Does international elite sporting success or hosting major events affect self-rated health? An examination of potential positive externalities related to international sporting tournaments

Rasmus K. Storm[a, b *] & Tor Georg Jakobsen[b]

[a] *Danish Institute for Sports Studies*
Frederiksgade 78 2. sal
DK-8000 Århus

[b] *NTNU Business School*
Norwegian University of Science and Technology
7491 Trondheim, Norway

[*] *Corresponding Author*

Does international elite sporting success or hosting major events affect self-rated health? An examination of potential positive externalities related to international sporting tournaments

Abstract

Research question

It is a common expectation among politicians, civil servants and sport managers that hosting a major sporting event or achieving international elite sport success yields a variety of positive externalities grounded in the 'Virtuous Cycle of Elite Sport and Events' model. However, over the years various studies have shown that this model is not necessarily an accurate depiction of reality. This paper adds to existing research by testing whether elite sport success or hosting a major sport event can have any positive effects on citizens' health.

Research methods

By employing multilevel regression models to nine rounds of the European Social Survey–consisting of individual-level data from 2002 to 2019, covering 37 countries, 219 country-survey-years, and almost 400,000 respondents–we test whether health-related impacts of elite sport success and hosting major sport events can be identified.

Results and Findings

The model output from our regressions does not indicate that sporting success or hosting major sport events contributes to better health.

Implications

The results question the 'Virtuous Cycle of Elite Sport and Events' model and stipulate that politicians, practitioners, and sports managers should be aware of overestimating potential positive externalities from elite sport.

Keywords: Elite sport; externalities; major sporting international events; health

Introduction

As pointed out by Coalter (2007), elite sport is neither harmful nor beneficial in itself. What shapes its outcomes–positively or negatively–is how its programmes are structured, financed and managed, and how the output is delivered to the public (De Rycke & De Bosscher, 2019). In recent years, however, the discourse on its positive externalities (Gouguet & Barget, 2006)–in the form of tangible and intangible 'trickle-down-effects'–has become a dominant assumption influencing policies aimed at managing elite sport (Alm et al., 2014). Not only does this discourse legitimize large subsidies for national elite sport systems, it also releases enormous amounts of public resources for attracting and hosting major (elite) sport events such as the Olympics, the FIFA World Cup, and the European Championships (Atkinson et al., 2008).

Among the usual claims made are that there are significant (tangible) economic impacts to be experienced from hosting major events, including an increase in tourism and greater brand value for the host city or nation–and that elite sports can also have intangible effects such as boosting national pride or 'feel-good effects' when a nation's athletes win prestigious tournaments (Peeters et al., 2014; Storm & Jakobsen, 2019). However, an increasing amount of research on elite sport and events has raised questions about these benefits (De Rycke & De Bosscher, 2019). With regard to tangible effects, evidence clearly points towards marginal, absent or even negative effects of hosting major sport events (Coates & Humphreys, 2008; Zimbalist, 2017).

With regard to *intangible* effects, some studies do find that 'feel-good effects' (e.g. Hallmann et al., 2013), increased subjective well-being (SWB) (e.g. Kavetsos & Szymanski, 2010), national pride (e.g. Denham, 2010; Dóczi, 2012), or increased mass participation (Potwarka & Wicker, 2021) can be associated with a nation's international elite sport success or hosting sport events. Such effects reflect the value accrued in the broader community from the events or the sporting success (Walton et al., 2008); i.e. the benefits that extend beyond the experience enjoyed by people who organize, participate as athletes in, or attend the (major) elite sport events themselves (Denstadli & Solberg, 2021; Gouguet & Barget, 2006). In this paper, we follow this line of research as we seek to identify other potential effects of elite sporting success and hosting events. Our paper adds to existing research by focusing on health, which has only been studied to a limited extent in connection to elite sport and major sport events (Wicker & Downward, 2019).

Health outcomes[1] are one of the (potentially) positive intangible externalities associated with elite international sporting success and hosting sport events, and they are often stated as an expected outcome in policy documents (Hogan & Norton, 2000) and research (e.g. Aizawa et al., 2016; McCartney et al., 2010). However, health is never studied directly, only by proxy–or, in other words, as a closely connected (expected) outcome–gauged by the inspiration or emotion people feel when they see their sporting heroes perform well in international tournaments (Frick & Wicker, 2016), or the motivation to exercise themselves after having experienced a locally hosted international event (Frawley & Cush, 2011).

Drawing a connection between public health and elite sport can reveal a new and interesting perspective compared to existing studies that have mainly focused on effects on participation in sports clubs and associations (e.g. Storm et al., 2018), limited samples of sports (e.g. De Bosscher et al., 2013), particular nations (e.g. Hogan & Norton, 2000), or specific sporting events (e.g. Downward et al., 2016).

[1] We understand health in a broad sense, i.e. both mental and physical. A more specific definition and discussion of health is given in the theoretical section of the paper.

Impacts on membership figures in associations and clubs are usually observed. However, using membership figures alone cannot capture effects on broader participation patterns that occur outside of organized sports (Storm & Holum, 2021), and thus fail to understand the effect on public health more generally. Further, as only a limited number of sports, nations, and events have been explored so far, there are several subsequent gaps in the research.

Future research should therefore aim to test whether existing research can be generalized across a broad set of nations and events in relation to health in particular. It should also study health directly, as some of the literature points to potentially negative health effects from hosting sporting events (Wicker & Downward, 2019) due to the promotion of unhealthy foods and alcohol (e.g. Piggin et al., 2019). Other studies argue that elite sport can have a 'discouragement effect' because the average human is not able to emulate the high level of the sport they are watching, therefore resulting in lower levels of mass participation. Elite sporting success or hosting major events could therefore have an adverse effect on health if they are found to discourage physical activity.

In this paper, we aim to address these considerations through multilevel regression modelling, where we aim to test whether elite sporting success and hosting major events can affect health directly. We have structured the paper as follows: First, we establish the conceptual underpinning of our research. Then, we briefly review existing research to understand how health-related externalities of hosting major events and international elite sport success are addressed in contemporary studies, which will help to better illustrate the abovementioned research gaps. Next, we present the data and methodology deployed and, finally, we discuss our findings, concluding with some reflections on the implications and limitations of the paper and future research perspectives.

Theoretical and Conceptual Underpinning: Positive Externalities of Elite Sport and Events

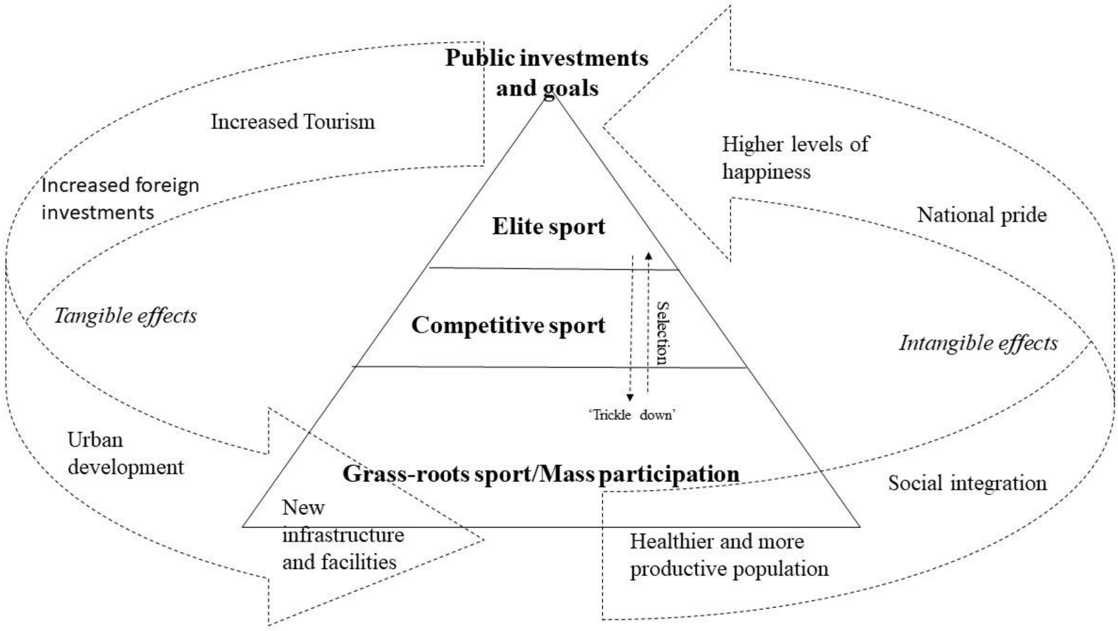
In recent years, government investments in elite sport and hosting major sport events have increased substantially across the globe (De Rycke & De Bosscher, 2019; Haut et al., 2017). National legitimacy concerns related to these investments have led to a variety of discourses that underscore expected outcomes (Gratton & Preuss, 2008; Tomlinson, 2014). For example, stakeholders and tourism organizations urge public authorities to fund large-scale sporting events because they believe it will generate more public revenue from tourism in the cities in which the events are hosted (Storm et al., 2020).

