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## Does sports make people happier, or do happy people more sports?

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# Does Sports Make People Happier, or Do Happy People More Sports?

Working Paper No. 2021-30

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[journals.sagepub.com/home/jse](https://journals.sagepub.com/home/jse)**Bruno S. Frey<sup>1,2</sup>**  and **Anthony Gullo<sup>2</sup>** 

## Abstract

We contribute to the happiness literature by analyzing the causal relationship between sports and happiness. Using longitudinal data from the German Socio-Economic Panel (GSOEP), we find a positive correlation between sports participation and reported life satisfaction. This relationship is stronger at younger and older ages than in middle age, and for people in bad health compared to those in average health. We further provide evidence for both causal directions. It turns out that the causal impact of engaging in sports on happiness is about four times higher than the effect of happiness on engaging in sports.

## Keywords

happiness, life satisfaction, well-being, sports, causality

## Introduction

Happiness research has recently become one of the most thriving and fruitful areas in economic research. Orthodox economic theory was originally constructed on the assumption that it is not possible to measure utility directly. Instead, the concept of revealed behavior was introduced, stating that people choose those goods and services from which they derive satisfaction or utility. The higher the demand, the

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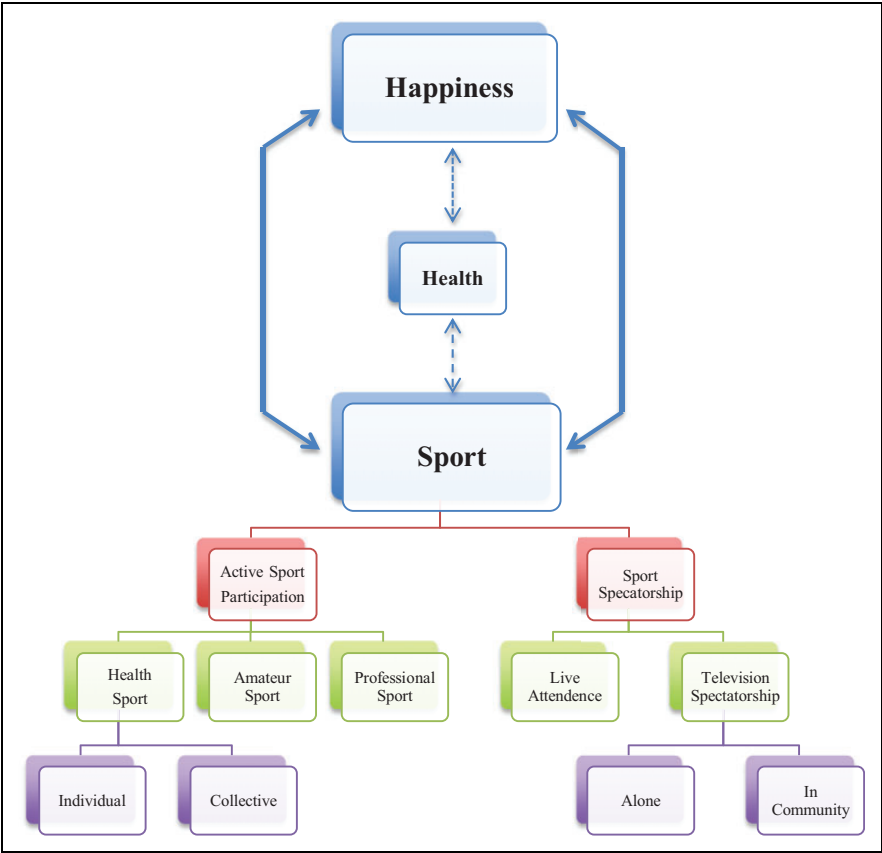
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higher is the utility gained, *ceteris paribus*. The consensus in the middle of the 20th century was still that direct measurement of utility was impossible. In 1974, Richard Easterlin wrote a paper challenging this view, but it was widely disregarded. Only close to the end of the century did other economists pick up his idea (see, e.g. the surveys by Dolan et al., 2008; Frey & Stutzer, 2002a; the books by Clark, 2018, Frey, 2008, 2018; Frey & Stutzer, 2002b; Layard, 2005; and the collection of articles by David et al., 2014; Easterlin, 2002; Frey & Stutzer, 2013). This development was helped by the fact that several noted social psychologists empirically studied the determinants of happiness (see e.g. Diener & Biswas-Diener, 2008; Gilbert, 2005; Kahneman et al., 1999).

Scholars of the economics of happiness have mainly studied the many influences of economic and social determinants on subjective life satisfaction. This concept is captured by surveys in which individuals answer the question: “Taken overall, how satisfied are you with the life you lead?” with a score between 0 (“not at all satisfied”) and 10 (“totally satisfied”). This measure has been shown to reflect well what is referred to colloquially as happiness. Following the scholarly literature, no difference is made between the terms “subjective life-satisfaction,” “subjective well-being,” and “happiness” (Veenhoven, 2012). The results of these surveys are in line with how partners, relatives, and friends rank the respondents’ happiness. Respondents’ answers also correlate closely with revealed behavior: People indicating that they are highly satisfied with their lives, smile more often, are more open, establish more social contacts, and are less prone to committing suicide (see e.g. Deaton, 2008; Kahneman & Krueger, 2006; Weimann et al., 2015).

Leisure has been shown to influence subjective life satisfaction (e.g., Wang & Wong, 2014). Manifold activities are undertaken outside work, most importantly in culture and in sport. Many people find it obvious that sport contributes to happiness. But engagement with sport can take many forms, ranging from sometimes highly paid professionals to people passively watching sport events. It is an open question how these different types of engagement influence happiness. There is moreover another problem, reverse causality: sport may contribute to happiness, and happy people may engage more in sporting activities. Separating these effects poses econometric challenges whose solutions require good data, most importantly with a panel structure.

Our paper contributes to empirical understanding of the relationship between sport and happiness in several ways. The second section critically discusses the existing literature. It lays the groundwork for theoretically capturing the various types of engagement in sport that may systematically influence life satisfaction. It turns out that most determinants cannot be empirically analyzed due to a lack of data. The third section provides econometric estimates with what is arguably the best data on life satisfaction, the German Socio-Economic Panel. The results reveal a strong and robust effect of active engagement in sport activities. The last section concludes.



