtues of regular physical exercise. The exercise boom of the 1970s saw a substantial increase in the number of people engaged in aerobic exercise, such as running and aerobic dancing (Cooper, 1982). The popular notion is that exercise enhances mood, self-concept, and general psychological well-being. People commonly report a reliance on exercise as a means of maintaining a wealth of psychological benefits.

Given these various claims, it is surprising that only a small proportion of scientific studies have examined the psychological effects of exercise among normal, nonclinically disturbed populations. Instead, the professional literature has focused on exercise as a clinical intervention. This review highlights those research studies that considered the psychological consequences of exercise in nonclinical populations since the publication of a past review article (Folkins & Sime, 1981). We excluded

studies that were severely methodologically flawed, for example, that failed to use control groups or used anecdotal case studies. Four areas of psychological functioning have been most widely examined in recent research. These include (a) psychological well-being and mood, (b) mild anxiety and stress, (c) personality and self-concept, and (d) cognition.

### Psychological Well-Being and Mood

In seeking to understand the beneficial effects of exercise and how they are produced, it is important to consider separately what happens to mood and well-being immediately after an exercise workout and what the longer-term benefits are of maintaining an exercise regimen. Two studies support the notion that physical activity improves mood and well-being immediately following an exercise workout. Lichtman and Posner (1983) studied 32 exercise class subjects at a local YMCA and 32 community college hobby class subjects matched for age. Although both exercise and hobby activities were associated with mood improvement, physical activity had a stronger association. Berger and Owen (1983) examined 36 beginning and intermediate college swim class members and 42 students attending physical education and health sciences lecture classes as controls. Results demonstrated that the swimmers experienced significantly improved mood relative to the control group immediately following their class.

Goldwater and Collis (1985) considered longer-term improvements in mood and well-being following participation in an exercise program. They selected 51 nonexercising volunteers from a university setting and randomly assigned them to an aerobic exercise group ( $n = 27$ ) or a pseudo-exercise control group ( $n = 24$ ) designed to "minimize . . . cardiovascular (conditioning) . . . while still giving the appearance of a conditioning program" (p. 177). Results demonstrated significant improvements in anxiety and well-being for the exercise group relative to the control group. A number of other studies have also supported the connection between exercise and well-being and/or mood (Brown & Lawton, 1986; Ewing & Scott, 1984; Hayes & Ross, 1986). Due to methodological considerations, however, the results and conclusions of these studies must be viewed with caution.

In summary, empirical research conducted since 1980 suggests that exercise improves mood and well-being immediately following an exercise workout. Although there is some evidence for improvement in general mood and well-being as a result of participating in a long-term exercise program, support for these long-term, cumulative effects is not as compelling as the evidence for the immediate effects of exercise on improved mood and well-being.

### Mild Anxiety, Depression, and Stress

Five studies that concentrated specifically on reductions in anxiety, depression, and/or stress among nonclinical subjects met our methodo-

logical criteria. Two used experimental manipulations by having some subjects participate in exercise programs over several weeks while the remaining subjects were assigned to control conditions (Blumenthal, Williams, Needels, & Wallace, 1982; Lobitz, Brammel, Stoll & Niccoli, 1983). Three used correlational methods to test the hypothesis that anxiety (Hayden & Allen, 1984; Sothmann & Ismail, 1984) and depression (Hayden & Allen, 1984; Lobstein, Mosbacher, & Ismail, 1983; Sothmann & Ismail, 1984) were lower in physically active adults than in sedentary ones. Four of these studies found significant reductions in stress, anxiety, and/or depression among exercisers (Blumenthal et al., 1982; Hayden & Allen, 1984; Lobitz et al., 1983; Lobstein et al., 1984).

Eight additional studies have explored the relationship between physical fitness and mild anxiety, depression, and stress (Farrell, Gustafson, Morgan, & Pert, 1987; Parent & Whall, 1984; Pauly, Palmer, Wright, & Pfeiffer, 1982; Perri & Timpler, 1985; Severtsen & Bruya, 1986; Tucker, Cole, & Freidman, 1986; Valliant & Asu, 1985; Willley & Kuncze, 1986). Although these studies have methodological flaws that preclude confidence in their results and conclusions, seven of them concluded that exercise is associated with less anxiety, depression, and/or stress. The data thus support the belief that exercise is effective in reducing negative emotional states. Here both the immediate and longer-term benefits of exercise seem apparent.