Other stakeholders argue that elite sport and events contribute to the greater public good because their activities lead to positive externalities, or meet broader political, social or economic goals, such as strengthening local or national identity (Ward, 2009), social integration (Girginov, 2012), urban development (Andranovich et al., 2001; Black, 2008), increased sport participation (Kokolakakis & Lera-Lopez, 2020), and national pride (Evans & Kelley, 2002). The idea is that elite sport has a symbiotic relationship with its environment, making it a natural beneficiary for public subsidies due to its trickle-down effects into the community (Denstadli & Solberg, 2021).

The 'Virtuous Circle of Elite Sport and Events'

According to Grix and Carmichael (2012), a narrative of a 'virtuous cycle' is established when there is a shared belief that national investments in elite sport or major sporting events are eventually fed back into society. This feedback mechanism is argued to make people happier, inspire them to exercise, be prouder, and, in turn, become more productive or healthier (Silva et al., 2019). Figure 1[2] illustrates this relationship as it often materializes in public and political discussions, and in arguments that public investment in elite sport and events gives rise to various externalities.

Figure 1: The 'Virtuous Circle' of Elite Sport and Events



Elite sport is in the centre of the figure, with the relationship between grassroots sport (or mass participation) and elite sport being shown in the pyramid form, which implies that grassroots sport channels talents upwards through the national elite sport system, with the best athletes competing in international tournaments (at the top of the pyramid).

In the traditional understanding of this pyramid model, inactive people are thought to be inspired by elite sportspeople to take up sport themselves (Storm et al., 2018; van Bottenburg, 2002). The trickle-down effects therefore materialize as an externality in the form of increased mass participation. In the literature this mechanism is typically identified as three general

[2] Figure 1 is inspired and adapted from Storm og Holum (2021).

variations: 1) Inspiration from hosting a major sporting event; 2) Inspiration from seeing athletes winning medals and performing at the highest level; and 3) Inspiration from role models (sport stars) who have a charismatic appearance (De Bosscher et al., 2013; Weimar et al., 2015).

Each of the three forms of inspiration strengthens the base of the pyramid model, as a broader recruitment base increases the chance of ‘growing’ more international champions (De Bosscher et al., 2006). Further, this leads to an increase in mass participation, and the process repeats itself in a virtuous symbiotic relationship (Storm & Holum, 2021).

Looking at the arrows surrounding the pyramid, we see a theoretical illustration of how other proclaimed impacts and externalities are typically associated with investment in elite sport and major events. The elite sport competition is the main attraction of international events and public subsidies are needed to organize and deliver them. One of the most common goals connected with events in terms of tangible effects (left side of Figure 1) is–as mentioned above–increased tourism (Baade & Matheson, 2016). Another is increased direct foreign investment (Jakobsen et al., 2013).

Nations hosting events also need to invest in improving their infrastructure and building new facilities (Alm et al., 2014) to host major events, so these events can potentially be used to meet broader urban development needs (Zimbalist, 2015), thus giving rise to positive externalities. Urban development can also lead to more *intangible* effects – shown on the right-hand side of Figure 1. For example, when residents gain access to new facilities that have been built for elite sport but can accommodate many more grassroots participants after the event, the assumption is that an increase in engagement in physical activity as a result of the event will make people in the host city or country healthier (Eime et al., 2017).

Socially integrated societies with thriving populations are part of the vision that hosting events will bring people together, result in national success and make everyone happier and prouder of their nation (Storm & Jakobsen, 2019). People also create relational goods (Becchetti et al., 2008) by volunteering to help at the events, which in turn leads to greater well-being and life satisfaction (Wicker & Downward, 2020). Therefore, the model presented above captures many of the anticipated tangible and intangible (positive) externalities often argued as being associated with elite sport and major sport events in a theoretical and conceptually coherent way.

However, and as mentioned in the introduction, there is increasing academic interest in and scepticism of the narrative of the virtuous cycle (Storm & Holum, 2021), specifically in relation to the questionable tangible effects of elite sport (on the left side of the virtuous cycle in Figure 1). Scholars have tested these effects by measuring the economic benefits brought about by major international events, finding that tangible effects are at best marginal, and usually absent (e.g. Baade & Matheson, 2016; Peeters et al., 2014).

Based on existing evidence of marginal or absent tangible effects, academic focus has recently shifted to *intangible* effects to examine whether broader social impact can be found (Storm & Jakobsen, 2019). Can other (positive) externalities follow on from elite sport and hosting major events? In this paper, we aim to answer this question specifically in relation to health. We focus on the effects of the presumed trickle-down dimensions of sporting success and hosting events[3] because the existence of potential health effects has only been studied to

[3] We exclude the role model dimension here because we do not have any relevant data on this variable and are therefore not able to conduct a reliable test in our design.

limited degree. As mentioned earlier, health effects are usually studied indirectly by assuming a connected impact from increased mass participation. However, a direct measurement has never been applied. In addition, there is a need to study more nations, more events and broader population groups. Should we find a correlation between health and elite sporting success and/or hosting events, it could be a strong argument for government intervention in, or a provision of economic subsidies for, elite sport and hosting events.

How do we Study Public Health Outcomes of Hosting Sport Events and International Sporting Success?

According to the World Health Organization (WHO), health is a multi-dimensional concept defined as ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’ (World Health Organization, 2019, p. 1). The first (physical) dimension is typically assessed objectively and by the absence of life threatening and chronic cardiovascular and metabolic diseases such as diabetes, cancer, obesity and heart related problems (World Health Organization, 2018). The other two dimensions are usually captured by clinical approaches and broader assessments of the psychological well-being of a person.

Theoretically, we could ask through what kind of mechanism can elite sporting success and hosting sport events affect people’s health? Increased physical activity levels brought about by inspiration to take up the types of sports present at the event would most likely enhance public health. The connection between physical activity and health is well documented in number of studies (e.g. Cabane & Lechner, 2015; Humphreyes et al., 2013; Marques et al., 2019; World Health Organization, 2018). For people who are already active, inspiration could increase their physical activity levels even more, thus boosting their health even more.

Inspiration can also potentially encourage inactive people to take up sport to the benefit of their physical and mental (social) health. It should be mentioned, however, that some researchers (e.g. Hindson et al., 1994) have identified a discouragement effect when high performance athletes are seen as being impossible for the average person to emulate (Hogan & Norton, 2000). If this is the case, the 'discouraged person's' health would remain unaffected or may even be affected negatively, for example, if they remain at home in front of the television or computer screen or are influenced by soft drink or alcohol commercials and sponsorship messages that can affect their nutritional intake (Piggin et al., 2019).