**Figure 1.** Aspects of sport and their possible relationship to happiness. Source: own figure.

### Review of the Literature

Figure 1 provides a framework illustrating various aspects of sport and their possible relation to happiness. The figure shows the many varieties of involvement with sport activities that may affect happiness in distinctive ways. These range from active sport involving health sport, amateur sport, and professional sport, to sport spectatorship through either live attendance or television consumption. The figure also shows that sport may affect happiness through health or in other ways and that happiness may also affect sport in a reverse causation.

#### *Active Sport Participation*

Substantial empirical evidence shows a positive relationship between active sport participation and physical health (e.g., Blacklock et al., 2007; Brown et al., 2007;

Stone, 2004). Good physical health in turn raises happiness. As a result, there is a positive connection between sport participation and happiness. This indirect relationship has been found in several studies (e.g., Dolan et al., 2014; Pawlowski et al., 2011). These studies do not include physical health measures in their estimates; they therefore cannot distinguish a direct relationship between sport participation and happiness from the indirect association through physical health.

There is also a direct link between participation in sport and happiness that is independent of health. Active sport participation provides opportunities for socialization, serves as a distraction from unfavorable stimuli, improves self-confidence, and helps to develop communication and cooperation skills. All these factors are closely related to happiness (Huang & Humphreys, 2012; Wang et al., 2012). A number of studies have explored this direct, non-health-related association between physical activity and subjective well-being. While holding physical health status constant, these studies in general find a positive effect of active sport participation on subjective well-being (e.g., Lee & Park, 2010). They further identify that the frequency of engaging in sport has a positive impact on happiness (e.g., Wheatley & Bickerton, 2017). Downward and Rasciute (2011) conclude that sports involving more social interactions are more positively correlated with happiness than are sports with fewer social interactions.

Participation in amateur sport is often motivated by intrinsic rewards from the activity rather than from the extrinsic rewards of money and fame (Eitzen, 1989). However, amateur sport possesses some characteristics not necessarily connected to health, such as the sense of competition and the application of skills. Moreover, amateur sport is often organized in clubs. Thus, athletes who are members of these clubs not only have privileges (e.g., the possibility to use the sport facility), but also obligations: Absences from training sessions for instance, usually have to be excused. Therefore, athletes are sometimes obliged to train even though they would prefer to do something else.

The most extreme level of sport participation is professional sport, in which athletes receive wage payments from their clubs or societies. As a result, extrinsic motivation may crowd out intrinsic motivation (e.g., Frey, 1997). Moreover, professional athletes' obligations toward clubs and societies are much stricter than those for amateur athletes. Professional athletes indeed represent their clubs and have a role-model status that restricts their freedom. Finally, Maxcy et al. (2019) argue that professional sport, which usually requires extreme physical and mental exertion, has a negative impact on the athletes' happiness. Triathlon athletes, who experienced mental torture or thoughts of giving up during the race, reported lower life satisfaction in the weeks after the race. It is thus open whether being a sport professional raises subjective well-being.

The different types of engagement with sport may have different effects on happiness. To the authors' knowledge, no scientific empirical literature has yet compared these manifold associations between sport participation and subjective well-being.

## ***Sport Spectatorship***

In our societies, sport spectatorship is an important leisure activity. The research literature consistently suggests a positive relationship between sport spectatorship and subjective well-being (e.g., Inoue et al., 2017; Knoll et al., 2014).

In contrast to active sport participation, the effect of sport spectatorship on happiness through physical health is open. Sport spectatorship may encourage young people to actively participate in sport (e.g., Frawley & Cush, 2011), but there may also be a negative influence through unhealthy habits and practices, such as consuming alcohol and unhealthy food (Cornil & Chandon, 2013). At least one study, by Inoue et al. (2015), argues that the several pathways through which sport spectatorship could potentially influence a population's health offset each other.

A large literature identifies a positive association between live spectatorship and subjective well-being (e.g., Inoue et al., 2019; Kawakami et al., 2017). Other scholars take into account a mediating effect between live attendance and happiness relating to team identification (e.g., Jang et al., 2017; Wann, 2006), game outcome (e.g., Stieger et al., 2015; Hallmann et al., 2013), and game process (e.g., Yang et al., 2012).

Live attendance constitutes only a small part of the overall spectatorship of sport events. Indeed, most people interested in sport watch events on television. Kim and Mao (2019) present a list of possible reasons for this choice in a qualitative analysis. This list includes multi-tasking, economic considerations, emotional hedge, and convenience. The relationship between sport spectatorship and happiness may vary depending on whether the event is attended physically or watched on television. However, to the authors' knowledge, the existing literature does not cover this issue. Kavetsos and Szymanski (2010), Task et al. (2016) and Dolan et al. (2019) take steps in this direction by identify a positive effect on happiness of hosting a sport event not only for those people who attend the event physically, but also for the whole hosting population. However, these studies do not specify whether those people who did not physically attend an event watched it on TV or not.

Our discussion suggests that the manifold relationships between sport and happiness should be given more importance in future studies.

## ***Causality Issues***

Does active sport participation make people happy or are happy people more willing to actively participate in sport?

Various studies have attempted to establish causation running from sport participation to happiness. Ruseski et al. (2014), Dolan et al. (2014), and Huang and Humphreys (2012) adopt one possible approach. All these studies are based on a cross-sectional two-stage instrumental variables approach. Each study uses different instruments for active sport participation. Whereas Huang and Humphreys (2012) use the number of sport facilities and instructors per person in an individual's country of residence, Dolan et al. (2014) use a respondent's perceived benefit from

active sport participation. Ruseski et al. (2014) combine both instruments: the distance between an individual's home and the nearest sporting facility and an individual's perception of the importance of active sport participation. The three studies conclude that active sport participation increases subjective well-being. However, it is questionable whether these studies clearly identify the causal effect of active sport participation on subjective well-being, for two reasons. First, the consistency of these estimates requires two conditions to be fulfilled: The instruments used must affect individuals' active sport participation but must not affect the unobservable factors determining subjective well-being. Although each of these studies meets the first condition by first-stage regressions, the latter condition can only be tested if more instruments than endogenous variables are used (overidentified coefficients). This has only been done by Ruseski et al. (2014).

