Sport participation, life satisfaction and domains of satisfaction among people with disabilities

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Abstract:
This study investigates the relationship between sport participation and the life satisfaction scores reported by people without and with disabilities, wherein overall life satisfaction is seen as an aggregate of satisfaction levels regarding various domains of life (and consistent with the bottom-up spillover theory). Using longitudinal data taken from the German Socio-Economic Panel for the period 1984-2013, this study presents estimates from a two-layer model that allows life satisfaction to be explained by the satisfaction scores reported by individuals with respect to six different domains of life satisfaction (i.e. job, health, housework, household income, dwelling, and leisure). We found that sport participation has a positive and significant correlation with the levels of satisfaction with health, housework, and leisure reported by people with disabilities. Furthermore, the domains of satisfaction with health, housework and household income are the main contributors to the enhancement of their levels of overall life satisfaction. However, the interrelations of these domains of life satisfaction with overall life satisfaction are mainly transitory. From a public policy perspective, it is necessary to undertake the design and implementation of inclusive public and private sport programs for people with disabilities that contribute to increasing not only their levels of overall life satisfaction but also other facets of life satisfaction.

Keywords: sports; disability; life satisfaction; domains of life satisfaction; Germany.

1 Introduction

Despite the well-recognized health benefits of physical activity, the World Health Organization, WHO, (2014a) points out that 23% of adults aged 18 and over (20 and 27% for males and females, respectively) do not undertake enough regular physical activity. International organizations (e.g. the United Nations and the WHO) and many developed countries (e.g. Australia, the United Kingdom, Germany, France, and India) have developed global and specific strategies together with action plans on physical activity to create and promote an active environment, society and life (WHO, 2017). However, and according to the International Sport and Culture Association (2015), people with lower-income demographics (e.g. older people, immigrants, women, and people with disabilities) are less likely to undertake physical activity, and hence they suffer from greater negative health consequences of inactivity as compared to their counterparts from more affluent segments of society.

Nowadays, there are more than 1,000 million people with disability globally, that is about 15% of the world's population or one in seven people (WHO, 2014b). Becoming disabled as a result of a disease, injury, accident or a worsening medical condition can affect many areas of an individual's life such as, for example, health status, employment, education, free time, social relations, housing, etc. (Pagan, 2012). For example, people with disabilities are far less likely to enjoy physically active lifestyles as compared to people without disabilities (e.g. Gatward and Burrell, 2002; Rimmer *et al.*, 2004; Stevenson, 2009; Wilhite *et al.*, 2009; Lundberg, 2010; Darcy and Dowse, 2013; and Sotiriadou and Wicker, 2014). To combat this low participation in physical activities, article 30 from the United Nation Convention on the Rights of Persons with Disabilities states that "States Parties shall take appropriate measures to encourage and promote the participation, to the fullest extent possible, of persons with disabilities in recreation and

leisure and sporting activities at all levels". In the same line, the European Disability Strategy 2010-2020 recognizes the "right to free movement, to choose where and how to live, and to have full access to cultural, recreational, and sports activities". In general, the existing literature on disability and happiness has found that people with disabilities are more likely to report lower levels of life satisfaction than people without disabilities (e.g. Lucas, 2007; Oswald and Powdthavee, 2008; Pagan, 2010 and 2012). Despite these figures and the increasing interest of policy makers, governments and non-governmental organisations in the social integration of people with disabilities, very little is known about the relationship between sport participation and the levels of satisfaction attained by these individuals (Rimmer *et al.*, 2004; Dupuis *et al.*, 2012; Sotiriadou and Wicker, 2014).

Using longitudinal panel data from the German Socio-Economic Panel (GSOEP) for the period 1984-2013, this article investigates the relationship between participation in sports and the levels of life satisfaction (LS) reported by people without and with disabilities. From a theoretical perspective, we found different theories that have tried to explain how leisure activities affect well-being such as, for example, disengagement theory (e.g. Lapointe and Perreault, 2013; Dong *et al.*, 2014), flow theory (e.g. Csikszentmihalyi, 1990), self-determination theory (e.g. Ryan and Deci, 2000), and bottom-up spill-over theory (e.g. Diener 1984; Diener *et al.*, 1999; Newman *et al.*, 2014; Kuykendall *et al.*, 2015; and Sirgy *et al.*, 2017). For the purpose of our study, we followed the bottom-up spillover theory of subjective well-being which is based on the premise that some life events affect various life domains (e.g. job, leisure, health, and household income) from the most concrete to the most abstract, and all of them affect satisfaction with life as a whole. Within this context, Newman *et al.* (2014) introduced a conceptual framework linking leisure to subjective well-being (SWB), wherein leisure was seen as a

"*multidimensional construct, encompassing both structural and subjective aspects* (pp. 555)". They proposed that "*both structural leisure (e.g., leisure-type activities and time spent outside obligated work time) and subjective leisure (e.g., perceived leisure frequency and perceived participation in leisure) relates to SWB via psychological mechanisms (i.e., detachment-recovery, autonomy, mastery, meaning, affiliation (DRAMMA)) by promoting the domain of leisure as one of many domains affecting global SWB* (pp. 557)". In this sense, Kuykendall *et al.*, (2015) found, using random-effects meta-analyses, that leisure interventions enhance SWB and mediated by leisure satisfaction. Recently, Sirgy *et al.* (2017) reviewed the literature of leisure and SWB and introduced a more-refined bottom-up spillover model based on the five psychological mechanisms proposed by Newman *et al*. (2014). These authors introduced 12 sets mechanisms and theorized that "*a leisure activity contributes to leisure well-being if it meets certain basic needs (benefits related to safety, health, economic, sensory, escape, and/or sensation/stimulation needs) and certain growth needs (benefits related to symbolic, aesthetic, moral, mastery, relatedness, and/or distinctiveness needs)*(pp. 206-207). For example, some individuals (e.g. people with disabilities) may be seriously concerned about the health-benefits from physical activities which may be perceived as critical contributors to enhancing their levels of satisfaction with leisure and overall SWB. From an empirical perspective, we have applied a two-layer model proposed by Van Praag *et al.* (2003) that allowed us to implement this bottom-up approach, taking into account unobserved heterogeneity and using simple OLS-techniques without any loss of information.