### Personality and Self-Concept

With so much attention given to findings that the hard-driving, competitive, Type A personality may be at greater risk for coronary heart disease (Friedman et al., 1986; Rosenman et al., 1975), recent studies have attempted to change aspects of this behavior pattern. Two have used aerobic exercise programs as the intervention and compared the exercise to the effects of stress management training (Lobitz et al., 1983; Roskies et al., 1986). Both studies found benefits for both the aerobic training and stress management interventions, but only Lobitz et al. found reductions in Type A behavior. Recent studies have suggested that only the potential for the hostility component (Dembroski & Costa, 1987) and the anger component (Booth-Kewley & Friedman, 1987) of the Type A personality are risk factors for coronary heart disease. Certain types of exercise (e.g., rapid, intense, energetic workouts on training machines) may work better than others to release pent-up anger and hostility. Lobitz et al. used this type of training, whereas Roskies et al. used jogging.

Other potential personality and self-concept changes following exercise have also been explored. Jasnoski and Holmes (1981) studied 103 college females before and after a 15-week aerobic training program. After statistically controlling for the effects of changes in aerobic conditioning they found that participation in the program resulted in subjects appearing less inhibited, more imaginative, and more self-assured. Greater aerobic performance was also significantly associated with more free-

thinking and less tension. These data suggest that although improved physical fitness itself is associated with changes, factors related to being involved in fitness training per se are also related to improved self-concept. Other studies also support the conclusion that being involved with and committed to an exercise program improves self-concept and self-esteem (Parent & Whall, 1984; Pauly et al., 1982; Perri & Templer, 1985; Valliant & Asu, 1985).

### Cognitive Processes

Studies comparing the test performance of subjects differing in physical fitness during and after exercise of short duration and moderate intensity (e.g., Sjöberg, 1980) support the view that cognitive function is facilitated by an increase in physical arousal. Also, physically fit individuals are better able to perform cognitive tasks while under moderate levels of physical stress than are less physically fit individuals. The effects of long-duration aerobic exercise are less clear, however. Tomporowski, Ellis, and Stephens (1985) studied subjects of low, moderate, and high fitness after each group had engaged in a strenuous run. No differential effects for any group, compared with a no-exercise control group, were found for performance on a memory task.

In summary, it appears that exercise may initially facilitate attentional processes; however, as exercise intensity and duration increase, the facilitative effects of exercise may be canceled by the debilitating effects of muscular fatigue. A full review of this literature has recently been published (Tomporowski & Ellis, 1986).

### Implications for Work Performance

If exercise improves performance, psychological well-being, mood, and self-concept and reduces mild anxiety and stress, as the research reviewed suggests, exercisers may prove to be better employees than nonexercisers. One could predict that if exercising employees are more psychologically and physically healthy relative to nonexercising employees, they would be more likely to be productive and satisfied with their jobs, be less likely to have high absenteeism or health care costs, and appear generally more well-adjusted in the workplace. But what actually changes psychologically as a function of exercise that is important for the work environment?

The short-term benefits of just having engaged in aerobic exercise seem most clearly due to the effects of aerobic activity per se. Fitness centers in the workplace make sense if employees return to work with elevated mood, less tension, and improved cognitive activity. It appears that performance in the workplace can be improved by the psychological gains derived from an aerobic exercise workout, in particular.

The long-term benefits of aerobic exercise per se for psychological well-being and performance seem less clear. Until now many investigators have considered aerobic training, resulting in a measurable increase in

oxygen uptake, to be necessary for longer-term psychological changes. However, results of two well-controlled prospective trials fail to support the hypothesis that changes in aerobic fitness levels are associated with changes in psychological health items (Hughes, 1984; King, Taylor, Haskell, & DeBusk, in press). In addition, at least one recent experimentally controlled study of the effects of systematic exercise training on clinical depression found significant reductions in depression relative to waiting list controls for participants engaging in both aerobic (running) and non-aerobic (weight lifting) activities (Doynne et al., 1987). Such findings call into question the mechanisms through which exercise may exert its influence on psychological state in the long run.

Until recently, investigators have not considered the possibility that many positive results may accrue because of psychological gains experienced from trying to get fit rather than, or at least in addition to, gains attributable to physical fitness per se. Yet the rapidity of the changes reported in most studies suggests that factors other than those stemming from improved physical conditioning are likely to be responsible. For example, perceived fitness, which is often uncorrelated with actual changes in  $\dot{V}O_2\text{max}$  (King et al., in press) may be the crucial variable leading to improved psychological changes. A similar finding in another domain showed that perceived health was a better predictor of mortality 20 years later than any of the "harder" physiological variables, including measurable cardiovascular health (Kaplan & Camacho, 1983). To a degree, the psychological meaning of engaging in exercise may be as important as the physical benefits.

