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REVISION submitted: March 4, 1999

Effects of Physical Exercise on Self-Concept and Well-Being

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Abstract

In 2 field experiments with middle-aged adults the effects of exercise on self-concept and well-being were investigated. In both experiments participants were randomly assigned to either experimental or control groups. In Experiment 1 total = 24 female and male participated in an exercise program for six months. Physical self-concept, self-esteem, and subjective well-being were assessed before and after the 6 months program. Compared with a wait-list control group (n=13), exercisers improved significantly in physical self-concept and decreased in psychosomatic complaints. In Experiment 2, 57 female and male participated in exercise programs for six months. Placebo attention groups (n = 36) were the control groups. The placebo attention group members took part either in relaxation- or back-training. Self-concept and well-being measures were assessed three times: before and after the 6 months program (running or mixed-sports program), and 6 months after the program's completion. The main effects of time showed that not only exercise but also other kinds of intervention were able to influence the dependent variables. Motor performance tests likewise indicated that participants of all groups improved over time. The results point to the fact that exercise is one, but not the only strategy to improve mental health.

Effects of Physical Exercise on Self-Concept and Well-Being

The impact of exercise on mental health is a long standing issue which became more clearly identified in the eighties. The review of Folkins and Sime (1981) was one of the first concerned with the relationship between physical exercise and mental health. Though the authors were rather critical as to the methodological rigor and the experimental design of the literature they were nevertheless confident that physical fitness training was beneficial to mental health. Since then a growing body of research aimed to demonstrate that exercise improves mental health (ISSP, 1992; McDonald & Hodgdon, 1991). Physical activity, especially aerobic exercise, is thought to be negatively associated to trait anxiety (Kerr & Vlaswinkel, 1990; Landers & Petruzzello, 1994; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991), depression (Morgan, 1994), and other indices of mental health (McAuley, 1994; McAuley & Rudolph, 1995), including self-concept (Sonstroem, 1997a; b). In a meta-analysis, Gruber (1986) demonstrated that physically active children showed higher self-esteem than inactive children. In another meta-analysis McDonald and Hodgdon (1991) likewise found significant differences in self-concept measures of exercisers and nonexercisers regardless of age and gender. However, the generalizability of the results is limited due to the fact that the majority of these studies has been done with „young adult groups, generally close to age 20“ (McDonald & Hodgdon, 1991, p. 142). Middle-aged and older adults were only rarely considered.

The two studies presented herein compared exercise groups with no exercise control groups using a pretest-posttest design. The purpose of the studies was to investigate long-term effects of exercise on self-concept and on psychological well-being. In addition, with regard to self-concept, the studies used as a framework the Exercise and Self-Esteem Model of Sonstroem and Morgan (1989) which was later revised into an expanded EXSEM (Sonstroem, Harlow, & Josephs, 1994; s. also Sonstroem, 1997b; 1998). Thus, an additional objective of the second study was to examine the hypothesized relationships within the EXSEM. It assumes that exercise first influences physical self-concept such that people develop a higher degree of physical competence and physical acceptance. This subsequently should lead to heightened feelings of global self-esteem (SE). Thus this model „represents another example of the skill development hypothesis“ of self-esteem (Sonstroem, 1997b, p. 7).

But at the same time SE could also have an influence on physical activity. The pathway from SE to activity and performance is represented by the fact that SE influences (our perception of) performance, and shapes our behaviors within the environment. This pathway corresponds to the self-enhancement hypothesis (Sonstroem, 1998, p. 134). Both causal pathways (from SE to environment and vice versa) represent a bidirectional influence of SE and behavior. SE is not only influenced by performance and success/failure, but is a causal agent itself. Thus, physical activity can not only improve perceived physical competence and this in turn self-esteem (the skill development hypothesis), SE can also influence physical activity (Sonstroem, 1998).

Both versions of the Exercise and Self-Esteem Model (cf. Sonstroem, 1997b) were tested in several studies since their publication. Sonstroem, Harlow, Gemma, and Osborne (1991) could demonstrate the validity of the older model with data from a sample of adults in their middle and later years. As suggested self-efficacy was directly related to physical competence (PC), but not to self-esteem (SE), whereas PC showed a significant path to SE. Baldwin and Courneya (1997) successfully demonstrated the usefulness of the model in a study with female breast cancer patients. Physical competence proved to be a mediator between strenuous exercise and self-esteem. Sonstroem, Harlow, and Salisbury (1993) tested the model in a longitudinal study with male swimmers. Participants were administered a test battery with a self-esteem scale, a physical competence scale, and a study-developed swimming skills scale. Significant increases were found in SE at Time 2, in PC at Time 3, and in perception of skills at Times 2 and 3. Unfortunately the increase in psychological scores could not be explained by a correspondent increase in physical performance. This might be attributable to the fact that the swimmers in this study were highly experienced and participated in competitions since years. The amount of change in physical performance was not large enough, and perhaps the study duration was not sufficient to influence trait variables.

The expanded EXSEM represents a hierarchical, four level model with self-efficacy/physical activity at the lowest (behavioral) level, physical competence as a multidimensional construct at the subdomain level, physical self-worth at the next highest (domain) level, and self-esteem at the highest level (s. also Fox & Corbin, 1989). Sonstroem, Harlow, and Josephs (1994) tested the structural relationships between the different components of the expanded EXSEM using the Physical Self-Perception Profile (PSPP) of Fox and Corbin (1989). Participants were middle-aged female aerobic dancers. Self-efficacy had significant paths to perceived sport competence, perceived physical condition, and perceived strength, but not to perceived bodily attractiveness. But the latter variable was associated rather strongly with overall physical self-worth (PSW), as was PSW with SE. The authors used the EQS program of Bentler and tested several models, with the EXSEM model having the best fit with data.

Caruso and Gill (1992) conducted two intervention studies with male and female students. The correlation patterns in both studies between the various self-concept measures offered some support for the hierarchical EXSEM. Sonstroem and Potts (1996) analyzed the relationship between physical self-concept and life adjustment indices in a sample of male and female university students. Using regression analyses the authors could show that self-perceptions of PC significantly explained associations with life adjustment. These relationships were robust across gender.

Besides changes of self-concept the experiments reported herein also addressed the effects of exercise on subjective well-being. Self-concept and well-being are both central aspects of mental health. Though the psychological benefits of exercise seem to be well established (International Society of Sport Psychology, 1992; Martinsen & Stephens, 1994; McAuley & Rudolph, 1995; McDonald & Hodgdon, 1991) questions remain.