Although we can find previous studies that analyse sport participation and life satisfaction for the general population (e.g. Becchetti *et al.*, 2008 and 2012; Lechner, 2009; Rasciute and Downward, 2010; Downward and Rasciute, 2011; Huang and

Humphreys, 2012; Wang and Wong, 2014; Ruseski *et al.*, 2014; Kim *et al*., 2016; and Schmiedeberg and Schroder, 2016), the number of studies focusing on people with disabilities is very scant, with the exception of the works of Lee and Park (2010), Yazicioglu *et al.* (2012), Phillips *et al.* (2013), and Pagan (2015). For example, Lee and Park (2010) found that the non-health effects of physical activity or sport participation on life satisfaction were positive and statistically significant, whereas Yazicioglu *et al.* (2012) concluded that people with physical disabilities who participated in adapted sports had significantly higher quality of life and life satisfaction scores compared to people with physical disabilities not involved in any adapted sports. In the same line, Phillips *et al.* (2013) obtained that increases in physical activity were associated with increases in exercise self-efficacy which, in turn, was associated with higher physical self-worth and fewer disability limitations that are associated with greater life satisfaction. Pagan (2015) also found that the participation of people with disabilities in sports was still very low as compared to that for their non-disabled counterparts, and this participation increased their levels of life satisfaction.

To our knowledge, this study is the first attempt to investigate the relationship between sport participation and life satisfaction and domains of life satisfaction for people with disabilities, filling an important gap in the existing literature. Another important contribution of this study is that unlike other previous studies, we use a very large panel data set which allows us to control for unobserved heterogeneity. Finally, our results can contribute to designing and implementing specific public actions and measures which increase sport participation for all individuals (with disabilities or not), and enhance their levels of satisfaction with life as a whole.

2 Data and methods

2.1 Sample and measures

To carry out this study we have used longitudinal data drawn from the German Socio-Economic Panel (GSOEP) for the period 1984-2013, which allow us to have information on a plethora of socioeconomic variables at an individual and household level. For example, the GSOEP questionnaire includes questions regarding free time (e.g. going to cultural events, meeting with friends and relatives, engaging in artistic or musical activities, volunteer work, attending religious events, and participation in *sports*), as well as information on the levels of satisfaction with life and different domains of life satisfaction reported by individuals. All these satisfaction variables are self-reported and are created from the responses to the question *"How satisfied are you with your life (job, health, etc.)?"*, and ranging from 0 (completely dissatisfied) to 10 (completely satisfied). In our case, we examine six domains of life satisfaction (i.e., satisfaction with job, health, housework, household income, place of dwelling and leisure) which are only available for the full period 1984-2013[1]. Although we have used data covering the period 1984-2013, there were some years for which we did not have information on individuals' sport participation due to the fact that they were not recorded on a yearly basis. As a result, the years for which we actually have observations for all variables of interest are 1984-1986, 1988, 1990, 1992, 1994-1999, 2001, 2003, 2005, 2007, 2008, 2009, 2011 and 2013 (i.e. 20 waves).

Looking at the GSOEP questionnaire, we found that the information on participation in sports has differed over the year. In 1984, we observe that the question to determine whether individuals do sports in their free time was: "*How often do you engage in the*

[1] Although we can find different instruments to measure subjective well-being (e.g. single *versus* multiple-item measures), the use of single-item measures (Gurin et al., 1960) has been very popular because of its high face validity and the widespread use of life-satisfaction ratings in the wellbeing literature (Schimmack, 2008). According to Veenhoven (1995) this single-item measure is generally as reliable and valid as multi-item measures. In addition, well-known international datasets (e.g. the International Social Survey Programme, the European Social Survey, the European Community Household Panel, the British Household Panel Study, and the German Socio-Economic Panel Study) have included in its main questionnaire this single-item measure of well-being. See, for example, Fujita and Diener (2005) and Kroh (2006) for additional information on the single-item used in the GSOEP and its validity and proprieties.

following activities in your free time? Active sports: never/rarely; occasionally; often/regularly". In 1985 and onwards, we can find two types of questions. The first of the questions was: "*Which of the following activities do you do in your free time? Please enter how often you practice each activity.... Active sports participation: every week; every month; less frequently; never*". This question was posed in 1985, 1986, 1988, 1992, 1994, 1996, 1997, 1999, 2001, 2005, 2007, 2009, 2011 and 2013. The second type used in 1990, 1995, 1998, 2003, and 2008, was "*How frequently do you do the following activities?… do sports: daily; once per week; once per month; less than once a month; never*". According to Lechner (2009) and although the wording is not exactly the same once the extreme categories (daily, once a week as well as never, less than monthly) of the second type of the questions are aggregated, both types of questions appear to be sufficiently similar to be used in combination[2]. In this sense, we have created a categorical variable called "*participation in sports*" with four categories: a) never, b) seldom, c) monthly, and d) daily/weekly. Because of the low number of individuals with disabilities in the first response "*daily*", we have combined the first two responses into one, i.e. "*daily/weekly*".