Second, several scholars (e.g., Frey & Stutzer, 2002b; Staubli et al., 2014; Stutzer & Frey, 2006; Wang et al., 2012) more generally argue that regressions using cross-sectional data capture only statistical correlations and not causality. They claim that the observation of causal relationships requires panel data. Only by looking at changes in both dependent and independent variables is it possible to identify the direction of causality. Only a few longitudinal studies have identified a causal effect of active sport participation on happiness. Becchetti et al. (2008), for instance, do so by estimating fixed effects using the German Social Economic Panel (GSOEP); they find that relational goods, including sport participation, individually and collectively increase life satisfaction. Lechner (2009) exploits the panel structure of the GSOEP data in a more complex way. A matching estimator is applied such that sport participation for individuals is initially the same. Subsequent changes over time are then explored. The results suggest significant positive effects of sport participation on the subjective well-being of males, and positive but insignificant effects for females. Wang et al. (2012) use longitudinal Canadian data to analyze the long-term association of leisure-time physical activity with happiness. They find that those individuals who remained inactive were more likely to become unhappy than were those who later became physically active. Additionally, a change from physically active to physically inactive was associated with increased odds of becoming unhappy 2 years later.

To the authors' knowledge, research literature on the reverse causality running from happiness to active sport participation is limited. In this respect, some experimental studies have captured the influence of an individual's affect on the decision to actively participate in sport. Although they used different experimental settings, both Bryan et al. (2007) and Kiviniemi et al. (2007) conclude that participants' positive affect leads to higher intentions to participate in sport. Similarly, Ajzen and Driver (1992) find that positive mood can lead to more favorable attitudes about exercise and result in higher intentions to actively participate in sport. Finally, Kwan and Bryan (2010) and Allen et al. (2013) suggest that negative moods discourage individuals from doing sport. Surprisingly, Allen et al. (2013) find the same negative effect for positive moods.



However, both positive and negative affects constitute momentary feelings and reflect people's short-run, current emotions. Happiness research typically abstracts from purely short-run feelings and therefore focuses on life satisfaction (Diener et al., 1999; Frey, 2018). To address this concern, Becker et al. (2006) and Schneider and Becker (2005) present determinants of active sport participation for the German population. In addition to several socio-demographic characteristics and life situation, they both find that life satisfaction is positively associated with active sport participation. However, since both use cross-sectional data, their findings are difficult to interpret causally. To the authors' knowledge, so far no longitudinal study has captured the effect of happiness on the decision to actively participate in sport.

## **Relating Sport Activities to Happiness: An Empirical Analysis**

Our econometric analysis of the relationship between sport participation and happiness proceeds in the following steps: The first subsection presents the panel data for the analysis. The second provides the purely correlational relationship by running a simple regression. The third subsection seeks to capture the causal links between sport participation and happiness. Both causal directions are tested: sport participation affecting a person's happiness and happiness influencing a person's decision to participate in sport. Finally, the last subsection checks the robustness of the econometric estimates.

### **Data**

Our study uses data from the GSOEP. This Panel is a representative survey of private households and individuals that was started in 1984 in the Federal Republic of Germany and was extended to residents in the former German Democratic Republic in 1990. Since the beginning of the survey, 35 waves have been collected. The latest wave (2018) consists of more than 33,000 individuals in almost 20,000 households in Germany. The GSOEP data has three substantial advantages: It includes a randomly selected sample of the German population, thus avoiding the need to use selection models (Heckman, 1979); it has a panel structure, which allows the same individuals to be resurveyed over years; and people in the survey are asked a wide range of questions about their socio-economic status, demographic characteristics, time use, personal attitudes, and self-assessed well-being (Stutzer & Frey, 2006). As indicated by Stutzer and Frey (2004), the GSOEP is one of the most valuable data sets for studying individual happiness in a longitudinal framework. It also measures individuals' sport activity extensively and over an extended time period.

Individual happiness is captured by responses to the question: "How satisfied are you with your life, all things considered?" Responses range from 0 ("completely dissatisfied") to 10 ("completely satisfied").

Sport activity is captured by a dummy variable (following, e.g. Becker et al., 2006): Individuals who do sport or exercise at least once a week are assigned as active (sport-active = 1). People who do sport or exercise less than once a week are assigned as inactive (sport-active = 0). Another variable capturing sport activity relates to the frequency. Three categories of sport frequency are distinguished:

- Weekly doing sport, if the respondent does sport or exercise at least once a week.
- Monthly doing sport, if the respondent does sport or exercise at least once a month.
- Rarely doing sport, if the respondent does sport or exercise less than once a month. This category also includes respondents who never do sport.

The econometric estimates include a large number of control variables:

- Age and age-squared (see e.g. Alesina et al., 2004; Blanchflower & Oswald, 2004; Di Tella et al, 2003; Easterlin, 2006; Frey, 2008).
- Gender: This variable is consistently included in happiness estimates. The dummy variable “male” is assigned the value of 1 if the respondent is male and 0 if she is female.
- Marital status: In line with several studies (e.g., Alesina et al., 2004; Di Tella et al., 2003), five categories of marital status are captured: single, married, separated, divorced, and widowed.
- Children: In line with Alesina et al. (2004) and Di Tella et al. (2003) and Schwarze and Härpfer (2007), the number of children is included among the controls. The number of children up to 16 years in the respondent’s household is classified into four groups: no children, one child, two children, three or more children.
- Health: Respondents are asked to describe their current physical health on a 5-point scale, which we reduced to three categories: bad health, average health, and good health.
- Education: Our study uses the natural logarithm of the respondent’s years of education.
- Social relationships: This variable captures how often respondents meet with friends, relatives, and neighbors in their free time. This frequency of social relationships is divided into four categories (similar to Powdthavee, 2008): weekly social relationships, monthly social relationships, rare social relationships if the respondent meets with friends, relatives or neighbors less than once a month, and no social relationships.
- Religiosity: This variable captures how often respondents attend church or religious events in their free time. It therefore applies a revealed behavioral approach, classified into four categories: weekly, monthly, rare, or no religious activities.

