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ORIGINAL ARTICLE

The effect of a four-week fitness program on satisfaction with health and life

Pamela Wicker · Dennis Coates · Christoph Breuer

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Abstract
Objectives To examine the effect of a 4-week fitness program on the participants' satisfaction with life and health.
Methods The threefold study design comprised a physical entry test accompanied by a pre-survey, a fitness program (six strength exercises; two times 30 min per week over a 4-week period), and an exit test accompanied by a post-survey. Participants (69.9 % female; mean age = 46.4; mean BMI = 25.9; $N = 10{,}386$) self-selected in the program in 316 fitness clubs across Germany. Regression analysis was used to isolate the effect of the fitness program while controlling for gender, age, age squared, education, income, motivation, physical performance, month, and state.
Results Physical performance improved significantly ($p < 0.001$). The reported level of satisfaction with life and health was significantly higher after participation in the 4-week fitness program.
Conclusions Significant positive effects on subjective well-being can already be observed after a period as short as 4 weeks. Policy makers should support the provision of such time-efficient programs which are appealing to overweight population groups.

Keywords Sport activity · Fitness · Health · Satisfaction · Well-being

P. Wicker (✉) · C. Breuer
German Sport University Cologne, Cologne, Germany
e-mail: p.wicker@dshs-koeln.de

D. Coates
University of Maryland, Baltimore County, USA

D. Coates
National Research University, Perm, Russia

Introduction

The positive effect of physical activity and sport participation on public health has been acknowledged in public policies worldwide. For example, the Game Plan in the UK talks about "the importance of increasing grassroots participation for health benefits" (Department for Culture, Media and Sport 2002, p. 5). Also, the German parliament has acknowledged that a physically active life style contributes significantly to health, well-being, and life quality (Deutscher Bundestag 2010). Previous research has mainly confirmed that sport activity positively influences various health parameters (Humphreys et al. 2014; WHO 2011), although a few studies could not support this positive relationship as summarized by Janssen and LeBlanc (2010). Individual health is important from a public perspective because the cost of inactivity represents financial burdens for health systems worldwide (Finkelstein et al. 2008; Sari 2009; WHO 2007).

Following Rasciute and Downward (2010), not only health is relevant to individual well-being, but also happiness; health and happiness are interrelated dimensions of well-being. Most studies show a positive effect of sport activity on subjective well-being in terms of happiness and life satisfaction (Huang and Humphreys 2012; Pawlowski et al. 2014; Ruseski et al. 2014), while other studies were more critical (e.g., Lechner 2009). Pawlowski et al. (2011) showed that the effect of sport activity on happiness increases with increasing age until the age of 70, while the effect is relatively low for people aged 70 years and older. Also, the type of sport is important to the happiness derived from sport. For example, the effects were found to be larger for sports allowing social interaction (Downward and Rasciute 2011). Another study documented that cycling only had a positive effect on health, not happiness, while other

sports including walking positively affected both dimensions of well-being (Rasciute and Downward 2010). However, previous studies examining the relationship between sport activity and subjective well-being used survey data and general measures for sport activity or frequency (Pawlowski et al. 2011; Rasciute and Downward 2010). It is still unclear after what time period the positive effects on subjective well-being occur and how much time needs to be invested per week.

This study tries to address these shortcomings by examining the effect of a 4-week fitness program on subjective well-being, i.e., satisfaction with life and health. The fitness program consists of six strength exercises, lasts 30 min, and was performed twice per week over the 4-week period. The study design was comprised of (1) a physical entry test followed by a pre-survey, (2) a fitness program as training intervention over a 4-week period, and (3) a physical exit test accompanied by a post-survey. The following main research question is advanced: How does participation in a 4-week fitness program affect individual satisfaction with health and life? This study contributes to the body of research on the relationship between sport activity and subjective well-being. Although there are studies like the one from DeBate et al. (2009) that have already used a pre- and post-intervention study design, the study focus was limited (i.e., young girls). An examination of the wider population is needed to derive conclusions for public health.

Methods

Study design

The study was part of a research project funded by a fitness consultancy company. Altogether, 316 fitness clubs across Germany that were clients from the consultancy took part in the project and received instructions regarding the fitness program and data management from the project team. The participation in the program was for free. Anybody aged 16 years or older, who was interested and showed up at a participating fitness club, could participate. The overall project took place from 01.04.2013 to 01.11.2013, while each participant was involved for 4 weeks.