As for our disability variable, we follow the work of Burkhauser and Schoeder (2007), which combines data on the degree of disability (officially registered) and health satisfaction scores to construct a disability measure comparable to the work limitation question used in the Current Population Survey (USA). These authors combine information on satisfaction with health (which is a completely subjective measure that is likely to be highly correlated with a self-perceived work limitation) and the degree of officially registered disability (because it directly captures part of the population with

[2] Once again, we have used a single-item instrument to measure our key variable "sport participation" which has been previously employed within the existing literature on sport participation in Germany (e.g. Becchetti *et al.*, 2008; Lechner, 2009; Pagan, 2015; Schmiedeberg and Schröder, 2016; Schűttoff *et al.*, 2018) and medical literature (e.g. Becker *et al.*, 2006).

disabilities) to create this disability measure. The health satisfaction question ranges again from 0 (completely dissatisfied) to 10 (completely satisfied), whereas the degree of disability ranges from 0 (not disabled) to 100 (severely disabled). Burkhauser and Schroeder (2007) evaluate this combination measure in detail based on those years a work limitation question is available and also provide an example of the power of such a measure (estimating the prevalence of disability for working-age men (aged 21–58) in the western states of Germany between 1984 and 2002). These authors conclude that an individual is considered "*disabled*" if his/her satisfaction with health is *at most* 2 or if he/she has a degree of disability of *at least* 53%. We restrict our analysis to individuals aged 16 and over, and with no missing information[3]. The final samples used in the estimation process consist of 155,880 and 16,545 person-year observations for the non-disabled and disabled samples, respectively (87,280 and 3,551 observations when we estimate the job satisfaction equation).

2.2 Method

As noted earlier, to estimate the determinants of life satisfaction (LS) we use the bottom-up approach proposed by Van Praag *et al.* (2003), wherein the different domains of life satisfaction (DS_j) determine (and are the component of) life satisfaction as an aggregate (Figure 1). This approach allows us to measure the impact of some socioeconomic variables (in our case, sport participation) on LS through different DS_j and obtain a more accurate description of this phenomenon than when we try to cover the two stages in only

[3]Although disability and health can be potentially correlated, Pagan (2010) demonstrates they do not share exactly the same information. For example, if we take the example of blindness, when it is generated by a chronic illness (such as diabetes), it is probably linked to poor health status; but when blindness is related to a congenital problem of the eyes, this disability and the health status of the individual will probably be orthogonal. In our case, 28% of people with disabilities have "very good" or "good" health status, whereas 40% have "poor" health. In addition, Grimby et al. (1988) conclude that the domain of disability extends far beyond health-related concerns to encompass the person's well-being, definition of self and social position.

one equation (Van Praag *et al.*, 2003). These authors call this method "*Probit Adapted OLS* (POLS)" which consists of the estimation of the following LS equation:

$$LS = LS\ (DS_1, \ldots., DS_j, Z) \qquad j= 1, \ldots., 6 \qquad [1]$$

and each domain of satisfaction:

$$DS_j = DS\ (\text{Participation in sports}, X_j) \qquad [2]$$

where "*participation in sports*" is our categorized variable (i.e. never, seldom, monthly, and daily/weekly), and X_j is an additional set of individual (gender, age and its square, marital status, year of education, nationality, employment status and if the individual is a home owner) and household characteristics (household size, number of children in the household, and real household income per capita) for the domain j. As for the variable Z, this is, by definition, unobservable and if no special treatment is given, becomes part of the error terms of the DS and LS equations. Van Praag *et al.* (2003) propose creating an instrumental variable (Z) obtained from the estimation of the DS equations which will be included in the LS equation [1]. Doing this, the remaining LS error is no longer correlated with the DS errors and the estimates obtained from the LS equation [1] do not suffer from endogeneity bias[4]. To apply POLS, it is also necessary to transform the dependent variables of Equations [1] and [2] into their conditional expectations and following, for example, the Terza method (1987). Additionally, we introduce in Equation [1] some dynamic components and replace the contribution of each domain with their annual value and their mean value over the period covered by the data. This inclusion allows us to differentiate between transitory and permanent effects of each DS_j on LS (Friedman,

[4] The inclusion of the additional variable Z in equation [1] is similar to the Heckman correction term (lambda).

1957). Finally, we include in the LS equation a fixed time and region effect by using regional and year dummy variables.

[Figure 1]

3 Results

Table 1 shows the levels of life satisfaction reported by people without and with disabilities according to their participation (and intensity) in sports, as well as the sample distribution in each sport category for both groups. First, we found that people with disabilities are less likely than people without disabilities to participate in sports. A total of 71.3% of people with disabilities have never undertaken sport activities, whereas for people without disabilities this percentage goes down to 43.1% (i.e. a differential of 28.2 percentage points). We also found that only 15.6% and 2.8% of people with disabilities participate in sports "*daily/weekly*" and "*monthly*", respectively. In contrast, these percentages rise to 31.3 and 6.9 for people without disabilities, respectively. These results are consistent with the results obtained, for example, by Gatward and Burrell (2002), Darcy and Dowse (2013), and Sotiriadou and Wicker (2014), and confirm the low levels of participation of the disabled population in sport activities. According to Rimmer *et al.* (2004), in many cases the possibilities of people with disabilities to practice physical exercise are quite limited (especially those with severe disabilities), with their participation affected by a multifactorial set of barriers and facilitators that are unique to this population, such as environment, cost of services or programs, equipment, policies, information, education and training of fitness facility staff, and services offered in community recreation facilities. As for life satisfaction scores, we found that people with disabilities have lower levels of life satisfaction as compared to people without disabilities (5.58 *versus* 7.15 points), independently of their intensity of participation in sports. For example, for the category "*daily/weekly*" we found that the differential of the life

satisfaction scores between people without and with disabilities is 1.35 points. This differential in favour of people without disabilities is 1.54, 1.43 and 1.18 points for the categories "*never*", "*seldom*" and "*monthly*", respectively (in all cases and according to a test of equality of means, this differential is statistically significant at the 5% level). Despite this differential, we found that for both groups the levels of life satisfaction increase as the participation in sports is more intense. Namely, the more sport people do the more satisfied they are. Additionally, we have calculated the difference in each sport category between people without and with disabilities, and have run a test of equality of proportions. In all cases, the differentials are statistically significant at the 5% level. For example, the differential in favour of people without disabilities is 15.7 percentage points for the category "*daily/weekly*", whereas for the category "*never*" it is -28.2 percentage points.