- Nationality: The dummy variable takes the value of 1 if the respondent is German and 0 if the individual is a foreigner.
- Place of residence: Following most happiness studies using the GSOEP data, residents of former West Germany (value 1) are distinguished from those of former East Germany (value 0).
- Logarithm of household income: Such income is typically characterized by diminishing marginal utility. This is accounted for by taking the natural logarithm of household income (following, e.g., Odermatt & Stutzer, 2019; Schwarze & Härpfer, 2007; Stutzer & Frey, 2006). It assigns the logarithmic value of 0 to households with zero household income.
- Household size<sup>1/2</sup>: This income has to be shared among the household members. In line with most happiness research, the square root of the household size is taken to capture a possible nonlinear relationship (e.g., Frey, 2008; Odermatt & Stutzer, 2019; Stutzer & Frey, 2006).
- Working status: According to several studies (e.g., Frey & Stutzer, 2005; Stutzer & Frey, 2004), nine categories of employment status are captured: Full-time employed, unemployed, self-employed, some work, non-working, maternity leave, military service, in education, and retired.
- Annual work hours
- Weekend work: This dummy variable takes the value of 1 if respondents have to work at weekends at least one a month and takes the value 0 if they have to work at weekends less than once a month. It should account for time limitations and the work–leisure conflict specifically on weekends.

The analysis uses the following 12 waves of the GSOEP: 1992, 1994, 1996, 1997, 1999, 2001, 2005, 2007, 2009, 2011, 2015, and 2017. The omission of some years is because some questions, in particular on sport participation, were not included in all waves. Moreover, this dataset represents an unbalanced panel, as the number of periods observed varies between individuals. However, this is normally the case when using longitudinal questionnaires, as some individuals always drop out of the sample and others join later. After eliminating the missing observations and non-responses for the relevant variables, the dataset comprises 213,563 observations for 58,368 individuals.

### ***Descriptive Findings***

Table 1 provides descriptive statistics of the key variables used in the regressions.<sup>1</sup>

Average life satisfaction of the residents of Germany for the 12 waves considered amounts to 7.049. This value is similar to the value of 6.985 found by Helliwell et al. (2019). Thus, average life satisfaction in Germany is high. Over the 12 waves analyzed, 31.5% of the German sample population is regularly sport-active (at least once per week). Of the remaining population, 62.2% rarely do sport, and 6.3% do sport monthly. A first interesting observation can be made: A large majority of the population (93.7%) either does sport regularly, at least once a week, or almost never,

**Table 1.** Descriptive Statistics of Key Variables.

Variables	Mean	Standard Deviation	Min	Max
Life satisfaction	7.049	1.777	0	10
Sport-active	0.315	0.464	0	1
Sport-inactive	0.685	0.464	0	1
Rarely doing sport	0.622	0.485	0	1
Monthly doing sport	0.063	0.244	0	1
Weekly doing sport	0.315	0.464	0	1
N = 213,563				
Years: 1992, 1994, 1996, 1997, 1999, 2001, 2005, 2007, 2009, 2011, 2015, 2017				

Source: GSOEP.

**Table 2.** Descriptive Statistics of Sport Participation and Average Life Satisfaction.

Variables	Average Life Satisfaction	$\Delta$ Average Life Satisfaction
Sport-active	7.442	
Sport-inactive	6.868	
Rarely doing sport	6.829	
Monthly doing sport	7.251	
Weekly doing sport	7.442	
Sport-active-Sport inactive		0.574***
Monthly doing sport-Rarely doing sport		0.422***
Weekly doing sport-Rarely doing sport		0.613***
Weekly doing sport-Monthly doing sport		0.191***
N = 213,563		
Years: 1992, 1994, 1996, 1997, 1999, 2001, 2005, 2007, 2009, 2011, 2015, 2017		

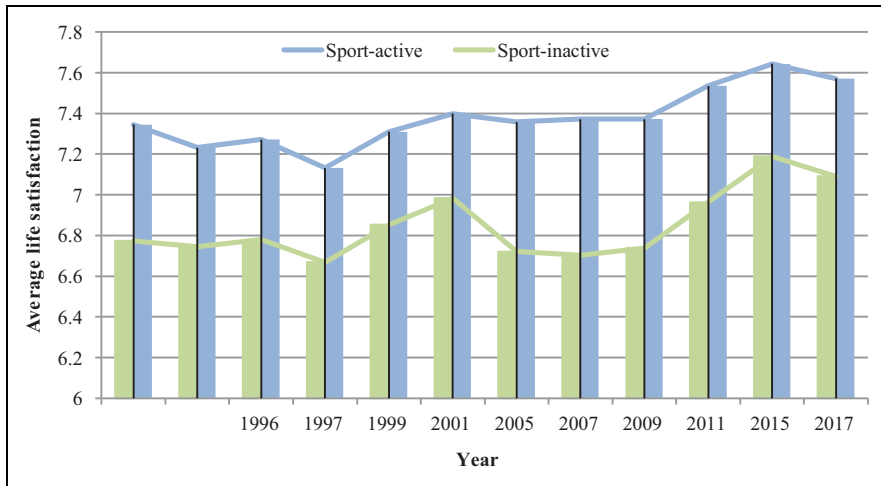
Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Source: GSOEP.

less than once a month. The intermediate level of sport participation, doing sport monthly, is less common. People who do sport seem to commit themselves to doing it frequently.

Table 2 summarizes average life satisfaction for different levels of sport participation. On average, people who are active in sport report being happier than those who are not. The difference of 0.574 is statistically significant. Moreover, a clear and statistically significant difference is observed for the three different levels of sport participation. Doing sport regularly is associated with greater happiness.