Thus, past research has demonstrated higher effects of exercise for clinical populations than for nonclinical, ‘normal’ individuals (Raglin, 1990), and larger effects for state variables than for psychological traits, like trait anxiety, where „results are less consistent than those involving psychological states“ (Leith, 1994, p. 189).

An additional problem of past research is the experimental design (Morgan, 1997, p. 13). The majority of investigations are cross-sectional or correlational and thus nonexperimental in nature (Leith, 1994, p. 193). As the mean effect size (mES)of correlational studies in meta-analyses (mES = .41 $\pm$ .16) doubles that of experimental investigations (Dishman, 1994, p. 12), nonexperimental research may somehow overestimate the mental health effects of sport and exercise, not to mention the problem of causal inference. In addition, even studies using an experimental paradigm focus on brief interventions and short-term effects. Thus experiments using longer interventions of 12 weeks and more seem warranted (cf. Craft & Landers, 1998; McAuley & Rudolph, 1995; Petruzzello et al., 1991).

In the current two studies, the focus was on the effects of exercise programs of six months duration on relatively stable psychological variables of mental health, namely self-concept and well-being, in middle-aged adults. The experimental procedure in both studies followed a pretest-posttest design, and participants were randomly assigned to exercise and control groups. We hypothesized that the exercise groups, compared to control groups, would improve in physical self-concept, in self-esteem, and in subjective well-being after half a year of regular exercise. In addition, because of the larger sample size, Experiment 2 allowed a test of the EXSEM using Structural Equation Modeling (Bentler, 1997).

Experiment 1

Method

Participants. Participants volunteered for an exercise program offered by the senior author’s research lab. The program was advertised in local newspapers and in the university faculties. To meet the requirements of the program applicants had to be healthy, middle-aged adults with a sedentary life-style and no exercise in the past 12 months. Due to restricted gym capacities no more than forty applicants could be accepted in the exercise program. As there were more applicants than places in the program, a waiting group was established. The waiting group got no program offered, but participated in data assessment. They were promised and offered an exercise program six months later. Participants were assigned randomly to the experimental or the control group. To accomodate participants' needs more persons in the experimental than in the waiting group were accepted. Before starting all participants got information about the exercise sessions, about the research project, and voluntary participation and confidentiality were assured.

Initially the experimental group consisted of 39 adults (11 males, 28 females), 25 to 50 years of age (*M* = 37.5 yrs). During the six-month program 11 persons dropped, five of them due to psychosomatic illnesses. Accordingly, the dropouts differed from the remaining participants significantly in their level of psychosomatic complaints. Four participants of the exercise group did not complete the Time 2 questionnaires. Thus, data of the experimental group include 24 participants (17 females, 7 males, M = 36.7 yrs, SD = 8.6). The control group initially consisted of 19 adults. Six persons dropped leaving 13 control participants in the whole study (12 females, 1 male; *M* = 39.3 years, *SD* = 11.27).

Instruments. The questionnaire package focused on physical self-concept, self-esteem, and subjective well-being (Table 1).

Physical self-concept was assessed by four subscales containing 31 items rated on a 6-point, Likert-type scale ranging from <u>strongly disagree</u> (1) to <u>strongly agree</u> (6). The scales had been developed using exploratory factor analysis and item analyses. The scales are measuring positive (12 items, e.g. „I am proud of my body“, Cronbach alpha = .86) and negative physical self-worth (7 items, e.g. „I tend to conceal my body“, Cronbach alpha = .69), concerns about physical attractiveness (6 items, e.g. „I am not satisfied with my figure“, Cronbach alpha = .54), and perceived physical fitness (6 items, e.g. „I am in a good shape“, Cronbach alpha = .80). All scales had been developed for middle-aged adults (cf. Alfermann & Stoll, 1996). Self-esteem was assessed by two scales tapping social self-esteem (6 items, Cronbach alpha = .78) and global self-esteem (10 items; Cronbach alpha = .57, Deusinger, 1986).

Subjective well-being included two variables, trait anxiety and psychosomatic complaints. Trait-anxiety was assessed by a German version of the Spielberger scale (20 items; Cronbach alpha = .90, Laux, Glanzmann, Schaffner, & Spielberger, 1981), and psychosomatic complaints by a 24-item scale, (Cronbach alpha = .88, called B-L’; Zerssen, 1976). The items are rated on 4-point scales (for further details see Table 1.)

<u>Design and procedures.</u> The experimental condition consisted of a six-month exercise program taking place 60 minutes once a week. The content was mixed and designed to train various aspects

of motor performance, namely endurance, strength, coordination, and flexibility. The typical practice session started with a warming-up (aerobic exercise) followed by stretching, exercises for improving strength and coordination, and by simplified versions of games like basketball or badminton. In the last five minutes participants regularly discussed the exercise session with the instructor. The load intensity of the physical acitivity intervention reached up to 75% (submaximal work load). The control condition consisted of a waiting group with no exercise or any other supervised activity during six months. At the beginning (t_1) and six months later (t_2) data were collected from the experimental and the control groups. At Time 2 the control group began the same exercise program as the experimental group in order to fulfil our promise and the requirements of ethical considerations .

Results

In order to control for sex differences in dependent variables the data of the control and the exercise groups at Time 1 were combined. Three multivariate analyses of variance were calculated with sex as between subjects factor. One of the three comparisons (physical self-concept) reached significance, $mF(4,18) = 9.53$, $p < .001$

Further analyses indicated a significant and substantial difference in one variable, namely perceived physical fitness, $t(32) = 3.82$, $p < .01$, with males scoring higher than females (M_M

= 25.0, SD=4.65; M_F = 18.0, SD=2.69). No further sex differences in dependent variables could be found. Thus results show that male and female participants were similar in dependent variables at Time 1. The only notable exception is the sex difference in perceived physical fitness. When comparing the development of male and female participants over time with 2 (sex) by 2 (time) analyses of variance no significant interaction effects could be found. This seems to suggest that males and females did not develop differently during the six month period.