The study design was threefold. First, participants completed a physical entry test and an online survey. In the entry test, the number of repetitions in two strength tests (lat. rowing,[1] leg press) at an individually chosen weight was assessed. The pre-survey was completed on a tablet computer that was provided by the fitness club. It consisted of questions relating to previous experiences with fitness training, motivation, satisfaction with several aspects of life (life in general, health, fitness, look etc.), and socio-economic characteristics. Motivation was assessed using the goal content for exercise scale which was developed and validated by Sebire et al. (2008) and already used in previous research (Kleinert et al. 2011). This scale consisted of 20 items that were measured on 7-point Likert scales (0 = not important at all, 6 = very important) and can be assigned to five constructs (i.e., social affiliation, image, health management, social recognition, and skill development; Table 1).

The level of satisfaction was assessed with the following question: How satisfied are you currently with your life in general (respectively health, fitness)? Satisfaction was measured on an 11-point scale (from 0 = totally unsatisfied to 10 = totally satisfied) like in the German Socio-Economic Panel (GSOEP) to allow comparisons with the German population average. The GSOEP is a nationwide and representative household panel which is conducted every year by the German Institute of Economics Research (DIW 2011). In previous research slightly different scales like 10-point (Downward and Rasciute 2011; Rasciute and Downward 2010) or 4-point scales for happiness (Huang and Humphreys 2012; Pawlowski et al. 2011), and 5-point scales for health were used (Huang and Humphreys, 2012; Rasciute and Downward 2010; Ruseski et al. 2014). The performance in the entry test, the gender, age, height, and weight of the participant, and the unchangeable club id and participant id were noted by the coach in the survey before the tablet computer was given to the participant for completion of the survey. The fitness clubs had received instruction from the project team regarding how the participant id should be created.

In the second phase, the participants performed a time-efficient fitness program over a period of 4 weeks. Specifically, they had to perform one set of the following exercises: chest press, lat. rowing, reverse fly, leg press, leg curl, and crunches. The training lasted only 30 min and should be performed twice per week. This time-efficient training was conceptualized because time is a major constraint of physical activity (Ruseski et al. 2011) and the most frequently stated answer when people are asked why they do not exercise is no time (Alexandris and Carroll 1999). The effect of such a short fitness program on individual strength was already proven in previous research (Boeckh-Behrens and Buskies 2007). The question is whether such a short program also affects an individual's subjective well-being in terms of satisfaction with life and health.

The third phase consisted of a physical exit test and a survey. In the exit test, the number of repetitions in the lat.

[1] Lat. is the abbreviation for latissimus. It refers to the main muscle that is trained with that exercise, the musculus latissimus dorsi (i.e., largest muscle of the back). Lat. rowing is a strength exercise where the individual is seated and pulls a weight in front of the individual with both arms horizontally towards the stomach.

Table 1 Training goals (Sebire et al. 2008; $N = 10{,}386$; Germany; 2013)

Construct	Items	Mean (item)	Mean (construct)
Social affiliation	To connect with others in a meaningful manner	2.06	1.72
	To share my exercise experiences with people who care for me	2.13	
	To develop close friendships	1.44	
	To form close bonds with others	1.23	
Image	To improve the look of my overall body shape	4.59	3.96
	To improve my appearance	3.92	
	To be slim to look attractive to others	3.36	
	To change my appearance by altering a specific area of my body	3.97	
Health management	To increase my resistance to illness and disease	4.83	5.11
	To increase my energy level	5.15	
	To improve my overall health	5.30	
	To improve my endurance, stamina	5.19	
Social recognition	To be well thought of by others	1.75	1.65
	To be socially respected by others	1.38	
	To gain favorable approval from others	1.92	
	So that others recognize me as an exerciser	1.51	
Skill development	To acquire new exercise skills	3.67	3.79
	To learn and exercise new techniques	3.47	
	To become skilled at a certain exercise or activity	3.88	
	To develop my exercise skills	4.14	

rowing and the leg press was assessed. Importantly, the same weight like in the entry test was used to allow analyzing changes in performance. The post-survey included questions about the time spent in the gym, potential membership, and the same set of questions relating to satisfaction with several aspects of life like in the pre-survey. The resulting variables from the survey questions are summarized in Table 2.