Similar insights can be gained from the temporal trend of average life satisfaction for those who are sport-active compared to those who are not (Figure 2). Over the



**Figure 2.** Temporal trend of sport activity and average life satisfaction. Source: GSOEP.

years, reported life satisfaction is constantly about 0.5 points higher for people active in sport. Moreover, a general trend of life satisfaction is visible: The temporal development of average life satisfaction for sport-active and sport-inactive people is almost identical. Therefore, in econometric estimates, the influence of aggregate time series trends has to be taken into account.

### Econometric Estimates

*Association between sport participation and happiness.* The first part of the empirical analysis deals with how active sport participation is related to happiness by applying a pooled ordinary least squares (OLS) estimate. The partial correlation between sport participation and happiness is estimated while keeping the large number of socio-demographic and economic factors constant.

Two specifications are estimated:

$$\begin{aligned} \text{Model 1 : } Life\ satisfaction_{it} = & \beta_1 + \beta_2 sport - active_{it} + \beta_3 sport - active_{it} \\ & \times age_{it} + \beta_4 sport - active_{it} \times age - squared_{it} + \beta_5 sport - active_{it} \\ & \times bad\ health_{it} + \beta_6 sport - active_{it} \times good\ health_{it} + \beta_7 X_{it} + u_{it} \text{ and} \end{aligned}$$

$$\begin{aligned} \text{Model 2 : } Life\ satisfaction_{it} = & \beta_1 + \beta_2 monthly\ doing\ sport_{it} \\ & + \beta_3 weekly\ doing\ sport_{it} + \beta_4 X_{it} + u_{it} \end{aligned}$$

where  $u_{it}$  is the error term and  $X_{it}$  is a vector of demographic and economic control variables including age, age-squared, gender (male or female), marital status (four variables), children (three variables), health (two variables), ln (years of education),

social relationships (three variables), religiosity (three variables), nationality (national or foreigner), place of residence (West Germany or East Germany),  $\ln$  (household income), square root of household size, and working status (eight variables).

Model 1 employs the dummy variable *sport-active<sub>it</sub>*, taking the value 1 if individuals are sport active and 0 if they are not. This model aims to capture how individuals' decisions to participate in sport or not is related to happiness: Are individuals who regularly do sport happier than those who do not? The additional interaction terms test whether the relationship between sport participation and happiness varies for different ages and health status.

Model 2 takes into account how the frequency of engaging in sport is related to happiness. It aims to identify whether the relationship between monthly sport participation and happiness differs from the connection between rare sport participation and happiness.

Since the dependent variable is discrete and qualitative, the ranking information contained in the scaled life satisfaction should theoretically be estimated by ordered probit or logit techniques. However, various happiness studies have shown (e.g., Ferrer-i-Carbonell & Frijters, 2004; Stutzer & Frey, 2006) that estimation coefficients in the OLS estimations and the average marginal effects in ordered probit estimations are quite similar. This means that assuming cardinality or ordinality of life satisfaction makes little difference. The present study opts for the OLS technique, and assumes cardinality of life satisfaction, as the coefficients are easier to interpret.

Table 3 reports the pooled OLS estimation results. The results are shown only for the variables that are essential to the research question. In order to control for aggregate time trends, dummy variables are included for the 12 waves.

The first column presents the partial correlations of the Model 1. The coefficient of the sport-active variable indicates a positive relationship between sport activity and life satisfaction: On average and other things equal, people who actively participate in sport report a 0.398 points higher life satisfaction than those who do not. This is a sizable relationship. Compared to the life satisfaction differential between single and married people (equal to 0.220, not shown in Table 3) participating in sport raises life satisfaction twice as much as being married, compared to not being married.

The coefficients of age and age-squared indicate a U-shaped curve with higher levels of happiness at younger and older ages and lower life satisfaction at middle ages for people who are sport-inactive. The lowest life satisfaction occurs around age 36. This finding is in line with previous happiness research (e.g., Blanchflower & Oswald, 2004; Ferrer-i-Carbonell & Gowdy, 2007; Frey, 2008; Frey & Stutzer, 2000; Staubli et al., 2014). Interestingly, on average, sport-active individuals experience the lowest life satisfaction around age 49. The positive association between sport participation and life satisfaction is stronger at younger and older ages than in middle age.

**Table 3.** Relationship Between Sport Participation and Happiness.

Dependent variable: Predictors (reference group)	(1) Pooled-OLS Life satisfaction	(2) Pooled-OLS Life satisfaction
Sport activity (reference: Sport-inactive)		
Sport-active	0.398*** (0.060)	
Sport frequency (reference: Rarely doing sport)		
Monthly doing sport		0.067*** (0.014)
Weekly doing sport		0.123*** (0.008)
Age	-0.021*** (0.002)	-0.025*** (0.002)
Age-squared	2.98e-4*** (1.70e-5)	3.28e-4*** (1.60e-5)
Sport-active $\times$ age	-0.015*** (0.003)	
Sport-active $\times$ age-squared	1.54e-4*** (2.53e-5)	
Health (reference: Average health)		
Good health	0.795*** (0.010)	0.793*** (0.008)
Bad health	-1.135*** (0.011)	-1.074*** (0.010)
Sport-active $\times$ good health	0.014 (0.017)	
Sport-active $\times$ bad health	0.298*** (0.024)	
Socio-demographic factors	included	included
Economic influences	included	included
Year effects	included	included
Constant	2.880*** (0.079)	2.983*** (0.076)
Observations	213,563	213,563
Adjusted R-squared	0.248	0.247

Notes: Standard errors in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Variables not shown for the socio-demographic factors: gender (male or female), marital status (four variables), children (three variables), ln (years of education), social relationships (three variables), religiosity (three variables), nationality (national or foreigner), place of residence (West Germany or East Germany), and economic influences: ln (household income), household size<sup>1/2</sup>, and working status (eight variables).

Source: GSOEP.

The coefficients of the three health categories confirm a close relationship between physical health and life satisfaction. In line with the research literature, better physical health contributes to higher life satisfaction. What is especially

striking is the strength of this association: Among people who do not participate in sport, individuals in bad health report 1.135 points lower life satisfaction than those in an average state of health, while individuals in good health report 0.795 points higher life satisfaction than those in an average state of health.