The impact of exercise on the dependent variables was tested with a series of factorial multivariate analyses of variance (2 x 2) with treatment (2) as between-subjects factor and time (2) as repeated measures factor. Physical self-concept (4 scales), self-esteem (2 scales), and subjective well-being (2 scales) each were the dependent variables. There were marginally significant interaction effects for physical self-concept, Traetment x Time $F(1, 33) = 2.09$, $p=.11$) and a significant three-way interaction for weel-being: Traetment x Time c Construct, $F(1, 33) = 6.25, p < .05$, which could be attributed to psychosomatic complaints $F(1, 31) = 8.49$, $p < .01$, $eta^2 = .22$, with nonexercisers at t_2 scoring higher but not at t_1 (Table 2).No significant effects were found for trait anxiety $F(1, 29) = 0.55$. No interaction effects were found for self-esteem. A significant main effect of treatment was found for well-being mF(2, 28) = 4.23, $p < .05$, $eta^2 = .23$, For physical self-concept there was a significant multivariate main effect of time $mF(4, 33) = 4.67$, $p < .01$, $eta^2 = .36$.). Main effects of time were found for the subscales positive physical self-worth, $F(1, 36) = 6.77$, $p \leq 01$, $eta^2 = .16$, and perceived physical fitness, $F(1, 36) = 10.24$, $p < .01$, $eta^2 = .22$.

The interaction effect „Treatment x Time" failed to reach significance, $mF(4, 33) = 1.90$. Univariate analyses of variance nevertheless revealed interaction effects on two scales showing that, compared to the control subjects, participants of the exercise group decreased in negative physical self-worth, $F(1, 36) = 4.72$, $p < .05$, $eta^2 = .12$, and in concerns about physical attractivess, $F(1, 36) = 5.23$, $p < .05$, $eta^2 = .13$ (descriptive statistics in Table 2.

A discriminant function analysis with physical self-concept and psychosomatic complaints at t_2 as predictors was able to classify 80% of the participants correctly into the two (experimental/control) groups. The remaining dependent variables could not improve the correct classification.

Discussion

The results of this experiment support the assumption that mental health may be enhanced by exercise. Contrary to predictions and to the meta-analyses of Petruzzello et al. (1991), and of McDonald and Hodgdon (1991) trait anxiety and self-esteem remained unchanged. Similar to the results of King, Taylor, Haskell, and DeBusk (1989), changes were seen primarily in those variables that seem to be most closely associated with the physical experiences during exercise. The benefits of exercise were most clearly seen in subjective measures of physical change, like physical self-concept and less so in measures of psychological change, namely self-esteem and trait anxiety. These two constructs may be more stable and enduring personality characteristics and thus less easily affected by physical exercise. A more intense exercise program, e.g. twice a week, might be needed to produce changes in self-esteem and trait anxiety.

An additional shortcoming of the design that requires some improvement is the wait-list control group. The control condition differed from the experimental condition not only in the amount of exercise but also in some other aspects, mainly attention and social support by the instructor and the group members that could have influenced the results.

In addition, larger sample size is preferable because larger sample size increase the statistical power of the data analyses (Thomas, Lochbaum, Landers, & He, 1997), and would allow to test the structural relations between the constructs of the EXSEM.

Therefore, a second experiment was conducted addressing both, the influence of exercise versus attention on the dependent measures, and the structure of the EXSEM. Exercise programs were administered twice a week, and the control groups were offered alternative intervention programs with the same amount of attention as the experimental groups. If physical activity itself was responsible for changes in self-concept and well-being, and less the attention and the social support participants got in the experimental condition, then the experimental groups should improve in the dependent variables significantly more than the control groups.

Experiment 2

Method

Participants. One hundred eighty-three middle-aged adults (50 males, 133 females) volunteered to participate in the study (M = 43.2 yrs, SD = 8.1). Similar to the first experiment the sample consisted of healthy, middle-aged adults with no exercise experience during the past 12 months. They had applied for any kind of intervention program offered by the senior author’s research lab. Subjects were informed about the programs, the experimenter controlled group assignment, and about their rights as research participants before the start of the experiment and before any measures were administered. Voluntary participation and confidentiality were assured. Nearly 50% dropped during the half-year program, leaving 93 participants (24 males and 69 females) in the full study. Attrition rates were similar between the experimental and the control conditions, and between males and females. The dropout rate was quite similar to that reported in the literature, especially when considering the randomization procedure (cf. Willis & Campbell, 1992, pp. 19-21). Multivariate and univariate analyses of variances revealed no significant differences on the dependent measures at Time 1 between dropouts and non-dropouts (p > .10). Six months after completion of the intervention programs, follow-up measurement took place. Seventy-two individuals (21 males, 51 females) were willing to participate in data assessment (cf. Table 3).

Instruments. The paper-pencil measures were identical to those in Experiment 1. In addition, trait anger was assessed by a German version of the Spielberger scale (Schwenkmezger, Hodapp, & Spielberger, 1992, cf. Table 1). Trait anger was included because of its health-related significance in previous research (Jorgensen, Johnson, Kolodziej, & Schreer, 1996; Suls, Wan, & Costa, 1995).

For reasons of program evaluation, and as a manipulation check ten motor performance tests were administered. The tests are supposed to represent a range of basic motor skills and abilities, namely endurance (fitness-index), flexibility, balance, speed (shuttle run), strength (jump and reach, throw distance, sit-ups, push-ups), and coordination (jump and throw). The fitness-index considers individual walking time on 2000m relative to the individual’s weight, height and recovering heart rate.

Design and procedures. All participants took part in an experimental or in a control group program. All programs lasted for half a year and took place twice a week for 60 minutes each. The experimental conditions consisted of two exercise groups. One group did exclusively aerobic exercise (jogging). This program was included because aerobic exercise is said to be better able to change subjective well-being than any other kind of exercise, as suggested by physiological theories explaining improvements in well-being (Hatfield, 1991). The activities of the jogging group were restricted to aerobic exercise, mainly walking and running, and occasionally cycling and swimming. The intensity was adapted to participants' level of fitness and reached up to 70% of individual maximal workload. At the start of the program a heart rate of about 130 for at least 10 minutes per lesson was aimed at, and this increased up to at least 30 minutes per lesson at the program's completion.

The other experimental condition (fitness group) consisted of the same exercise program as in Experiment 1.

The control conditions consisted of two programs which were designed to be different from exercise. But at the same time they should be able to attract volunteers who were willing to participate in any of the intervention programs offered. The programs had to be nearly equally attractive and acceptable, and they had to be interesting enough to last for half a year. Therefore, the following two control programs were implemented.

Relaxation training was chosen because meditation/relaxation is a well-known (psycho)therapeutic method and because it has been used as a control condition in the exercise literature (e.g. Bahrke and Morgan, 1978; Greist; 1987). Participants of the relaxation group learned progressive muscle relaxation and autogenic training. Each lesson consisted of 15 to 20 minutes of verbal instruction and discussion. The remainder of the session was dedicated to relaxation practice.