However, sporting success and sport events can also create (positive) arousal (Uhm et al., 2020) among spectators and television viewers, bringing different people together to celebrate (Green & Chalip, 1998) and socialize (Pfister et al., 2018), which can have a positive effect on the mental dimension of health. Moreover, the volunteering positions offered by hosting events (Doherty, 2009) potentially affect the people involved through the creation of relational goods (Becchetti et al., 2008) that are produced, for example, through emotional support and belonging to a group (Wicker & Downward, 2020). Giving the impression that the event is well-managed (Allen & Bartley, 2014) can also boost mental health due to the impression of having a good reputation among people from other nations who participate in the event or follow the event on television from abroad.

It important to stress that public health outcomes resulting from elite sport success or hosting events can be argued in part as tangible because a healthy population reduces expenditure in the (public) health care system. Mentally and physically healthy people use hospitals and other parts of the health care system less than unhealthy people, meaning that if trickle down-effects from international elite sport success or events are present, they will have an (indirect) economic impact on the society or nation involved. However, in this paper we follow the economic approach suggested by Wicker and Downward (2019), which views health outcomes as being '…more *in*tangible in nature' (p. 429).

In the following section, we briefly review the existing research on sports management, sports policy and economics that has questioned the trickle-down effects from international sporting success and hosting sport events to understand how health factors into their studies.[4] A few studies from other disciplines are included as well, as they focus on the potential negative health effects of the sponsorship and commercial media campaigns that support the elite athletes and the organizers of the major international events we include in the study.

Literature Review: Trickle-Down Effects from Elite Sport Success and Hosting Events

One of the first studies addressing the question of trickle-down effects was conducted by Hogan and Norton (2000), focusing on Australian sport participation. It found no trickle-down effects from the nation's international sporting success, and no health effects were evident, despite being anticipated in many Australian sport development policy documents. In fact, during the period examined, the Australians who were expected to be inspired to exercise were becoming more overweight, with children "… in particular … becoming less fit" (p. 216). Hanstad and Skille (2010), who studied Norwegian biathlon's effect on membership figures, reached the same conclusion of an absence of trickle-down effects and associated health impacts.

[4] As mentioned earlier, we omit studies focusing on inspirational trickle-down effects from role models. Therefore, we only touch upon studies focusing on trickle-down effects from international elite sport success and hosting major events in this literature review.

De Bosscher's (2013) study on the effect of sporting success on membership figures (in 20 different sports) in Flanders, and Haut and Gaum's (2017) study of table tennis in France, Germany and Austria returned no significant results. Storm et al. (2018) also found little to no relationship between the Danish national handball team's success and club memberships, and Storm and Holum (2021) looked at professional soccer and found no impact on local amateur clubs. One study that showed inconsistent findings was Frick and Wicker's (2016) study on German National team soccer. Another study by Pyun et al. (2020) on German club soccer showed that the promotion of local professional football clubs in the Metropolitan Rhine-Ruhr region appeared to increase amateur club membership figures, which could indicate potential health effects. Common to these studies, however, is that they do not consider health issues specifically. Only the participation element of trickle-down is in focus. Further, they only consider one aspect of participation 'legacy' by focusing on organized sports rather than the potential effect on unorganized activities outside the clubs.

Findings identifying a casual effect of hosting sport events on mass participation or membership figures are rare. Systematic reviews such as those undertaken by Weed et al., (2015) have not been able to identify reliable evidence of such a relationship, nor in relation to health (McCartney et al., 2010). However, some studies indicate that these types of effects may exist. Weimar et al., (2015) studied 12 German Olympic sports and identified effects on both junior and senior memberships after hosting a major event. Aizawa (2016) also concluded that Japanese people who experienced the Tokyo Olympic Games in 1964 more frequently participated in physical activities over a 20-year span than others, which, according the author, could have affected their health positively. Kokolakakis, Lera-López and Ramchandani (2019) and Kokolakakis and Lera-López (2020) revealed short-term national participation effects from the 2012 London Olympics, although primarily among active people who increased their frequency of activity. They argued that this could also have resulted in wider health benefits among the population, a finding backed by Castellanos-Garcia et al. (2021).

The results from these event studies contrast with Veal, Toohey and Frawley’s (2012) findings from their examination of participation patterns following the 2000 Sydney Olympic Games, where they found no obvious effect from hosting the Games. Frawley and Cush (2011) could not demonstrate any effects from the 2003 Rugby World Cup either, instead arguing that increases in membership figures were due to school campaigns initiated by the Australian Rugby Union. Craig and Bauman were similarly unable to identify effects on Canadian children’s physical activity from the Vancouver Winter Olympics, and Downward, Dawson and Mills (2016) failed to identify trickle down-effects from the 2012 London Olympics, indicating that hosting major sport events does not have any effect on mass participation–and therefore not on health either.

Bartosz and Mailer (2020) were unable to find evidence of a positive participation legacy from the 2018 UCI Cycling World Championship held in Austria, a finding that is consistent with the study by Denstadli and Solberg (2021) on the 2017 Road Cycling Championship held in the city of Bergen, Norway.

Other Potential Trickle-Down Effects Affecting Health

Besides the studies on potential trickle-down effects and mass participation sport, other studies have looked at how various factors associated with international elite sport success and hosting events could affect health. Instead of testing the assumption that international sporting success or hosting events would lead to positive externalities, some studies have tested whether they in fact result in negative effects. As international elite sport and event hosting have become extremely commercialized (Tomlinson, 2005), unhealthy consumption patterns are often part of the circus when sponsors and television rights holders aim to sell products to gain a profit from their engagement.

This problem is pointed out by Piggin et al. (2019), who found that the managers of the Rio 2016 Olympic Games' venues shaped the consumers' choices '…so that the food and drink being sold and consumed met neither the spectators' nor Brazilian policy definitions of health' (p. 481). According the authors, their findings challenge policy arguments for using sport events for health promotion because there is a risk that the commercial messages and architecture of events supports unhealthy eating behaviours. It also questions the public health outcomes promised in connection with the events.

In relation to alcohol consumption, which often accompanies watching elite sport on television or at the venue and is also connected to various health problems, O'Brien et al. (2014) and Zerhouni et al. (2019) deploy an experimental design to investigate attitudes towards alcohol brands, finding that incidental exposure to alcohol marketing messages at sporting events has a positive effect on evaluation of various alcohol brands. This could potentially lead to higher consumption frequency with unhealthy consequences, which is backed up by a study by Davis (2009), who finds that boys involved in sport who are exposed to alcohol sponsorship are '…more likely both to drink alcohol and to get drunk' (p. 20).

Hamer, Weiler and Stamatakis (2014), who studied the connection between viewing sports (on television) and physical activity rates among older adults in England found that those who watched sport on television every day had a greater chance of becoming obese even when relevant confounders where controlled for.

Analysis of inconsistent findings in the literature

What is clear from the above review is that even though trickle-down effects are seldom identified, some studies do show evidence of effects (Potwarka & Wicker, 2021). Further, some studies reveal opposite findings despite examining the same case (e.g. Downward et al., (2016) and Kokolakakis et al. (2019) on the 2012 London Olympics). The inconsistent evidence can be partly explained by the different methodologies applied. Some of the studies that failed to identify the existence of trickle-down effects deployed an inappropriate methodological approach (Kokolakakis et al., 2019) such as descriptive analyses (e.g. Hogan & Norton, 2000) or bivariate- or correlation approaches (e.g. De Bosscher et al., 2013) (Frick & Wicker, 2016; Storm et al., 2018).

This is a problem because many factors can theoretically affect sport participation (Cabane & Lechner, 2015; Downward et al., 2014) and health. To single out potential trickle-down effects, appropriate econometric designs with relevant control variables need to be included (Storm & Holum, 2021). Further, many of the existing studies examine a limited sample of people (for example, those participating in organized sports only) and countries when investigating potential for trickle-down effects. Additionally, some studies identify negative effects, like obesity (e.g. Hamer et al., 2014), potential unhealthy consumption patterns (e.g. Piggin et al., 2019) and discouragement (Hogan & Norton, 2000) connected to watching (elite) sport on television and at venues. However, these studies are also limited in scope. Therefore, more studies covering broader population groups and a larger set of events would be helpful to understand to what extent health externalities exist–be they positive or negative–if they are present at all.