[Table 1]

Figure 2 shows the mean levels of satisfaction for our six domains of satisfaction by sport participation and disability status. First, we found that individuals with disabilities report lower levels of satisfaction as compared to people without disabilities, except for the satisfaction with leisure. This satisfaction differential is also particularly high and significant in some life domains such as satisfaction with health, household income and job. As an illustration, the gap is 3.83 and 1.56 in favour of people without disabilities if the participation in sport is "*daily/weekly*" for the domains of health and job satisfaction, respectively. Second, and looking at the six domains of satisfaction and for those individuals who participate in sports (i.e. seldom, monthly, and daily/weekly), in general we found a positive relationship between the intensity of the participation in sports and all satisfaction domains, i.e. satisfaction scores for all individuals (with disabilities or not) increase as the participation in sports is more intense. However, these premiums in terms

of satisfaction are relatively higher in some domains of satisfaction such as health, household income and leisure. For example, if we calculate the distance in terms of satisfaction between the highest sport participation category (daily/weekly) and the lowest one (never), we found that the highest differentials for people without disabilities are found for satisfaction with health (0.78 points), household income (0.47 points) and job (0.23 points), whereas for people with disabilities they are found for satisfaction with health (0.67 points), housework (0.42 points) and household income (0.24 points). In some cases (e.g. satisfaction with household income, dwelling and leisure), this spread is lower due to the fact that we detect the existence of an unexpected high satisfaction score for those individuals who never participate in sports as compared to those who are participants in some intensity. Overall, these results suggest that participation in sports generates a positive spill-over effect which leads to participation in sports having an impact not only on the individual's life satisfaction scores but also on the rest of the domains of life satisfaction.

[Figure 2]

As for the econometric analysis, Table 2 presents the estimates of the six DS equations [2]. First, we have tested the presence of selectivity bias in our estimates by using the method proposed by Verbeek and Nijman (1992)[5] for random-effects models, and the results rejected the relevance of selectivity bias in the non-disabled and disabled samples used in our analysis (they are available upon request). Second, we found in general a positive and significant association of sport participation with nearly all six domains of satisfaction for the non-disabled and disabled samples. However, the magnitude of this relation depends on the domain of satisfaction. For example, we found

[5] This test is based on the inclusion of three additional variables in our model: (1) the number of waves in which the ith individual participates in the panel; (2) a binary variable taking the value 1 if and only if the ith individual is observed over the entire sample and 0 otherwise; and (3) a binary variable indicating whether the individual was observed in the previous period.

that the contribution of sports to the levels of health satisfaction is higher for people with disabilities than for people without disabilities (almost double). In this sense, the benefits of sports in terms of health (e.g. reducing stress, depression, hypertension, osteoporosis and obesity, and increasing emotional well-being, energy levels, self-esteem, and social relations) are well-documented in the existing literature (e.g. Bouchard *et al.*, 1994; Gauvin and Spence, 1996; Sherwood and Jeffery, 2000; and Dimeo *et al.*, 2001), and can be particularly relevant for people with disabilities. They can spend more time in rehabilitation programs (e.g. being part of a medical prescription or continuous therapy) which include the practice of some therapeutic physical exercises and sport activities (e.g. walking, swimming, yoga and fitness) as a crucial element to boost their recovery process and maintain an active and healthy lifestyle, and thus increasing their levels of health satisfaction. The contribution of sports for people with disabilities is also significant to the domain of satisfaction with housework. On the other hand, for the disabled sample, the coefficients on "*monthly*" and "*daily/weekly*" are not significant at conventional levels in the domains of satisfaction with job and dwelling with respect to the reference category, "*never*" (and even the coefficient on "*seldom*" is statistically significant at the 1% level in both domains). Once again, these results confirm the importance of taking into account the spill-over effect of sport participation on all facets of life satisfaction, which in turn also have an impact on individuals' overall life satisfaction scores. As we expected, we also find significant coefficients on other individual and job characteristics (gender, age, education, household income, nationality, employment status, among others) for the six domains of life satisfaction shown in Table 1, and consistent with the previous literature. As noted earlier, we have also calculated from these estimates the variable Z, which will be included in Equation [1] in order to control the possible endogeneity bias.

[Table 2]

Table 3 shows the results obtained for the LS equation [1] for people without and with disabilities. As noted earlier, this table allows us to estimate LS as an aggregate of various domains of satisfaction and also identify the transitory (i.e. coefficient on each domain) and permanent interrelations (i.e. coefficient on the mean satisfaction of the corresponding domain) of each of them on LS. First, the coefficient on the additional variable Z included in Equation [1] is significant at conventional levels for the non-disabled and disabled samples (in the latter it is only at 10%). Following Van Praag *et al.* (2003), this result shows the importance of correcting for the potential presence of endogeneity bias in this type of analysis wherein we used a two-layer model of life satisfaction. In addition, we found that the contribution of the individual random effect to the total variance is higher for the disabled sample (0.40). Second, overall we found that all coefficients are significant at conventional levels for the non-disabled and disabled samples (except for the coefficient on "mean (dwelling satisfaction) for the disabled sample). Furthermore, all of these significant coefficients are positive, indicating a direct relationship between LS and each domain of life satisfaction.