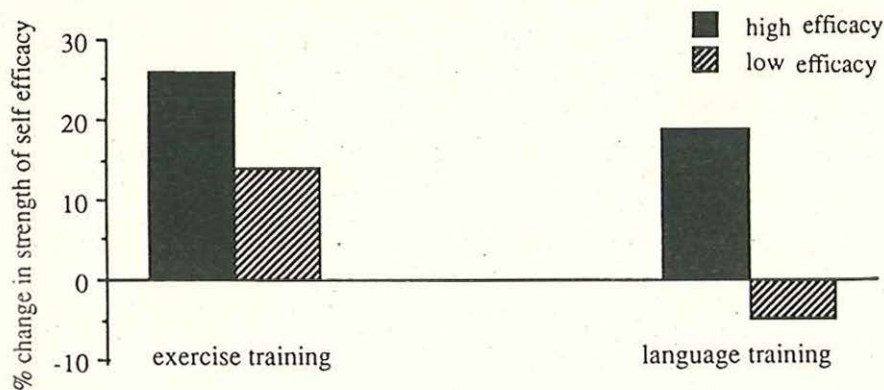
Why might these perceived variables be the crucial mediators between engaging in exercise and positive psychological effects? Among the types of thoughts that affect human motivation and action, none is more central or pervasive than those concerning personal efficacy. Perceived self-efficacy refers to beliefs in one's capabilities to execute the competencies needed to have control over events that affect one's welfare. My work (Rodin, 1986) and Bandura's (1986) have shown that self-efficacy plays a central role in human behavior. People's feelings of control affect their sense of choice regarding the courses of action they wish to pursue. When people feel efficacious, they are likely to mobilize considerably more effort, that is, to appear more motivated and to persevere in the face of obstacles and failure experiences. People who regard themselves as highly efficacious set themselves challenges and intensify their efforts when their performances fall short of their goals. Perceived control leads to a sense of task importance and commitment. Such self-assured endeavor produces accomplishments.

It is possible that viewing oneself as physically fit or having the self-image of an exerciser influences self-efficacy because exercise requires effort and commitment. Getting fit is hard work. Of course, good physical conditioning itself may enhance one's sense of efficacy, but it is possible that there is an additional gain. Engaging in exercise itself may lead to an increased sense of power and self-determination.

In order to assess these hypotheses, we selected individuals who were not aerobically fit and had not engaged in any systematic exercise program for at least 2 years and assigned them at random to one of four experimental conditions (Rodin, unpublished data). In two groups, subjects went through two exercise classes per week for 12 weeks. The other two groups had language classes of the same duration for the same number of weeks. One exercise group and one language group were given repeated information over the course of the several weeks of training that what they were doing was extremely difficult and that few people were able to achieve what they had achieved in so short a time. Other such encouragement continued throughout the sessions. This encouragement was intended to give subjects an increased sense of self-efficacy: that what they were doing was something difficult, something that they should feel proud about, and something that few others could do quite as well. No direct manipulations of efficacy were provided for the other two groups.

Measures of self-efficacy showed that the manipulations were highly successful (see Figure 1). Subjects in the high-efficacy conditions had significantly and uniformly higher levels of perceived self-efficacy from before to after the training. The results on all categories of psychological variables described earlier showed significant improvement for the high-efficacy groups. As Figure 2 demonstrates, there were substantial improvements in mood and psychological well-being, reductions in anxiety and stress, increased self-concept, and increased performance on cognitive tasks. Within the high-efficacy conditions, the effects of high experienced efficacy were greater for the exercise than for the language group on some variables.

These data suggest that high perceived control does produce the gains in psychological well-being and performance that have been studied in the exercise literature, regardless of the type of task that induces the sense of efficacy. Thus, when exercise enhances self-efficacy, its benefits may



**Figure 1.** Percent change in perceptions of self-efficacy from before to after exercise and language training. High and low efficacy groups refer to manipulations intended to influence perceived efficacy.