Finally, because the majority of the studies on trickle-down effects do not consider links to health directly, and mainly as a feature connected to (enhanced) mass participation, there is a need to measure health benefits more specifically because it will help us understand whether health effects materializes instead of just anticipating they do. In the following, we describe our empirical strategy to address these gaps in the literature.

Methodology

To test the presence of health effects more directly and to understand whether elite sporting success or hosting major events give rise to positive externalities in a broader set of nations, events and among larger population groups, we analyse all nine rounds of the European Social Survey (ESS) (2018). This survey contains individual level data collected from 2002 to 2019, covering 37 countries,[5] 219 country-survey-years, and almost 400,000 respondents.[6] Each country-year includes a random sample of the respective countries' adult population. As the surveyed individuals are nested into country-survey-years which again are nested into countries, we use multilevel modeling to conduct the analysis. More specifically, we use three-level random intercept models[7] to allow for an estimation of errors at all levels simultaneously with the linear coefficients.

The structure of the data is the reason why we make use of hierarchical models. The level 2 variables are measured at the country-year level, which includes *success*, *host*, *GDPpc*, and *health expenditure* (more on these variables below). That is, these variables have observations

---

[5] The countries included are Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and the United Kingdom.

[6] The data applied in the analysis in this publication is based on the ESS Multilevel Data provided by the European Social Survey and prepared and made available by NSD, the Norwegian Centre for Research Data. Neither the European Social Survey nor NSD are responsible for the analyses of the data presented here.

[7] The results presented are from linear multilevel models. In addition, we ran sensitivity models using multilevel ordered logit and multilevel logistic regression (on a dichotomized dependent variable), the results (which can be accessed upon request) from these models did not differ substantially from those in the present paper.

for different years within each country, which is the reason for our choice of models.[8] As such, time constitutes part of the multilevel structure of our data.[9]

The Dependent Health Variable

Our dependent variable deployed to address health effects is a five-point ordinal scale measuring *Self-rated health* (SRH), which was assessed guided by the following question: ‘How is your health in general?’. The response categories were: ‘very good’, ‘good’, ‘fair’, ‘bad’, and ‘very bad’. The health item is a subjective (Kaplan et al., 1976) perception of the overall health condition of the respondent. However, the SRH measure is highly credible and correlates significantly with ‘concurrent measures of health and also predicts future health problems … and mortality’ (Zajacova et al., 2017, p. 58). Besides having a physical dimension, SRH–in correspondence with the WHO definition presented earlier–conceptually captures mental and social aspects of health and is thus a broad representation of the potential existence of (positive) externalities. We have coded the variable so that high values indicate good SRH.

Independent Variables

As mentioned earlier, many factors can potentially affect our health. Therefore, to single out the impact from sporting success and event hosting on health specifically, we include a range of control variables, all presented in Table 1.

Table 1: ***Descriptive statistics***

Variable	N	Mean	Std. dev.	Min.	Max
Self-rated Health	398,639	3.773	0.931	1	5
woman	398,639	0.557	0.499	0	1

[8] As some of our explanatory variables vary from one year to another (within each country), country-survey-year thus constitutes our level 2, with individual respondents being level 1, and countries level 3.
[9] We have tested other hierarchical models, including two-level, and three-level including time as a covariate, and the results from these are substantially similar to our main analysis.

age	398,639	47.956	18.540	13	123
eduyears	398,639	12.341	4.051	0	56
partner	398,639	0.560	0.496	0	1
social activ.	398,639	2.701	0.945	1	5
Level 2					
Success	219	0.438	1.206	0	6
Host	219	0.046	0.209	0	1
GDPpc	219	35.647	21.863	2.659	99.778
Health exp.	219	2.838	1.513	0.374	7.867

Note. Descriptive statistics based on the N of models 1 and 3

The two main explanatory variables in this study are situated on level 2 of our regression design. These are *Success* (0–6) and *Host* (0–1). The variables are based on the international sporting success of the respective nations and their hosting of a broad set of international events, including the Summer Olympics, the Winter Olympics, the FIFA World Cup, the UEFA Championship, the Cricket World Cup, the Commonwealth Games, Rugby World Cup, and Rugby League World Cup.

We include this range of events to expand on contemporary research and see whether there are any general trends present. Our approach also takes into consideration that, for some countries, events other than the Olympics or the FIFA World Cup can influence SRH. Smaller countries are not often competitive in major tournaments. The index scores employed are based on the placing[10] and importance of the events, and whether the country hosted an event (Storm & Jakobsen, 2019). For a list of the points attributed to the variable *Success*, see Appendix A1. These scores apply to the country-survey-year following the tournament. Based on existing studies, it is expected that hosting major events (e.g. Kokolakakis et al., 2019) and sporting success (e.g. Wicker et al., 2012, 2015) could potentially affect our dependent variable positively.

[10] For the Olympics, this is based on the total medal count.

Additional controls at level 2 are *GDP per capita* and *Health expenditure,* both obtained from the World Bank (2020). The former is measured as constant local currency and is divided by 1000 in our models; the latter is a measure of current health expenditure as a percentage of that country's GDP. Both variables are included because we expect wealth and the quality of the nation's health care system, measured as a proportion of GDP, to have a significant influence on SRH (Liang & Tussing, 2019; Quaglio et al., 2013).

Previous research has shown that there can be differences in sports participation at the individual level (Deelen et al., 2018). Therefore, two demographic measures, *Age* and *Gender* (0=men, 1=women), are added as controls at level 1 to detect differences across different age groups (Andersen et al., 2007) and genders (Coenders et al., 2017; Hallmann et al., 2013; Meir & Mutz, 2016). Secondly, two variables, *Partner* (0–1) and *Social activities* (1–5)[11], are included to see whether any kind of everyday or general social support from a partner or others affects SRH (Clark et al., 2008; Eikemo et al., 2008; Gardner & Oswald, 2006). Finally, in relation to individual level factors, we include *Years of education* (1–10) to see whether higher levels of education affect health. We expect to see a positive relationship between (higher) education and SRH (Ross & Wu, 1995; Seippel, 2017).[12]

Specifications

A total of four models are presented, where we test the effect of *Success* and *Host* with different combinations of control variables. We choose to present the broader selection of

---

[11] The wording of this variable is: "Take part in social activities compared to others of same age" and the answer categories are: 1 = Much less than most; 2 = Less than most; 3 = About the same; 4 = More than most; and 5 = Much more than most."

[12] A variable, *Household income* (1–10), measured in quartiles was excluded from the main analysis due to missing data. We performed a sensitivity analysis including this data, which did not differ substantially from the results presented in this article. The sensitivity output can be accessed upon request.

model outputs because the dependent variable (*Self-rated health*) is situated at the lowest level, and we seek to explain its variation using information from all levels (Steenbergen & Jones, 2002). Even though the dataset is large, the standard errors of the level 2 variables are calculated based on the level 2 *N* (that is, the number of country-survey years), which places restrictions on how many variables can be tested simultaneously. Because of this problem, presenting a larger set of models with different combinations of variables gives a more coherent picture of how each–and combinations thereof–affects the dependent variable. Equation 1 represents all of our models in which the country-year level variables vary between models.

$$[1]\quad \begin{aligned} & self\ rated\ health_{ijk} = \beta_0 + \beta_1 woman_{ijk} + \beta_2 age_{ijk} + \beta_3 eduyears_{ijk} + \beta_4 partner_{ijk} \\ & + \beta_5 social\ activities_{ijk} + \beta_6 success\ /\ host_{jk\,t-1} + \beta_7 GDPpc\ /\ healthex_{jk\,t-1} + e_{ijk} + u_{0jk} + v_{0k} \end{aligned}$$

Results and Discussion

By calculating the intraclass correlation coefficients for our dependent variable, we find 91% of its variance to be situated at the lowest level and 9% at the higher level. Since the variance at the upper levels exceeds 5%, it should not be ignored (Mehmetoglu & Jakobsen, 2017). As shown in Table 2, the effects of the individual-level control variables are very similar in all models, and they are all statistically significant at the 1% level. Women have poorer SRH than men, and older people score lower than younger generations. This is all in accordance with existing literature on the subject. Related to *Gender*, previous studies (e.g. Jylhä et al., 1998) have found no substantial difference as to how men and women report SRH, making our results inconsistent with previous studies. Related to *Age*, our results are strong and consistent with Andersen et al. (2007), who find that the older one gets, the less healthy one considers oneself.