[Table 3]

For people without disabilities, we have found strong transitory interrelations for the domains of satisfaction with household income (24.2%) and health (22%). A similar result is found for people with disabilities regarding transitory interrelations, i.e. satisfaction with health (22.6%) and household income (16.4%). The lowest transitory interrelations for people without disabilities are found for housework and leisure satisfaction (9.9 and 11.5%, respectively), and satisfaction with leisure and dwelling for the disabled sample (4 and 6%, respectively). However, the magnitude of these transitory interrelations are relatively higher than those related to permanent interrelations (i.e. coefficients on means). For example, if the transitory interrelation of satisfaction with

household income goes up by 1%, people with disabilities' overall life satisfaction increases by 16.4%, and only by 6.3% through the permanent interrelation. Once again, the permanent interrelations are especially high for the domains of satisfaction with health and household income (9.7 and 8.8%, respectively) for people without disabilities, and health and leisure for people with disabilities (7.7% and 6.8%, respectively).

Following Van Praag *et al.* (2003) and using the estimation results shown in Table 3, we have generated the level effects which have been obtained by adding up the transitory interrelations and the coefficients of the corresponding "*mean*" satisfaction variables (Table 4). A ranking of domains of satisfaction is also shown in this table for each sample, as well as the trade-off ratios between each domain of satisfaction and the domain of satisfaction with household income. For people without and with disabilities, the domains of satisfaction with household income (0.33 *versus* 0.227) and health (0.317 *versus* 0.303) are the main components with the highest positive relationship with overall satisfaction. On the other hand, for people without disabilities the domains of satisfaction with leisure and housework are the components with the lowest associations with overall satisfaction (0.121 and 0.169, respectively), whereas for the disabled sample we found that they are the domains of satisfaction with leisure and dwelling (0.108 and 0.033, respectively).

[Table 4]

As for the trade-off ratios, these can be interpreted as how much the satisfaction with a domain has to rise to compensate the fall in other domains of satisfaction in order to keep the overall LS constant (i.e. the marginal rate of substitution between different domains). Van Praag *et al.* (2003) point out that these trade-offs can be easily calculated as the ratio between the level effects previously obtained for each domain. As noted earlier, we have used as a reference the domain of satisfaction with household income to calculate all these trade-off ratios. For example, we found that the trade-off ratio between

health satisfaction and household income satisfaction for the non-disabled sample is 0.961 (=0.317/0.33), i.e., a reduction in health satisfaction must be compensated by an increase of 0.961 in household income satisfaction in order to keep overall LS unchanging. For a reduction in the domain of dwelling satisfaction, the increase in household income satisfaction is 0.518, whereas for a reduction in housework satisfaction, the increase in household income satisfaction is only 0.367. For the disabled sample, once again we found higher household income levels in terms of satisfaction to compensate reductions in health satisfaction (1.335) to keep overall LS invariable. In contrast, a reduction in dwelling satisfaction must be accomplished by an increase in household income satisfaction by 0.145. In this latter case, we have to take into consideration that this calculation has been obtained by adding up the permanent interrelation which is negative and with a significant coefficient. Overall, we have found that all these level effects of satisfaction with life domains on overall life satisfaction for people with disabilities mainly reflect transitory interrelations.

Finally as we noted earlier, we have reestimated our LS equation [1] but now including as an additional explanatory variable the domain of satisfaction with job (Appendix Table A.1). We found that the transitory and permanent interrelations of satisfaction with job are positive and significant at conventional levels for people without and with disabilities. For people without disabilities (people with disabilities) an increase by 1 percentage point in the transitory satisfaction with job increases the overall life satisfaction by 13.1% (8.2%), whereas a 1 percentage point increase in permanent satisfaction with job leads to an additional 4.6% (7.1%) increase in life satisfaction. As for the remaining coefficients, we observe that they are similar to those shown in Table 3[6]. However, for the disabled sample we found a lower number of coefficients that are

[6] We have also calculated the level effects when we include job satisfaction in our LS equation [1]. Once again, satisfaction with health and household income are the domains with the highest contribution to LS.

significant (mainly because of the considerable reduction in the number of observations as compared to those shown in Table 3).

4 Conclusion

This study provides new insights into the relationship between sport participation and life satisfaction by using a longitudinal sample of German people without and with disabilities for the period 1984-2013. From a two-layer model of LS proposed by Van Praag *et al.* (2003) wherein LS is seen as a aggregation of six different domains of satisfaction (bottom-up approach), we have estimated a POLS model which has allowed us to identify, first, the direct relationship between sport participation and each domain or facet of LS, and second, the contribution of these domains to overall LS. The results have shown the existence of a significant spill-over effect (mainly positive) of undertaking sport activities not only on life satisfaction but also on the remaining domains of LS. For example, sport participation had a significant and positive association with the levels of satisfaction with health, housework, and leisure reported by people with disabilities. For the non-disabled sample, satisfaction with health, leisure and household income were strongly correlated with participation in sports. As for overall LS, we have found the significant contribution of transitory and permanent interrelations in all satisfaction domains (except for the permanent interrelation of dwelling for the disabled sample) for the non-disabled and disabled samples. Although we have found that the main components related positively to LS among people with disabilities are satisfaction with health and household income, these relations with LS are mainly transitory.