Sample

Using the unchangeable club id and the participant id, a six-digit pin was created to allow identifying each participant in the pre- and post-survey. Altogether, 21,746 people participated in the pre-survey and physical entry test, and 13,594 in the post-survey and physical exit test. After the data cleaning (e.g., drop outs, implausible answers, one pin given to several people) 18,984 (pre), respectively, 12,131 cases (post) were left. These two datasets were matched with the pin leading to a longitudinal sample of 11,239. Several plausibility checks (by comparing age, gender, height, and weight) were conducted to ensure that the matched persons are correct. During this procedure, another 758 cases had to be removed leaving 10,481 cases for the analysis. Finally, after dropping cases with missing values for relevant variables, the analysis is based on 10,386 individuals. This pure longitudinal sample allows analyzing intra-individual changes in satisfaction as a result of the training intervention (fitness program) while controlling for motivational, socio-economic, and physical factors.

Summary statistics

The summary statistics (Table 2), split by pre- and post-fitness program participation responses, show that the respondents were on average 46.4 years old, mainly female (69.9 %), and well educated (42.1 % have at least a university entrance degree). The income distribution indicates that most participants have low to middle income; 30.4 % earn up to € 1,000 net per month and 30.2 % have a monthly net income between € 1,001 and € 2,000. The average individual is 1.71 meters tall and, at the start of the program, weighed 75.7 kilos with a body mass index (BMI) of 25.89. According to the WHO (2007), people with a BMI >25 are considered overweight. Following this definition, 50.9 % of the participants in this study were overweight at the time of the entry test. Thus, a group of overweight participants self-selected into the study.

The participants' motivation to participate in the fitness program was assessed with a training goals scale (Sebire et al. 2008; Table 1). To reduce the complexity of the goal variables, the 20 items on the scale were grouped into the five underlying constructs of social affiliation, image,

Table 2 Overview of variables and summary statistics ($N = 10{,}386$; Germany; 2013)

Variable	Description	Pre-survey		Post-survey	
		Mean	SD	Mean	SD
Life satisfaction	How satisfied are you currently with your life in general? (0 = totally unsatisfied, 10 = totally satisfied)	7.08	2.09	7.24	2.09
Health satisfaction	How satisfied are you currently with your health? (0 = totally unsatisfied, 10 = totally satisfied)	5.99	2.41	6.80	2.18
Gender	0 = male; 1 = female	0.699	0.459	0.699	0.459
Age	Age	46.40	15.42	46.44	15.42
Age squared	Age × age	2,390.25	1,409.22	2,394.25	1,410.32
Education	Highest educational level attained (1 = person has at least a university entrance degree)	0.421	0.494	–	–
Income	Monthly individual income (in €); 1 = no report	0.154	0.361	–	–
	2 = up to 1,000	0.304	0.460	–	–
	3 = 1,001–2,000	0.302	0.459	–	–
	4 = 2,001–3,000	0.149	0.356	–	–
	5 = 3,001–4,000	0.056	0.231	–	–
	6 = over 4,000	0.035	0.185	–	–
Height	Height (in cm)	170.63	8.72	170.62	8.72
Weight	Weight (in kg)	75.66	16.32	75.49	16.24
BMI	Body mass index = weight in kg/(height in m)^2	25.89	4.74	25.83	4.70
Leg press	Number of repetitions in the leg press exercise	17.20	11.72	29.05	18.02
Lat. rowing	Number of repetitions in the lat. rowing exercise	13.92	7.73	21.50	12.18

SD standard deviation

health management, social recognition, and skill development. Mean values for each construct were calculated. On average, the main training goal of the participants was health management ($M = 5.11$), followed by image ($M = 3.96$) and skill development ($M = 3.79$). The two social goals have means half the size of skill development, suggesting these are weaker motivations for participation in the fitness program than the other three goals.

In the physical entry test, participants performed on average 17.2 repetitions in the leg press and 13.9 in the lat. rowing. The figures are higher in the exit test where participants were able to perform 29.1 (leg press) and 21.5 repetitions (lat. rowing), respectively, using their individual weight from the entry test. The individuals' weight ($M = 75.5$) and BMI ($M = 25.8$) are slightly lower after the 4-week fitness program and the percentage of overweight people was reduced to 50.5 % in the exit test. Difference of means t tests for the pre- and post-weight and BMI cannot reject the null hypothesis of equal means, but can reject the null hypothesis for the leg press and lat. rowing ($p < 0.001$). Thus, the fitness program did not produce significant reductions in either weight or BMI, but participants did improve their fitness as evidenced by significant increases in the number of repetitions in the leg press and lat. rowing between the pre- and the post-test.