The interaction terms of physical health and sport activity have to be interpreted as differences in differences. Some of the estimated coefficients are statistically insignificant. The positive relationship between sport activity and life satisfaction turns out to be the same for people in good health as it is for people in average health. However, the positive correlation between sport activity and life satisfaction is stronger for people in bad health compared to those in average health.

The results for the socio-demographic and economic control variables,<sup>2</sup> which are not explicitly shown in Table 3, are generally consistent with the empirical results from the happiness literature cited above: Higher household income, fewer household members, more children, regular social relationships, and religious activities are associated with higher life satisfaction. Moreover, males are less happy than females, single individuals are less happy than married individuals but happier than divorced and separated people, foreigners are less happy than nationals, residents of East Germany are less happy than residents of West Germany, and full-time employed people are happier than part-time employed, unemployed, and self-employed people, but less happy than women on maternity leave, individuals in education, and retired people.

The partial correlations of Model 2 are shown in the second column of Table 3. The coefficient signs and the sizes of the control variables are almost identical to those in Model 1. However, this estimate suggests that people who participate in sport monthly are happier than those who rarely do. The more frequently sport is undertaken, the stronger is the positive relation to happiness.

*Causal analyses.* This correlational analysis does not address the underlying causal mechanism: Does sport participation affect an individual's happiness, or are happier people more willing to engage in sport? This second part of the empirical analysis addresses this issue by testing both causal directions.

Following econometric textbooks (e.g., Baltagi, 2008; Stock & Watson, 2007; Wooldridge, 2002) and prominent happiness studies (e.g., Ferrer-i-Carbonell & Frijters, 2004; Stutzer & Frey, 2006), we employ the fixed effects model controlling for all time invariant unobserved differences between the individuals and capturing causes of changes within an individual. These within individual effects are then averaged across individuals.

Two separate fixed effects models are estimated, each with two model specifications for each causal path. The specifications correspond with those in the correlational study, thus capturing individuals' decisions to participate in sport or not (Models 3 and 5) and the frequency of sport participation (Models 4 and 6).<sup>3</sup>

The econometric estimates are presented in Table 4. Results are only shown for the variables essential to our research question. Year dummies are included to control for underlying time patterns.<sup>4</sup>



**Table 4.** Causal Link Between Sport Participation and Happiness.

Dependent Variable: Predictors (Reference Group)	(3) FE-OLS Life Satisfaction	(4) FE-OLS Life Satisfaction	(5) FE-OLS Sports- Active	(6) FE-OLS Sports Frequency
<i>Sport activity (reference: Sport-inactive)</i>				
Sport-active	0.235*** (0.079)			
<i>Sport frequency (reference: Rarely doing sport)</i>				
Monthly doing sport		0.049*** (0.014)		
Weekly doing sport		0.074*** (0.010)		
Life satisfaction			0.005*** (0.001)	0.009*** (0.002)
Age	-0.005 (0.003)	-0.007** (0.003)	0.021*** (0.002)	0.040*** (0.003)
Age-squared	-8.03e-5** (3.39e-5)	-4.18e-5 (3.21e-5)	-1.46e-4*** (1.41e-5)	-2.93e-4*** (2.73e-5)
Sport-active × age	-0.014*** (0.003)			
Sport-active × age-squared	1.92e-4*** (3.28e-5)			
<i>Health (reference: Average health)</i>				
Good health	0.429*** (0.011)	0.436*** (0.009)	0.023*** (0.004)	0.042*** (0.007)
Bad health	-0.760*** (0.015)	-0.735*** (0.014)	-0.027*** (0.004)	-0.055*** (0.008)
Sport-active × good health	0.029* (0.017)			
Sport-active × bad health	0.124*** (0.028)			
Annual work hours			-1.06e-5*** (2.79e-6)	-1.81e-5*** (5.25e-6)
Weekend work			-0.013** (0.005)	-0.024** (0.009)
Socio-demographic factors	included	included	included	included
Economic influences	included	included	included	included
Year effects	included	included	included	included
Constant	5.301*** (0.251)	5.369*** (0.248)	-0.658*** (0.132)	0.273 (0.304)
Observations	213,563	213,563	125,477	125,477
Within R-squared	0.091	0.090	0.018	0.020
Overall R-squared	0.186	0.186	0.010	0.010

(continued)

**Table 4.** (continued)

Dependent Variable: Predictors (Reference Group)	(3) FE-OLS Life Satisfaction	(4) FE-OLS Life Satisfaction	(5) FE-OLS Sports- Active	(6) FE-OLS Sports Frequency
Number of individuals	58,368	58,368	45,808	45,808

Notes: Clustered standard errors in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Variables not indicated for the socio-demographic factors: marital status (four variables), children (three variables), ln (years of education), social relationships (three variables), religiosity (three variables), place of residence (West Germany or East Germany), and economic influences: ln (household income), household size<sup>1/2</sup>, and working status (eight variables).

Source: GSOEP.

*Effects of sport participation on happiness.* The first two columns report the causal determinants of happiness. The results of both specifications largely confirm the results obtained in the correlational study.

The coefficient of the sport-active variable in Model 3 indicates that the positive relationship between sport participation and life satisfaction found in the correlational study can be interpreted causally: On average, becoming sport-active increases life satisfaction by 0.235 points, *ceteris paribus*. Again, the effect size can be compared to the effect size of marrying (equal to 0.103, not shown in Table 4); participating in sport affects life satisfaction twice as much as marrying.

A positive effect can also be found for the frequency of doing sport shown in Model 4: Previously rarely active individuals; those engaging in sport less than once a month, who start to do sport monthly increase their life satisfaction by 0.049 points, on average. This effect size is higher for those individuals who start to do sport weekly: Doing sport at least once a week increases life satisfaction by 0.074 points, on average.

In both model specifications, physical health contributes to life satisfaction. The positive effect is larger for people whose health is worsening than for people remaining in average health. Sport participation thus seems to be particularly beneficial for people experiencing worsening physical health.

For both model specifications, the influences of socio-demographic and economic control variables are again largely consistent with the pooled OLS results.