The second control condition (back group) was chosen because it is a quite popular activity for health prevention in the authors' country, yet with unproven validity. The back group participated in a training aimed to strengthen the back muscles and to learn to sit and move in a way that presumably is able to prevent back pain. Instruction focused as much on practice as on information about everyday behavior and back pain. Participants were randomly assigned to one of the four conditions. The only restriction was a meaningful group size which had to be adapted to the programs. Therefore, the control groups have slightly less participants than the experimental groups (cf. Table 3).

Paper-pencil measures were collected three times: at the beginning of the intervention program, six months later at program's completion, and another six months later as a follow-up. Participants' motor performance was tested at the beginning of the program and half a year later at the program's completion.

Results

Exercise and Self-Esteem Model (EXSEM). The data of the whole sample at Time 1 were analyzed in order to test the relationships between the manifest variables of the expanded version of the EXSEM. The model generally assumes that changes in perceptions of specific self-concept components generalize to changes in broader self constructs. In our study we therefore expected higher correlations between variables of adjacent levels than between variables of more remote levels. As can be seen from Table 4, the physical competence variables on the lowest level („perceived physical fitness" and „concerns about physical attractiveness") correlate only moderately with positive and negative PSW on the second level, but even lower with SE (as expected). The latter two correlate highly with SE (measured by the subscales global and social SE), as hypothesized. Based on the theoretical assumptions global self-esteem was regressed on the two PC scales and the two PSW scales. Only the two PSW scales contributed significantly to SE, explaining 45% of the variability in global SE, $F(2, 161) = 64.67$, $p < .001$ (positive PSW: $\beta = 0.34$, $T = 4.88$, $p < .001$; negative PSW: $\beta = -0.42$, $T = 6.11$, $p < .001$). With regard to social SE, the PSW scales explain 16.8% of the variability, $F(2, 161) = 16.34$, $p < .001$ (positive PSW: $\beta = 0.18$, $T = 2.09$, $p < .05$; negative PSW: $\beta = -0.24$, $T = 3.38$, $p < .001$).

Structural equation models are virtually always multiple equation models with multiple dependent as well as independent variables. The simplest extension of the regression model is the multivariate regression model, in which several dependent variables are regressed on several predictor variables. In the EXSEM, global self-esteem is the dependent variable which is supposed to be predicted by positive and negative PSW, and in turn PSW by the PC variables of physical fitness and (concern about) physical attractiveness. Using structural equation modeling a path analysis was performed (EQS version 5.6; Bentler, 1997). The results clearly confirm the EXSEM with the exception of perceived physical fitness which shows a direct (instead of an indirect) path to SE (Figure 1).

The path model in Figure 1 shows moderate loadings from PSW and one PC variable (perceived physical fitness) to global SE. Furthermore, negative PSW is moderated strongly by concerns about physical attractiveness (λ = .40). There is no direct influence from this variable to global SE (λ = -.06). The goodness of fit indices allow to accept the model, χ^2 (5, N = 178) = 4.74, p = .44, Bentler-Bonnet normed fit index (BBNFI)=.922, Bentler-Bonnet nonnormed fit index (BBNNFI) = 1.010, comparative fit index = 1.000).

Motor performance. The motor-performance variables were used as a manipulation check (control variable). We analyzed the data of the motor performance tests using 2 (time) x 4 (treatment) univariate analyses of variance. Due to the number of tests a probability level of $p < .01$ was accepted. If the experimental participants had improved more than the control groups Time x Treatment interaction effects were to be expected. There was one significant interaction effect for the endurance test (fitness-index), $F(3,66) = 4.88$, $p < .01$, $eta^2 = .20$. This result can be attributed to the fact that, as expected, the jogging group improved significantly over time and more than the other three groups. In five of the ten tests measuring strength (sit-ups, push-ups, throw distance), speed (shuttle run) and balance significant main effects of time emerged with eta^2-values between .11 (shuttle run) and .41 (push-ups). Contrary to our predictions participants' testscores obviously increased regardless of the intervention program (Table 4).

Paper-pencil measures of self-concept and well-being. Similar to Experiment 1, sex differences occurred on physical self-concept, $mF(4, 163) = 29.26$, $p < .001$, and on psychological well-being, $mF(3, 152) = 5.50$, $p < .001$. Again males scored higher on perceived physical fitness $F(1, 166) = 93.39$, $p < .001$, $eta^2 = .36$, $M = 24.8$ vs. 18.8, and lower on psychosomatic complaints $F(1, 155) = 9.94$, $p < .01$, $eta^2 = .06$, $M = 16.4$ vs. 21.7.

To examine changes in self-concept and well-being after six months intervention, data of Time 1 and Time 2 were analyzed with three multivariate 2 (time) x 4 (treatment) analyses of variance, with physical self-concept, self-esteem, and psychological well-being as dependent variables. Data of Time 2 and Time 3 were analyzed comparably.

Comparing t_1 and t_2 the results of the MANOVAS revealed main effects of time for all three constructs, physical self-concept $mF(4, 74) = 5.13$, $p < .001$, $eta^2 = .22$, self-esteem $mF(2, 80) = 3.67$, $p < .05$, $eta^2 = .08$ and well-being, $mF(3, 67) = 3.80$, $p = .01$, $eta^2 = .15$.

In univariate analyses of variance significant main effects of time were obtained for perceived physical fitness $F(1, 83) = 20.75$, $p < .001$, $eta^2 = .20$, for negative physical self-worth $F(1, 83) = 4.54$, $p < .05$, $eta^2 = .05$, for global self-esteem, $F(1, 82) = 8.47$, $p < .001$, $eta^2 = .09$, and for psychosomatic complaints, $F(1, 76) = 11.88$, $p < .001$, $eta^2 = .13$. All effects indicate that participants improved in these variables, regardless of the kind of intervention program (Table 3). This seems to suggest that all intervention programs were equally effective.

Follow-up. When comparing the second and third points of measurement with MANOVAS no additional changes over time could be revealed. All multivariate F-values were nonsignificant. This can be interpreted as indicating neither any further improvement nor deterioration in participants' mental health after the end of the intervention.

Discussion

The purpose of this experiment was to conduct a test of the hypothesized positive effects of exercise on self-concept and well-being. Instead of a wait-list control group like in

Experiment 1, in this experiment placebo attention groups were preferred. _All_ participants took part in some supervised intervention program with the same amount of invested time and attention but with quite a different amount of physical activity. Contrary to our predictions, the control groups improved as much as the experimental groups on the dependent variables of self-concept and well-being, and the effects remained even six months after the program’s completion. Though we had not expected this result in advance there are some hints in the literature which cast some doubt on the superiority of exercise for mental health prevention and which seem to corroborate our findings that other interventions may be equally effective. Examples of these successful interventions include quiet rest (Raglin & Morgan, 1987), meditation (Bahrke & Morgan, 1978), psychotherapy (cf. Craft & Landers, 1998; Greist, 1987), and relaxation training (Hautzinger & Kleine, 1995). The results of all these studies point to the fact that the treatment of controls obviously is a very sensitive issue in exercise research.