From a public policy perspective, policy makers with the collaboration of sport managers and staff, health professionals, sport clubs and disability associations must

The contribution of satisfaction with job is 0.177 for the non-disabled sample (fourth place), whereas for the disabled one it is in third place (0.153).

design and implement strategies and actions which eliminate or at least reduce the social marginalization of people with disabilities in sport facilities and environments. According to Toepoel (2013), participation in sports, social activities or cultural events may be the most important leisure activity for predicting social integration for this group. Participants with disabilities in leisure activities play a role in constructing social acceptance (either proactively or reactively) within inclusive leisure contexts and obtain an increase in their physical and emotional health and levels of happiness (Devine and Lashua, 2002; Wilhite and Shank, 2009; Pagan, 2015). Furthermore, these actions and measures are consistent with the social model of disability which can be used as an adequate framework to design and promote physical activity through participation in sports and reduce the discrimination, marginalization, and stigmatization that people with disabilities suffer. According to our estimation results, sport participation has a positive and significant association with satisfaction with health for people with disabilities which allow us to identity and incorporate into the sport debate the crucial role of health promoters and caregivers, vocational rehabilitation members, sport professionals and academic institutions to increase their levels of sport participation and quality of life. In this sense, it is also important to provide easily accessible information on participation in local sports and recreation activities, as well as a more sophisticated understanding of differential needs and appropriate sources, accessible experiences, and the provision of adequate accommodation (e.g. ramps for wheelchairs) are needed (Darcy and Dowse, 2013). To do this, it is essential to ensure that sport staff are adequately trained in adaptive sport and inclusion of people with disabilities. We must also ensure that all sport services and facilities are accessed equally by females and males with disabilities in order to reduce the well-known double discrimination that females with disabilities suffer (from being disabled and female).

Finally, one of the main limitations of the paper is the use of self-reported data on disability and health status. In addition, the GSOEP does not include information on the types of disability that individuals have, and thus this limits our study. We may expect strong differences in the relationship between sport participation and domains of life satisfaction as well as its impact on life satisfaction according to the kind of disability. For instance, some people with disabilities may be more likely to suffer from strong barriers and difficulties to access sport facilities, equipment, information, communication, and sport professionals (e.g. those with mental and psychological disorders who experience the most negative social attitudes and discriminatory practices in the workplace) and significant reduction in their levels of life satisfaction and other domains of satisfaction. According to Chafetz *et al.* (2008), those people with severe mental health living in community residential facilities are more likely to suffer from isolation and discrimination because of their social context and living situation (e.g. distance to the sport facility, lack of companionship and financial support). Furthermore, Mcdevitt *et al.* (2006) point out that mental illness symptoms, medications, weight gain from medications, fear of discrimination, and safety concerns are the main barriers to physical activity in people with serious and persistent mental illness. However, people with serious and persistent mental illness viewed physical activity positively, and they linked being active to improved mental health. In the same line, people with spinal cord injury face multiple barriers to physical fitness in functional, psychological, and architectural domains (e.g. poor accessibility, lack of privacy, fear of injury, cost of an exercise program, knowledgeable instructors, and public exposure) (Scelza *et al.*, 2005). With regard to future research in this area, it may include study of the impact of the onset of disability on the participation in sports (and its intensity) and life satisfaction in order to test anticipation and adaptation effects.

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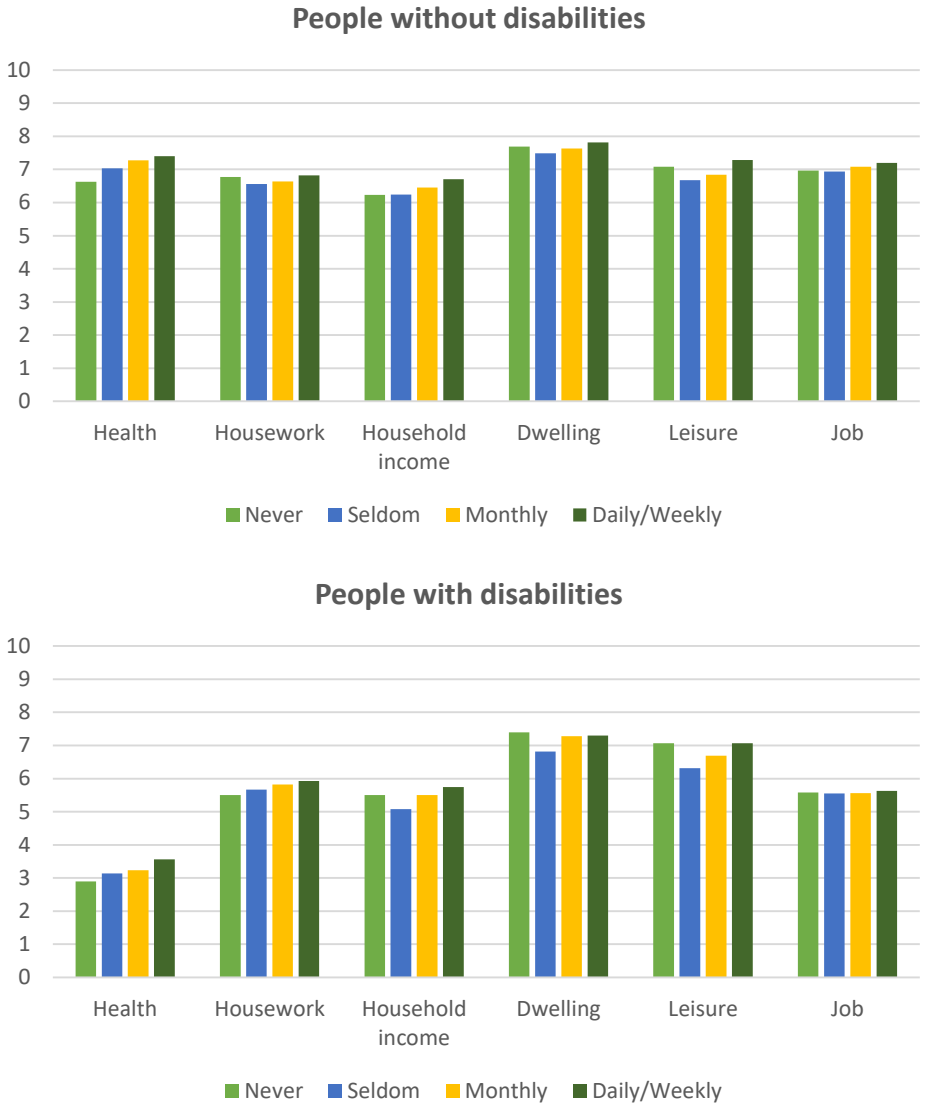
Figure 1 The two-layer model proposed by Van Praag *et al.* (2003).

