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Effects of Physical Exercise on Resources Evaluation, Body

Self-Concept and Well-Being Among Older Adults

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Abstract

This study addressed the effects of a 14-week moderate physical activity program on resources evaluation, body self-concept and other health-related psychological variables among older adults. In a quasi-experimental design participants were divided into three groups and completed questionnaires twice, before (t1) and after (t2) the 14-week program. The experimental group participated in a supervised mixed exercise program of moderate intensity. The placebo attention control group took part in a foreign language course. The no intervention control group did not get any intervention/attention at all. The dependent variables were resources evaluation, body self-concept, trait anxiety, and psychosomatic complaints. Using the pretest data as covariates multivariate analyses of covariance revealed significant improvements in body self-concept in the experimental group compared to the control groups. No other significant differences could be detected. Results point to the positive effects of exercise on body self-concept even among older adults.

Key-Words: aging, physical exercise, self-concept

Effects of Physical Exercise on Resources Evaluation, Body
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Research about the effects of moderate physical activity on mental health has a long standing tradition. Early interest focused on the effects of physical activity on mental health variables like trait anxiety, depression, and other variables of well-being (e.g. Folkins & Sime, 1981). Research interest in this area contributed to a growing number of studies which showed that exercise is able to improve mental health (e.g. Landers & Petruzzello, 1994; Mc Auley, 1994; McAuley & Rudolph, 1995; McDonald & Hodgdon, 1991; Morgan, 1997). Exercise can reduce trait anxiety (Taylor, 2000; Kerr & Vlaswinkel, 1990; Landers & Petruzzello, 1994; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991) and depression (Morgan, 1994; Mutrie, 2000). Exercise can improve other variables known to be connected to mental health, like psychological well-being, self-efficacy, and self-concept (Alfermann & Stoll, 2000; Fox, 2000; McAuley, 1994; McAuley & Rudolph, 1995). In order to be effective minimum programme duration is to be eight weeks, preferably three months or longer (Leith, 1994). Most of the available evidence is based on studies using aerobic exercise, like running, cycling or walking. Less is known about the effects of non-aerobic exercise, like gymnastics or resistance training. Likewise, a majority of studies was conducted with young adults whereas middle-aged and older adults were less often considered.

Therefore there is scope for better understanding how older people benefit from exercise programs.

Most of the studies among the elderly focused on cognitive functional variables like concentration and memory tasks (Chodzko-Zajko & Moore, 1994). However, sport and exercise could have additional protective functions. Older people are often victims of traumatic loss of physical (age-related decreasing cardio-pulmonal and motor-functional abilities) as well as psycho-social resources (e.g. loss of self-confidence because of retirement, loss of spouse). Physical activity programs offer: 1) the enhancement of physical and motor-functional abilities; 2) a social and supportive environment with „similar others“, namely older people with comparable problems; and 3) the possibility to gain self-confidence by experiencing successful coping with physical demands. This success may in turn optimize general resources evaluation which is associated with improved stress resistancy. Stoll (1999) showed improvements of resources evaluations (in terms of increased resource gains) connected with decreasing trait anxiety and psychosomatic complaints of elderly patients who were treated with physical therapy interventions. To our knowledge this is the first study to show that exercise is not only able to improve mental health but also to increase psychological resources.

The Conservation of Resources theory (COR theory) suggests that psychological distress following a traumatic experience

will be predicted by the extent of resource loss, e.g. material, financial resources and/or intra-/interindividual resources (in summary Hobfoll, 1998). Furthermore these losses can be stopped by utilizing other intact resources to regain what was lost (Hobfoll, 1988, 1989). The present study extends past research by applying COR theory and measurement scales to the field of physical exercise. Its focus is on the effects of an exercise program of 14 weeks duration on resources and on relatively stable psychological variables of mental health, namely body self-concept and well-being, in older adults. According to the literature a three months programme should be long enough to provoke the expected effects (cf. Leith, 1994). The experimental procedure in this study follows a quasi-experimental pretest-posttest design. Participants were not randomly assigned to exercise and control groups, but according to their own preference. We hypothesized that the exercise groups, compared to the no intervention and to the placebo attention control groups, would improve in body self-concept, resources evaluations, and decrease in negative well-being (decreased trait anxiety and psychosomatic complaints) after 14 weeks of regular health-oriented exercise.

Method

Participants

Initially, 101 individuals (84 women, 17 men) enrolled in the project. The higher number of women is partly due to the higher life expectancy of women partly due to an obviously

higher interest of women in the offered activities. The minimum age of the individuals was limited to 50 years. Of these 50 individuals were recruited for the exercise program following an advertisement in a local newspaper and in a meeting-centre for senior citizens in Leipzig, another 22 for the English group, and 29 for the control group (s. below). Before starting all participants got information about the research project, voluntary participation and confidentiality were assured. Participants were thanked, but no money was paid for their involvement. In the period between pre- and posttest 13 individuals dropped leaving 88 persons in the study. Analyses of variance with age as dependent and group as independent variable revealed no significant age differences between the three groups. The male:female ratio was slightly different between the groups at Time 1, but not at Time 2 (Table 1).