Regarding subjective well-being, participants' satisfaction with life in general had a mean value of 7.08 in the pre-survey. This value is higher than the German population average ($M = 6.98$; DIW 2011). On the contrary, the average satisfaction with health ($M = 5.99$) is lower than in the German population ($M = 6.57$; DIW 2011). Participants on average reported an increase in both life satisfaction ($M = 7.24$) and health satisfaction ($M = 6.80$) after participating in the fitness program. Difference in means t-tests reveals that these differences in reported satisfaction with both life and health are statistically significant, indicating an effect of participation in the fitness program. Importantly, the mean value for satisfaction with health in the post-survey is higher than the German population average.

Empirical model

The statistical analysis was performed in STATA. Least squares regressions with robust standard errors were estimated to analyze the effect of the 4-week fitness program on subjective well-being while controlling for other factors that could also affect subjective well-being. Let the reported level of satisfaction with either one's life or health, y_{it}, be a function of gender, age, age squared, education, income, BMI, performance on the fitness tests,

federal state of residence, month of the year, and the training goals. These variables are included because research shows that gender, age, age squared, education, and income significantly affect subjective well-being (Downward and Rasciute 2011; Huang and Humphreys 2012; Kye and Park 2014). Controlling for the month and federal state is important since the level of satisfaction may be different in the summer months and may depend on the living circumstances in the state (e.g., more rural areas may have a slower pace of life and therefore less stress than in urban areas). Also, the models control for training goals, since research shows that the goals and values people express through sport have a mediating effect on the well-being derived from sport (Chatzisarantis and Hagger 2007).

Let all these variables be x_{ijt} where j indicates a specific variable, t indicates either the pre- ($t = 0$) or post-fitness program ($t = 1$) survey, and i is the individual. This relationship is represented in the equation below, where α and the β_j are parameters to be estimated and ε_{it} is an i.i.d. random variable with mean zero and constant variance.

$$y_{it} = \alpha + \sum_{j=1}^{K} \beta_j x_{ijt} + \delta t_{it} + \varepsilon_{it} \quad (1)$$

In the equation, t_i is a dummy variable that takes value 1 if the reported satisfaction and other variables come from the post-fitness program survey, and takes value of 0 for the pre-program survey; δ is the post-fitness program increment to satisfaction. Subtracting $y_{i1} - y_{i0}$ produces the change in the reported satisfaction between the pre-program and post-program surveys.

$$y_{i1} - y_{i0} = \Delta y_i = \sum_{j=1}^{K} \beta_j \Delta x_{ij} + \delta + \Delta \varepsilon_i \quad (2)$$

Any explanatory variable that does not change from one survey to the next drops out of the analysis since the difference is zero. Differencing this way removes education, gender, income, federal state, and motivation from the equation as they are the same before and after participation in the fitness program. Only those variables that are different before and after the fitness program will remain in the differenced model: age, age squared, BMI, leg press and lat. rowing performance, and month of the year. The pre- and post-survey dummy remains, but as the constant term in a regression of Eq. (2), captured by δ above.

Results

Table 3 presents the results of estimating the regression model (2). The implications of the two models are quite different. Changes in life satisfaction are not affected by getting older or by changes in BMI or performance in the fitness tests while health satisfaction is altered by those factors. An increase in BMI reduces satisfaction with one's health, while an increase in the performance on the fitness tests raises health satisfaction. Interestingly, the month of the year is associated with reported satisfaction with both one's life and health. The omitted month in the analysis is October, so these results indicate that satisfaction is greater in the months June through September than in October, but that May and October are not different from one another. One explanation for this finding could be that the weather

Table 3 Fitness program impacts on life and health satisfaction (Germany; 2013)

	Life satisfaction				Health satisfaction			
	Coefficient	Standard error	*t* statistics	*p* value	Coefficient	Standard error	*t* statistics	*p* value
Age	0.241	0.263	0.920	0.359	0.446	0.329	1.350	0.176
Age squared	−0.002	0.003	−0.660	0.508	−0.005	0.003	−1.360	0.173
BMI	−0.060	0.050	−1.200	0.229	−0.109	0.059	−1.850	0.064*
Leg press	0.001	0.001	0.810	0.420	0.004	0.002	2.310	0.021**
Lat. rowing	−0.003	0.003	−0.970	0.332	0.004	0.004	1.010	0.312
May	0.578	0.518	1.110	0.265	0.669	0.503	1.330	0.183
June	0.463	0.188	2.460	0.014**	0.522	0.211	2.480	0.013**
July	0.373	0.140	2.660	0.008***	0.425	0.158	2.690	0.007***
August	0.282	0.098	2.870	0.004***	0.360	0.111	3.230	0.001***
September	0.180	0.061	2.930	0.003***	0.210	0.070	2.980	0.003***
Fitness program	0.275	0.052	5.250	<0.001***	0.840	0.061	13.710	<0.001***
R squared	0.001				0.003			
$N = 10{,}386$								

Reference category for month is October

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

is usually better from June to September which positively affects subjective well-being.