Figure 2 Mean levels of satisfaction in six domains for people without and with disabilities by participation in sports for the period 1984-2013 in Germany.



Note: Sample consists of individuals aged 16 or over. Weighted data.
Source: GSOEP for the period 1984-2013.

Table 1 Life satisfaction scores (LS) by participation in sports and disability status in Germany.

	PEOPLE WITHOUT DISABILITIES		**PEOPLE WITH DISABILITIES**			
	LS	***%***	**LS**	***%***	*Difference in LS*	*Difference in %*
Participation in sports:						
Daily/Weekly	7.41	*31.3*	6.06	*15.6*	1.35 *	*15.7* *
Monthly	7.19	*6.9*	6.01	*2.8*	1.18 *	*4.1* *
Seldom	7.02	*18.7*	5.59	*10.3*	1.43 *	*8.4* *
Never	7.01	*43.1*	5.47	*71.3*	1.54 *	*-28.2* *
TOTAL =	**7.15**	***100***	**5.58**	***100***	**1.57** *	

Source: GSOEP for the period 1984-2013. Individuals aged 16 or over. Weighted data. (*) Difference between people without disabilities and people with disabilities is significant at $P<0.05$).

Table 2 Domains of life satisfaction for people without and with disabilities (POLS individual Random Effects).

	PEOPLE WITHOUT DISABILITIES						PEOPLE WITH DISABILITIES					
	Job	**Health**	**Housework**	**Income**	**Dwelling**	**Leisure**	**Job**	**Health**	**Housework**	**Income**	**Dwelling**	**Leisure**
Participation in sports:												
Daily/Weekly	0.036***	0.133***	0.055***	0.074***	0.035***	0.179***	-0.015	0.213***	0.162***	0.091***	0.019	0.159***
Monthly	0.006	0.062***	0.015	0.028***	-0.003	0.081***	-0.030	0.139***	0.102**	0.107***	0.001	0.077*
Seldom	-0.033***	0.013**	0.001	0.003	-0.021***	0.022***	-0.111***	0.084***	0.043*	-0.008	-0.088***	-0.036
Male	-0.034***	0.046***	-0.067***	-0.127***	-0.057***	0.107***	0.016	0.223***	0.049**	-0.094***	-0.012	0.173***
Age	-0.032***	-0.039***	0.003**	-0.025***	-0.004***	-0.010***	-0.011	0.020***	0.025***	-0.008**	0.014***	0.014***
Age^2	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000	0.000***	0.000***	0.000***	0.000*	0.000*
German	0.060***	-0.042***	0.014	0.081***	0.219***	0.034***	0.175***	0.126***	0.152***	0.174***	0.386***	0.145***
Year of education	0.011***	0.027***	-0.009***	0.029***	0.004**	-0.012***	-0.002	0.011***	-0.008*	0.017***	0.007	-0.012***
Log (real household income)	0.107***	0.074***	0.029***	0.426***	0.131***	0.034***	0.150***	0.048***	0.031	0.417***	0.083***	0.003
Household size:												
1	-0.023	-0.019	0.059***	0.048***	0.027**	-0.022***	-0.008	-0.013	0.008	0.038	0.009	-0.049
2	-0.002	-0.027**	-0.040***	-0.001	-0.051***	-0.110***	-0.055	-0.085**	-0.146***	-0.117***	-0.061	-0.171***
3+	0.012	-0.037**	-0.081***	-0.010	-0.067***	-0.125***	-0.185**	-0.167***	-0.226***	-0.156***	-0.089*	-0.244***
Number of children:												
1	0.043***	0.043***	-0.028***	0.046***	0.005	-0.061***	0.062	-0.024	0.040	0.032	-0.010	-0.057
2	0.065***	0.054***	-0.042***	0.107***	0.026**	-0.150***	0.129	-0.043	0.047	0.049	-0.138**	-0.064
3+	0.104***	0.072***	-0.040**	0.132***	-0.004	-0.254***	0.096	-0.027	-0.108	-0.026	-0.244***	-0.381***
Marital status:												
Single	-0.046***	-0.034***	-0.103***	-0.092***	-0.073***	0.034***	-0.012	0.026	-0.135***	-0.145***	-0.096**	0.030
Widowed	0.071**	-0.034**	0.032*	0.000	0.012	0.077***	0.215**	-0.004	-0.039	-0.047	-0.015	0.072*
Divorced	0.003	0.000	-0.067***	-0.217***	-0.084***	-0.029**	-0.043	-0.084**	-0.068*	-0.310***	-0.098***	-0.083**
Separated	0.081***	-0.001	-0.089***	-0.255***	-0.080***	-0.037**	0.286**	-0.171***	-0.082	-0.299***	-0.078	-0.145**
Employment status:												
Part-time	-0.039***	0.007	-0.014	-0.123***	0.017*	0.234***	0.130***	0.121***	0.046	-0.022	0.041	0.269***
Not working	-	0.016**	0.025***	-0.201***	0.000	0.404***	-	0.166***	0.002	-0.105***	0.061**	0.421***
Homeowner	0.008	0.025***	0.022***	0.082***	0.349***	0.037***	0.019	0.028	0.000	0.148***	0.313***	0.035*
Constant	0.423***	0.969***	0.259***	-1.857***	-0.758***	0.067	-0.309	-1.559***	-0.292	-2.413***	-1.362***	-0.845***
σ_u	0.644	0.633	0.653	0.608	0.594	0.591	0.728	0.589	0.668	0.645	0.669	0.624
σ_e	0.763	0.701	0.758	0.663	0.716	0.704	0.665	0.661	0.727	0.610	0.666	0.686
ρ	0.415	0.449	0.426	0.457	0.408	0.414	0.545	0.442	0.458	0.528	0.503	0.452
R^2	0.026	0.106	0.021	0.200	0.111	0.143	0.057	0.073	0.046	0.234	0.113	0.124
Number of observations	87,280	155,880	155,880	155,880	155,880	155,880	3,551	16,545	16,545	16,545	16,545	16,545
Number of individuals	25,396	37,709	37,709	37,709	37,709	37,709	2,231	7,007	7,007	7,007	7,007	7,007