Insert Table 1 about here

Materials

The questionnaire package focused on resources evaluation, body self-concept, and subjective well-being (see Table 2).

Insert Table 2 about here

Resources evaluation was measured by a German version of the Conservation of Resources-Evaluation (COR-E), originally published by Hobfoll (1989). The original instrument was modified in accordance with the demands of older people. The final list includes 25 items with material (e.g. „an appropriate apartment“, „furniture“), financial („health insurance“, „pension“), health-related („personal health“, „health of family members“), social (e.g. „friends“, „good relations to my children“) and coping resources („the ability to solve problems“, „self-discipline“). Exploratory factor analysis suggested a four-factor solution. The resulting four subscales include social resources, financial and health-related resources, material resources, and coping resources (Table 2). Participants responded to the COR-E items on 5-point Likert-type scales in three dimensions (importance, loss, gain) from 1 (no importance/loss/gain) to 4 (Extreme amount of importance/loss/gain). Individuals respond to all three items. Finally an index for each COR-E dimension is calculated as following: Net Gain = Importance X Gain, Net Loss = Importance X Loss, Index = Net gain - Net Loss. This procedure leads to ranges between -24 and +24.

Body self-concept was assessed by four subscales containing 31 items rated on a 6-point, Likert-type scale ranging from strongly disagree (1) to strongly agree (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's alpha = .86) and negative physical self-worth (7 items, e.g. „I tend to conceal my body,“ Cronbach's alpha = .69), concerns about physical attractiveness (6 items, e.g. „I am not satisfied with my figure,“ Cronbach's alpha = .54), and perceived physical fitness (6 items, e.g. „I am in a good shape,“ Cronbach's alpha = .80). The scales had been developed for middle-aged adults (cf. Alfermann & Stoll, 2000) and had been pretested with seniors in our lab.

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's alpha = .90, Laux, Glanzmann, Schaffner, & Spielberger, 1981), and psychosomatic complaints by the 24-item scale „B-L“ (Zerssen, 1976). The items (e.g. „sometimes headaches“, „feeling of sickness“, „cold feet“) are rated on 4-point scales (for further details see Table 2).

Design and Procedures

The experimental condition (EC) consisted of a 14 week exercise program with 60 to 75 minute sessions weekly. The content was mixed and intended 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, and exercises for improving strength and coordination. Furthermore, easy dances and functional gymnastics were

performed. In the last five to ten minutes, participants regularly discussed the exercise session with the two female instructors, who both were Masters students in Physical Education. The load intensity of the physical activity intervention reached up to 55% (submaximal work load), measured randomly by some persons of the experimental group, using heart frequency monitors.

The placebo attention condition (PAC) consisted of a beginners learning English course (once a week for 90 minutes) offered by a community education center in Leipzig. The no intervention control condition (CC) consisted of a waiting group with no exercise or any other supervised activity during the 14 weeks. Participants were recruited in the pedestrian area of downtown Leipzig. Participants could enroll in the study by asking the course instructors of the experimental group condition, who installed a sign-up table in the pedestrian area. At the beginning (t_1) and three months later (t_2) data were collected from the experimental, the placebo attention and the no intervention groups.

Results

Descriptive data for the dependent variables at both points of measurement can be found in Table 3. No differences between male and female participants in the dependent variables emerged though the analyses should be regarded with caution due to the highly unequal cell frequencies. As there were significant pretest differences between the three

conditions on some dependent variables (Table 4) the statistical procedure for this study includes three multivariate analyses of covariance (MANCOVA), using the pretest results as covariate.

Insert Tables 3 and 4 about here

With this procedure, general treatment effects are expressed as main effects of measurement while differences between the treatment conditions at Time 2 are shown as main effects of treatment (which would support the hypothesis of a different impact of exercise vs. no exercise). When the pretest measures are included as covariate, the measurement by treatment interaction is identical with the main effect of the treatment condition in this analysis of covariance. Three multivariate analyses of covariance were calculated with treatment (3) as between subjects factor and body self-concept (4 scales), resources evaluation (4 scales), and well-being (2 scales) as dependent variables.

The significant main effect of treatment for body self-concept suggests that the three conditions have a different impact on body self-concept, Wilks Lambda $mF(8, 150) = 2.67, 0 < .01, \eta^2 = 0.13$. The other two analyses failed to reach significance (resources: Wilks Lambda $mF(8, 116) = .75$, subjective well being: Wilks Lambda $mF(4, 164) = .50$). Univariate analyses of covariance for body self-concept reveal

a significant effect of treatment for perceived physical fitness and no other significant effects (Table 6). This is due to the fact that the experimental group has a significantly higher perceived physical fitness at Time 2 than the other two groups.