Most studies so far have not included placebo or alternative treatment groups (Morgan, 1997). But if they do exercise seems to be as equally effective as other types of intervention. For example, in their meta-analysis of the effects of exercise on depression Craft and Landers (1998) report dramatically different effect sizes (_ES_) depending on the experimental design. For wait-list control group studies (like Experiment 1 in this article) they found a large mean ES (0.77), whereas the mean ES in experiments comparing exercise to alternative interventions (like in Experiment 2) was close to zero (0.06 and 0.03). This would suggest that the beneficial effects of exercise may have been overestimated in the past due to the preponderance of wait-list control groups.

Though Ojanen (1994) has rejected the usefulness of a placebo treatment and has considerable doubt that exercise and placebo effects can be separated Morgan (1997) convincingly argues for the inclusion of placebo and of other intervention control groups. The design of Experiment 2 thus fulfils the requirement expressed by Morgan (1997) that „the question of whether or not physical activity results in psychological improvement should be expanded to include the question of 'compared to what'?" (p. 12). 'Compared to what' the results of this experiment suggest that exercise is able to improve self-concept and well-being as much as, but also no less than relaxation and back training. Exercise seems to be as good for mental health purposes as other preventive strategies, at least according to the results of this study. We thus should consider the possibility that exercise is an effective but no superior strategy to improve self-esteem and subjective well-being. But it is superior when compared to no activity, as was shown in Experiment 1 and as it has been shown in a number of meta-analyses and reviews.

But not only the kind of control group program seems to affect the impact of exercise on psychological variables. There are more moderator variables in meta-analyses suggesting that exercise effects on psychological variables may be lower than has been assumed in the past. Firstly, as was mentioned in the introduction, experimental studies produce lower effect sizes than correlational ones. This too could have contributed to the no difference result that was found here. Secondly, publication policy obviously plays an important role. Not surprisingly, studies with significant and hypothesis confirming differences are more likely to be published. Craft and Landers (1998) report that the mean ES from published studies (mES = 0.91) was nearly twice that from unpublished studies (mES = 0.49). Again this may help to explain why the psychological effects of exercise could be overestimated.

An additional limitation of this experiment lies in the sample size. This surely reduced the power of the statistical tests, in Experiment 2 in particular, because this design needs a larger number of participants than the wait-list control group design of Experiment 1, due to the presumably smaller effect size (cf. Thomas et al. 1997). Thus with a larger sample we might have detected significant and meaningful differences between experimental and control groups and thus larger effects of exercise.

The small sample size is mainly a consequence of the attrition rate in our study. In consequence, the generalizability of the results is restricted to those participants who are willing to adhere to an intervention for half a year. Presumably only those participants are willing to attend the whole program whose expectations are met and who subjectively benefit from the program. This too could have contributed to the pattern of results leaving only those individuals in the experiment who experienced positive changes in their mental health and accordingly filled in the questionnaires. Or, as Craft and Landers (1998) put it in summarizing the results of their meta-analysis on depression, „what is being observed (...) is that exercise programs produce changes in depression scores“ (p. 353).

Considering the changes in motor performance it is striking that only one of ten test results, the fitness test, corresponds to our assumptions. This is nearly as much as would be expected by chance. On the other hand, it seems reasonable to conclude that the endurance measure which includes a 2km walking time may reflect the real differences between the four groups due to the different programs. The jogging group, with its exclusive emphasis on aerobic exercise, improved significantly in endurance, but not the other groups. This is clearly in accordance with the program’s content.

Apart from that there were significant main effects of time in five of the ten motor performance tests, measuring strength, speed, and balance, an unexpected result. Obviously the participants of all groups improved in some aspects of motor performance though the interventions clearly differed in this respect. The reasons for the similarity in motor performance of all groups are unclear and desire some speculation about possible methodological artifacts. As each participant was tested twice the increase in motor performance might reflect test effects. In addition, participants were tested in groups, and this could have contributed to some competitive atmosphere leading to heightened motivation and performance, similar to the Hawthorne effect. And finally, demand characteristics, like being a „good“ subject, might have influenced the participants’ behavior. During the six months intervention period each participant had been asked to report any self-paced exercise activities per week. When using this variable as a covariate in an ANCOVA with motor performance as dependent measures the main effects of time remained. Though we cannot rule out the possibility that the participants did not always tell the truth, the fact remains that all groups improved in motor performance. At first glance this in turn might help to explain the mental health effects in this experiment, but the results of other studies (e.g. King et al, 1989; Sonstroem et al., 1993) show that changes in physical variables do not necessarily correspond to changes in psychological variables, and vice versa. Thus, expectancy effects cannot be ruled out.

The expanded EXSEM (Sonstroem et al., 1994) was partly supported. The hierarchical structure of (physical) self-concept is reflected by the correlational pattern and confirmed by the results of the path analysis (Figure 1). Different from other studies (Harter, 1996) physical attractiveness is not (highly) correlated to self-esteem. Instead, it has a significant path to physical self-worth, thus confirming the results of Sonstroem et al. (1994, s. also Sonstroem 1997a).

The only contradictory result to the predictions of the EXSEM is the direct significant path of perceived physical fitness to SE (and not to PSW). Obviously in our sample physical competence is still an important contributor to SE even when the influence of PSW is partialled out. Further research is needed to clarify if this result is specific for our sample or for this age group in general.

In summary, it may be said that the results of both experiments corroborate the assumption that exercise improves physical self-concept. Participants in the experimental groups showed significant increases in physical self-concept after six months of exercise. However, only in Experiment 2 do we find any increments in self-esteem, and these hold true for all participants, not only for the experimental groups.

Both studies differ mainly in the ‘treatment’ of the control groups. In Experiment 1 an exercise group is compared with a wait-list control group. The results show a positive effect of exercise on some dependent variables as was hypothesized and as is suggested by the literature. In Experiment 2, exercise groups are compared with treatment control groups. Though exercise again seems to influence self-concept and well-being this time the control groups show the same response pattern. Thus alternative interventions may have a similar positive effect on mental health as exercise.