The results indicating higher education, having a partner and participating in social activities are positively related to SRH and are in line with existing research. As pointed out by (Clark et al., 2008; Gardner & Oswald, 2006), living with a partner affects well-being and, consequently, SRH. Participating in social gatherings and activities has also been shown to be positively correlated with SRH because humans are socially dependent individuals who derive welfare from socializing (Eikemo et al., 2008). This has also been shown to be true in relation to sports involving more than one person (Downward & Rasciute, 2011). Results from our *Years of education* variable are consistent with existing research (e.g. Ross & Wu, 1995), finding that higher education is linked to better health.

We find the first level 2 control variable *GDP per capita* to be positive and significant at the 1% level in all models where it is included, implying that wealthier societies generally have better SRH scores than poorer societies. The same effect is found for our second level 2 control *health expenditure*. All of these findings are consistent with existing research, such as Quaglio et al. (2013), Liang & Tussing (2019), and Wicker and Downward (2017).

In models 1 and 2 we investigate how successful a country has been in sport events prior to the current ESS survey. For this variable (*Success*), we find a weak negative and non-significant effect. When it comes to hosting an event (models 3 and 4) the sign is reversed, becoming positive, which is inconsistent with some prior findings (e.g. Kokolakakis et al., 2019). However, here the result is not significant. Seen in isolation, this indicates that positive externalities are absent. These findings are in correspondence with most research on trickle-down effects presented earlier (e.g. Bartosz & Mailer, 2020; Storm et al., 2018).

Table 2: *Effect of sporting success and hosting on self-rated health (1–5), 2002–2019*

	Model 1	**Model 2**	**Model 3**	**Model 4**

intercept	3.690***	3.818***	3.689***	3.815***
	(0.048)	(0.042)	(0.048)	(0.042)
woman	-0.070***	-0.073***	-0.070***	-0.073***
	(0.003)	(0.003)	(0.003)	(0.003)
age	-0.019***	-0.019***	-0.019***	-0.019
	(0.000)	(0.000)	(0.000)	(0.000)
eduyears	0.027***	0.028***	0.027***	0.028***
	(0.000)	(0.000)	(0.000)	(0.000)
partner	0.092***	0.091***	0.092***	0.091***
	(0.003)	(0.003)	(0.003)	(0.003)
social activities	0.145***	0.143***	0.145***	0.143***
	(0.001)	(0.001)	(0.001)	(0.001)
Level-2				
success	-0.003	-0.003	---	---
	(0.004)	(0.005)		
host	---	---	0.018	0.031
			(0.023)	(0.022)
GDPpc †	0.007***	---	0.007***	---
	(0.001)		(0.001)	
healthexp. †	---	0.035***	---	0.035***
		(0.006)		(0.042)
Variance				
Level-1	0.616	0.615	0.616	0.615
	(0.001)	(0.001)	(0.001)	(0.001)
Level-2	0.004	0.004	0.004	0.004
	(0.000)	(0.000)	(0.000)	(0.000)
Level-3	0.041	0.051	0.041	0.051
	(0.010)	(0.013)	(0.010)	(0.012)
Level-1 R^2	0.230	0.230	0.230	0.231
Level-2 R^2	0.073	0.167	0.074	0.176
Level-3 R^2	0.456	0.323	0.455	0.325
Level-1 N	398,639	362,901	398,639	362,901
Level-2 N	219	199	219	199
Level-3 N	37	35	37	35
Log Lik.	-469,415.6	-427,110.7	-469,415.6	-427,109.8

Note. Multilevel random intercept regression coefficients with standard errors in parentheses. *p<.10; **p<0.05; ***p<0.01, two-tailed tests. † The variables are lagged one year.

Conclusion, Implications, and Future Research

Summary

Our study indicates that there is no effect of either elite sport success or hosting a major sporting event on health. The effects of the individual level variables applied to this study are all as expected. Overall, our results do not support the claim that there are significant positive intangible externalities, in the form of health benefits, connected to elite sport success and hosting major events, thus questioning the trickle-down effect claim that is often connected to the 'Virtuous Cycle of Elite Sport and Events' model described in our theoretical section. Despite such trickle-down effects often being claimed by proponents of elite sports, our examination of the data from the European Social Survey suggest that they are not backed by evidence.

Implications

The implications of our findings are that proponents of the virtuous cycle of sport should be cautious when using the metaphor as a representation of reality. While this study does not deny that elite sport and major events may give rise to other kinds of (intangible) externalities, it is important to understand that such effects are not automatic, nor do they materialize as a casual trickle-down mechanism benefitting broader social needs. Having tested the findings from earlier studies on a larger set of countries, events and with a broader conceptual scope, our results instead suggest that when effects are present, they depend on contextual factors present in the existing studies with a more limited scope. This could, for example, be leverage activities connected to specific events or sports, as pointed out by Potwarka and Wicker (2021).

Based on this paper's findings, sport managers, politicians and other stakeholders should look for more convincing arguments when considering to spend large amounts of public money on elite sport and major events. This could be done by identifying more best practices where positive effects are evident and positive externalities such as health benefits are proven.

Limitations and Future Research

The main limitation of this study is that our survey data is only biannual and, while it covers a large area, it is not very detailed. For example, we do not have true time series survey data and have used biannual data for the countries present in each ESS survey. Future studies would benefit from including annual data because this could reveal effects in the shorter term that are not captured by our data.

Related to this problem, we would ideally prefer to use surveys conducted with a focus on particular sports closer to the time of the events (for example before and after), as some studies indicate that effects–when found–are not long-term and flatten out quickly (e.g. Dolan et al., 2019; Seippel, 2017). Therefore, it would potentially strengthen the validity of our findings if our results were compared with such data in the future. This approach could also reveal the circumstances under which effects can be found (De Bosscher et al., 2013). There could also be a problem of sensitivity related to our approach. Even though we have performed appropriate econometric modelling, there is a risk that, by deploying such a large dataset, the effects on some nations could be that they 'drown in the data pool'.

In regard to the negative consumption behaviours connected to passive viewing of elite sport events that could potentially affect spectators' health, and which have been suggested in some of the reviewed studies, it is also a limitation of this study that no systematic data on these behaviours exist. Future research should aim to gather the relevant data and test whether such factors have a say in how potential health effects materialize.

Disclosure Statement

The authors declare no conflict of interest.

Funding

The research presented here has not received any funding.