Insert Tables 5 and 6 about here

Discussion

The results of this study only partly support our assumption that mental health may be enhanced by exercise. There was one of three multivariate effects indicating that exercise is beneficial to the physical self, whereas the other two groups of variables, resources evaluation and subjective well-being, showed no improvements in the experimental group nor in any of the two control groups. The significant impact of exercise on the physical self was not only reflected by increases in perceived physical fitness but also corroborated by the motor performance of the exercise group who increased significantly in five out of ten variables such as flexibility and strength (for data-details see Stoll, 2001). The results for body self-concept and motor performance support the findings of earlier research in this area (Alfermann & Stoll, 1997; Alfermann & Stoll, 2000, Sonstroem, 1997; Stoll, 2001).

Contrary to the results of several reviews (e.g. Berger & Hecht, 1989; Brown, 1990; McDonald & Hogdon, 1991; Taylor,

2000) that postulated a general positive effect of physical activity on mental health variables, our results revealed no improvements in anxiety and psychosomatic complaints due to exercise. Contrary to predictions and to the meta-analyses of Petruzzello et al. (1991), and of McDonald and Hodgdon (1991), trait anxiety remained unchanged. One reason for this lack of change may be attributed to the stable and enduring nature of personality characteristics. Though it is quite common in the literature to have shorter programs (of 6 to 8 weeks) than ours it seems plausible to assume that an exercise program with more frequent (e.g. twice a week) and longer duration (e.g. 6 months) might be needed to produce changes in psychosomatic complaints and trait anxiety. On the other hand it should be noted that the participants in our study scored quite low on both variables and that therefore the chance is limited to decrease the scores even further. Furthermore, the exercise intervention was not specifically focused on decreasing anxiety and psychosomatic complaints.

Our results are not surprising considering newer meta-analysis, which included only empirical studies with methodological rigor and experimental study designs (Knoll, 1997; Moeller, 1999). These more sophisticated reviews suggest that experimental designs result in potent effects of physical activity on mental health.

Another critical point is a bias in publishing policy. Studies with significant and hypothesis confirming results are

more likely to be published. As Craft and Landers (1998) point out, the mean effect size (MES) from published studies (MES = 0.91) was nearly twice that from unpublished studies (MES = 0.49).

The intervention failed to have any positive effects on resources evaluations as well. The failure to find significant effects in these variables suggest that there is no difference in the appraisals of the experimental, control and placebo-attention groups.

In other words, even though the individuals in the experimental group experienced a supportive group environment, and even though they received increasing coping resources by learning new motor skills, their evaluation of resources was no higher than those of the two control groups. Given the preventive nature of this setting, which included individuals not suffering from any chronic illnesses, living comfortably in their retirement and so not being threatened by critical life events, resources may not have been challenged enough to indicate a positive change in perceived resources due to exercise. The only threat participants might have experienced was the normal age-related decrease in some functional and health related variables, which could be prevented by exercising on a regular basis. As such, this setting may offer too little challenges for the individuals to appraise it as threat to acute loss. COR theory which has been well supported with individuals experiencing critical and even dramatic life

events (like HIV) may less be suited for more recreational settings like exercise with the average population like in our study. Further research is needed to test the promises and prospects of COR theory in an applied setting like exercise with older adults.

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Table 1

Sample Characteristics by Condition at Time 1 and Time 2

Condition	<i>n</i>		Age (in years)	
	female	male	<i>M</i>	<i>SD</i>
Experimental <i>t</i> 1	45	5	61.86	5.73
Experimental <i>t</i> 2	38	4	61.60	5.88
Placebo attention <i>t</i> 1	19	3	59.55	4.23
Placebo attention <i>t</i> 2	15	3	59.67	3.36
No intervention <i>t</i> 1	20	9	61.97	7.40
No intervention <i>t</i> 2	19	9	61.93	7.54

Notes. No significant age differences at Time 1 or Time 2, $F(2, 98) = 1.33$; $F(2, 85) = 0.85$; female:male ration at Time 1: $X^2(2, N = 101) = 6.00$, $p = .05$; and at Time 2: $X^2(2, N = 88) = 5.81$, $p > .05$