*Effects of happiness on sport participation.* Models 5 and 6 in Table 4 report the causal determinants of sport participation. These models are based on the demo-economic theoretical model of Breuer (2006). The core of his model is the economic budget theory, which states that a non- or semi-market-oriented choice such as the decision to participate in sport, is subject to both monetary and time budget restrictions.

Accordingly we include two additional variables, which account for time limitations and the work–leisure conflict: Annual work hours and weekend work.<sup>5</sup>

Both specifications reveal a significant but very small effect of life satisfaction on sport participation. Model 5 shows that even an increase in life satisfaction by 10 units from “completely dissatisfied” to “completely satisfied” increases the probability of sport participation by just 4.57%. The same small effect occurs in Model 6.

The two models again generally agree on the influences of socio-demographic and economic control variables on sport participation.

### ***Robustness Analyses: Alternative Models***

The first two alternative models A and B test the robustness of the correlational analyses by estimating ordered logit regressions for sport participation and sport frequency.

The estimates are presented in Table 5. Only results for the variables that are essential for the research question are shown. Year dummies are included to control for underlying time patterns.<sup>6</sup>

The results shown in Table 5 mainly confirm the pooled OLS results. The coefficient of the sport-active supports a sizable positive relationship between sport activity and life satisfaction: compared to the life satisfaction differential between single and married people (equal to 0.276; not shown in Table 5), participating in sport is 1.5 times more effective in raising life satisfaction than marrying. The results for sport frequency are confirmed as well: the more frequently sport is undertaken, the stronger is the positive relation to happiness.

Models C and D test the robustness of the estimated coefficients for the causal analyses. For that purpose, the high life satisfaction dummy variable, is used; this takes the value one if reported life satisfaction is higher than 7, and zero otherwise (following Frey & Stutzer, 2006).

The last two columns of Table 5 present fixed effects estimates of models C and D. The results are again in line with the basic fixed effects Models 3 and 4 in Table 4. Sport activity has a positive effect on the probability of becoming highly satisfied with life and is stronger at younger and older ages than middle ages. Compared to Model 3, the effect size is smaller: participating in sport is about 1.7 times better for life satisfaction than getting married (equal to 0.030, not shown in Table 5).

The reverse causal link between sport activity and life satisfaction also holds. Becoming highly satisfied with life has a positive effect on the probability of being active in sport. Again, the effect is small: The positive effect on sport participation of remaining single instead of marrying is about four times higher than the effect of becoming highly satisfied with life.

The estimation results for the socio-demographic and economic control variables again confirm the results from the base fixed effects estimations.

**Table 5.** Alternative Model Specifications.

Dependent Variable: Predictors (Reference Group)	(A) Ord. logit Life Satisfaction	(B) Ord. logit Life Satisfaction	(C) FE-OLS High Life Satisfaction	(D) FE-OLS Sport- Active
<i>Sport activity (reference: Sport-inactive)</i>				
Sport-active	0.417*** (0.070)		0.051** (0.022)	
<i>Sport frequency (reference: Rarely doing sports)</i>				
Monthly doing sport		0.071*** (0.016)		
Weekly doing sport		0.143*** (0.009)		
<i>Life satisfaction (reference: Low life satisfaction)</i>				0.013*** (0.004)
High life satisfaction				0.021*** (0.002)
Age	-0.031*** (0.002)	-0.034*** (0.002)	0.001 (9.27e-4)	
Age-squared	4.02e-4*** (2.02e-5)	4.38e-4*** (1.90e-5)	-2.86e-5*** (8.94e-6)	-1.46e-4*** (1.41e-5)
Sport-active × age	-0.017*** (0.003)		-0.003*** (0.001)	
Sport-active × age-squared	1.74e-4*** (2.97e-5)		4.05e-5*** (9.18e-6)	
<i>Health (reference: Average health)</i>				
Good health	1.009*** (0.011)	1.019*** (0.009)	0.106*** (0.003)	0.024*** (0.004)
Bad health	-1.169*** (0.014)	-1.110*** (0.012)	-0.166*** (0.004)	-0.028*** (0.004)
Sport-active × good health	0.054*** (0.019)		-0.005 (0.005)	
Sport-active × bad health	0.283*** (0.029)		0.011 (0.008)	
Annual work hours				-1.06e-5*** (2.79e-6)
Weekend work				-0.013*** (0.0045)
Socio-demographic factors	Included	Included	Included	included
Economic influences	included	included	included	included
Year effects	included	included	included	included
Clustered standard errors	No	No	Yes	Yes
Constant			0.200*** (0.068)	-0.634*** (0.132)
Observations	213,563	213,563	213,563	125,477

(continued)

**Table 5.** (continued)

Dependent Variable: Predictors (Reference Group)	(A) Ord. logit Life Satisfaction	(B) Ord. logit Life Satisfaction	(C) FE-OLS High Life Satisfaction	(D) FE-OLS Sport- Active
Pseudo R-squared	0.0735	0.0733		
Within R-squared			0.056	0.018
Overall R-squared			0.168	0.010
Number of individuals	58,368	58,368	58,368	45,808

Notes: Standard errors in parentheses.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Variables not shown for the socio-demographic factors: gender (male or female), marital status (four variables), children (three variables), *ln* (years of education), social relationships (three variables), religiosity (three variables), nationality (national or foreigner), place of residence (West Germany or East Germany), and economic influences: *ln* (household income), household size<sup>1/2</sup>, and working status (eight variables).

Source: GSOEP.

## Limitations

Our study is subject to various limitations, which could be addressed in future research.

First, as third section showed, engagement in sport can take several forms. An important distinction is between active sport participation and sport spectatorship. Active sport participation can be further divided in health sport, which may be individual or collective, amateur sport, and professional sport. Sport spectatorship in turn includes live attendance and TV spectatorship, which may be alone or in company. Due to the severely restricted availability of data, the present study uses a relative broad definition of sport: The variables of sport participation and sport frequency measure whether and how often participants engage in sport or exercise. If more extensive data become available, future research should analyze how various aspects of sport are related to happiness.