References

Aizawa, K., Wu, J., Inoue, Y., & Sato, M. (2016). Long-term impact of the Tokyo 1964 Olympic Games on sport participation: A cohort analysis. *Sport Management Review*, *21*, 86–97. https://doi.org/10.1016/j.smr.2017.05.001

Allen, J. B., & Bartley, M. (2014). Sport event volunteers' engagement: management matters. *Managing Leisure*, *19*(1), 36–50. https://doi.org/10.1080/13606719.2013.849502

Alm, J., Solberg, H. A., Storm, R. K., & Jakobsen, T. G. (2014). Hosting major sports events: the challenge of taming white elephants. *Leisure Studies*, *35*(5), 1–19. https://doi.org/10.1080/02614367.2014.994550

Andersen, F., Christensen, K., & Frederiksen, H. (2007). Self-rated health and age: A cross-sectional and longitudinal study of 11,000 Danes aged 45—102. *Scandinavian Journal of Public Health*, *35*(2), 164–171. https://doi.org/10.1080/14034940600975674

Andranovich, G., Burbank, M. J., & Heying, C. H. (2001). Olympic Cities: Lessons Learned from Mega-Event Politics. *Journal of Urban Affairs*, *23*(2), 113–131. https://doi.org/10.1111/0735-2166.00079

Atkinson, G., Mourato, S., Szymanski, S., & Ozdemiroglu, E. (2008). Are we willing to pay enough to "back the bid"?: Valuing the intangible impacts of London's bid to host the 2012 summer olympic games. *Urban Studies*, *45*(2), 419–444. https://doi.org/10.1177/0042098007085971

Baade, R. A., & Matheson, V. A. (2016). Going for the Gold: The Economics of the Olympics. *Journal of Economic Perspectives*, *30*(2), 201–218. https://doi.org/10.1257/jep.30.2.201

Bartosz, B., & Mailer, M. (2020). Can large cycling events promote active mobility? Expectations versus reality on the example of the 2018 UCI Cycling World Championship. *Research in Transportation Business & Management*, *September*. https://doi.org/10.1016/j.rtbm.2020.100564

Becchetti, L., Pelloni, A., & Rossetti, F. (2008). Relational goods, sociability, and happiness. *Kyklos*, *61*(3), 343–363. https://doi.org/10.1111/j.1467-6435.2008.00405.x

Black, D. (2008). Dreaming big: The pursuit of “second order” games as a strategic response to globalization. *Sport in Society*, *11*(4), 467–480. https://doi.org/10.1080/17430430802019441

Cabane, C., & Lechner, M. (2015). Physical activity of adults: A survey of correlates, determinants, and effects. *Jahrbucher Fur Nationalokonomie Und Statistik*, *235*(4–5), 376–402. https://doi.org/10.1515/jbnst-2015-4-504

Castellanos-García, P., Kokolakakis, T., Shibli, S., Downward, P., & Bingham, J. (2021). Membership of English sport clubs: A dynamic panel data analysis of the trickle-down effect. *International Journal of Sport Policy and Politics*, *13*(1), 105–122. https://doi.org/10.1080/19406940.2021.1877170

Clark, A. E., Diener, E., Georgellis, Y., & Lucas, R. E. (2008). Lags and leads in life satisfaction: A test of the baseline hypothesis. *Economic Journal*, *118*(529), 222–243. https://doi.org/10.1111/j.1468-0297.2008.02150.x

Coalter, F. (2007). *A wider role for sport: Who's keeping the score?* Routledge.

Coates, D., & Humphreys, B. R. (2008). Do economists reach a conclusion on subsidies for sports franchises, stadiums, and mega-events? *Econ Journal Watch*, *5*(3), 294–315.

Coenders, F., Mensvoort, C. V., Kraaykamp, G., & Breddveld, K. (2017). Does sport-participation improve health? A panel analysis on the role of educational attainment, economic deprivation and work-family load. *European Journal for Sport and Society*, *14*(1), 45–59. https://doi.org/https://doi.org/10.1080/16138171.2017.1284388 ©

Davies, F. (2009). An investigation into the effects of sporting involvement and alcohol sponsorship on underage drinking. *International Journal of Sports Marketing and Sponsorship*, *11*(1), 25–45. https://doi.org/10.1108/ijsms-11-01-2009-b003

De Bosscher, V., De Knop, P., Van Bottenburg, M., & Shibli, S. (2006). A Conceptual Framework for Analysing Sports Policy Factors Leading to International Sporting Success. *European Sport Management Quarterly*, *6*(2), 185–215. https://doi.org/10.1080/16184740600955087

De Bosscher, V., Sotiriadou, P., & van Bottenburg, M. (2013). Scrutinizing the sport pyramid metaphor: an examination of the relationship between elite success and mass participation in Flanders. *International Journal of Sport Policy and Politics*, *5*(3), 319–339. https://doi.org/10.1080/19406940.2013.806340

De Rycke, J., & De Bosscher, V. (2019). Mapping the potential societal impacts triggered by elite sport: a conceptual framework. *International Journal of Sport Policy and Politics*, *6940*, 1–18. https://doi.org/10.1080/19406940.2019.1581649

Deelen, I., Ettema, D., & Kamphuis, C. B. M. (2018). Sports participation in sport clubs, gyms or public spaces: How users of different sports settings differ in their motivations, goals, and sports frequency. *PLoS ONE*, *13*(10), 1–17. https://doi.org/10.1371/journal.pone.0205198

Denham, B. E. (2010). Correlates of pride in the performance success of United States athletes competing on an international stage. *International Review for the Sociology of Sport*, *45*(4), 457–473. https://doi.org/10.1177/1012690210373540

Denstadli, J. M., & Solberg, H. A. (2021). I want to ride my bicycle! Or not? Health and transportation legacies of the 2017 World Road Cycling Championship. *European Sport Management Quarterly*, *0*(0), 1–17. https://doi.org/10.1080/16184742.2020.1862272

Dóczi, T. (2012). Gold fever(?): Sport and national identity - the hungarian case. *International Review for the Sociology of Sport*, *47*(2), 165–182. https://doi.org/10.1177/1012690210393828

Doherty, A. (2009). The volunteer legacy of a major sport event. *Journal of Policy Research in Tourism, Leisure and Events*, *1*(3), 185–207. https://doi.org/10.1080/19407960903204356

Dolan, P., Kavetsos, G., Krekel, C., Mavridis, D., Metcalfe, R., Senik, C., Szymanski, S., & Ziebarth, N. R. (2019). Quantifying the intangible impact of the Olympics using subjective well-being data. *Journal of Public Economics*, *177*, 104043. https://doi.org/10.1016/j.jpubeco.2019.07.002

Downward, P., Dawson, P., & Mills, T. C. (2016). Sports participation as an investment in (subjective) health: A time series analysis of the life course. *Journal of Public Health (United Kingdom)*, *38*(4), e504–e510. https://doi.org/10.1093/pubmed/fdv164

Downward, P., Lera-López, F., & Rasciute, S. (2014). The correlates of sports participation in Europe. *European Journal of Sport Science*, *14*(6), 592–602. https://doi.org/10.1080/17461391.2014.880191

Downward, P., & Rasciute, S. (2011). Does sport make you happy? An analysis of the well-being derived from sports participation. *International Review of Applied Economics*, *25*(3), 331–348. https://doi.org/10.1080/02692171.2010.511168

Eikemo, T. A., Bambra, C., Judge, K., & Ringdal, K. (2008). Welfare state regimes and differences in self-perceived health in Europe: A multilevel analysis. *Social Science and Medicine*, *66*(11), 2281–2295. https://doi.org/10.1016/j.socscimed.2008.01.022

Eime, R. M., Harvey, J., Charity, M. J., Casey, M., Westerbeek, H., & Payne, W. R. (2017). The relationship of sport participation to provision of sports facilities and socioeconomic status: a geographical analysis. *Australian and New Zealand Journal of Public Health*, *41*(3), 248–255. https://doi.org/10.1111/1753-6405.12647

European Social Survey. (2018). *European Social Survey Cumulative File, ESS 1–8*. NSD – Norwegian Centre for Research Data. doi:10.21338/NSD-ESS-CUMULATIVE

Evans, M. D. R., & Kelley, J. (2002). National pride in the developed world: survey data from 24 nations. *International Journal of Public Opinion Research*, *14*, 303–338. https://doi.org/10.1093/ijpor/14.3.303

Frawley, S., & Cush, A. (2011). Major sport events and participation legacy: The case of the 2003 Rugby World Cup. *Managing Leisure*, *16*(1), 65–76. https://doi.org/10.1080/13606719.2011.532605

Frick, B., & Wicker, P. (2016). The trickle-down effect: How elite sporting success affects amateur participation in German football. *Applied Economics Letters*, *23*(4), 259–263. https://doi.org/10.1080/13504851.2015.1068916

Gardner, J., & Oswald, A. J. (2006). Do divorcing couples become happier by breaking up? *Journal of the Royal Statistical Society. Series A: Statistics in Society*, *169*(2), 319–336. https://doi.org/10.1111/j.1467-985X.2006.00403.x

Girginov, V. (2012). Governance of the London 2012 Olympic Games legacy. *International Review for the Sociology of Sport*, *47*(5), 543–558.

https://doi.org/10.1177/1012690211413966

Gouguet, J.-J., & Barget, E. (2006). Sporting externalities. In W. Andreff & S. Szymanski (Eds.), *Handbook on the Economics of Sport* (pp. 168–176). Edward Elgar Publishing.