References

Alfermann, D., & Stoll, O. (1996). Sport im mittleren Erwachsenenalter: Auswirkungen auf Selbstkonzept, subjektives Wohlbefinden und Stresstoleranz [Exercise in middle adulthood: Effects on self-concept, subjective well-being and stress reactivity] (Research Rep.). Leipzig, Germany: University of Leipzig, Department of Sport Psychology.

Bahrke, M.S., & Morgan, W.P. (1978). Anxiety reduction following exercise and meditation. Cognitive Therapy and Research, 2, 323-333.

Baldwin, M.K., & Courneya, K.S. (1997). Exercise and self-esteem in breast cancer survivors: An application of the exercise and self-esteem model. Journal of Sport & Exercise Psychology, 19, 347-358.

Bentler, P.M. (1997). EQS -Structural Equations Program. Update Version 5.6. Encino, CA: Multivariate Software Incorporation.

Caruso, C.M., & Gill, D.L. (1992). Strengthening physical self-perceptions through exercise. Journal of Sports Medicine and Physical Fitness, 32, 416-417.

Craft, L.L., & Landers, D.M. (1998). The effect of exercise on clinical depression and depression resulting from mental illness: A meta-analysis. Journal of Sport & Exercise Psychology, 20, 339-357.

Deusinger, I. (1986). Die Frankfurter Selbstkonzeptskalen (FSKN) [The Frankfurt self-concept scales (FSKN)]. Göttingen: Hogrefe.

Dishman, R.K. (1994). Introduction: Consensus, problems, and prospects. In R.K. Dishman (Ed.), Advances in exercise adherence (pp. 1-28). Champaign, IL: Human Kinetics.

Folkins, C.H., & Sime, W.E. (1981). Physical fitness training and mental health. American Psychologist, 36, 373-389.

Fox, K.R., & Corbin, C.B. (1989). The physical self-perception profile: Development and preliminary validation. Journal of Sport & Exercise Psychology, 14, 1-12.

Greist, J.H. (1987). Exercise intervention with depressed outpatients. In W.P. Morgan & S.E. Goldston (Eds.), Exercise and mental health (pp. 117-121). Washington: Hemisphere.

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 (pp. 30-48). Champaign, IL: Human Kinetics and American Academy of Physical Education.

Harter, S. (1996). Causes, correlates, and the functional role of global self-worth: A life-span perspective. In R.J. Sternberg & J. Kolligian, jr. (Eds.), Competence considered (pp. 67-97). New Haven: Yale University Press.

Hatfield, B.D. (1991). Exercise and mental health: The mechanisms of exercise-induced psychological states. In L. Diamant (Ed.), Psychology of sports, exercise and fitness (pp. 17-49). New York: Hemisphere.

Hautzinger, M., & Kleine, W. (1995). Sportliche Aktivitaet und psychisches Wohlbefinden: Zur Wirkung von Sport auf depressive Symptomatik [Exercise and psychological well-being: The effects of exercise on depressive symptoms]. Zeitschrift fuer Gesundheitspsychologie, 3, 255-267.

International Society of Sport Psychology (ISSP) (1992). Physical activity and psychological benefits: A position statement. International Journal of Sport Psychology, 23, 86-91.

Jorgensen, R.S., Johnson, B.T., Kolodziej, M.E., & Schreer, G.E. (1996). Elevated blood pressure and personality: A meta-analytic review. Psychological Bulletin, 120, 293-320.

Kerr, J.H., & Vlaswinkel, E.H. (1990). Effects of exercise on anxiety: A review. Anxiety Research, 3, 309-321.

King, A.C., Taylor, C.B., Haskell, W.L., & DeBusk, R.F. (1989). Influence of regular aerobic exercise on psychological health: A randomized, controlled trial of healthy middle-aged adults. Health Psychology, 8, 305-324.

Landers, D.M., & Petruzzello, S.J. (1994). Physical activity, fitness, and anxiety. In C. Bouchard, R.J. Shephard, & T. Stephens (Eds.), Physical activity, fitness, and health. International proceedings and consensus statement (pp. 868-882). Champaign, IL: Human Kinetics.

Laux, L., Glanzmann, P., Schaffner, P., & Spielberger, C.D. (1981). STAI. Das State-Trait-Angst-Inventar: Theoretische Grundlagen und Handweisung [The state-trait-anxiety inventory: Theoretical foundations and manual]. Weinheim: Beltz Testgesellschaft.

Leith, L.M. (1994). Foundations of exercise and mental health. Morgantown, WV: Fitness Information Technology.

Martinsen, E.W., & 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. International proceedings and consensus statement (pp. 551-568). Champaign, IL: Human Kinetics.

McAuley, E., & Rudolph, D. (1995). Physical activity, aging, and psychological well-being. Journal of Aging and Physical Activity, 3, 67-96.

McDonald, D.G., & Hodgdon, J.A. (1991). Psychological effects of aerobic fitness training. Research and theory. New York: Springer.

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

Morgan, W.P. (1997). Methodological considerations. In W.P. Morgan (Ed.), Physical activity and mental health (pp. 3-32). Washington, DC: Taylor & Francis.

Ojanen, M. (1994). Can the true effects of exercise on psychological variables be separated from placebo effects? International Journal of Sport Psychology, 25, 63-80.

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

Raglin, J.S. (1990). Exercise and mental health. Beneficial and detrimental effects. Sports Medicine, 9, 323-329.

Raglin, J.S., & Morgan, W.P. (1987). Influence of exercise and quiet rest on state anxiety and blood pressure. Medicine and Science in Sports and Exercise, 19, 456-483.

Schwenkmezger, P., Hodapp, V., & Spielberger, C.D. (1992). Das State-Trait-Ärgerausdrucksinventar (STAXI) [The state-trait-anger-expression inventory]. Bern: Huber.

Sonstroem, R.J. (1997a). Physical activity and self-esteem. In W.P. Morgan (Ed.), Physical activity and mental health (pp. 127-143). Washington, DC: Taylor & Francis.

Sonstroem, R.J. (1997b). The physical self-system: A mediator of exercise and self-esteem. In K.R. Fox (Ed.), The physical self: From motivation to well-being (pp. 3-26). Champaign, IL: Human Kinetics.

Sonstroem, R.J. (1998). Physical self-concept: Assessment and extermal validity. Exercise and Sport Sciences Reviews, 26, 133-144.

Sonstroem, R.J., Harlow, L.L., Gemma, L.M., & Osborne, S. (1991). Test of structural relations within a proposed exercise and self-esteem model. Journal of Personality Assessment, 56, 348-364.