Note: All equations include region and year dummies. The standard errors are robust. Individuals aged 16 and over. *, **, *** imply significance at the 10%, 5% and 1% levels, respectively. We use overall R^2. **Source:** Author's calculations using the German Socio-Economic Panel (GSOEP) for the period 1984-2013.

Table 3 Overall life satisfaction (POLS individual random effects) for people without and with disabilities.

	PEOPLE WITHOUT DISABILITIES	**PEOPLE WITH DISABILITIES**
	Coeff.	*Coeff.*
Health satisfaction	0.220 ***	0.226 ***
Housework satisfaction	0.099 ***	0.119 ***
Household income satisfaction	0.242 ***	0.164 ***
Dwelling satisfaction	0.117 ***	0.060 ***
Leisure satisfaction	0.115 ***	0.040 ***
Mean (health satisfaction)	0.097 ***	0.077 ***
Mean (housework satisfaction)	0.022 ***	0.029 **
Mean (household income satisfaction)	0.088 ***	0.063 ***
Mean (dwelling satisfaction)	0.054 ***	-0.027
Mean (leisure satisfaction)	0.054 ***	0.068 ***
Z	-0.056 ***	0.030 *
Constant	0.197 ***	0.277 ***
σ_u	0.423	0.525
σ_e	0.656	0.642
ρ	0.293	0.400
R^2	0.409	0.374
Number of observations	155,880	16,545
Number of individuals	37,709	7,007

Note: All equations include regional and year dummies. The standard errors are robust. Individuals aged 16 and over. *, **, *** imply significance at the 10%, 5% and 1% levels, respectively. We use overall R^2. **Source:** Author's calculations using the German Socio-Economic Panel (GSOEP) for the period 1984-2013.

Table 4 Level effects of each domain of satisfaction on life satisfaction and trade-offs between each domain and the domain "*household income*".

	PEOPLE WITHOUT DISABILITIES			**PEOPLE WITH DISABILITIES**		
	Level effect	*Rank*	*Trade-offs*	*Level effect*	*Rank*	*Trade-offs*
Health satisfaction	0.317	*(2)*	0.961	0.303	*(1)*	1.335
Housework satisfaction	0.121	*(5)*	0.367	0.148	*(3)*	0.652
Household income satisfaction	0.330	*(1)*	1.000	0.227	*(2)*	1.000
Dwelling satisfaction	0.171	*(3)*	0.518	0.033	*(5)*	0.145
Leisure satisfaction	0.169	*(4)*	0.512	0.108	*(4)*	0.476

Source: Results shown in Table 3.

Appendix

Table A.1 Overall life satisfaction (POLS individual random effects) including satisfaction with job for people without and with disabilities.

	PEOPLE WITHOUT DISABILITIES	**PEOPLE WITH DISABILITIES**
	Coeff.	*Coeff.*
Job satisfaction	0.131 ***	0.082 **
Health satisfaction	0.194 ***	0.232 ***
Housework satisfaction	0.064 ***	0.050
Household income satisfaction	0.214 ***	0.139 ***
Dwelling satisfaction	0.119 ***	0.056 *
Leisure satisfaction	0.124 ***	0.012
Mean (job satisfaction)	0.046 ***	0.071 *
Mean (health satisfaction)	0.072 ***	-0.015
Mean (housework satisfaction)	0.022 ***	0.001
Mean (household income satisfaction)	0.077 ***	0.057
Mean (dwelling satisfaction)	0.032 ***	-0.058
Mean (leisure satisfaction)	0.057 ***	0.137 ***
Z	-0.068 ***	0.030
Constant	0.138 ***	0.257 **
σ_u	0.410	0.555
σ_e	0.616	0.632
ρ	0.307	0.435
R^2	0.419	0.327
Number of observations	87,280	3,551
Number of individuals	25,396	2,231

Note: All equations include regional and year dummies. The standard errors are robust. Individuals aged 16 and over. *, **, *** imply significance at the 10%, 5% and 1% levels, respectively. We use overall R^2. **Source:** Author's calculations using the German Socio-Economic Panel (GSOEP) for the period 1984-2013.