Gratton, C., & Preuss, H. (2008). Maximizing Olympic Impacts by Building Up Legacies. *The International Journal of the History of Sport*, *25*(14), 1922–1938. https://doi.org/10.1080/09523360802439023

Green, B. C., & Chalip, L. (1998). Sport tourism as the celebration of subculture. *Annals of Tourism Research*, *25*(2), 275–291. https://doi.org/10.1016/S0160-7383(99)00013-4

Grix, J., & Carmichael, F. (2012). Why do governments invest in elite sport? A polemic. *International Journal of Sport Policy*, *4*(1), 73–90. https://doi.org/10.1080/19406940.2011.627358

Hallmann, K., Breuer, C., & Kühnreich, B. (2013). Happiness, pride and elite sporting success: What population segments gain most from national athletic achievements? *Sport Management Review*, *16*(2), 226–235. https://doi.org/10.1016/j.smr.2012.07.001

Hamer, M., Weiler, R., & Stamatakis, E. (2014). Watching sport on television, physical activity, and risk of obesity in older adults. *BMC Public Health*, *14*(1), 10. https://doi.org/10.1186/1471-2458-14-10

Hanstad, D. V., & Skille, E. Å. (2010). Does Elite Sport Develop Mass Sport? *Scandinavian Sport Studies Forum*, *1*, 51–68. www.sportstudies.org

Haut, J., & Gaum, C. (2017). Does elite success trigger mass participation in table tennis? An analysis of trickle-down effects in Germany, France and Austria. *Journal of Sports Sciences*, *00*(00), 1–8. https://doi.org/10.1080/02640414.2017.1361895

Haut, J., Grix, J., Brannagan, P. M., & Hilvoorde, I. van. (2017). International prestige through 'sporting success': an evaluation of the evidence. *European Journal for Sport and Society*, *14*(4), 311–326. https://doi.org/10.1080/16138171.2017.1421502

Hindson, A., Gidlow, B., & Peebles, C. (1994). The "trickle down effect" of top level sport: myth or reality? A case study of the Olympics. *Australian Journal of Leisure and Recreation*, *4*(1). https://www.srknowledge.org.nz/research-completed/the-trickle-down-effect-of-top-level-sport-myth-or-reality-a-case-study-of-the-olympics/

Hogan, K., & Norton, K. (2000). The “Price” of Olympic Gold. *Journal of Science and the Medicine in Sport*, *3*(2), 203–218.

Humphreyes, B. R., Mcleod, L., & Ruseski, J. E. (2013). Physical Activity and Health Out Comes Evidence from Canada. *Health Economics*, *23*, 33–54. https://doi.org/10.1002/hec

Jakobsen, J., Solberg, H. A., Halvorsen, T., & Jakobsen, T. G. (2013). Fool’s gold: Major sport events and foreign direct investment. *International Journal of Sport Policy*, *5*(3), 363–380. https://doi.org/10.1080/19406940.2012.717099

Jylhä, M., Guralnik, J. M., Ferrucci, L., Jokela, J., & Heikkinen, E. (1998). Is self-rated health comparable across cultures and genders? *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, *53*(3), 144–152. https://doi.org/10.1093/geronb/53B.3.S144

Kaplan, R. M., Bush, J. W., & Berry, C. C. (1976). Health status: types of validity and the index of well-being. *Health Services Research*, *11*(4), 478–507. http://www.ncbi.nlm.nih.gov/pubmed/1030700%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC1071947

Kavetsos, G., & Szymanski, S. (2010). National well-being and international sports events. *Journal of Economic Psychology*, *31*(2), 158–171. https://doi.org/10.1016/j.joep.2009.11.005

Kokolakakis, T., & Lera-Lopez, F. (2020). Sport promotion through sport mega-events. An analysis for types of olympic sports in London 2012. *International Journal of Environmental Research and Public Health*, *17*(17), 1–17. https://doi.org/10.3390/ijerph17176193

Kokolakakis, T., Lera-Lopez, F., & Ramchandani, G. (2019). Did London 2012 deliver a sports participation legacy? *Sport Management Review*, *22*(2), 276–287. https://doi.org/10.1016/j.smr.2018.04.004

Liang, L. L., & Tussing, A. D. (2019). The cyclicality of government health expenditure and its effects on population health. *Health Policy*, *123*(1), 96–103.

https://doi.org/10.1016/j.healthpol.2018.11.004

Marques, A., Peralta, M., Gouveia, É. R., Martins, J., Sarmento, H., & Gomez-Baya, D. (2019). Leisure-time physical activity is negatively associated with depression symptoms independently of the socioeconomic status. *European Journal of Sport Science*, *0*(0), 1–9. https://doi.org/10.1080/17461391.2019.1701716

McCartney, G., Thomas, S., Thomson, H., Scott, J., Hamilton, V., Hanlon, P., Morrison, D. S., & Bond, L. (2010). The health and socioeconomic impacts of major multi-sport events: Systematic review (1978-2008). *BMJ (Online)*, *340*(7758), 1229. https://doi.org/10.1136/bmj.c2369

Mehmetoglu, M., & Jakobsen, T. G. (2017). *Applied Statistics Using Stata: A Guide for the Social Sciences*. Sage Publications.

Meir, H. E., & Mutz, M. (2016). Sport-Related National Pride in East and West Germany, 1992-2008: Persistent Differences or Trends Toward Convergence? *SAGE Open*, *51*(3), 332–348. https://doi.org/10.1177/1012690214526400

O'Brien, K. S., Ferris, J., Greenlees, I., Jowett, S., Rhind, D., Cook, P. A., & Kypri, K. (2014). Alcohol industry sponsorship and hazardous drinking in UK university students who play sport. *Addiction (Abingdon, England)*, *109*(10), 1647–1654. https://doi.org/10.1111/add.12604

Peeters, T., Matheson, V., & Szymanski, S. (2014). Tourism and the 2010 World Cup: Lessons for developing countries. *Journal of African Economies*, *23*(2), 290–320. https://doi.org/10.1093/jae/ejt031

Pfister, G., Mintert, S.-M., & Lenneis, V. (2018). 'One Is Not Born, But Rather Becomes a Fan': The Socialization of Female Football Fans—A Case Study in Denmark. In G. Pfister & S. Pobe (Eds.), *Female Football Players and Fans. Football Research in an Enlarged Europe* (pp. 211–240). Palgrave Macmillan. https://doi.org/10.1057/978-1-137-59025-1_10

Piggin, J., Souza, D. L., Furtado, S., Milanez, M., Cunha, G., Louzada, B. H., Graeff, B., & Tlili, H. (2019). Do the Olympic Games promote dietary health for spectators? An interdisciplinary study of health promotion through sport. *European Sport Management Quarterly*, *19*(4), 481–501. https://doi.org/10.1080/16184742.2018.1562484

Potwarka, L. R., & Wicker, P. (2021). Conditions under Which Trickle-Down Effects Occur : A Realist Synthesis Approach. *Sustainability*, 1–17. https://doi.org/https://doi.org/10.3390/su13010069

Pyun, H., Kim, J., Schlesinger, T., & Matto, L. (2020). Positive Externalities from Professional Football Clubs in the Metropolitan Rhine-Ruhr, Germany: Trickle-Down Effects Associated with Promotion and Relegation. *Sustainability*, *12*(20), 8638. https://doi.org/10.3390/su12208638

Quaglio, G. L., Karapiperis, T., Van Woensel, L., Arnold, E. ., & McDaid, D. (2013). Austerity and health in Europe. *Health Policy*, *113*(1–2), 13–19. https://doi.org/10.1016/j.healthpol.2013.09.005

Ross, C., & Wu, C.-L. (1995). The Links Between Education and Health. *American Sociological Review*, *60*(5), 719–745.