The key result of the analysis is the finding that the intercepts, which capture the effect of participation in the fitness program, are positive and statistically significant in both the life and health satisfaction regressions. In other words, after participating in the 4-week fitness program, individuals report significantly greater satisfaction with their life and with their health. For life satisfaction, the increase of 0.275 is about a 3.9 % increase in reported satisfaction; for health, the increase of 0.840 is a 14 % increase in reported satisfaction with one's health.

Discussion

Discussion of results and implications

The sample structure shows that this fitness program was successful in targeting a group of people who were overweight on average. Recall that participants self-selected in the project. Therefore, the composition of the study population is an interesting outcome. It shows that this time-efficient and guided fitness program was appealing to overweight people. The significant increases in physical performance between the entry and exit test are in line with previous research (Boeckh-Behrens and Buskies 2007). Importantly, the composition of the sample indicates that these significant improvements in physical performance are not a result of a participant group that was in particularly good shape or young. In fact, the sample is close to the mean age of the German population which was 42.8 years for males and 45.5 years for females in 2012 (Federal Institute for Population Research 2014). The high share of females in the sample is in line with previous research documenting that females are more likely to participate in fitness programs than males (Downward and Riordan 2007).

What previous research has not yet investigated is whether this 4-week program also affects subjective well-being in terms of satisfaction with life and health. The results provided evidence that participation in the fitness program had a significant and positive effect on reported satisfaction with life and health. This finding is in line with the comprehensive review provided by Fox (1999) who concluded that moderate regular exercise is a viable way of improving mental well-being in the general public. However, up to now, it was unclear after what period of time such positive effects occur and how frequent people have to exercise. The present study provided evidence that these positive effects can be achieved after a period of time as short as 4 weeks with a fitness program that takes 30 min and is performed only twice per week.

The findings of this study have implications for policy makers, sport and fitness providers, and participants. Given the appealing character of the time-efficient fitness program and its positive effects on subjective well-being, it can be recommended that policy makers provide (financial) incentives for fitness clubs and other sport providers to provide such time-efficient fitness programs. Also, incentives for participation in such programs should be provided for potential participants, specifically for people who can be considered overweight or who would benefit from exercise because of other health problems. The latter recommendation is in line with the suggestion of Langer (2006) to also provide incentives for the demand side (participants) and not only the supply side (sport providers).

For sport and fitness providers, it can be recommended to provide such time-efficient programs to a greater extent because they may also be attractive for people with limited leisure time. The low score on the social affiliation variable indicates that making new contacts in the fitness club was not a priority to participants. Yet, previous research showed that social relationships also contribute to subjective well-being (Nieminen et al. 2010) and, therefore, participants should exploit the opportunity of meeting new people in a fitness club.

Conclusions

This study provided evidence that participation in a fitness program over a 4-week period leads to significant increases in the participants' reported satisfaction with life and health. The fitness program was time efficient; participants only exercised 30 min twice a week. The provision of such time-efficient programs should be supported by policy makers to a greater extent, not only because of the positive effects on subjective well-being, but also because such programs seem to be appealing to overweight people which are one of the main target groups of public health policies. Therefore, they can also contribute to reduce the costs of obesity that represent financial burdens on health systems worldwide (WHO 2007).

This study has some limitations that can guide future research. First, due to the nature of the exercises that require specific fitness equipment (strength training machines) usually available in fitness clubs, the sample is limited to people who are somewhat interested in fitness. It would be interesting to examine whether there are equivalent time-efficient programs in other sports that are more accessible to population groups not interested in fitness. Second, the study focused on subjective well-being (mental health); the effects of such fitness program on physical health (diabetes, high blood pressure, heart disease, etc.) were not examined. Third, it is unclear whether the

participants have continued with the fitness program and how such time-efficient programs affect subjective well-being in the long term. Future studies should examine the impact on physical health and the long-term effects of such time-efficient fitness programs.

Conflict of interest The authors declare that there are no conflicts of interest.

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