Sonstroem, R.J., Harlow, L.L., & Josephs, L. (1994). Exercise and self-esteem: Validity of model expansion and exercise associations. Journal of Sport & Exercise Psychology, 16, 29-42.

Sonstroem, R.J., Harlow, L.L., & Salisbury, K.A. (1993). Path analysis of a self-esteem model across a competitive swim season. Research Quarterly in Exercise and Sport, 64, 335-342.

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

Sonstroem, R.J., & Potts, S.A. (1996). Life adjustment correlates of physical self-concepts. Medicine and Science in Sports and Exercise, 28, 619-625.

Suls, J., Wan, C.K., & Costa, P.T.jr. (1995). Relationship of trait anger to resting blood pressure: A meta-analysis. Health Psychology, 14, 444-456.

Thomas, J.R., Lochbaum, M.R., Landers, D.M., & He, C. (1997). Planning significant and meaningful research in exercise science: Estimating sample size. Research Quarterly for Exercise and Sport, 68, 33-43.

Willis, J.D. & Campbell, L.F. (1992). Exercise psychology. Champaign, IL: Human Kinetics.

Zerssen, D.v. (1976). Die Beschwerdenliste. Manual [List of complaints. Manual]. Weinheim: Beltz Testgesellschaft.

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The research reported herein was financially supported by a grant from the Ministry of Art and Science Hessen (Experiment 1), and by a grant from the Deutsche Forschungsgemeinschaft (Al 305/3-1; Experiment 2) to the first author.

The authors are indebted to Stevan Hobfoll and two anonymous reviewers for helpful comments on an earlier version of this article. Portions of the data were presented at the IXth European Congress of Sport Psychology 1995 in Brussels, Belgium, and at the XXVIth International Congress of Psychology 1996 in Montreal, Canada.

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Table 1

Cronbach α, Item-Total Correlations and Scale Ranges of the Subscales Used in Experiments 1 and 2

Instrument	Cronbach α	rpbis (range)	Scale (range)
Body-Self-Concept			
Positive physical self-worth	.86	.46 - .70	12 - 72
Negative physical self-worth	.69	.40 - .61	7 - 42
Physical fitness	.54	.37 - .56	6 - 36
Physical attractiveness	.80	.38 - .56	6 - 36
Self-esteem			
Global self-esteem	.78	.39 - .72	10 - 60
Social self-esteem	.57	.38 - .46	6 - 36
Subjective well-being			
Trait Anger	.88	.39 - .54	10 - 40
Trait anxiety	.90	.38 - .68	20 - 80
Psychosomatic complaints	.88	.33 - .70	0 - 72

Table 2

Means and Standard Deviations for the Subscales in Experiment 1 as a Function of Time and Condition

	Exercise Group (n^a = 24)		Control Group (n^a = 13)	
	M	SD	M	SD
Positive physical self-worth				
Time 1	50.54	6.74	47.57	10.26
Time 2	53.92	6.57	49.14	9.78
Negative physical self-worth				
Time 1	18.33	5.33	18.57	6.35
Time 2	17.71	4.87	20.14	5.82
Perceived physical fitness				
Time 1	20.75	4.11	19.29	4.07
Time 2	22.96	4.13	20.29	3.81
Concerns about physical attractiveness				
Time 1	19.92	6.36	21.64	8.25
Time 2	18.88	6.80	22.93	8.48
Global self-esteem				
Time 1	48.67	5.67	46.92	7.85
Time 2	49.83	5.47	47.31	7.60

(table continues)

	Exercise Group (n = 24)		Control Group (n = 13)	
	M	*SD*	*M*	*SD*
Social self-esteem				
Time 1	25.83	4.69	26.00	4.32
Time 2	26.91	4.36	25.17	4.45
Psychosomatic complaints				
Time 1	18.46	8.74	21.18	10.62
Time 2	18.10	6.49	27.82	9.31
Trait anxiety				
Time 1	37.05	9.33	40.50	12.72
Time 2	35.52	7.43	40.17	9.54

Table 3

Means and Standard Deviations for the Subscales in Experiment 2 as a Function of Time and Condition

	Experimental Condition[a]				Control Condition[a]			
	Fitness (F)		Jogging (J)		Relaxation (R)		Back (B)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Positive physical self-worth								
Time 1	51.82	8.30	51.72	6.30	51.12	8.23	54.37	6.07
Time 2	52.73	6.72	52.16	8.24	55.15	7.50	53.79	6.93
Time 3	49.82	11.05	50.27	11.35	48.43	11.75	49.13	13.82
Negative physical self-worth								
Time 1	15.52	5.64	17.40	4.71	16.80	5.76	15.37	3.96
Time 2	15.33	5.22	15.64	4.43	15.53	5.62	15.35	4.63
Time 3	16.25	7.49	18.00	6.34	18.86	9.12	16.73	10.28
Perceived physical fitness								
Time 1	21.27	4.20	20.31	4.94	20.12	3.59	21.85	4.29
Time 2	22.80	3.32	23.20	3.70	21.27	3.88	21.89	2.64
Time 3	22.74	3.31	22.74	4.22	20.71	2.89	20.88	2.47
Concerns about physical attractiveness								
Time 1	20.32	2.69	20.08	3.08	20.31	2.39	19.05	2.86
Time 2	19.27	2.99	19.64	2.81	19.80	2.24	20.70	2.81
Time 3	19.85	3.12	19.61	2.93	20.64	2.50	19.63	2.63

Table 3 (continued)

	Experimental Condition[a]				Control Condition[a]			
	Fitness (F)		Jogging (J)		Relaxation (R)		Back (B)	
	M	SD	M	SD	M	SD	M	SD
Global self-esteem								
Time 1	49.55	5.55	47.40	6.28	49.58	10.04	49.43	5.42
Time 2	51.07	5.54	48.00	6.28	50.08	8.95	51.82	4.74
Time 3	51.88	5.43	48.95	6.45	49.55	10.55	48.85	4.45
Social self-esteem								
Time 1	26.44	4.50	26.81	4.15	29.08	4.25	26.38	4.31
Time 2	26.42	3.61	26.30	4.76	29.08	2.23	27.23	3.88
Time 3	27.50	4.11	27.55	5.16	29.55	3.47	27.80	4.30
Psychosomatic complaints								
Time 1	19.69	6.73	20.00	10.99	20.92	10.82	21.30	9.66
Time 2	18.80	5.83	17.50	9.21	17.67	8.97	17.79	7.97
Time 3	16.85	7.50	17.09	10.30	17.92	11.30	18.94	10.53
Trait anger								
Time 1	18.84	4.27	17.88	4.17	17.69	3.55	18.10	3.80
Time 2	18.17	3.82	17.00	4.18	15.40	3.29	19.22	4.08
Time 3	16.82	3.45	16.83	4.33	18.00	3.55	16.69	2.82