Seippel, Ø. (2017). Sports and Nationalism in a Globalized World. *International Journal of Sociology*, *47*(1), 43–61. https://doi.org/10.1080/00207659.2017.1264835

Silva, A., Monteiro, D., & Sobreiro, P. (2019). Effects of sports participation and the perceived value of elite sport on subjective well-being. *Sport in Society*, *0*(0), 1–22. https://doi.org/10.1080/17430437.2019.1613376

Steenbergen, M. R., & Jones, B. S. (2002). Modeling Multilevel Data Structures. *American Journal of Political Science*, *46*(1), 218. https://doi.org/10.2307/3088424

Storm, R. K., & Holum, M. L. (2021). Does local sporting success affect sport participation? An examination of Danish professional soccer’s effect on club membership. *European Sport Management Quarterly*, *21*(2), 237–256. https://doi.org/10.1080/16184742.2020.1739726

Storm, R. K., & Jakobsen, T. G. (2019). National pride, sporting success and event hosting: an analysis of intangible effects related to major athletic tournaments. *International Journal of Sport Policy and Politics*, *00*(00), 1–16. https://doi.org/10.1080/19406940.2019.1646303

Storm, R. K., Jakobsen, T. G., & Nielsen, C. G. (2020). The impact of Formula 1 on regional economies in Europe. *Regional Studies*, *54*(6), 827–837.

https://doi.org/10.1080/00343404.2019.1648787

Storm, R. K., Nielsen, C. G., & Jakobsen, T. G. (2018). Can international elite sport success trickle down to mass sport participation? Evidence from Danish team handball. *European Journal of Sport Science*, *18*(8), 1139–1150. https://doi.org/10.1080/17461391.2018.1489000

Tomlinson, A. (2005). The commercialization of the Olympics: Cities, corporations and the Olympic commodity. In K. Young & K. B. Wamsley (Eds.), *Global Olympics: Historical and sociological studies of the modern Games* (Issue January, pp. 179–200). Elsevier. http://alantomlinson.typepad.com/alan_tomlinson/files/Tomlinson_YoungBook.pdf

Tomlinson, A. (2014). Olympic legacies: Recurrent rhetoric and harsh realities. *Contemporary Social Science*, *9*(2), 137–158. https://doi.org/10.1080/21582041.2014.912792

Uhm, J. P., Lee, H. W., & Han, J. W. (2020). Creating sense of presence in a virtual reality experience: Impact on neurophysiological arousal and attitude towards a winter sport. *Sport Management Review, 23*(4), 588–600. https://doi.org/10.1016/j.smr.2019.10.003

van Bottenburg, M. (2002). Sport for All and elite sport: do they benefit one another? In *IX World Sport for All Congress* (Issue October). https://dspace.library.uu.nl/handle/1874/309609

Veal, A. J., Toohey, K., & Frawley, S. (2012). The sport participation legacy of the Sydney 2000 Olympic Games and other international sporting events hosted in Australia. *Journal of Policy Research in Tourism, Leisure and Events*, *4*(2), 155–184. https://doi.org/10.1080/19407963.2012.662619

Walton, H., Longo, A., & Dawson, P. (2008). A contingent valuation of the 2012 London Olympic Games: A regional perspective. *Journal of Sports Economics*, *9*(3), 304–317. https://doi.org/10.1177/1527002507308769

Ward, T. (2009). Sport and national identity. *Soccer and Society*, *10*(5), 518–531. https://doi.org/10.1080/14660970902955455

Weed, M., Coren, E., Fiore, J., Wellard, I., Chatziefstathiou, D., Mansfield, L., & Dowse, S.

(2015). The Olympic Games and raising sport participation: a systematic review of evidence and an interrogation of policy for a demonstration effect. *European Sport Management Quarterly*, *15*(2), 195–226. https://doi.org/10.1080/16184742.2014.998695

Weimar, D., Wicker, P., & Prinz, J. (2015). Membership in Nonprofit Sport Clubs: A Dynamic Panel Analysis of External Organizational Factors. *Nonprofit and Voluntary Sector Quarterly*, *44*(3), 417–436. https://doi.org/10.1177/0899764014548425

Wicker, P., & Downward, P. (2017). Exploring spillovers between government quality and individual health production through sport and physical activity. *European Sport Management Quarterly*, *17*(2), 244–264. https://doi.org/10.1080/16184742.2016.1257038

Wicker, P., & Downward, P. (2019). Positive and Negative Externalities of Sport Events: From Well-Being, Pride, and Social Capital to Traffic and Crime. In P. Downward, B. Frick, B. R. Humphreys, T. Pawlowski, J. E. Roseski, & B. P. Soebbing (Eds.), *The SAGE Handbook of Sports Economics* (pp. 428–438). SAGE Publications Inc.

Wicker, P., & Downward, P. (2020). The Causal Effect of Voluntary Roles in Sport on Subjective Well-Being in European Countries. *Journal of Sport Management*, *34*(4), 303–315. https://doi.org/10.1123/jsm.2019-0159

Wicker, P., Hallmann, K., Breuer, C., & Feiler, S. (2012). The value of Olympic success and the intangible effects of sport events – a contingent valuation approach in Germany. *European Sport Management Quarterly*, *12*(4), 337–355. https://doi.org/10.1080/16184742.2012.693117

Wicker, P., Kiefer, S., & Dilger, A. (2015). The Value of Sporting Success to Germans - Comparing the 2012 UEFA Championships with the 2012 Olympics. *Journal of Business Economics*, *85*(2), 897–919. https://doi.org/10.1007/s11573-014-0761-1

World Health Organization. (2018). *Global Recommendations on Physical Activity and Health*. World Health Organisation. https://apps.who.int/iris/bitstream/handle/10665/44399/9789241599979_eng.pdf;jsessionid=634E0E2D8B1411BF7E7DFD761F7FFC7D?sequence=1

World Health Organization. (2019). *Basic Documents*. World Health Organisation.

Zajacova, A., Huzurbazar, S., & Todd, M. (2017). Gender and the structure of self-rated health across the adult life span. *Social Science and Medicine, 187*, 58–66. https://doi.org/10.1016/j.socscimed.2017.06.019

Zerhouni, O., Bègue, L., & O'Brien, K. S. (2019). How alcohol advertising and sponsorship works: Effects through indirect measures. *Drug and Alcohol Review*, *38*(4), 391–398. https://doi.org/10.1111/dar.12929

Zimbalist, A. (2015). *Circus Maximus*. The Brookings Institution.

Zimbalist, A. (2017). The Economic Legacy of Rio. In A. Zimbalist (Ed.), *Rio 2016: Olympic Myths, Hard Realities* (pp. 207–238). Brookings Institution Press. http://www.jstor.org/stable/10.7864/j.ctt1vjqnp9

Appendix

Table A1: *Index scores*

Event	**1st**	**2nd**	**3rd**	**4th**
Summer Olympics	4	3	2	–
Winter Olympics	3	2	1	–
FIFA World Cup	6	3	2	1
UEFA Eur. Champion.	4	2	1	0.5
Cricket World Cup	3	1	–	–
Commonwealth Games.	2	–	–	–
Rugby World Cup	4	2	1	0.5
Rugby League WC	2	1	0.5	0.25

Table A2: *Tournaments included in the analysis*

Summer Olympics	2004, 2008, 2012, 2016
Winter Olympics	2002, 2006, 2010, 2014, 2018
FIFA World Cup	2002, 2006, 2010, 2014, 2018
UEFA European Championship	2004, 2008, 2012, 2016
Cricket World Cup	2003, 2007, 2011, 2015
Commonwealth Games	2002, 2006, 2010, 2014, 2018
Rugby World Cup	2003, 2007, 2011, 2015
Rugby League World Cup	2008, 2013, 2017