Second, although fixed effects models for panel data are widely recognized as powerful tools for causal analyses, these models also have some limitations. The primary limitation is that fixed effects models are unable to control for unobserved characteristics that vary over time (Hill et al., 2020). One such possible aspect is expectations. Expectations may be correlated with both subjective well-being and the decision to participate in sport. Another limitation is that fixed effects models are unable to capture the effect of time-invariant variables. This can be problematic when one is interested in the effect of race, gender, or remaining married over time. These time-invariant characteristics and groups are dropped from the analysis in fixed effects models (Bell & Jones, 2015). Finally, in order to satisfy the mean-zero error assumption, fixed effects models require the explanatory variables at a given time (*s*)

to be uncorrelated with the idiosyncratic errors at any time ( $t$ ) ( $\text{Cov}(x_{is}, u_{it}) = 0$  s,  $t = 1, \dots, T$ ). It should therefore be controlled for all variables that are associated with the independent and dependent variables. Since almost any factor can be imagined to exert a direct influence on a person's happiness and on a person's decision to participate in sports, this assumption will almost never be satisfied (Frey & Stutzer, 2013, p. 12). Thus, the accuracy of the estimated effects might be compromised. For the same reason, the models' explained variance is quite low. To account for the shortcomings of fixed effects models difference-in-difference models (diff-in-diff) and regression discontinuity designs (RDD) have increasingly been used for causal inference. Both methods are "shock-based" designs; they rely on the external effect on the dependent variable of a sudden, unexpected change in the explanatory variable. Accordingly, these designs have been called "natural experiments" or "quasi-experiments" (Atanasov & Black, 2016). For such a design to be used requires an external shock to sport, which until recently was not the case. However, the current global outbreak of COVID-19 might produce such a natural experiment. Sport was temporarily interrupted by exogenous interventions by governments. Once a sufficient quantity of data is available, the causal impact of sport on happiness may be investigated with these alternative estimation techniques.

## Conclusion

Economic happiness research is widely accepted and has emerged as one of the most thriving areas in current economic research. However, happiness research has largely disregarded the important activity of sport. The present study aims to fill this research gap by applying happiness research to sport.

Two research questions are addressed: The first examines the association between sport and happiness; the second analyzes the underlying causal path. Both research questions are answered by using the GSOEP.

The first part of the empirical analysis provides new evidence on the positive relationship between sport and happiness: People actively participating in sport report 0.398 points higher life satisfaction than those who do not engage in sport. The correlation between sport and happiness is almost twice as high as the relationship between marriage and happiness. Moreover, this positive association is stronger at younger and older ages than middle ages and stronger for people in bad health than for those in average health. This finding has interesting implications: It indicates that sport participation and happiness are related not only indirectly through the traditional path of physical health but also directly. Finally, the present study finds that the more frequently sport is undertaken, the stronger is the positive association with happiness.

The causal analysis suggests that the causality runs in both directions: Sport has a positive effect on happiness, and happiness has a positive impact on sport.

On average, becoming active in sport increases life satisfaction by 0.235 points. This effect is more than twice as large as the effect on happiness of marrying. The positive effect of sport participation on life satisfaction is again U-shaped: It is stronger at younger and older ages than middle ages. Furthermore, the insight about physical health gained in the first empirical part is confirmed: Sport participation is particularly beneficial for people experiencing worsening physical health. Finally, the more frequently sport is undertaken, the stronger is the positive effect on happiness.

The present study also finds evidence for the reverse causality: Life satisfaction has a positive effect on sport activity and sport frequency. However, the effect sizes are very small: An increase in life satisfaction by one unit on average increases the probability of sport participation by only 0.457%. The effect can again be compared to the effect size of happiness on being married: The positive effect of remaining single instead of marrying on the probability of sport participation is about 12 times stronger than the effect of a one-unit increase in life satisfaction. A similar relative effect size is found for sport frequency.

The effect of sport participation on happiness thus dominates the reverse causality from happiness to sport participation: Using alternative model specifications in which the sport and happiness variables are both defined as dummy variables shows that the causal impact of sport participation on happiness is about four times higher than the reverse causal effect.

The empirical results highlight the importance of sport in everyday life. At the micro level, individuals can decide to participate in sport or not, knowing that on average it will have a positive impact on their happiness. At the macro level, the dominant causal direction identified from sport to life satisfaction is relevant for policy interventions intended to increase happiness. Policies promoting sport may include many elements (Fritz et al., 2004): New and renovated sport facilities, financial support for sports organizations by tax incentives and subsidies, minimal requirements for physical education lessons in schools, and public information campaigns on the benefits of sporting activity.

While the present study is subject to limitations mostly due to missing data, it contributes to our knowledge. It reports detailed evidence on the positive relationship between sports and happiness. It helps to fill a research gap by identifying a positive causal impact of sports on happiness, which strongly dominates the positive effect of happiness on engaging in sports.


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## Notes

1. The entire descriptive statistics is available on request.
2. Results on socio-demographic and economic control variables are available on request.
3. The dependent variable “sport-active<sub>*i*, *t*</sub>” in Model 5 is dichotomous, and the dependent variable “sport-frequency<sub>*i*, *t*</sub>” in Model 6 is discretely qualitative. Thus, logit or ordered probit estimations would be appropriate (Becchetti et al., 2008; Frey & Stutzer, 2005). However, as assuming cardinality or ordinality of a dichotomous dependent variable makes little difference to the estimated coefficients, the present study assumes cardinality of sport participation because the coefficients are easier to interpret (Hellevik, 2009). The present study also assumes cardinality of sport frequency, in line with happiness research assuming cardinality of life satisfaction (Di Tella et al., 2001; Ferrer-i-Carbonell & Frijters, 2004; Stutzer & Frey, 2006) and following existing literature recommending linear fixed effects models if the relative effects on the discrete qualitative dependent variable are of interest (e.g., Riedl & Geishecker, 2014).
4. Results on socio-demographic and economic control variables are available on request.
5. Annual work hours and weekend work are not available for the waves 1992, 1994, 1996, 1997, 1999, and 2001, thus reducing the sample size to 45,808 individuals and 125,477 observations.
6. Results on socio-demographic and economic control variables are available on request

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