Table 2

Cronbach's α , Item-Total Correlations and Scale Ranges of the Subscales

Instrument	Cronbach's α	Item-Total Correlat. (range)	Scale values (range)
<u>Body self-concept</u>			
Positive physical self-worth	.86	.46 - .70	12 - 72
Negative physical self-worth	.69	.40 - .61	7 - 42
Perceived physical fitness	.54	.37 - .56	6 - 36
Concerns about physical attractiveness	.80	.38 - .56	6 - 36
<u>Resources evaluation</u>			
Social resources	.84	.40 - .65	-24 - 24
Financial and health-related resources	.82	.47 - .69	-24 - 24
Material resources	.76	.44 - .69	-24 - 24
Coping resources	.72	.38 - .52	-24 - 24
<u>Subjective well-being</u>			
Trait anxiety	.90	.38 - .68	20 - 80
Psychosomatic complaints	.88	.33 - .70	0 - 72

Table 3

Summary Statistics for All Dependent Variables

Variable	Experimental		Placebo		No	
	condition		attention		intervention	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Positive physical self-worth						
Time 1	15.10	2.98	15.28	3.27	17.11	2.13
Time 2	15.21	3.31	14.50	2.92	17.10	2.80
Negative physical self-worth						
Time 1	12.51	2.88	11.00	3.83	11.25	3.00
Time 2	12.28	2.56	11.50	4.03	11.57	3.11
Concerns about physical attractiveness						
Time 1	14.26	4.25	14.28	4.51	11.14	4.19
Time 2	14.74	4.23	14.22	4.77	12.36	4.03
Perceived physical fitness						
Time 1	14.05	3.03	14.83	3.59	15.11	3.02
Time 2	15.93	2.54	14.83	3.37	14.96	3.25
Social resources						
Time 1	5.38	3.60	3.41	4.70	5.70	3.85
Time 2	5.52	3.83	4.22	3.31	6.14	3.58
Financial and health-related resources						
Time 1	2.76	4.56	2.63	4.43	5.78	5.90
Time 2	3.94	4.77	3.04	4.32	5.55	5.92

Material resources						
Time 1	5.15	3.74	4.65	4.59	8.25	5.04
Time 2	4.74	4.24	3.76	4.27	6.29	5.35
Coping resources						
Time 1	3.71	3.66	2.84	3.35	6.56	4.53
Time 2	4.53	3.58	2.48	3.69	5.19	4.23
Trait anxiety						
Time 1	40.43	9.33	41.39	11.20	39.54	8.88
Time 2	40.45	9.39	39.67	8.66	38.96	7.54
Psychosomatic complaints						
Time 1	49.19	9.67	47.72	9.44	48.43	9.65
Time 2	48.78	9.61	45.83	11.12	46.29	10.06

Table 4

Univariate Analyses for Time 1 with Group as Independent Variable

Variable	<i>df</i>	<i>F</i>
Positive physical self-worth	2, 98	5.16**
Negative physical self-worth	2, 98	2.52
Concerns physical attractiveness	2, 98	3.36*
Perceived physical fitness	2, 98	6.96***
Social resources	2, 82	2.86
Financial and health-related resources	2, 82	2.89
Material resources	2, 82	3.77*
Coping resources	2, 82	5.43**
Trait anxiety	2, 98	.74
Psychosomatic complaints	2, 98	.12

Notes. * $p < .05$; ** $p < .01$; *** $p < .001$ (Bonferroni adjustment); *df* for the resources scales is lower due to missing values

Table 5

Adjusted Means for all Dependent Variables at Time 2

Variable	Group	<i>M</i>	<i>SE</i>
Positive physical self-worth	EC	15.81	.37
	PAC	14.81	.50
	CC	15.96	.41
Negative physical self-worth	EC	11.69	.37
	PAC	11.83	.55
	CC	12.18	.45
Concerns about attractiveness	EC	14.17	.40
	PAC	13.71	.60
	CC	13.49	.49
Perceived physical fitness	EC	16.34	.37
	PAC	14.59	.50
	CC	14.54	.41
Social resources	EC	5.41	.58
	PAC	5.06	.77
	CC	5.61	.72
Financial and health-related resources	EC	4.47	.76
	PAC	4.04	1.01
	CC	3.99	.94
Material resources	EC	4.98	.82
	PAC	4.48	1.09
	CC	5.37	1.02
Coping resources	EC	5.05	.62
	PAC	3.24	.82
	CC	3.82	.77
Trait anxiety	EC	40.32	.49
	PAC	39.46	.74
	CC	39.72	.64
Psychosomatic complaints	EC	48.40	.68
	PAC	47.38	1.03
	CC	46.60	.90

Note. EC = experimental condition; PAC = placebo control condition; CC = no intervention control condition

Table 6

Analyses of Covariance (ANCOVA) for Body Self-Concept at Time 2 with Time 1 as Covariate

Dependent variable	Between subjects		
	<i>F</i>	<i>df</i>	η^2
Positive physical self-worth	1.78	2, 78	
Negative physical self-worth	0.34	2, 78	
Physical attractiveness	0.59	2, 78	
Perceived physical fitness	7.38***	2, 78	.16

Note. *** $p < .001$