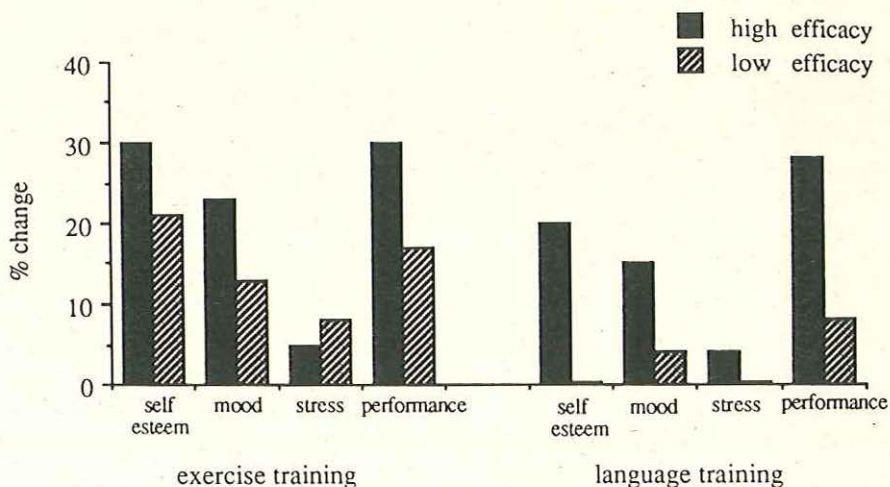


Figure 2. Percent change in measures of the effects of differential self-efficacy among subjects in the exercise training and language training groups. Measures include self-esteem, mood, stress, and performance on a memory task.

be above and beyond effects due to improvement in fitness per se. Over time, however, the two most likely become mutually reinforcing domains. As individuals feel more efficacious and better about themselves, they are willing to exercise more and to persist in exercise regimens. This can improve their overall fitness because persistence and motivation to exercise are crucial to long-term gains in conditioning. Our weight control studies suggest that even people who only do jumping jacks for 10 minutes a day three times a week are substantially more successful at weight control. Clearly we cannot attribute these effects to increased metabolic rate or increased physical expenditure alone when the type and amount of exercise is so minimal. Quite likely these people, seeing themselves as "exercisers" who were doing something about their health, actually restricted their food intake more, particularly of high-calorie foods. Thus the psychological meaning of exercise is central.

There are many other psychological benefits of exercise that have not yet been fully explored. For example, exercise may improve one's sense of optimism. Optimism, as defined by Webster's dictionary, is an inclination to anticipate the best possible outcome. Since the influence of Norman Cousins and before him Norman Vincent Peale, there has been popular interest in the power of positive thinking. But only recently has scientific attention been devoted to the possibility that optimism may confer beneficial effects. This work, like studies investigating the effects of perceived control, is based on the assumption that people's actions are greatly affected by their beliefs about the probable outcomes of these actions.



Recent evidence has suggested that a person's sense of optimism seems to promote a higher level of physical well-being. For example, studies by Recker and Wong (1985) and Scheier and Carver (1985) found that optimists report fewer physical symptoms and more positive physical, psychological, and general well-being. Indeed, Scheier and Carver and their coworkers recently showed that optimists, as determined prior to coronary artery bypass surgery, were judged by members of the cardiac rehabilitation team as showing a faster rate of recovery (described in Scheier & Carver, 1987). They used fewer pain medications, had fewer signs of intraoperative complications, and showed much better psychological adjustment to the surgical procedures. Pilot work that we are just completing suggests that exercise increases one's sense of optimism. If so, there is another mechanism whereby the psychological gains from exercise may have tangible physical health benefits.

Many other theories have also been offered to explain psychological improvements resulting from exercise. One states that exercise is a form of meditation that triggers an altered and more relaxed state of consciousness (e.g., Buffone, 1980). Another proposes that exercise is a form of biofeedback that teaches exercisers to regulate their own autonomic arousal (e.g., Hollandsworth, 1979). Another theory suggests that exercise provides distraction, diversion, or time-out from unpleasant cognitions, emotions, and behaviors (e.g., Long, 1983). It has also been suggested that exercise has beneficial effects because it produces the physical symptoms associated with anxiety and stress (e.g., sweating, hyperventilation, fatigue) without the subjective experience of emotional distress. Repeated pairing of the symptoms in the absence of associated distress results in improved psychological functioning (Hughes, 1984). Finally, the substantial social reinforcement afforded exercisers may also lead to improved psychological states (Hughes). Although I favor the power and optimism explanations, at present no single theory or group of theories has been confirmed with sufficient scientific evidence. Systematic studies are needed to test these alternative perspectives.

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