(*table continues*)

	Experimental Condition[a]				Control Condition[a]			
	Fitness (F)		Jogging (J)		Relaxation (R)		Back (B)	
	M	SD	M	SD	M	SD	M	SD
Trait anxiety								
Time 1	36.08	8.53	38.00	11.78	32.08	9.28	33.44	8.36
Time 2	33.69	8.60	35.87	10.74	33.25	13.23	35.24	7,60
Time 3	34.67	8.99	34.09	10.64	34.23	14.12	34.06	8.23

Note. [a]Sample sizes at Time 1: n = 57 (F), 50 (J), 36 (R), 40 (B); at Time 2: n = 31 (F), 26 (J), 16 (R), 20 (B); at Time 3: n = 24 (F), 20 (J), 14 (R), 14 (B); sample sizes may vary in some scales due to missing values.

Table 4: Means and Standard Deviations for the variables of the motoric performance in Experiment 2 as a Function of Time and Condition

	Experimental Condition[a]				Control Condition[a]					
	Fitness (F)		Jogging (J)		Relaxation (R)		Back (B)		Effect TIME	
	M	SD	M	SD	M	SD	M	SD	F	p
Fit-Ind. t1	100.8	16.5	95.9	16.2	103.9	12.2	108.3	8.6	2.50	n.s.
Fit-Ind. t2	103.8	16.5	107.0	13.9	97.5	17.5	99.5	16.6		
Situps t1	14.6	5.8	14.2	3.3	12.5	2.8	12.9	3.2	38.08	P<.001
Situps t2	16.6	4.7	15.4	4.2	15.5	2.3	16.8	2.7		
Pushups t1	11.2	3.2	9.6	2.6	9.6	2.0	9.3	3.5	44.84	P<.001
Pushups t2	13.1	3.1	12.5	2.6	13.4	3.5	11.5	2.1		
Throw t1	5.9	1.2	5.8	1.7	5.1	1.0	5.9	1.1	11.59	P<.001
Throw t2	6.1	1.1	5.9	1.4	5.6	1.1	6.0	1.1		
Speed t1	11.6	1.3	12.4	0.9	12.9	0.6	11.5	0.6	7.72	P<.01
Speed t2	12.0	1.2	13.3	2.2	13.0	1.3	12.5	1.5		
Balance t1	27.9	19.3	27.0	3.5	15.5	11.1	21.8	16.0	9.66	P<.01
Balance t2	45.4	31.9	30.6	8.1	24.5	20.5	33.0	20.1		

Table 5

Pearson Correlations among EXSEM Scales at Time 1 (Experiment 1)

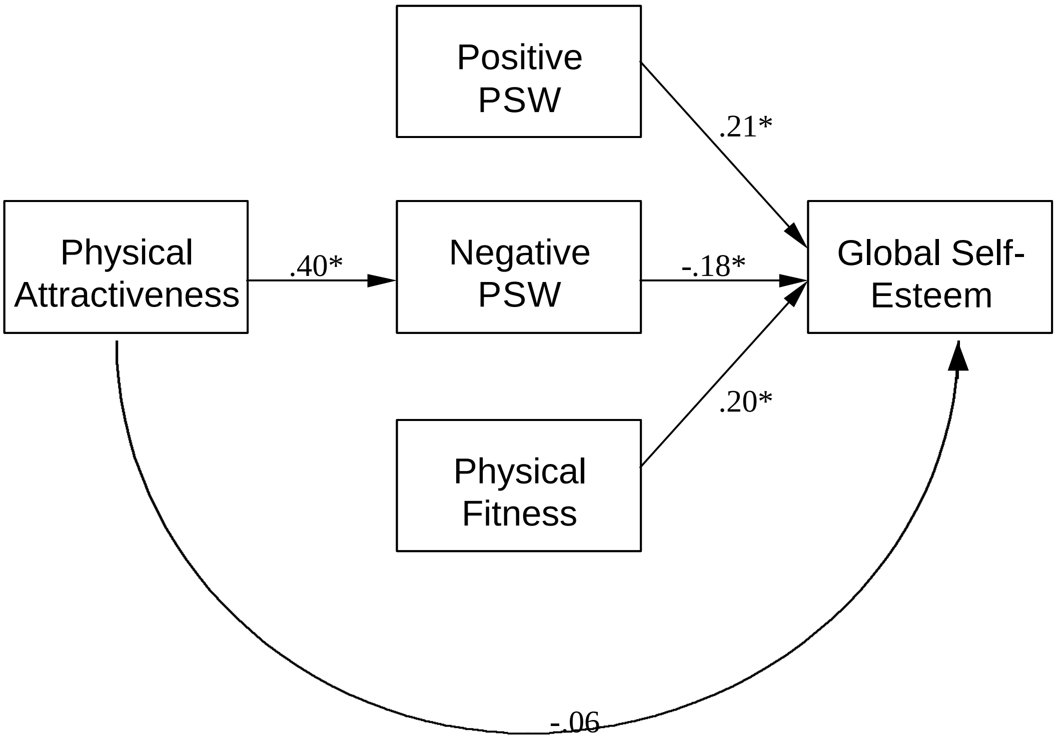
Scales	1	2	3	4	5	6
1. Perceived physical fitness	-	-.15*	.12	-.30**	.19*	.08
2. Concerns about physical attractiveness	-	-	-.09	.24**	-.13	-.07
3. Positive physical self-worth	-	-	-	-.52***	.54***	.34***
4. Negative physical self-worth	-	-	-	-	-.61***	-.39***
5. Global self-esteem	-	-	-	-	-	.48***
6. Social self-esteem	-	-	-	-	-	-

Notes. *p < .05; **p < .01; ***p < .001

Figure Caption

Figure 1. Path analysis solution.

Method: Maximum Likelihood, χ^2=4.74 (df=5), p=.44, Bentler-Bonnet Normed Fit Index (BBNFI)=.922, Bentler-Bonnet Nonnormed Fit Index = 1.010, Comparative Fit Index = 1.000; PSW = Physical self-concept


Positive PSW
.21*
Physical Attractiveness
.40*
Negative PSW
-.18*
Global Self-Esteem
.20*
Physical Fitness
-.06